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Coconino National Forest Land and Resource Management Plan

Final Environmental Impact Statement

Volume IIb. Chapter 3: Wildlife, Fish, and Plants; Glossary; and References

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Final Environmental Impact Statement for the Coconino National Forest Land and Resource Management Plan

Volume IIb. Chapter 3 (continued): Wildlife, Fish, and Plants; Glossary; and References

Coconino, Gila, and Yavapai Counties, Arizona

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Abstract: To comply with the National Forest Management Act and address changes that have occurred over the past 30 years, the Coconino National Forest proposes to revise the current land management plan (1987 plan). This programmatic final environmental impact statement (FEIS) documents analysis of the impacts of four alternatives developed for programmatic management of the 1.8 million acres administered by the Coconino National Forest. The analysis displays the anticipated progress toward the desired conditions as well as the potential environmental and social consequences of implementing each alternative. Alternative A is the no-action alternative, which is the1987 forest plan, as amended. Alternative B (modified) is the preferred alternative and is reflected in the accompanying Final Land and Resource Management Plan for the Coconino National Forest. This alternative addresses new information and concerns received since the 1987 forest plan was published, and it meets objectives of Federal laws, regulations, and policies. Alternative C considers increases in the amount of wilderness and special areas, as well as increased opportunities for semi-primitive recreation. Alternative D considers fewer restrictions on human access, use, and infrastructure.

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Fine Filter: Sensitive and Other Planning Species

This section discloses and compares the effects of four different alternatives on species on the Southwestern Region Sensitive species list and on other planning species, many of which are endemic or have restricted distributions. This section assesses how species viability would be maintained under each alternative. Detailed information for the habitats is located in volume I of this FEIS by resource, in the Coarse Filter: Habitat section above, and in the respective specialist reports.

Agave Species

Phillip's agave, Page Springs agave, Sacred Mountain agave, Tonto Basin agave

These species are grouped together due to the similarity of these species (and their habitats) and their affinities for archaeological sites, which is the defining feature for the presence of these species. All four are Forest Service Sensitive species and all are pre-Columbian domesticates. The Desert Communities, Semi-desert Grassland, and Pinyon Juniper Evergreen Shrub ERU habitats are more fully evaluated in the Coarse Filter: Habitat section.

Affected Environment

Distribution

The known distribution of Phillip's agave is central and northern Arizona, and it may have originated in the foothills of Sonora and/or Chihuahua, Mexico. Phillip's agave grows on gravelly, stony basalt slopes, ridges, terraces and canyons.

Page Springs Agave is a narrow endemic, occurring at only a few sites near Page Springs and Loy Canyon where it is associated with archaeological sites and prehistoric field sites in Semi-desert Grasslands.

Sacred Mountain agave is endemic to central Arizona and occurs at several locations in the Verde Valley.

The known distribution of Tonto Basin agave is central Arizona. It usually occurs on the tops of benches, edges of slopes, and on gentle slopes overlooking major drainages and perennial streams in certain areas of the Verde Valley.

Habitat

The Phillip's and Tonto Basin agaves occur in or near archaeological sites in Desert Communities, Semi-desert Grassland, and Pinyon Juniper Evergreen Shrub ERUs.

The Page Springs agave occurs in or near archaeological sites in Semi-desert Grassland and Pinyon Juniper Evergreen Shrub ERUs.

The Sacred Mountain agave occurs in or near archaeological sites in Desert Communities and Semi-desert Grassland ERUs.

Risk Factors

Rarity is an inherent threat to these species due to their restricted distribution. They are vulnerable to perturbations in the environments such as ground-disturbing activities because of their small population sizes. Actions that compromise site stability and integrity of associated archaeology sites may also compromise these unique plants if they are present on the sites. Theft of plant parts or entire plants may also occur. The uniqueness of these species make them desirable to collectors.

Environmental Consequences

Table 76 summarizes the viability analyses for Phillip's, Tonto Basin, Page Springs, and Sacred Mountain agaves. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species' viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 76. Analysis summary for agave species

Species, status, and F Rank	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Condition and habitat trend relative to desired conditions	**Likelihood species is limited**	**Condition and habitat trend relative to desired conditions**	**Likelihood species is limited**
Phillip's agave, Tonto Basin agave (Both Sensitive) F Rank = F1*	Archaeological sites in SDG	Poor, away	VH	Poor, slightly toward	VH
	Archaeological sites in PJES	Fair, away	M-H	Fair, away	M-H
	Archaeological sites in DC	Poor, away	VH	Poor, away	VH
Page Springs agave (Sensitive) F Rank = F1*	Archaeological sites SDG	Poor, away	VH	Poor, slightly toward	VH
	Archaeological sites in PJES	Fair, away	M-H	Fair, away	M-H

Species, status, and F Rank	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Condition and habitat trend relative to desired conditions	Likelihood species is limited	Condition and habitat trend relative to desired conditions	Likelihood species is limited
Sacred Mountain agave (Sensitive, Endemic) F Rank = F1*	Archaeological sites SDG	Poor, away	VH	Poor, slightly toward	VH
	Archaeological sites in DC	Poor, away	VH	Poor, away	VH
Management Effect		DC, SDG, and PJES = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat.

Common to All Alternatives

All of these agave species are considered to be rare and/or at-risk because there are few populations known and they are vulnerable to stochastic events. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Alternative A

Table 76 shows that under alternative A, Desert Communities, Semi-desert Grassland, and Pinyon Juniper Evergreen Shrub would trend away from desired conditions. Desert Communities would remain in poor condition due to increased density of shrubs and understory species. Semi-desert Grassland would remain in poor condition due to continued increases in shrubs and trees and increased fragmentation from urbanization. Pinyon Juniper Evergreen Shrub would remain in fair condition, but because the fire return interval is also trending away, tree and shrub regeneration would increase. Increased density of trees, shrubs, and understory could increase competition with these agave species and facilitate a higher fire severity than these agaves had evolved with, thereby degrading agave habitat.

As shown in table 76, the likelihood that these agave species would be limited by their habitat on the forest is moderate-high to very high depending on the habitat. These likelihoods were derived by combining these agave species' F Ranks of F1 with the likelihood of habitat limitation variables for each ERU: Semi-desert Grassland (high), Desert Communities (high), and Pinyon Juniper Evergreen Shrub (low-moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Desert Communities, Semi-desert Grassland, and Pinyon Juniper Evergreen Shrub, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives. This is primarily because alternative A provides outdated direction for Desert Communities and for a large portion of Semi-desert Grassland (in the Verde Valley Management Area). This outdated direction emphasizes range and forage improvement rather than composition, structure, and natural processes as in the desired conditions. This alternative also emphasizes using methods such as soil scarification and broadcast seeding, which could facilitate the establishment of invasive plant species that compete with native species and can facilitate the spread of wildfire to which Desert Communities is not adapted.

A plan component in the Verde Valley Management Area that recommends review of soil potential for revegetation and erosion potential prior to treatment is positive, however, for areas containing the Verde Formation. Mitigation measures could be employed to avoid severe impairment of soil productivity. Another positive plan component in this same management area would improve conditions on prioritized watersheds in unsatisfactory condition in the Verde Valley Management Area. This could move degraded areas toward desired conditions, depending on the methods used.

Alternative A also does not distinguish between nor provide desired conditions for the three pinyon juniper types that differ in composition, structure, and processes. There is one broad vegetation category of Pinyon Juniper and plan direction varies by slope. Consequently, vegetation structure would not be equitably distributed across the landscape. As a result, Pinyon Juniper Evergreen Shrub’s unique composition and structure is not addressed in this alternative.

Alternative A contains no specific desired conditions for Desert Communities. About 87 percent of the ERU is included in the Verde Valley Management Area (MA 11) with the remaining percentage spread throughout nine management areas. The management emphasis for MA 11 is watershed condition, range management, wildlife habitat for upland game birds, and dispersed recreation (1987 Plan, page 166). The different types of grasslands differ in composition, structure, and processes and are not differentiated in alternative A. Vegetation quality is expected to trend away from desired conditions primarily due to the lack of plan objectives in this alternative, thus tree and shrub cover would continue to increase and understory would decrease in abundance and vigor. The different pinyon juniper types are differentiated on the basis of slope instead of composition, structure, and processes. Consequently, managers lack specific guidance for the ERUs that support these agaves. Alternative A also lacks guidance that would assist with controlling illegal collecting of agaves. Even though guidance for the habitats is outdated or has different emphasis, these species would still be addressed during site-specific projects because they are Southwestern Region sensitive species.

Alternative B (modified)

Table Table 76 summarizes and compares the analyses for Phillip's agave, Tonto Basin agave, Page Springs agave, and Sacred Mountain agave. This table shows that under alternative B (modified), Semi-desert Grassland would remain in poor condition, but would trend slightly toward desired conditions primarily due to plan objectives that would remove tree and shrub cover and create more open conditions. Pinyon Juniper Evergreen Shrub would remain in fair condition, but trend away from desired conditions because the plan objectives would be insufficient to outpace growth and reproduction in the ERU. Desert Communities would also remain in poor condition and would trend away from desired conditions primarily because shrub and understory growth is anticipated to continue.

As shown in table 76, the likelihood that these agave species would be limited by their habitat on the forest is moderate-high to very high depending on the habitat. These likelihoods were derived by combining these agave species' F Ranks of F1 with the likelihood of habitat limitation variables for each ERU: Semi-desert Grassland (high), Desert Communities (high), and Pinyon Juniper Evergreen Shrub (low-moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for the habitats associated with Phillip's agave, Tonto Basin agave, Page Springs agave, and Sacred Mountain agave. This means that plan components in alternatives B (modified), C, and D maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. This rating is due to these alternatives containing explicit and updated direction for Semi-desert Grassland and Desert Communities.

For Pinyon Juniper Evergreen Shrub, this rating is because these alternatives clearly distinguish between different Pinyon Juniper types on the forest and provides desired conditions, objectives and guidance that are specific to the each type. Management direction would promote properly functioning ecosystems that are resilient to natural disturbances and climate change; promote characteristic disturbances and reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby furthering sustainability and adaptability (FW-Eco-DC-1-4, FW-TerrERU-All-DC-2). ERU-specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-PJ-DC-5-9; G-1-3, 5). There is additional direction for this ERU within the wildland-urban interface. Within WUI, fire and vegetation management would favor low-intensity surface fires despite the historic fire regime that favors high-severity (and typically high-intensity) fires (FW-WUI-DC-8). This is intended to mitigate the risks to surrounding communities.

In contrast to alternative A, alternative B (modified) has language that better addresses species' specific threats and better provides for habitat for species with restricted ranges and distribution: i.e., rarity. Plan language in alternative B (modified) promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10).

The defining feature for these species is the close association with archaeological sites, particularly ancient fields. The desired conditions for Heritage Resources (FW-Hrtg-DC 1, 2 and 4) address protection, site integrity, and theft of heritage resources. These components also provide protection for the biological features on the sites including the agaves associated with them.

In contrast to alternative A, guidance in Wildlife, Fish, and Plants (FW-WFP-G-16) specifically applies to agaves by limiting the harvest of stalks to research and traditional tribal uses helping to preserve the fruits and seeds of agaves. The stalks of agaves are also important to unique invertebrates that are associated with them such as carpenter bees, which are native pollinators and contribute to ecosystem services. Alternative B (modified) includes a desired condition that addresses the presence of native invertebrates including pollinators (FW-Eco-DC-4). Preserving stalks of agaves and other suitable habitats for native insects will help preserve the habitats for pollinator insects.

Illegal collecting can be problematic for plants in general and has been noted in certain areas containing agaves and other desert plants. This can affect individuals of many species. Forestwide guidance in forest products in alternative B (modified) (FW-Fprod-DC-1 and 3, FW-Fprod-G-3 and 4) would help control illegal collecting. This guidance is not present in alternative A.

Alternative C

Alternative C has the same consequences as alternative B (modified).

Alternative D

Alternative D has the same consequences as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Phillip's agave, Tonto Basin agave, Page Springs agave, and Sacred Mountain agave, although individuals may be impacted by site-specific activities or uses or illegal activities such as damage to archaeological sites or plant collection. Consequently, none of the alternatives would lead to a trend toward Federal listing for Phillip's agave, Tonto Basin agave, Page Springs agave, and Sacred Mountain agave, which are Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A. Plan components for Desert Communities, Semi-desert Grasslands, and Pinyon Juniper Evergreen Shrub ERUs provide better protection for these habitats and updated plan language for at-risk and rare species.

Aquatic and Riparian Invertebrates

A caddisfly (Lepidostoma knulli), a caddisfly (Wormaldia planae), a mayfly (Moribaetis. mimbresaurus), Fossil springsnail, Arizona snaketail (a dragonfly), Persephone's darner (a dragonfly), and Redrock stonefly.

These species are grouped together because they share similar habitats and threats. These habitats (e.g., springs, streams, riparian forest types) are more fully evaluated in the Coarse Filter: Habitat section.

Affected Environment

L. knulli, W. planae, M. mimbresaurus, and Fossil springsnails are Forest Service sensitive species. The others are classified as other planning species. *L. knulli,* Arizona snaketail, and Persephone's darner are endemic species. *W. planae, M. mimbresaurus,* and redrock stonefly are considered to have restricted distributions, and fossil springsnail is a narrowly endemic species.

Distribution

L. knulli is found in higher elevation, forested habitats in northern Arizona and is found on the Coconino NF along Oak Creek from Sedona upstream to Pumphouse Wash, 14.5 stream miles.

W. planae is present on the Coconino NF in the Fossil Creek-Verde River 5th HUC watershed (10.7 potential perennial stream miles). It is typically found only in the Fossil Creek and Wet Beaver Creek.

M. mimbresaurus is the only species in its genus north of Mexico. It has only been gathered twice (2007 and 2014) from a pool at the confluence of Pumphouse Wash in Oak Creek (Stevens and Ledbetter 2014); it has also been collected from a spring next to Oak Creek (Spring Stewardship Institute 2016).

Fossil springsnails are present on the Coconino NF in the Fossil Creek-Verde River 5th HUC watershed (10.7 potential perennial stream miles). It is endemic to only two spring complexes, one near the town of Strawberry in Gila County, and the second being Fossil Springs in Yavapai County, on the Coconino NF (Stevens and Ledbetter 2014).

Arizona snaketail is endemic to the Mogollon Rim in Arizona and western New Mexico and is typically found in elevations ranging from 4,900 to 8,200 feet. It has been found along Oak Creek on the forest.

Persephone's darner is endemic to northeastern Mexico and the southwestern United States (Stevens and Ledbetter 2014) and is typically found in elevations ranging from 1,800 to 7,500 feet. It has been found along Oak Creek on the forest.

Redrock stonefly is known from Wet Beaver Creek on the forest (Smith 2015). It has been found in and along partially shaded desert and mid-elevation streams within and near lower Oak Creek, Page Springs, and upper-middle Tonto Creek in Arizona on lands of other ownership.

Habitat

L. knulli, M. mimbresaurus, Fossil springsnails, Arizona snaketail, Persephone's darner, and Redrock stonefly are all associated with springs, perennial streams, Cottonwood Willow Riparian Forest, and Mixed Broadleaf Deciduous Riparian Forest.

M. mimbresaurus is associated with perennial and intermittent streams, springs, Cottonwood Willow Riparian Forest, and Mixed Broadleaf Deciduous Riparian Forest.

W. planae are associated with perennial streams, Cottonwood Willow Riparian Forest, and Mixed Broadleaf Deciduous Riparian Forest.

Risk Factors

Rarity is a threat to all of these species because they are only known from a few locations.

Environmental Consequences

Table 77 summarizes the viability analyses for seven aquatic and riparian invertebrate species: *L. knulli*, *M. mimbresaurus*, *W. planae*, fossil springsnail, Arizona snaketail, Persephone's darner, and Redrock stonefly. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 77. Analysis summary for aquatic and riparian invertebrates

Species, status, and F Rank	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Condition and habitat trend relative to desired conditions	**Likelihood species is limited**	**Condition and habitat trend relative to desired conditions**	**Likelihood species is limited**
A caddisfly (*L. knulli*), Fossil springsnail (Sensitive)	Springs	Fair**, slowly toward	H	Fair**, slowly toward	H
Arizona snaketail, Persephone's darner,	Perennial streams	Poor, static	H	Poor, toward	H
Redrock stonefly (Other)	CWRF	Fair, slowly toward	H	Good, slowly toward	M-H
F Rank = F2*	MBDRF	Good, static to slowly toward	M-H	Good, slowly toward	M-H
A caddisfly (*W. planae*) (Sensitive)	Perennial streams	Poor, static	H	Poor, toward	H
F Rank = F?*	CWRF	Fair, slowly toward	H	Good, slowly toward	M
	MBDRF	Good, static to slowly toward	M	Good, slowly toward	M

Species, status, and F Rank	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Condition and habitat trend relative to desired conditions	Likelihood species is limited	Condition and habitat trend relative to desired conditions	Likelihood species is limited
A mayfly (*M. mimbresaurus*)	Springs	Fair**, slowly toward	H	Fair**, slowly toward	H
(Sensitive)	Perennial streams	Poor, static	H	Poor, toward	H
F Rank = F2*	Intermittent streams	Poor, static	Accessible: H Inaccessible: M_H	Poor, slowly toward	Accessible: H Inaccessible: M_H
	CWRF	Fair, slowly toward	H	Good, slowly toward	M-H
	MBDRF	Good, static to slowly toward	M-H	Good, slowly toward	M-H
Management Effect		Springs and perennial streams = 4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Intermittent streams, CWRF, MBDRF = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F2 = Rare on the forest within its habitat - occupies a small portion of its habitat. F? = Present on the forest but abundance information is insufficient to develop risk.

**For analysis, springs were considered in fair condition. However, some springs could be in poor or good condition depending on accessibility, protection, or degree of development.

Common to All Alternatives

All of these species are considered to be rare and/or at-risk because there are few populations known and they are vulnerable to stochastic events. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Plan components in all alternatives have plan objectives or management emphasis to improve or restore riparian ecosystems, direction to use best management practices, and would employ either filter strips (alternative A) or aquatic management zones (remaining alternatives) to protect water quality and to avoid detrimental changes in water temperature, chemical composition, sediment deposits, or blockages. These plan components would maintain or improve water conditions, habitat for aquatic and riparian species, and connected downstream resources. See p. 23, 71, 72, 72-1, 172-177; FW-Rip-Wtlnds-O-1, FW-Rip-Spr-O-1, FW-Rip-RipType-O-1, and FW-WFP-O-4, FW-Rip-All-G-3, FW-Rip-Strm-G-2, FW-Water-G-4, and FW-BioPhys-Geo-G-8.

Instream flow water rights would be maintained and procured at similar levels under all alternatives (1987 Plan, pages 74 and 206 and FW-Water-G-3). Procurement of instream flow water rights would improve the extent of uninterrupted streamflows across NFS lands, thereby providing greater aquatic and riparian habitat continuity and resilience.

All alternatives provide language for monitoring, including the use of aquatic macroinvertebrates as monitoring indicators for condition of waterways and riparian areas. Water quality monitoring using the Arizona Department of Environmental Quality standards is also supported under all alternatives.

Alternative A

Table 77 shows that under alternative A, springs would remain in fair condition with a trend slowly toward desired conditions. Accessible, unprotected springs would remain in poor condition, while springs that are inaccessible, protected, or undeveloped would remain in good condition.

Intermittent streamcourses would remain in poor condition with a static trend relative to desired conditions mainly due to roads crossing the drainages and contributing sediment to connected waters. Perennial streams would remain in poor condition with a static trend in relation to desired conditions. This condition is generally due to most streams having invasive and non-native animal species that are outside of their historic variability.

Cottonwood Willow Riparian Forest would remain in fair condition and Mixed Broadleaf Deciduous Riparian Forest would remain in good condition. All of these riparian forest types would mostly have a static trend or slow trend toward desired conditions. In Cottonwood Willow, some portions of the Verde River, Dry Beaver Creek, and Spring Creek, would be static due to high recreation or private land. In Mixed Broadleaf Deciduous Riparian Forest, static trends are associated with the Oak Creek 5th code and West Clear Creek 5th code HUCs. Trends that are slowly toward desired conditions are associated with the Beaver Creek and the Fossil Creek-Lower Verde River 5th code HUCs except portions of Fossil Creek have a trend away from desired conditions where recreation use is high.

As shown in table 77, the likelihood that these aquatic and riparian invertebrate species would be limited by their habitat on the forest is moderate to high depending on the habitat. These likelihoods were derived by combining these species' F Ranks of F2 or F? with the likelihood of habitat limitation variables for each habitat: springs (high), perennial streamcourses (high), intermittent streamcourses (high if accessible, moderate if inaccessible), Cottonwood Willow Riparian Forest (high), and Mixed Broadleaf Deciduous Riparian Forest (moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 4 for springs and perennial streams, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. For springs, desired conditions and guidelines are largely lacking therefore managers do not have clear direction when restoring or protecting springs or to maintain or restore toward desired condition of properly functioning, resilient springs and spring riparian areas (USDA Forest Service 2016b). For perennial streams, language is largely lacking for invasive and non-native aquatic species that were not present historically. These species can alter the composition, structure and processes of stream ecosystems. As described in the Coarse Filter: Habitat section, the threat of dispersed recreation to riparian resources is not addressed forestwide in alternative A. Special areas such as the Verde Wild and Scenic River and wilderness, and the management areas within Flagstaff/Lake Mary Ecosystem Area and the Sedona-Oak Creek Planning Area most specifically address the conflicts and strategies to resolve resource damage in riparian areas. This direction mainly addresses dispersed recreations impact to specific riparian areas where there have been past conflicts and resource damage, but it provides very limited direction when areas that previously received low use are “discovered” and see unexpected increases in recreation, such as Fossil Creek. As a result, alternative A addresses this threat sporadically compared with alternatives B (modified), C, and D, but it does mitigate some of the areas where the conflict is most pronounced.

The management effect is classified as a 3 for Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and intermittent streamcourses which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives.

Alternative A would maintain or improve riparian forests and intermittent streamcourses because it has a focus on improving riparian areas in any condition, preventing damage to riparian vegetation, stream banks, and channels, and restoring degraded riparian areas to good condition as soon as possible (1987 Plan, pages 65-2, 65-8, 172, and 206-8). Other protective language includes the following: Only beneficial new special uses are allowed in riparian areas and exceptions such as utility line or roads crossing stream courses are designed to minimize the extent and magnitude of impact to riparian (1987 Plan, page 177). Aggressive fire suppression may be used to prevent resource damage utilizing methods that minimize long-term adverse impacts to riparian habitats (1987 Plan, page 177). In addition, acquisition of riparian areas through land exchange is a high priority (1987 Plan, pages 177 and 185). The plan would manage commercial uses, and recreation in some areas, to protect riparian values (1987 Plan, pages 206-10, 22, 26, and 39).

This alternative has the least potential for improvement to riparian condition compared to the other alternatives because desired conditions for specific riparian forest types are lacking and there is not a focus on functioning-at-risk and non-functional riparian areas (USDA Forest Service 2016b).

Alternative B (modified)

Table 77 shows that under alternative B (modified) springs would remain in fair condition with a trend slowly toward desired conditions, like alternative A. Perennial streams would remain in poor condition but the trend would be toward desired conditions because of updated plan components (see management effect discussion below).

Cottonwood Willow Riparian Forest would improve to good condition and trend slowly toward desired conditions except portions of the Verde River, Towel Creek, Spring Creek and Dry Beaver Creek would improve faster (i.e., have a trend toward desired conditions).

Mixed Broadleaf Deciduous Riparian Forest would remain in good condition and would slowly move toward desired conditions except portions of Fossil Creek and Wet Beaver Creek would remain static in areas of high recreation use. It would improve faster than alternative A in the Beaver Creek, Oak Creek, West Clear Creek, and Fossil Creek 5th code HUCs.

As shown in table 77, the likelihood that these aquatic and riparian invertebrate species would be limited by their habitat on the forest is moderate to high depending on the habitat. These likelihoods were derived by combining these species' F Ranks of F2 or F? with the likelihood of habitat limitation variables for each habitat: springs (high), perennial streamcourses (high), intermittent streamcourses (high if accessible, moderate if inaccessible), CWRF (moderate), and MBDRF (moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the coarse filter habitats associated with these aquatic and riparian species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For springs, this rating is because alternative B (modified) has desired conditions and guidelines to guide spring management on the forest (FW-Rip-Spr-DC-1, 2, 3, 4 and FW-Rip-Spr-G-1, 2, 3, 4) whereas these are largely absent in alternative A.

For perennial streams, this rating is based on language regarding mitigating the effects of roads and promoting connectivity within drainages and between streamcourses and upland habitats, (See FW-RdsFac-G-2, 5, 7 and 9 and the Connectivity topic in the Wildlife and Plants Topics and Issues section). Although there are three recommended wildernesses, only the Davey's recommended wilderness area connects to perennial water, Fossil Creek. Guidelines for recommended wilderness would lessen the effects of roads by restricting motorized use except for limited permitted and administrative use and promoting trails for mechanized and non-motorized use (SA-RWild-G-3, 5). This is beneficial for connected waters and habitat for these species because roads can alter natural water flow patterns and natural sediment levels.

More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3; Fw-Rip-Strm-G-2). Also, alternative B (modified) has a guideline that balances recreation activities, permitted uses, and management activities with soil function, riparian vegetation, and water quality at the stream reach scale (FW-Rip-RipType-G-3). This guideline would not apply to fine scale activities and facilities such as intermittent livestock crossing locations, water gaps, or other infrastructure used to manage impacts to riparian areas at a larger scale. This guideline is intended to protect riparian function, especially in areas of high recreation use such as Oak Creek, Beaver Creek, and Fossil Creek.

Alternative B (modified) has desired conditions that protect riparian resources including soil conditions and water quality while recognizing the demand for and need to properly manage the public's dispersed recreation opportunities. A forestwide desired condition for dispersed recreation supports managing dispersed recreation to avoid resource damage (FW-Rec-Disp-DC-3) Several guidelines about dispersed recreation would manage trails, camping, and recreation types to prevent further resource damage to riparian resources (FW-Rec-Disp-G-1 to 5).

Plan components in alternative B (modified) specify that livestock grazing maintains desired conditions of plant communities (FW-Graz-DC-2; FW-Graz-G-2). They also protect and minimize impacts to riparian areas by recommending that livestock use be restricted to the dormant season, recommending utilization levels on woody vegetation, maintenance of adequate vegetative cover to protect streambanks, and state that riparian areas are rarely negatively impacted by livestock (FW-Graz-G-7). This would maintain riparian structure, composition, and promote proper functioning. Guidelines are in place to reduce cattle concentrations and sedimentation into connected waters by specifying that range improvements should not interfere with riparian function and rare species, and further specifies a minimum distance of salts and supplements from riparian areas (FW-Graz-G-4 and 5).

Alternative B (modified) addresses uncharacteristic flooding by maintaining natural hydrographs through time and by promoting riparian forest composition and structure that would reduce the effects of flooding (FW-Rip-Strm-DC-4, FW-Rip-RipType-DC-2). For stream riparian areas, functional riparian areas and herbaceous vegetation provide protection from uncharacteristic wildfire and flooding disturbance, resiliency, and should filter sediment and protect water quality (FW-RIP-RipType-DC-2, 3, 4). This alternative also contains a guideline that protects riparian resources by recommending against issuing a lands and recreation special-use permit for activities proposed to occur within 200 feet of perennial streams, springs, or waters that contribute to or support sensitive resources, such as federally listed or Southwestern Region sensitive species (FW-SpecUse-G-3).

For Cottonwood Willow and Mixed Broadleaf Deciduous Riparian Forests, this rating is primarily because there are updated desired conditions and guidelines that support the composition, structure, and function of riparian forest types (FW-Rip-RipType-DC-1 to 6, FW-Rip-RipType-G-1 to 4). In addition, riparian functional condition would improve faster than alternative A, especially along the Verde River, Towel Creek, Spring Creek, and Dry Beaver Creek. Plan components manage for vegetation diversity and riparian function (FW-Rip-RipType-DC-1 and 2; FW-Water-G-2; FW-Rip-RipType-O-1). Plan components in the Wildlife, Fish and Plants section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1 and 3).

Unlike alternative A, alternative B (modified) specifically supports conditions for endemic, rare, or specialized species in springs. Alternative B (modified) also has language that better addresses species specific threats: i.e. rarity and invasive or non-native animals. Plan language in alternative B (modified) promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10).

Alternative B (modified) better addresses the threat of invasive species and disease than alternative A by supporting native species and addressing disease and invasive, non-native species forestwide (FW-WFP-DC-3, FW-Eco-DC-1, FW-Water-DC-6 and G-6, FW-Rip-Strm-G-1, FW-Rip-Spr-DC-2, FW-Rip-RipType-DC2, 6, and G-2, and FW-TerrERU-All-G-3). The plan components for invasive species can be applied to any non-native plant or animal on the forest. The forestwide desired conditions for invasive species (FW-Invas-DC-1 and 2) and guidelines (FW-Invas-G-1 through 3) apply to all organisms. Unlike alternative A, invasive species guidance is incorporated in many portions of this alternative. A forestwide desired condition states that non-native invasive plants and non-native or invasive aquatic organisms are not established or transported around these high use areas of the forest, which is particularly beneficial for several of these species because they are adjacent to developed campgrounds (FW-Rec-Dev-DC-9). A forestwide guideline provides guidance for controlling invasive species at these sites before they become established and widespread (FW-Rec-Dev-G-2).

Alternative C

Alternative C has the same effects as alternative B (modified).

Alternative D

Alternative D has the same effects as alternative B (modified).

Findings

Considering cumulative effects for wildlife and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of *L. knulli, M. mimbresaurus*, *W. planae*, Fossil springsnail, Arizona snaketail, Persephone's darner, and Redrock stonefly, although individuals may be impacted by management activities or permitted uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for *L. knulli, M. mimbresaurus*, *W. planae*, and Fossil springsnail, which are Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A particularly because these alternatives have updated language for at-risk species, especially for species like these with limited ranges. Due to the lack of specificity of plan language for endemic or restricted distribution species, springs, and the different riparian forest types, continued implementation of alternative A would provide for lower viability for these species on the forest compared to the other alternatives.

Cliff and Cave-dwelling Wildlife

American peregrine falcons, Pale Townsend's big-eared bat, and spotted bat.

These species are grouped together because they share similar habitats. All three species are classified as Southwestern Region Forest Service sensitive species.

Affected Environment

Distribution

Peregrines use a wide range of elevations and habitats. There are a total of 28 known nesting pairs of peregrine falcons that occur on the Coconino, some of which overlap with other forests or state parks. In addition to being found in greater numbers than in the 1950s and 1960s, Arizona's peregrines are being found in areas that formerly would have been considered marginal. This suggests that populations may have reached levels saturating the optimal habitat available, and new breeding pairs are forced to breed in sub-optimal areas (Arizona Game and Fish Department 2002).

Pale Townsend's big-eared bats occur throughout the west in a wide variety of habitats and elevations. They produce one young per year and maternity colonies range in size from a few individuals to several hundred individuals. They may migrate locally along an altitudinal gradient. Winter hibernating colonies may be of mixed gender and of varying sizes. They forage over large distances. They have been found in caves, sinkholes, and fissures on and near the forest.

Spotted bats occur throughout the West in a wide variety of habitats and elevations. Broadly distributed, spotted bats are rarely common but may be locally abundant in some areas, such as the Arizona/Utah border. Winter range and hibernacula are unknown for most of its range.

Habitat

The essential habitat for peregrine falcon includes rock cliffs for nesting, for vantage points to look for prey, and a foraging area with sufficient abundance of prey. Suitable nesting sites on rock cliffs have a mean height of 200 to 300 feet, often in canyons.

Pale Townsend's big-eared bats and spotted bats: These species roost primarily in cliffs and caves. Spotted bats roost as individuals or in small groups in cracks, crevices, and caves, usually high in cliffs.

Risk Factors

Peregrines: Individual breeding pairs and young may be impacted by disturbance during the breeding season from human activities such as rock climbing, recreational shooting, and overflights.

Pale Townsend's big-eared bats and spotted bats: The primary risk factor for both species is disturbance. An additional risk factor for Pale Townsend's big-eared bats is disease. Townsend's are very sensitive to human disturbance and may abandon roost sites after human visitation. Recreational rock climbing could cause roost disturbance for spotted bats in some areas, should this species roost on the forest. Pale Townsend's big-eared bats have tested positive for white-nose syndrome disease, but no diagnostic signs have been documented.

Environmental Consequences

The Wildlife and Plant Issues and Topics section has more detail about Non-Native or Invasive Species, and Motor Vehicle Disturbance and Disturbance in General.

Table 78 summarizes the viability analyses for American peregrine falcon, Pale Townsend's big-eared bat, and spotted bat. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 78. Analysis summary for cliff and cave-dwelling wildlife

Species, status, and F Rank	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Condition and habitat trend relative to desired conditions	Likelihood species is limited	Condition and habitat trend relative to desired conditions	Likelihood species is limited
Peregrine falcon (Sensitive) F Rank = F4*	Cliffs	Good, static	L	Good, static	L
Pale Townsend's big-eared bat (Sensitive) F Rank = F3*	Cliffs	Good, static	L	Good, static	L
	Caves	Good, static	L	Good, static	L
Spotted bat (Sensitive) F Rank= FN*	Cliffs	Good, static	L	Good, static	L
	Caves	Good, static	L	Good, static	L
Management effects		Cliffs = 4: There is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Caves = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		Management Effect = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for **most** habitat and habitat element occurrences in the plan area.	

*F4 = Common on the forest within its habitat. *F3=Uncommon on the forest within its habitat. *FN = Occurs on the forest, but no breeding population is documented on the forest.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

All alternatives have seasonal closures in habitat for American peregrine falcons, spotted bats, and Pale Townsend's big-eared bats, which would provide habitat with reduced disturbance from motorized activities. This would be beneficial for reproduction and survival. The seasonal closures are Pine Grove, Rattlesnake, and Woody Ridge (1987 Plan, pages 59, 206-114, Off-Road Driving Management Plan (map) for Land and Resource Management Planning (Revised May 1991; FW-Rec-Disp-G-6, MA-PineBelt-DC- 5,6,7,8, MA-LkMary-DC-4,MA-PineBelt-S-1, 2, 3, 4, and MA-LkMary-S-1).

All alternatives have guidelines that would protect the habitat for all three of these species in the vicinity of Walnut Canyon. These would be beneficial for the survival and reproduction of these species and would benefit the habitat for their prey species. These guidelines would protect the natural and cultural resources in the urban/wildland interface and the lands surrounding the (Walnut Canyon) National Monument. See 1987 Plan pages 206-109, MA-Walnut-G-1.

All alternatives would protect caves and areas immediately adjacent from unnatural disturbances such as seismic disturbances and drilling. All alternatives would evaluate or utilize a 300-foot buffer around caves to protect cave and karst resources and ecology, and visitor impacts would be managed to maintain the values of significant caves. Collectively these plan components would maintain the microclimate, airflow, chemical, physical, and biological conditions within the cave necessary for bat roosting, overwintering, reproduction and survival (1987 Plan, page 51-2, FW-BioPhys-Geo-G-2, 3, 4, and S-1).

Alternative A

Table 78 shows that under alternative A, cliffs and caves would remain in good condition and have a static trend with regard to desired conditions. The condition and trend for caves is based on an assumption that any cave used by these species would be rarely visited, and therefore, in good condition and likely to remain in that condition.

As shown in table 78, the likelihood that habitat on the forest would be a limiting factor for these cliff and cave-dwelling species is low. This likelihood was derived by combining these species' F Ranks of F3, F4, FN with the likelihood of habitat limitation variable: cliffs (low) and caves (low assuming inaccessible, rarely visited, resources in good condition) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for caves, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives. The management effect is classified as a 4 for cliffs, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.

Alternative A lacks explicit plan components for cliffs, nesting, and roosting habitat for these species. Consequently, alternative A contributes less to the viability of these species than the other alternatives.

Alternative A contains plan language beneficial for peregrine falcons that could also be beneficial for the other cliff-dwelling species in locations where they share habitat with peregrine falcons.

It includes plan language in the Sedona/Oak Creek Ecosystem Area to work with air tour companies and rock climbers to eliminate disturbing activities near occupied eyries during the peregrine falcon breeding season (March 1 to August 31); and guidelines for specific buffers depending on the disturbance (including smoke from fires) (1987 Plan, pages 206-11 through 13). There is similar guidance in the Flagstaff-Lake Mary Ecosystem Area (page 206-67, 116) and forestwide direction to reduce disturbance to nesting peregrines on page 64-1.

Particularly beneficial plan components for cave-dwelling species include conserving wildlife habitat provided by caves; preventing contamination of water draining into, issue from or are contained within caves, and protecting cave resources (1987 Plan, pages 22, 51-2). Caves used or recently used by bat populations would be managed to maintain or enhance these populations 1987 Plan, page 51-1). In addition, alternative A has standards and guidelines to examine activities near or within a cave areas for potential impacts to caves and karst features including adding nutrients or other chemicals (including pesticides that could impact bats or their prey) (1987 Plan, page 51-2).

Alternative B (modified)

Table 78 shows that under alternative B (modified), cliffs and caves would remain in good condition and have a static trend with regard to desired conditions, the same as alternative A. The condition and trend for caves is based on an assumption that any cave used by these species would be rarely visited, and therefore, in good condition and likely to remain in that condition.

As shown in table 78, the likelihood that habitat on the forest would be a limiting factor for these cliff and cave-dwelling species is low. This likelihood was derived by combining these species' F Ranks of F3, F4, and FN with the likelihood of habitat limitation variable: cliffs (low) and caves (low assuming inaccessible, rarely visited, resources in good condition) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for both habitats, which means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

In contrast to alternative A, alternative B (modified) has desired conditions, guidelines, and management approaches that would be beneficial for cliff-dwelling species and their habitat and these apply forestwide rather than specific areas like in alternative A. Alternative B (modified) has desired conditions that would promote biophysical features such as cliffs and caves to be generally undisturbed by human activities and their associated geological, hydrological, and biological resources would be maintained (FW-BioPhys-Geo-DC-1). Another desired condition promotes specialized habitats for a variety of plant and animals species (FW-BioPhys-Geo-DC-6). A guideline in the section for Geological Features states that projects should be designed and uses should be managed to maintain the integrity and function of cliffs and caves and where alteration of these resources cannot be avoided, they should be mitigated to mimic pre-disturbance conditions and function (FW-BioPhys-Geo-G-1). Desired conditions in the Anderson Mesa, Long Valley, and Pine Belt Management Areas would specifically be beneficial for peregrines because they would promote management so functioning wetlands provide foraging habitat for peregrine falcons, as well as other raptors (MA-AMesa-DC-4, MA-LongV-DC-6, MA-PineBelt-DC-1).

Alternative B (modified) has a management approach in the section on Wildlife, Fish, and Plants to remind managers that a one-size-fits-all buffer to reduce disturbance may not be the best solution for all species and circumstances and best available science should be used for site-specific decisions. Less tolerant species like peregrines may need a one-half-mile buffer where more tolerant species may only need 300 feet. Another management approach in this same section reminds managers to collaborate with the Federal Aviation Administration, airport administrations, air tour operators, military and government agencies, and other aircraft operators to minimize disturbances caused by aircraft over key wildlife areas during important times of their life cycle. Examples could include peregrine falcon nesting sites and big game wintering habitat.

Some particularly beneficial plan components for cave-dwelling species include desired conditions in the section on Geological Features that would provide habitat for species that require specialized niches for roosting and overwintering and disease within natural levels. Other desired conditions promote protection and maintenance of subterranean microclimate and ecology, and promotes quantity and quality of water within and entering caves within the natural range of variability. See FW-BioPhys-Geo-DC-2, 3, 4 and G-8. Beneficial guidelines include maintenance and protection of the chemical, physical, and biological conditions of cave resources and protection of endemic cave species (FW-BioPhys-Geo-G-2, 4, and 7). Guidelines also promote management of caves to prevent disturbance, spread of disease, and the use of wildlife-friendly gates that meet Bat Conservation International recommendations (FW-BioPhys-Geo-G- 5 and 6). Another guideline in the section on Wildlife, Fish, and Plants requires managers to follow established protocols to prevent the introduction and spread of disease, a particularly beneficial guideline for bats (FW-WFP-G-12).

A guideline in the Wildlife, Fish, and Plant section would protect bats and their prey by ensuring that projects include measures to minimize the negative impact of pesticides and other chemicals to species and their habitat, including chemical-free buffers around bat roosts, riparian, or aquatic habitat (FW-WFP-G-4).

A guideline in alternative B (modified) requires timing restrictions to be applied to projects and activities that have the potential to negatively affect Southwestern Region sensitive species (FW-WFP-G-8). This guideline addresses the disturbance risk factor for these species and should result in higher levels of survival and successful reproduction.

Alternative B (modified) has several other guidelines that would maintain or protect habitat for these species, contribute to their viability, and preclude the need for listing. Management activities would comply with species conservation agreements, assessments, strategies, or national guidelines and projects and activities would be managed to maintain or improve habitat for native species and to prevent or reduce the likelihood of introduction or spread of disease (FW-WFP-G-2 and 3). Other beneficial guidelines promote structural improvements that provide wildlife with safe use of water (especially important for bats), promote the use of fire suppression techniques that minimize habitat and disturbance impacts where there are Southwestern Region sensitive species (consistent with public and firefighter safety), and promote the design and implementation of projects and activities that maintain refugia and primary life cycle needs of Southwestern Region sensitive species (FW-WFP-G-5, 9, and 10).

Alternative B (modified) recommends 3 wildernesses that could be used for foraging. Plan components for recommended wilderness would be beneficial for these species because recommended wilderness would be managed to maintain or enhance primitive and undeveloped characteristics; to preserve native species and unique features; to reduce evidence of modern human control and manipulations; and motor vehicle uses should only occur for limited administrative and permitted activities to be consistent with wilderness character (FW-RWild-DC-1 to 3; FW-RWild-G-1 and 3). Recommended wildernesses would provide additional areas of low disturbance, but the recommended wilderness would also preclude restoration treatments that would require motorized equipment. With this restriction on motorized equipment, the forest would be less likely to conduct restoration treatments, which, over time, could increase the risk of uncharacteristic fire or slow the trend toward desired conditions in these areas.

Alternative C

Alternative C has the same effects as alternative B (modified) except there are more areas that are not suitable for recreational shooting than the other alternatives; there are more acres of recommended wilderness than the other alternatives, and there are management areas in which reduction of disturbance to habitat (by restricting public access) is emphasized. All of these areas are suitable for peregrine falcon foraging and as potential habitat for the other cliff dwelling species. Cliffs in the recommended wildernesses have known or suitable habitat for eyries. Collectively, this alternative would provide the least disturbance to these species and their prey, particularly peregrine falcons. These factors are further discussed in the section on Disturbance under Wildlife Issues and Topics above.

Alternative D

Alternative D has the same effects as alternative B (modified) except there are no recommended wildernesses, which could provide areas of reduced disturbance for cliff-dwelling species.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives will provide for the viability of American peregrine falcons, pale Townsend’s big-eared bats, and spotted bats, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for American peregrine falcons, pale Townsend’s big-eared bats, and spotted bats, which are Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A primarily because they contain plan components for cliffs (which are absent in alternative A) and updated plan language for disease. Alternative C would provide slightly higher viability for these species than the other alternative because it contributes more to reducing disturbance. Alternative A provides lower viability for these species than the other alternatives because it generally lacks direction for cliffs. However, that is mitigated somewhat because it does have an overarching goal to maintain viability for wildlife which allows considerable flexibility for managers.

Cliffs and Rocky Outcrop Plants

Lyngholm's cliffbrake, Rock fleabane, Senator Mine alumroot, Fossil Creek bedstraw, black spleenwort, ebony spleenwort, and Utah bladderfern

Lyngholm's cliffbrake, rock fleabane and Senator Mine alumroot are classified as Southwestern Region Forest Service Sensitive species. Fossil Creek bedstraw, black spleenwort, ebony spleenwort, and Utah bladderfern are classified as Other planning species.

Affected Environment

Distribution

Lyngholm's cliffbrake is a rare fern that is narrowly endemic and is limited to a few locations in the Fay Canyon area of Sedona.

Rock fleabane is endemic to northern and central Arizona. The known locations include Barbershop Canyon, East Clear Creek, Mount Elden., Oak Creek Canyon, Tule Canyon, Walnut Canyon, West Fork of Oak Creek Canyon and Sycamore Canyon.

Senator Mine alumroot is endemic to central Arizona. Cliff habitats in some areas of the forest could potentially support this species. A recent revision of the genus *Heuchera* by Folk and Alexander (2015) updated the taxonomy of many specimens including those collected within the boundaries of the Coconino NF. As a result of the changes in taxonomy, there are no documented locations for this Forest Service sensitive species on the forest.

The endemic Fossil Creek bedstraw is native to central Arizona and occurs in the Fossil Creek area on the Coconino NF and adjacent Tonto NF. Predictive modelling for Fossil Creek bedstraw estimates a much larger range for the species including much of the Mogollon Rim.

Black spleenwort is a rare fern that is primarily known from Europe, with rare occurrences in the United States. It is of hybrid origin and was formed from two European parents. There are only a few occurrences of this species on the Coconino NF where it grows on dacite flows of Mount Elden.

Ebony spleenwort is a rare fern that is an ecological generalist. It has a disjunct distribution, occurring in southern Africa as well as in the United States. There are only a few occurrences of this species on the Coconino NF where it grows on dacite flows of Mount Elden.

Utah bladderfern occurs on Mount Elden and Munds Mountain. There are also several collections in Walnut Canyon National Monument.

Habitat

Lyngholm's cliffbrake occurs on cliffs in canyons, ravines on rocky slopes and ledges in thin, sandy soil associated with sandstone outcrops.

Rock fleabane prefers Coconino sandstone cliffs and known locations include Barbershop Canyon, East Clear Creek, Mount Elden, Oak Creek Canyon, Tule Canyon, Walnut Canyon, West Fork of Oak Creek Canyon and Sycamore Canyon.

Senator Mine alumroot potential habitat includes moist slopes in ponderosa pine forests and canyons where it typically grows on slopes or cliffs.

Fossil Creek bedstraw grows at the bases of steep cliffs and in rocky crevices.

Black spleenwort's preferred habitat is cliffs.

Ebony spleenwort habitats include forest floors, rocks, masonry and disturbed soils but is only known from dacite flows on Mt. Elden on the forest.

Utah bladderfern grows in cracks and ledges on cliffs on calcareous substrates. Habitats include calcareous cliffs of the Weber Formation; particularly on sandy ledges and in crevices. It has been collected on partially shaded to shaded west- to north-facing cliffs, on calcareous substrates including sandstone, limestone, and dacite.

Risk Factors

Rarity.

Environmental Consequences

Table 79 summarizes the viability analyses for seven cliff and rocky outcrop plant species: Lyngholm's cliffbrake, Rock fleabane, Senator Mine alumroot, Fossil Creek bedstraw, black spleenwort, ebony spleenwort, and Utah bladderfern. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, habitat, habitat trend, and likelihood that the species is limited by the habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 79. Analysis summary for cliff and rocky outcrop plants

Species, status, and F Rank	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Condition and habitat trend relative to desired conditions	**Likelihood species is limited**	**Condition and habitat trend relative to desired conditions**	**Likelihood species is limited**
Lyngholm's cliffbrake (Sensitive), rock fleabane (Sensitive), Fossil Creek bedstraw (Other), black spleenwort (Other), ebony spleenwort (Other), Utah bladderfern (Other) F Rank = F1*	Cliffs	Good, static	M	Good, static	M
Senator Mine alumroot F Rank= FP*	Cliffs	Good, static	L	Good, static	L

Management Effect	Management Effect =4: There is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.	Management Effect = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for **most** habitat and habitat element occurrences in the plan area. .

* F1: Very rare on the forest within its habitat – occupies a very small portion of their habitats. *FP: Possibly could occur on the forest, but documented occurrences not known.

Common to All alternatives

All of these species are considered to be rare and/or at-risk because there are few populations known and they are vulnerable to stochastic events. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Alternative A

Table 79 shows that under alternative A, cliffs would remain in good condition with a static trend relative to desired conditions. This means cliffs are generally undisturbed and provide specialized habitats for cliff-dependent species.

As shown in table 79, the likelihood that these species would be limited by cliffs on the forest is moderate. This likelihood was derived by combining these plants' F Rank of F1 and FP with the likelihood of habitat limitation variable: cliffs (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row in this table shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 4 for cliffs which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Desired conditions and guidelines for cliffs are largely lacking therefore managers do not have clear direction when protecting cliffs or managing uses and activities that might affect cliffs.

Alternative B (modified)

Table 79 shows that the habitat trend and likelihood that these species would be limited by cliffs is the same as alternative A, good condition with a static trend relative to desired condition.

As shown in table 79, the likelihood that habitat on the forest would be a limiting factor for these cliff and rocky outcrop plants is low. This likelihood was derived by combining these species' F Ranks of F1 and FP with the likelihood of habitat limitation variable: cliffs (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the coarse filter habitats associated with these plant species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. Plan components also better address at-risk species and endemic species.

For example, desired conditions for Biophysical Features seek to maintain cliffs in generally undisturbed conditions from human activities, maintaining the cultural, archaeological, geological, hydrological, paleontological, biological, and aesthetic resources of these features (FW-BioPhy-Geo-DC-1) and acknowledge the importance of the specialized habitats for plants and animals that depend on them (FW-BioPhy-Geo-DC-6). Projects should be designed and uses should be managed to maintain the integrity and function of caves, karst, cliffs, and talus slopes. Where alteration of these resources cannot be avoided, they should be mitigated to mimic pre-disturbance conditions and function (FW-BioPhys-Geo-G-1). A desired conditions in Wildlife, Fish and Plants also refers to the unique habitat provided by cliffs. This component provides direction for preserving the composition, structure and function of the ERUs and the physical features including cliffs and rock piles that provide habitat and refugia for the plants and animals that depend on them (FW-WFP–DC-5).

Forestwide desired conditions for recreation contain guidance that would apply to recreation activities that could affect cliffs by altering microclimates or cliff surfaces and features used by a variety of species. A forestwide Recreation desired condition states that low impact recreation principles are widely practiced and sites are free from litter, graffiti, and vandalism (FW-Rec-All-DC-5). This desired condition would help maintain cliffs in their natural condition. These could include observing timing restrictions for raptors or avoiding areas with fragile native plants. The forestwide guidance for dispersed recreation includes a desired condition to maintain areas used for dispersed recreation in their natural character to the extent possible while having minimal evidence of human waste and resource damage (FW-Rec-Disp-DC-3). This guidance would help to preserve cliff faces, cracks, and microclimates necessary for species habitat requirements, and would minimize resource damage from uses such as rock climbing.

There is no specific direction in the Heritage section of the forest plan that applies to cliff dwellings, but protection of these sites by law, policy, and direction relating to heritage sites would also protect cliff dwellings and the cliffs with which they are associated.

In contrast to alternative A, alternative B (modified) has language that better addresses species specific threats and better provides for habitat for species with restricted ranges and distribution: i.e., rarity. Plan language in alternative B (modified) promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10).

Alternative C
Alternative C has the same effects as alternative B (modified).

Alternative D
Alternative D has the same effects as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Lyngholm's cliffbrake, Rock fleabane, Senator Mine alumroot, Fossil Creek bedstraw, black spleenwort, ebony spleenwort, and Utah bladderfern, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Lyngholm's cliffbrake, rock fleabane and Senator Mine alumroot, which are Forest Service sensitive species. Alternatives B (modified), C, and D contain plan components for cliffs (which are absent in alternative A) and updated plan language that addresses at-risk, endemic, and rare species. The language in alternative A is substantially less robust than the other alternatives and alternative A generally lacks direction for cliffs as habitat, thus, management direction for projects and uses that affect cliffs is lacking. However, alternative A has an overarching goal to maintain viability for wildlife (which includes plants) and fish species. This goal provides some flexibility to manage forest uses to maintain viability for cliff dwelling species but a comprehensive forestwide approach to managing cliffs is lacking.

Desert Plants

Basin bladderpod, Bigelow's onion, Mearn's lotus, and skunk-top scurfpea

These species are grouped together due to the similarity of their habitat. Desert Communities, Semi-desert Grassland, Interior Chaparral, and Pinyon Juniper Evergreen Shrub ERUs are more fully evaluated in the Coarse Filter: Habitat section.

Affected Environment

Distribution

The known distribution of basin bladderpod, classified as an Other planning species, is Coconino, Maricopa, Mohave, and Yavapai counties, Arizona (Hodgson et al. 2014).

The known distribution of Bigelow's onion, classified as an Other planning species, is from southwestern New Mexico, northwestward across central Arizona to Mohave County, into extreme southeastern Nevada. Many of the known occurrences on the forest are in the proposed Cottonwood Basin Geological and Botanical Area (alternatives B (modified) and C).

The known distribution of Mearn's lotus, classified as an Other planning species, is Coconino, Maricopa, Mohave, and Yavapai counties, Arizona (Hodgson et al. 2014).

The known distribution of skunk-top scurfpea, classified as an Other planning species, is Arizona, Nevada, and Utah. It has been collected near Sedona, Arizona, but it is very rare on the forest.

Habitat

Basin bladderpod occurs in Desert Communities, Semi-desert Grassland, and Pinyon Juniper Evergreen Shrub ERUs. Plants tend to grow on rocky slopes on calcareous soils, sandstone cobble, and gypsum soils (Baker 2010).

Bigelow's onion occurs in Desert Communities, Semi-desert Grassland, and Interior Chaparral ERUs. Habitats include open, dry rocky soil in grassland and open chaparral, and desert scrub communities. It has been collected on various soil types, including lake deposits with siltstone, sandstone and limestone. (AZGFD 2005).

Mearn's lotus occurs in Desert Communities, Semi-desert Grassland, and Pinyon Juniper Evergreen Shrub ERUs. The species occurs in streambeds and of various aspects of dry, rocky slopes and ridgelines. Soils include limestone, clay, calcareous sand gravel, and deep sand.

The skunk-top scurfpea occurs in Semi-desert Grassland ERU.

Risk Factors

Rarity is an inherent threat to these species due to their restricted distribution. They are vulnerable to perturbations in the environments such as ground-disturbing activities because of their small population sizes.

Environmental Consequences

Table 80 summarizes the viability analyses for basin bladderpod, Bigelow's onion, Mearn's lotus, and skunk-top scurfpea. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 80. Analysis summary for desert species

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Basin bladderpod,	DC	Poor, away	M-H	Poor away	M-H
Mearns lotus (Other)	SDG	Poor, away	M-H	Poor, slightly toward	M-H
F Rank =F3*	PJES	Fair, away	L-M	Fair, away	L-M
Bigelow's	DC	Poor, away	H	Poor, away	H
onion (Other)	SDG	Poor, away	H	Poor, slightly toward	H
F Rank = F2*	IC	Good, away at short term then Fair, away	Short term: M Long term: M-H	Good, away	M
Skunk-top scurfpea (Other) F Rank =F1*	SDG	Poor, away	VH	Poor, slightly toward	VH

Management Effect	DC, SDG, PJES and PP = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences. IC=4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.	All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat, F2 = Rare on the forest within its habitat - occupies a small portion of its habitat. F3 = Uncommon on the forest within its habitat

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Plan language under all alternatives directs implementing site-specific best management practices (BMPs) for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific BMPs should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed.

All alternatives address the threat of invasive plants. Invasive plants can increase as a consequence of ground disturbance, and once established, would compete with these species for water and nutrients or could alter the fire regime. All alternatives address the threat of invasive plants by pointing to the Final Environmental Impact Statement for the Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005). This direction includes best management practices, among other guidance, which would help prevent, mitigate, and reduce the threat of invasive plants. All alternatives prioritize treatments, call for incorporating control measures in project planning and implementation, and emphasize coordination with partners (1987 Plan, pages 23, 69, 70, 182, 206-14, 206-76, 206-101, 201-116, FW-Invas-DC-1 through 3, FW Invas- G- 1, 2, -3, FW-Invas-MgtApp, FW-WFP-DC-10, FW-Graz-MgtApp, FW-RdsFac-G-8 ,FW-Rec-Dev-DC-9, FW-Rec-Dev-G-2, FW-TerrERU-Grass-DC-2). Additional information and analysis is discussed under the Non-native Species and Disease topic in the Wildlife and Plant Topics and Issues section.

About 766 acres (1 percent) of Desert Communities, about 3,640 acres of Semi-desert Grassland (4 percent), about 47,893 acres (18 percent) of Pinyon Juniper Evergreen Shrub, and 39,065 acres (77 percent) of Interior Chaparral are in designated wilderness. Plan language for designated wilderness provides additional protection to these species so would contribute to their viability in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised. Ground disturbance would be reduced in the habitats for these species because motorized and mechanized use in wildernesses are not allowed (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Alternative A

Table 80 shows that under alternative A, DC, SDG, and PJES would trend away from desired conditions. Desert Communities would remain in poor condition due to increased density of shrubs and understory species and Semi-desert Grasslands would remain in poor condition due to continued increases in shrubs and trees and increased fragmentation from urbanization. Pinyon Juniper Evergreen Shrub would remain in fair condition but because the fire return interval is also trending away, tree and shrub regeneration would increase. Increased density of trees, shrubs, and understory could increase competition with these species and facilitate a higher fire severity than these species had evolved with thereby degrading their habitat. The Interior Chaparral habitat of Bigelow’s onion would remain in good condition at the short term and move to fair condition in the long term, trending away due to the threats of non-native invasive weeds and uncharacteristic wildfire.

As shown in table 80, the likelihood that habitats on the forest would be a limiting factor for these species is low-moderate to very high depending on the habitat. These likelihoods were derived by combining this species’ F Ranks of F1, F2, and F3 with the likelihood of habitat limitation variables for each habitat: Desert Communities and Semi-desert Grasslands (high), Pinyon Juniper Evergreen Shrub (low-moderate), and Interior Chaparral (low at short term, moderate at long term) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Desert Communities, Semi-desert Grassland, and Pinyon Juniper Evergreen Shrub, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives. The management effect rating is classified as a 4 for Interior Chaparral, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Alternative A provides no direction on specific desired conditions for interior chaparral. The Sedona/Oak Creek Ecosystem-wide plan direction includes some beneficial general guidance, but it only covers a small proportion of Interior Chaparral ERU.

The reasons for this management effect rating are listed below. Alternative A provides outdated direction for Desert Communities and for a large portion of Semi-desert Grassland (in the Verde Valley MA). This outdated direction emphasizes range and forage improvement rather than composition, structure, and natural processes as in the desired conditions. This alternative also emphasizes using methods such as soil scarification and broadcast seeding which could facilitate the establishment of invasive plant species which compete with native species and can facilitate the spread of wildfire to which Desert Communities is not adapted. In the portions of Desert Communities and Semi-desert Grassland that overlaps the Verde Valley Management Area, the current forest plan emphasizes watershed condition and range management. Range management focuses on less than satisfactory range conditions, broadcast seeding following burning to increase production, and forage improvement. The direction for soil in this alternative focuses on achieving range improvement by identifying areas suitable for soil scarification and seeding of early seral species to a “more productive state” and to evaluate soils to determine the best species to promote stabilization (1987 Plan, page 166, 168, 169). This direction does not move this ERU toward the ecologically based desired conditions in alternative B (modified). Scarification and seeding would disturb the soil surface and lead to increased erosion and lead to the establishment of non-native species like Lehmann love grass (*Eragrostis lehmanniana*) that competes with native plants and facilitates fire spread. However, vegetative treatments to improve these habitats would be reviewed for soil potential for revegetation and erosion potential prior to treatment. In the portion of these habitats that overlap the Savannah Management Area, the current plan promotes an open vegetation structure, using prescribed fire and mechanical treatments, and would increase the area occupied by grasses and forbs while decreasing the area occupied by shrubs and trees in comparison to recent historic levels (1987 plan, page 206-50). This could improve the survival of these species.

The current forest plan contains outdated direction for managing fragile desert soils. The direction for soil in MA 11 (Verde Valley Management Area) in this alternative focuses on achieving range improvement by identifying areas suitable for soil scarification and seeding of early seral species to a “more productive state” and to evaluate soils to determine the best species to promote stabilization (1987 Plan, page 169). This direction does not move this ERU toward the ecologically based desired conditions in alternative B (modified). Scarification would disturb the soil surface in the Verde Formation, a soil type in Desert Communities, Semi-desert Grassland, and Pinyon Juniper Evergreen Shrub, and lead to increased erosion. Scarification and seeding of early seral species can introduce non-native species like Lehmann love grass (*Eragrostis lehmanniana*) that compete with native plants and facilitate fire spread.

A plan component in the Verde Valley MA that recommends review of soil potential for revegetation and erosion potential prior to treatment is positive however for areas containing the Verde Formation. Mitigation measures could be employed to avoid severe impairment of soil productivity. Another positive plan component in this same MA would improve conditions on prioritized watersheds in unsatisfactory condition in the Verde Valley MA. This could move degraded areas toward desired conditions depending on the methods used (1987 Plan, pages 168 and 169).

Alternative A provides little to no direction on specific desired conditions for interior chaparral. The Sedona/Oak Creek Ecosystem-wide plan direction includes some beneficial guidance, but it only covers a small proportion of Interior Chaparral ERU. Sedona/Oak Creek Ecosystem-wide plan direction includes provisions to conserve or restore natural ecosystem disturbance patterns and function and to promote the natural ecological role of fire within the constraints of human health and safety while the mosaic of vegetative conditions reduce the occurrence of catastrophic fires (1987 Plan, pages 206-9, 206-11, 206-19). The ecosystem-wide direction would reduce fire risk by prohibiting camping and campfires in the Neighborwoods, Oak Creek Canyon, and Redrock-Front Country MAs, except in designated places (1987 Plan, page 206-24).

For Pinyon Juniper Evergreen Shrub, this management effect rating is because alternative A also does not distinguish between nor provide desired conditions for the three pinyon juniper types that differ in composition, structure, and processes. There is one broad vegetation category of Pinyon Juniper. The different pinyon juniper types are differentiated on the basis of slope. Vegetation structure, and consequently, habitat for these species, would not be equitably, or naturally, distributed across the landscape, and managers lack specific guidance for the Pinyon Juniper Evergreen Shrub ERU. The emphasis on the use of prescribed fire and mechanical treatments to achieve management objectives associated with range and watershed condition could maintain or improve habitat for these species (1987 Plan, pages 148 through 155; 162 through 165).

Prescribed fire and wildfires managed for resource objectives may be used in these ERUs, but there is no provision for using wildfires managed for resource objectives in the wildland-urban interface (1987 Plan, pages 92, 155, and 165) and the language to manage wildfires for resource objectives in wilderness impedes the use of this tool (1987 Plan, pages 111-112). This does not contribute to the viability of these species because this would limit the restoration of fire as a natural process in the wildland-urban interface and in wilderness, and canopy cover and shrub and tree density would be expected to increase in these areas. There would also be increased potential for uncharacteristic fire in the wildland-urban interface and wilderness portions of these ERUs. This is particularly problematic in Semi-desert Grassland because the landownership pattern is intermixed between public and private ownerships. However, plan language for designated wilderness provides additional protection to these species and would contribute to species viability in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Desert Communities and Semi-Desert Grassland ERUs occur within the Verde Valley Botanical Area, which is within MA 17 (special areas) of this alternative. Plan components in alternative A are generally protective of the composition, structure, and function of the different vegetation types within botanical areas. For example, existing conditions and natural processes would be maintained; natural events would not be rehabilitated; and off-road driving would be prohibited (1987 Plan, page 194). Visitors should be limited in some areas depending on carrying capacity and the uniqueness and ecological condition of these areas should be protected and maintained, including in allotment management plans. In addition, timber harvest and firewood cutting is prohibited (1987 Plan, page 195). Other protective measures include: Special-use authorizations that would or could adversely affect the areas would not be allowed; adjacent roads would be managed to prevent vehicular intrusion, and road access would be blocked and obliterated. Fire suppression tactics would minimize damage to character of the areas and prescribed fire with planned ignitions may be used as a management tool provided it is a compatible use (1987 Plan, page 196). Collectively, these standards and guidelines mitigate the soil disturbance and plant damage that can result from these activities and maintain the conditions and characteristics for which this botanical area was established. Mechanized use in botanical areas is not explicitly addressed resulting in vague direction to managers. It is unclear as to whether mechanized use is prohibited, is allowed only on trails, or is allowed on and off trail in these areas. Consequently, mechanized use could damage vegetation or contribute to accelerated soil erosion within localized areas in this ERU.

Alternative A does not include a designation for the Cottonwood Basin Geological Area or the combined Cottonwood Basin Geological and Botanical Area. This would leave between 185 to 763 acres of Semi-desert Grassland ERU habitat for the Bigelow's onion with less protection than alternatives B (modified), C, and D. Alternative A does not have plan components that directly address the threat to the geologic formations and the plant community from motor vehicle use which has been problematic in the past.

Alternative B (modified)

Table 80 shows that the condition and trend of Desert Communities (poor and away from desired conditions) and Pinyon Juniper Evergreen Shrub (fair and away from desired conditions) would be the same as for alternative A. The condition of Semi-desert Grassland (poor) would be the same as for alternative A; however, trend would improve to slightly toward desired conditions. Interior Chaparral would remain in good condition with a trend away from desired conditions.

As shown in table 80, the likelihood that habitats on the forest would be a limiting factor for these species is low-moderate to very high depending on the habitat. These likelihoods were derived by combining these species' F Ranks of F3, F2, and F1 with the likelihood of habitat limitation variables for each ERU: DC and SDG (high), IC (low), and PJES (low-moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as 2 for all the habitats associated with these species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For alternative B (modified), shrub density, tree density, and canopy cover are likely to increase in Interior Chaparral and Pinyon Juniper Evergreen Shrub. The increases would have the negative effect of shading understory species and maintaining a greater number of small to medium-sized trees than desired (Pinyon Juniper Evergreen Shrub) or maintaining larger patches of older shrubs in Interior Chaparral due to lack of fire. For Pinyon Juniper Evergreen Shrub, these same changes increase the potential for a greater proportion of the ERU to burn at the high end of the range for mixed severity fires. For Interior Chaparral, these changes would increase the potential for a larger patch sizes of high severity fires. Reproduction or survival may be negatively affected because these species may not be adapted to these consequences, especially in Pinyon Juniper Evergreen Shrub. High-severity fire is the natural fire regime in Interior Chaparral, so the effect to Bigelow's onion may be less. Shading understory species could result in reduced abundance of vegetative ground cover and accelerated erosion. Collectively, shading could degrade habitat for Basin bladderpod, Mearn's lotus, and Bigelow's onion over the long term. However, there is an objective to use naturally ignited wildfires (i.e., lightning-caused fires that are managed for resource objectives) to treat at least 3,750 acres in Pinyon Juniper Evergreen Shrub within the natural fire regime during each 10-year period over the life of the plan (FW-TerrERU-PJ-O-3). This would be beneficial for these species in the areas where burning creates canopy gaps and reduces tree density by allowing sunlight and precipitation to increase the vigor and abundance of understory.

For Interior Chaparral, there are no plan objectives, but any treatments that might occur in this ERU, over the life of the plan, would follow the direction in alternative B (modified) and would be expected to maintain or improve habitat for Bigelow's onion. Alternative B (modified) has specific desired conditions and guidelines for this ERU, whereas these are absent in alternative A. These plan components provide managers with guidance to promote natural disturbances, a diversity of age classes and seral stages of native species, and to rotate treatments to re-establish seed banks, protect soils from accelerated erosion, and facilitate the distribution and quantity of fuels necessary for fire (FW-TerrERU-IC-DC- 1, 2. 3, G-1).

For Pinyon Juniper Evergreen Shrub, alternative B (modified) distinguishes between the different Pinyon Juniper types on the forest and provides desired conditions, objectives and guidance that are specific to the each type. Management direction would promote properly functioning ecosystems that are resilient to natural disturbances and climate change; promote characteristic disturbances and reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby, furthering sustainability and adaptability (FW-Eco-DC-1-4, FW-TerrERU-All-DC-2). ERU specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-PJ-DC-5-9; G-1-3, 5).

Table 80 shows that like alternative A, Semi-desert Grassland ERU would remain in poor condition but unlike alternative A, this ERU would trend toward desired conditions due to plan objectives that would restore or improve at least 3,500 acres of Semi-desert Grassland ERU during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-1). The plan objective would remove tree and shrub cover and create more open conditions that could favor these species. This alternative distinguishes between the grassland habitats on the forest and containing explicit and updated direction on the composition, structure, and processes for these ERUs (FW-TerrERU-Grass-DC-4, 8), compared to alternative A, which has a more forage-based approach. Alternative B (modified) also provides plan components to promote properly functioning and resilient ecosystems, promote characteristic disturbances, reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems thereby furthering sustainability and adaptability (FW-Eco-DC-1, 2, 3, 4, FW-TerrERU-All-DC-2). ERU specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-Grass-DC-1 to 5, 7, 8, 9, FW-TerrERU-Grass-G-2).

Alternative B (modified) would provide clearer direction than alternative A for Desert Communities, allowing for a greater potential to reduce ERU departure and move toward desired conditions (FW-Eco-DC-1, FW-Eco-DC-4, FW-TerrERU-All-DC-1 to 3; FW-TerrERU-DC-DC-1 to 4). Soil desired conditions would promote proper functioning soils, soil protection and stabilization, and nutrient cycling (FW-Soil-DC-1 to 4). Forestwide soil guidelines would avoid excessive ground disturbance, limit accelerated erosion, and minimize bringing more calcareous soil to the surface (FW-Soil-G-1 to 3). Bringing calcareous soil to the surface would limit soil plant nutrient availability. About 97 percent of Desert Communities ERU occurs within the Verde Valley Management Area. Desired conditions and guidelines would maintain or improve conditions in Desert Communities ERU by promoting watershed function and balancing recreational opportunities and dispersed recreation with resource protection and/or maintaining or moving toward other desired conditions (MA-VerdeV-DC-4 and MA-VerdeV-G-1 and 2).

Unlike alternative A, alternative B (modified) does not restrict the use of wildfires managed for resource objectives within the wildland-urban interface. Fire and vegetation management in the wildland-urban interface would favor low intensity surface fires; higher frequency of disturbance than the natural disturbance regime from prescribed burning, wildfires managed for resource objectives, and/or vegetative treatments; more area of grass/forb/shrub vegetation or early seral vegetation, and more open conditions. Wildland-urban interface areas would still be within the range of desired conditions (FW-WUI-DC-3, 4, 6, 7, and G-1). Although intended to reduce the risk of wildfire to surrounding communities and values-at-risk, conditions and activities in the wildland-urban interface could have the positive effect of maintaining habitat for these desert plant species by stimulating flowering, seed release, germination, removing competitors, or causing a temporary increase in nutrient availability (Satterthwaite et al. 2002). Areas with increased disturbance from management activities could degrade habitat through accelerated soil erosion, soil compaction, depletion of the seedbank in the soil, and establishment of non-native species could out-compete with these species (Cione et al. 2002). Plants could respond negatively or positively to more frequent fire depending on timing (when flowering, forming seed, actively growing, or when carbohydrate reserves are relatively low), frequency, severity, duration, and extent of burning and how these factors interface with plant morphology or other existing conditions like drought (DeBano et al. 1998). Furthermore, more frequent low severity ground fires are not the natural fire regime for DC, IC, or PJES so composition and structure of these ERUs in WUI could shift (FW-TerrERU-PJ-DC-8). The effect of these altered conditions in the WUI on these species is dependent on the site-specific and species specific interaction of the above mentioned possible effects and conditions.

Rarity is a risk for these species and they all have restricted distributions or are endemic. In contrast to alternative A, alternative B (modified) has language that better addresses species specific threats and better provides for habitat for species with restricted ranges and distribution: i.e., rarity. Plan language in alternative B (modified) also promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10). Additional information and analysis is discussed under the At Risk topic in the Wildlife and Plant Topics and Issues section.

Alternative B (modified) addresses disturbance to plants and their habitat better than alternative A by adding language so roads and recreational activities and locations are managed to move toward desired conditions for other resources; so unneeded roads are decommissioned, and so temporary roads are naturalized in a timely manner (FW-RdsFac-G-1, 6, 8 and FW-Rec-All-G-1). A Roads and Facilities desired condition may lead to temporary increases in roads to allow for management activities including restoration treatments and prescribed burning (FW-RdsFac-DC-3). These temporary roads could crush plants, degrade habitat, contribute to soil loss, or increase the risk of non-native plant establishment. However, these activities are needed to conduct vegetative treatments that would reduce departure from desired conditions in ERUs and reduce the risk of uncharacteristic fire. These treatments would generally open canopy and would improve the distribution and abundance of herbaceous understory, including habitat for rare plants. Additional information and analysis is discussed under the Disturbance (plants) topic in the Wildlife and Plant Topics and Issues section.

Forestwide direction for recreation would improve conditions in these habitats more than alternative A. This is because it integrates the need to protect sensitive resources from the impacts of motorized and non-motorized recreation; the need to rehabilitate unauthorized trails so as to prevent accelerated erosion; and the need to potentially restrict national forest visitor activities where they would inhibit site restoration or cannot be made compatible through appropriate mitigations (FW-Rec-All-DC-6, FW-Rec-All-G-1, FW-Rec-All-G-2, FW-Rec-Trails-DC-3, FW-Rec-Trails-DC- 4, FW-Rec-Trails-DC-11, FW-Rec-Trails-G-1, FW-Rec-Trails-G-3).

There are 132 acres (less than 1 percent) of SDG and 723 acres (less than 1 percent) of PJES in recommended wilderness in this alternative. Recommended wilderness would be managed to maintain or enhance primitive and undeveloped characteristics; to preserve native species and unique features; to reduce evidence of modern human control and manipulations; and motor vehicle uses should only occur for limited administrative and permitted activities to be consistent with wilderness character (FW- RWild-DC-1, 2, 3, FW- RWild-G-3). This would protect habitat by reducing some ground disturbance that could occur as result of management activities or permitted uses. Recommended wilderness would not prohibit prescribed or managed wildfires but could make them more challenging to implement because vehicle use needed to manage fire should be consistent with wilderness character and depending on site-specific conditions, this may not always be possible. Active vegetative management and vehicle use would be limited or prohibited (vehicle use) if recommended wildernesses become designated. Designation could restrict the use of vegetative treatments or fire to reach the desired conditions for the ERU. The magnitude of the effect on species and their habitat depends on what needs to be restored in SDG and PJES in recommended wilderness, what tools might be needed for restoration, and whether access in the areas adjacent to RWA is sufficient to allow for safe use of prescribed or managed fire if needed.

Unlike alternative A, mechanized use in botanical and geological areas is not suitable except mechanized travel would be suitable on routes designated for mechanized travel. This plan language is intended to limit soil and vegetation impacts to the trail prism (see Chapter 4 Recreation and Transportation Suitability). Subsequent environmental analysis would need to be done for this direction to take effect. This suitability recommendation is considered to be protective of the special features including plants and their habitat because impacts to the plant species would be evaluated during the environmental analysis and impacts would be limited to the trail prism. This direction applies to the Verde Valley Botanical Area (1,029 acres of Desert Communities) and the proposed Cottonwood Basin Geological and Botanical Area (178 acres of Desert Communities). Currently only the Verde Valley Botanical Area has designated trails whereas there are none in the proposed Cottonwood Basin Geological and Botanical Area which also has most of the occurrences of Bigelow’s onion on the forest (SEINet 2016). This alternative has specific guidance restricting travel to foot traffic within the Cottonwood Basin Geological and Botanical Area (SA-RNABotGeo-G-7). Designation of this area will preserve this unique botanical community and help protect the area from such threats as illegal off-road vehicle use. This guidance would remove vehicle travel and would better protect the unique rock formations and plants occurring in this area.

Alternative C

The effects to these species under alternative C would be the same as alternative B (modified) except there would be 949 acres of Desert Communities (2 percent), 12,041 acres of Semi-desert Grasslands (13 percent), 50,164 acres of Pinyon Juniper Evergreen Shrub (19 percent), and 1,720 acres (3 percent) of Interior Chaparral in recommended wilderness. In alternative C, mechanized use in botanical and geological areas is not suitable even on designated routes. This plan language is intended to limit soil and vegetation impacts to the trail prism. Subsequent environmental analysis would need to be done for this direction to take effect. This suitability recommendation is considered to be protective of the special features including plants and their habitat because impacts to the plant species would be evaluated during the environmental analysis. This direction applies to the Verde Valley Botanical Area (1,029 acres of Desert Communities and 162 acres of Semi-desert Grassland) and the proposed Cottonwood Basin Geological and Botanical Area (178 acres of Desert Communities and 574 of Semi-desert Grassland). Currently only the Verde Valley Botanical Area has designated trails whereas there are none in the proposed Cottonwood Basin Geological and Botanical Area, which also has most of the occurrences of Bigelow's onion on the forest (SEINet 2016).

Alternative D

For alternative D, only the Cottonwood Basin Geological Area would be designated. The geological area would be much smaller (185 acres). It is assumed that plant diversity would be lower in the designated area as well. Alternative D would also have the guideline limiting travel to foot travel, but it would only apply to the designated geological area. Accordingly, alternative D would provide less protection for Bigelow's onion on about 600 acres.

Findings

Considering the cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, viability would be provided for in all alternatives for basin bladderpod, Bigelow's onion, Mearn's lotus, and skunk-top scurfpea, although individuals may be impacted by site-specific activities or uses. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A primarily because they distinguish between the grassland and Pinyon Juniper types on the forest. These alternatives also provide updated and improved plan direction for those ERUs, as well as Desert Communities and Interior Chaparral ERUs that would guide future projects.

With regard to Bigelow's onion, alternatives B (modified) and C contribute more to its viability than alternatives A and D because those alternatives would designate a 763 geological and botanical area that includes the Semi-desert Grassland ERU habitat used by this species. Alternative D contributes more to the viability of Bigelow's onion than alternative A, which would not include any special area designation in Cottonwood Basin. Alternative D contributes less to the viability of this species than alternatives B (modified) and C, which would designate a larger, combined geological and botanical area in Cottonwood Basin. All three action alternatives contain occurrences of the species, but alternatives B (modified) and C would protect more habitat. Alternative A provides no designation for this area.

Eagles

Bald eagles and golden eagles

These species are grouped together due to the similarity of these species (and their habitat). Cottonwood Willow, Mixed Broadleaf Deciduous, and Montane Willow riparian forest types, as well as the Ponderosa Pine ERU and cliffs are more fully evaluated in the Coarse Filter: Habitat section.

Bald eagles are a Southwestern Region sensitive species. Golden eagles are “Other” species classification for this analysis. For golden eagles, the Fish and Wildlife Service has issued a report titled Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Golden Eagle Management and Permit Issuance (Pagel et al. 2010).This analysis includes a finding relative to viability and a determination relative to ‘take’ under the Bald and Gold Eagle Protection Act for each alternative.

Affected Environment

All golden and bald eagles, regardless of status, are protected under the Bald and Golden Eagle Protection Act (Eagle Act). This analysis determines if take is likely to occur with implementation of the action alternatives. Take is defined in the Eagle Act as to “…pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest or disturb.” Disturb is further defined “…to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.” The Fish and Wildlife Service is the regulatory authority for this Act.

Distribution

Bald eagles are found in Canada, Alaska, all of the contiguous United States, and northern Mexico. There are both nesting and wintering bald eagles on the Coconino NF. There are currently 11 confirmed and 27 potential bald eagle roosts on the forest. There are six breeding areas on the forest and all are below the Mogollon Rim except for one in the Lake Mary area. The breeding areas below the Mogollon Rim are located along the Verde River or within 1 mile of the confluence of major tributaries to the Verde River.

Golden eagles are found in North America, Eurasia, and parts of North Africa. In Arizona, breeding bird surveyors noted gold eagles throughout their previously described range (Corman and Wise-Gervais (2005)). On the forest, there are 10 confirmed nests. Two are within Red Rock-Secret Mountain Wilderness, one is at the edge of Munds Mountain Wilderness, and one is within Walnut Canyon National Monument.

Habitat

In Arizona, bald eagles are migratory and permanent residents. They are associated with Cottonwood Willow Riparian, Mixed Broadleaf Deciduous Riparian, Montane Willow Riparian, Ponderosa Pine, and Cliffs, Small to moderately sized groups (2 to 48 eagles) night roost in clumps (less than 1 to 43 acres) of large trees in protected locations. Large trees are used for roosting, nesting, and perches. Roosting eagles are associated with Ponderosa Pine ERU. Eagles typically roost in the following locations: ponderosa pine stands that are variable in size (less than an acre to 43 acres), north or northeast-facing slopes, and areas close to daytime foraging areas

(Dargan 1991). Roost trees are large live or dead ponderosa pine trees averaging 28 inches d.b.h. that occur in groups and are much larger than other trees in roost stands (Dargan 1991).

In Arizona, golden eagles are permanent residents and nest from arid desert scrub to open conifer forest often near cliffs and canyons, and large open areas for foraging. They are associated with cliffs. On the forest, they occasionally nest in snags and large trees in Ponderosa Pine ERU. Eakle and Grubb (1986) identified a total of 38 prey items representing 12 species in golden eagle diets in central Arizona. Mammals made up 78.9 percent, birds 18.4 percent, and reptiles 2.6 percent. The majority of remains were black-tailed jackrabbit (*Lepus californicus*) and rock squirrel (*Spermophilus variegatus*) indicating their importance to nesting eagles in central Arizona.

Additional information on these ERUs and cliffs can be found above in the Coarse Filter: Habitat section.

Risk Factors

The primary species threat to bald eagles is disturbance during the breeding season, which may result in failed reproduction or fewer young. Disturbance at bald eagle winter roosts could negatively impact survival or could increase winter stress.

According to Corman and Wise-Gervais (2005), there are no outstanding threats to golden eagles in Arizona; however, urban encroachment and increased recreational activity could affect some local breeding areas. They are cautious of humans and golden eagles are sparse or absent where human disturbance is frequent.

Both eagles have threats from electrocution from transmission lines; collisions, injury or death associated with communication towers or energy development structures and large-scale wind and solar energy development.

Environmental Consequences

Table 81 summarizes the viability analyses for bald eagles and golden eagles. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 81. Analysis summary for bald eagles and golden eagles

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Bald eagle (Sensitive) F Rank = F3*	CWRF	Fair, slowly toward	M-H	Good, slowly toward	M
	MBDRF	Good, static to slowly toward	M	Good, slowly toward	M
	MWRF	Good, static to slowly toward	M	Good, slowly toward	M
	PP	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
	Cliffs	Good, static	L	Good, static	L

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Golden eagle	Cliffs	Good, static	L	Good, static	L
(Other) F Rank = F3*	PP	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
Management Effect		CWRF, MBDRF, MWRF, and PP = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences. Cliffs=4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

* F3 = Uncommon on the forest within its habitat

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

All alternatives have areas that are closed seasonally to provide recreation opportunities in areas undisturbed by vehicles and/or to provide quiet areas for wildlife. These areas total about 47,134 acres, include eagle habitat, and are existing closure orders: Cottonwood Basin, Pine Grove, Rattlesnake, Woods, and Woody Ridge (1987 Plan, pages 59, 206-114, the Off-Road Driving Management Plan for Land and Resource Management Planning (Revised May 1991); FW-Rec-Disp-G-6, MA-PineBelt-DC-5, 6, 7, 8, MA-LkMary-DC-4, MA-PineBelt-S-1, 2, 3, 4, MA-LkMary-S-1, MA-VerdeV- DC-7 and S-1).

Particularly beneficial plan language includes implementation of timing restrictions to reduce disturbance to bald eagles during the nesting season. These would have the indirect positive effects of promoting population recruitment and survival (1987 Plan, pages 167 (bald eagles only), 206-73 (bald eagles only), 209-67 (both eagles in FLEA area only); and FW-WFP-S-2 (both eagles) and FW-WFP-G-8.

Designated wilderness areas would also provide some protection from disturbance under all alternatives. For bald eagles, there are 33,724 acres of Ponderosa Pine, Cottonwood Willow Riparian, Mixed Broadleaf Deciduous Riparian, and Montane Willow Riparian habitat in designated wilderness. There are additional unknown acres of cliffs. For golden eagles, there are 31,087 acres of Ponderosa Pine ERU in designated wilderness plus an unknown amount of cliffs. Only a portion of pine type near grasslands or pinyon juniper would be suitable for golden eagles. These areas would provide habitat undisturbed by motorized vehicles to nesting or foraging eagles.

All alternatives would reduce collision and transmission line hazards to eagles by promoting the use of existing transmission corridors to capacity with compatible utilities (where additions are environmentally and visually acceptable before evaluating new routes) (1987 Plan, page 79, FW-SpecUse-G-4) and specifying that power lines and towers would be constructed or reconstructed to specifications compatible with raptor use (1987 Plan, page 80, FW-SpecUse-DC-5). All alternatives would not allow new construction in research natural areas, geological and botanical areas, the Mt. Elden Environmental Study Area, and the Verde Wild and Scenic River (1987 Plan, page 79, FW-SpecUse-G-10; page 115-5 and page 27 in the Verde Wild and Scenic River Comprehensive River Management Plan). Consequently, new power lines and transmission corridors would not occur in these areas which could contain roosting, nesting, or foraging habitat for bald and golden eagles.

Alternative A

Table 81 shows that under alternative A, Cottonwood Willow Riparian Forest would be in fair condition and Mixed Broadleaf Deciduous Riparian Forest and Montane Willow Riparian Forest would remain in good condition. All of these riparian forest types would have a static trend or slow trend toward desired conditions. In Cottonwood Willow, some portions of the Verde River, Dry Beaver Creek and Lower Oak Creek would be static due to high recreation and private land. In Mixed Broadleaf Deciduous Riparian Forest, static trends are associated with the Oak Creek 5th code HUC; trends that are slowly toward desired conditions are associated with the Beaver Creek 5th code HUC; and portions of Fossil Creek are trending away from desired conditions where recreation impacts occur. In Montane Willow Riparian Forest, the Upper Clear Creek 5th code HUC is trending toward desired conditions.

Table 81 shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term. Cliffs would be in good condition with a static trend related to desired conditions.

As shown in table 81, the likelihood that habitats on the forest would be a limiting factor for these species is low-moderate to moderate depending on the habitat. These likelihoods were derived by combining these species' F Rank of F3 with the likelihood of habitat limitation variables for each

ERU: Cottonwood Willow Riparian Forest (high), Mixed Broadleaf Deciduous Riparian Forest (moderate), Montane Willow Riparian Forest (moderate, except the Fern Mountain Botanical Area and Upper Clear Creek 5th code HUC is high), Ponderosa Pine ERU (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), and cliffs (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, Montane Willow Riparian Forest, and Ponderosa Pine ERU, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives.

Alternative A does not distinguish riparian forest types from other riparian areas and lacks plan components relative to composition, structure, and function yet it has a number of protective standards or guidelines.

Alternative A would maintain or improve riparian forests and streamcourses because it has a focus on improving riparian areas in any condition, preventing damage to riparian vegetation, stream banks, and channels, and restoring degraded riparian areas to good condition as soon as possible (1987 Plan, pages 65-2, 65-8, 172, and 206-8). Other protective language includes the following: Only beneficial new special uses are allowed in riparian areas and exceptions such as utility line or roads crossing stream courses are designed to minimize the extent and magnitude of impact to riparian (1987 Plan, page 177). Aggressive fire suppression may be used to prevent resource damage utilizing methods that minimize long-term adverse impacts to riparian habitats (1987 Plan, page 177). In addition, acquisition of riparian areas through land exchange is a high priority (1987 Plan, pages 177 and 185). The plan would manage commercial uses, and recreation in some areas, to protect riparian values (1987 Plan, pages 206-10, 22, 26, and 39).

Plan components in the Sedona-Oak Creek Ecosystem would maintain riparian pasture and riparian exclosures to prevent livestock trespass, which can degrade sensitive species habitat (1987 Plan, page 206-12) and directs that fire management activities protect riparian (1987 Plan, page 206-11). Flagstaff/Lake Mary Ecosystem Area (FLEA) goals and objectives would assure riparian communities benefit riparian-dependent resources and support diverse assemblages of aquatic and terrestrial species; streambanks are protected; and stream flow is adequate to maintain aquatic communities and water sources for wildlife (1987 Plan, page 206-78). FLEA area-wide guidelines emphasize rehabilitation of high elevation riparian communities, ensure that riparian areas are in a condition to improve or maintain high quality water in the Lake Mary and Oak Creek Watersheds, and would avoid placing large group events in riparian or open water areas (1987 Plan, pages 206-66, 78). In Oak Creek Canyon MA 14, there is a goal to ensure woody materials, such as logs, tree limbs, and snags, are present in riparian communities for prey base habitat, aquatic nutrient cycling and soil retention consistent with public safety (1987 Plan, page 185). Although these are positive plan components for eagles, they only apply in localized areas. This alternative has the least potential for improvement to riparian condition compared to the other alternatives.

Although there is outdated plan language for Ponderosa Pine ERU, some of it is positive. The plan direction emphasizes uneven–aged structure and canopy cover retention as well as snag, minimum levels for logs and woody debris for various habitat categories (1987 Plan, pages 65-9 to 65-11). General direction is provided to manage for old age trees such that as much old forest structure as possible is sustained over time across the landscape and to sustain a mosaic of vegetation densities (overstory and understory), age classes and species composition across the landscape (1987 Plan, pages 65-7, 70-1, and 70-2).

An objective in Roads and Facilities would "decommission between 200 to 800 miles of a combination of unauthorized roads and system roads not identified on the motor vehicle use map during the 10 years following approval." This analysis assumes that the majority of decommissioning would occur in Ponderosa Pine because that is where most of the 4FRI-related activities are currently planned and that decommissioning effectively closes the road. This could have a positive effect on eagle roosting by preserving more snag roosts. Snag and log abundance within Ponderosa Pine could be affected by road decommissioning. Several authors have documented a direct correlation between snag availability and road access. Wisdom and Bates (2008) reported that snags were nearly three times more abundant in stands away from roads as they were in stands with roads and snags were less abundant in stands closer to towns or in flatter topography. Likewise, Chambers (2002), and Ganey et al. (2014) reported a similar relationship between human access and decreased snag and log availability in northern Arizona pine-oak habitat. Fuelwooding is one of the activities that could impact snag and log abundance. Current fuelwood regulations have limits on the locations and timing where fuelwood can be gathered and the size of snags that can be removed, and the snag sizes are based on forest plan direction.

Direction for botanical areas, geological areas and research natural areas is found in Management Area 17. Standards and guidelines would maintain and protect habitat for wildlife species due to emphasis on ecological condition, requiring allotment management plans to have provisions to protect ecological conditions, prohibiting timber harvest and fuelwood harvest, restricting special use permits that would have a negative impact on the uniqueness of special areas, and preventing motor vehicle intrusions (1987 Plan, pages 195 and 196). Alternative A proposes the 925-acre Rocky Gulch Research Natural Area, which is nearly all ponderosa pine. In addition, about 2,518 acres of existing special areas contain ponderosa pine, and about 190 acres contain Cottonwood Willow, Mixed Broadleaf Deciduous, or Montane Willow riparian forest types.

However, some portions of alternative A (and alternative C) follow the 1987 plan for managing old growth as 100- to 300-acre stands over no less than 20 percent of each forested ecosystem management area. Consequences of this plan direction are described in detail in the Vegetation and Fire section in volume I of the FEIS. This strategy would provide less ability than alternatives B (modified) and D to promote vertical structure and age class diversity; would tend to maintain a more continuous canopy than alternatives B (modified) and D that would be more conducive to crown fires; and would result in more even-aged conditions. This structure and age class diversity is not reflective of frequent low-severity fires characteristic of this ERU. During wildfires, there is likely to be more area in mixed severity condition with 25 percent to 75 percent loss of dominant overstory, compared to loss of 25 percent or less, which is characteristic of low-severity fires. Old-growth stands would be less resilient to endemic levels of disturbances. There would be fewer openings and less understory.

Suppression objectives in the plan would minimize impact on the land while keeping fires to 10 acres or fewer in areas mapped as the wildland-urban interface (1987 Plan, pages 93, 155, 165). In areas outside the wildland-urban interface, the suppression objective is to minimize cost and provide for personnel safety while holding fires to 100 acres or less (1987 Plan, pages 94, 137). These limitations to the role of fire in the ecosystem were designed to protect ponderosa pine suitable timberlands, but they also serve to inhibit the restoration of this ERU and does not acknowledge the natural role of fire in ecosystem processes and function.

Prescribed fire and wildfires managed for resource objectives may be used in Ponderosa Pine, but plan language that limits the use of wildfires managed for resource objectives in wilderness and in wildland-urban interface would not be beneficial for eagles because Ponderosa Pine is a fire-adapted ecosystem. This language eliminates one management tool that would favor restoration of the historic fire regime in these areas, which would promote the growth of large trees for roosting or nesting.

This alternative would avoid transmission lines in the Ponderosa Pine and Mixed Conifer vegetation types and would evaluate new corridors for their potential impacts on habitats for threatened and endangered species (1987 Plan, page 79). Avoidance of these ERUs would be beneficial because large ponderosa pine trees and snags in these ERUs can be used for roosting and nesting by both golden and bald eagles.

The management effect is classified as a 4 for cliffs, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Plan components for cliffs and rock outcrops are generally lacking in alternative A, thus, there is little direction for management of these features and the environments they provide. Guidance for cliffs is limited to visual quality and their importance to archaeology. Scenery guidance for cliffs occurs in the Red Cliff and Front Country management areas (1987 Plan, pages 206-43 and 206-46), which represent less than 9,000 acres of the forest. Alternative A directs the forest to manage and stabilize several of the major known cliff dwellings (1987 Plan, page 56).

Alternative A has language to follow approved or more recent conservation strategies or assessments for bald eagles (1987 Plan, page 206-100), but lacks this direction for golden eagles. Following these conservation strategies or assessments could reduce the risk associated with bald eagles by providing more specific direction on species and project management.

Alternative A has language that requires powerlines and towers to be built or reconstructed to specifications compatible with raptor use (1987 Plan, page 80). This is beneficial for both eagles and should reduce the risk of collisions, injury or death associated with communication towers or energy development structures. Alternative A does not specifically address alternative energy developments, such as large-scale wind and solar energy development, so the guidance in the forest plan would not be adequate to mitigate potential impacts to eagles and other wildlife species.

Alternative A is silent on allowing bicycles on designated trails in botanical and geological areas, thus, could have consequences on bald and golden eagles. Golden eagles nest in one of the geological areas on the forest. Even though there are no mountain biking trails here at this time, they could be developed in the future. Although there are no known nests or roosts, bald and golden eagles could use portions of the other geological and botanical areas for nesting and roosting.

Alternative B (modified)

Table 81 shows that under alternative B (modified) all the riparian forest types that provide habitat for bald eagles would be in good condition and slowly trend toward desired conditions. In Mixed Broadleaf Deciduous Riparian Forest, toward trends would be associated with the Beaver Creek 5th code HUC, Oak Creek 5th code HUC, and Fossil Creek 5th code HUC. In Montane Willow Riparian Forest, the Upper Clear Creek 5th code HUC would be trending toward.

Ponderosa Pine ERU would be similar to alternative A, remaining in poor condition with a trend toward desired conditions in the short term under low treatment objectives (50,000 acres mechanical, 150,000 acres prescribed fire). However, in the short term under the high vegetation treatment objectives (260,050 acres mechanical, 200,000 acres prescribed fire) and in the long term under both the low and high vegetation treatment objectives, the condition would improve to fair and trend toward desired conditions.

Like alternative A, cliffs would be in good condition with a static trend related to desired conditions.

As shown in table 81, the likelihood that habitats on the forest would be a limiting factor for these species is low-moderate to moderate, depending on the habitat. These likelihoods were derived by combining these species' F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Cottonwood Willow Riparian Forest (moderate), Mixed Broadleaf Deciduous Riparian Forest (moderate), Montane Willow Riparian Forest (moderate), Ponderosa Pine ERU (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), and cliffs (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the habitats associated with bald eagles and golden eagles. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

The "2" rating is primarily because there are updated desired conditions and guidelines that distinguish between the riparian forest types and that support their respective composition, structure, and function (FW-Rip-RipType-DC-1 to 6 FW-Rip-RipType-G-1 to 4). In addition, riparian functional condition would improve faster than alternative A, especially along the Verde River, Towel Creek, Spring Creek, and Dry Beaver Creek which is habitat for bald eagles. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1 and 2; FW-Water-G-2; FW-Rip-RipType-O-1). More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3; Fw-Rip-Strm-G-2) (USDA Forest Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1 and 3).

For Ponderosa Pine, this rating is because alternative B (modified) emphasizes ecological conditions and composition, structure, and function of this ERU using current science, in contrast to alternative A (Reynolds et al. 2013). Particularly beneficial guidelines provide sideboards that would promote or sustain old-growth forest attributes, uneven-aged conditions, pre-settlement trees, occupancy of small wildlife species, and reduce the risk of uncharacteristic bark beetle outbreaks (FW-TerrERU-PP-G-1 through 7). Although alternative B (modified) promotes an open uneven-aged structure similar to historic conditions, it also has provisions for denser areas such as on steep slopes and in canyons and larger tree groups in areas managed for bald eagles (FW-TerrERU-PP-DC-8 and 13).

For cliffs, this rating is due to this alternative containing explicit and updated direction related to maintaining the integrity and function of these biophysical features and the specialized habitat they provide. For example, alternative B (modified) has desired conditions, guidelines, and management approaches that would be particularly beneficial for cliff-dwelling species and their habitat. These plan components apply forestwide, rather than to specific areas like in alternative A. Alternative B (modified) has desired conditions that would promote biophysical features, such as cliffs, to be generally undisturbed by human activities and their associated geological, hydrological, and biological resources would be maintained (FW-BioPhys-Geo-DC-1). Another desired condition promotes specialized habitats for a variety of plant and animals species (FW-BioPhys-Geo-DC-6). A guideline in the section for Geological Features states that projects should be designed and uses should be managed to maintain the integrity and function of cliffs and caves and where alteration of these resources cannot be avoided, they should be mitigated to mimic pre-disturbance conditions and function (FW-BioPhys-Geo-G-1).

Although language in alternative B (modified) would not specifically avoid transmission lines in mixed conifer and ponderosa pine habitat like alternative A, other plan language could achieve the same end. Other plan components would mitigate the impacts from urban and rural development by locating and designing new and reconstructed overhead utility lines, support towers and other utility infrastructure to minimize adverse ecological and wildlife impacts (FW-SpecUse-G-5); retaining vegetation in rights-of-way to allow for habitat for species and wildlife movement corridors if vegetation does not interfere with meeting vegetation clearance requirements (FW-SpecUse-G-6), and designing alternative energy developments, such as wind energy, to minimize or avoid impact to other uses and resources, in particular wildlife (FW-SpecUse-G-11). New utility corridors should avoid research natural areas, geological areas, botanical areas, and environmental study areas (FW-SpecUse-G-10).These plan components address several risk factors for these species (urban and rural development; electrocution from transmission lines; collisions, injury or death associated with communication towers or energy development structures and large-scale wind and solar energy development) and should result in higher levels of survival and successful reproduction.

Alternative B (modified) emphasizes characteristic disturbances in species habitats more so than alternative A. This supports an underlying assumption of the revised plan that sustainable populations of native species would be maintained or enhanced where the ecosystems in which they occur or evolved are functioning properly. Desired conditions in Ponderosa Pine support this: “Frequent, low-severity fires (Fire Regime I) are characteristic in the vast majority of this ERU” (FW-TerrERU-PP-DC-3).This would contribute to the viability of bald and golden eagles. This is also supported in fire management with a desired condition that wildland fires would not result in loss of ecosystem function (FW-Fire-DC-3). In addition, the emphasis on ecosystem function is better articulated in alternative B (modified) than alternative A. See FW-Eco-DC-1, 2, FW-Soil-DC-1, 2, FW-Water-DC-2, 3, FW-Rip-All-G-2, FW-Rip-Wtlnds-DC-1, FW-Rip-Spr-DC-1, and FW-WFP-DC-1.

Unlike alternative A, alternative B (modified) has the following guideline: “Fire suppression techniques that minimize habitat and disturbance impacts should be used where there are federally listed and Southwestern Region sensitive species, consistent with public and firefighter safety” (FW-WFP-G-9). This is intended to mitigate or eliminate potential impacts that could occur with suppression tactics and would be beneficial to bald eagles.

Alternative B (modified) recommends 3 wildernesses, which could be used by both eagles, probably mainly for foraging. Recommended wilderness would provide an additional area of low disturbance for eagles, but the recommended wilderness would also preclude restoration treatments that would require motorized equipment. With this restriction on motorized equipment, the forest would be less likely to conduct restoration treatments, which, over time, could increase the risk of uncharacteristic fire or slow the trend toward desired conditions in these areas.

Like alternative A, alternative B (modified) has direction to follow conservation strategies, assessments or plans to improve the status of species and prevent Federal listing. Rather than restrict this to a few species, alternative B (modified) expands this direction via a forest wide guideline (FW-WFP-G-2). Following these conservation strategies or assessments could reduce the risk associated with bald eagles and golden eagles by providing more specific direction on species and project management. The Fish and Wildlife Service recommends using the “Conservation Assessment and Strategy for Bald Eagles in Arizona” (Driscoll et al. 2006) in conjunction with the “Bald Eagle National Management Guidelines” (USDI Fish and Wildlife Service 2007c) to protect bald eagles in Arizona. For golden eagles, the Fish and Wildlife Service has issued a report titled, “Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Golden Eagle Management and Permit Issuance” (Pagel et al. 2010).

Alternative B (modified) requires timing restrictions to be applied to projects and activities that have the potential to negatively affect bald eagles and golden eagles (FW-WFP-S-2). This standard addresses the disturbance risk factor for these species and should result in higher levels of survival and successful reproduction. Alternative A lacks timing restrictions for golden eagles.

Mechanized use in botanical and geological areas is not suitable in this alternative except on trails designated for this purpose. This use could result in disturbance to eagles in localized areas.

Alternative C

Alternative C is the same as alternative B (modified) except for the following.

It has the same effects as alternative B (modified) for recommended wilderness except there are 4,462 acres of Ponderosa Pine ERU in recommended wilderness (both eagles) and 1,333 additional of acres of riparian forest types (for nesting bald eagles). There are nearly 91,000 acres of recommended wilderness in this alternative, which could be used for foraging. Eagles and their prey would benefit from the reduced disturbance in these areas in the short term, as they are considered for wilderness designation, and in the long term if they are designated as wilderness.

Mechanized use in botanical and geological areas is not suitable in this alternative on any trails. This language would reduce disturbance to eagles in localized areas.

Alternative C is the only alternative that has areas designated as not suitable for recreational shooting. The designation of management areas as not suitable for recreational shooting would result in reduced disturbance within the following management areas totaling about 588,223 acres: Anderson Mesa, Blue Ridge, Hospital Ridge, Jack's Canyon, Knoll Lake, Limestone Pasture, Pine Grove, Second Chance, Walnut Canyon, Long Valley, and Sedona Neighborwoods Management Areas. These acres include areas that might already be excluded from recreational shooting by law. Areas designated as not suitable do not automatically become no recreational shooting areas. Subsequent environmental analysis (including public review and comment) and decisions need to be done to make this official. There are 5,268 acres in other areas that contain eagle habitat that are also not suitable for recreational shooting. These areas include Cottonwood Basin Geological and Botanical Area (763 acres) Fern Mountain Botanical Area (186 acres), Oak Creek Research Natural Area (1,853 acres), Red Mountain Geological Area (1,201 acres), Mogollon Rim Botanical Area (339 acres), and Rocky Gulch Research Natural Area (926 areas).

Alternative C is the only alternative with management areas designed to reduce disturbance to wildlife habitat. Design features to accomplish this would include low-disturbance non-motorized recreational activities; no net increase in the area of motorized dispersed camping corridors; limitations on the roads that provide public motorized access; and a ban on large group recreation events and large commercial tours, except in support of research. These management areas total 377,106 acres and would emphasize native species including bald and golden eagles. They include Anderson Mesa, Blue Ridge, Hospital Ridge, Jack's Canyon, Knoll Lake, Limestone Pasture, Pine Grove, and Second Chance Management Areas. They would reduce human disturbance in those areas where the area is not already protected by or in addition to existing designations such as wild and scenic rivers or inventoried roadless areas.

Alternative D

Alternative D is the same as alternative B (modified) except there is no recommended wilderness. Alternative D would set the scenic integrity objectives associated with the power line between Sycamore Canyon Wilderness and Red Rock-Secret Mountain Wilderness to a low rating (instead of a moderate rating) and would set the scenic integrity objectives associated with the energy corridor along State Highway 87 to a low rating (instead of a moderate or high rating). The assumption is that the width of a power line corridor would not change under a moderate scenic integrity objective, but can double in size under a low scenic integrity objective before it would be lowered to a very low scenic integrity objective category. Therefore, under alternative D, these segments could substantially increase in size, including the clearing of trees to meet regulations. It could get no larger than the distance between the Sycamore and Red Rock Wilderness boundaries in that area. This could increase transmission line size or number of lines within the corridor increasing localized risk to eagles. The risk could be mitigated by design. This alternative has the highest potential for risk to eagles from transmission lines.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of bald eagles and golden eagles, although individuals may be impacted by management activities or permitted uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for bald eagles, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A because of updated plan guidance for the riparian forest types, the Ponderosa Pine ERU, and cliffs. In all alternatives, plan objectives would reduce the coarse filter threat of uncharacteristic fire and facilitate the growth of large trees in Ponderosa Pine ERU. Recommended wilderness in alternative B (modified) would slightly increase areas of low disturbance for this species. Alternative C would reduce disturbance to this species the most due to management areas that are not suitable for recreational shooting, management areas managed for reduced disturbance to wildlife, and more acres of eagle habitat in recommended wilderness. Alternative D would provide lower viability for these species than alternatives B (modified) and C in localized areas on the forest due to the lower scenic integrity objectives that could facilitate larger transmission lines or an increased number of lines within a transmission corridor.

Considering all environmental and cumulative consequences, alternative A could result in take, as defined in the Eagle Act, for bald or golden eagles on the forest. However, its plan guidance to minimize disturbance effects emphasizes bald eagles more so than golden eagles in terms of timing restrictions, does not address wind and solar energy sites, and allows mountain biking in geological and botanical areas, so the likelihood of unavoidable take at the project level would be higher than the other alternatives.

Considering all environmental and cumulative consequences, alternative B (modified) could result in take, as defined in the Eagle Act, for bald or golden eagles on the forest. Its plan guidance minimizes disturbance effects to both bald eagles and golden eagles in terms of timing restrictions, addresses wind and solar energy sites, has the least amount of risk associated with energy development yet would allow mountain biking in geological and botanical areas, so the likelihood of unavoidable take is lower than alternative A and higher than alternative C at the project level.

Considering all environmental and cumulative consequences that apply to alternative B (modified), plus the differences analyzed above, alternative C could result in take—as defined in the Eagle Act—or bald or golden eagles on the forest, but alternative C would reduce disturbance to eagles in some parts of the forest more so than the other alternatives. When these area-specific restrictions are taken into account, this alternative would have the lowest likelihood of unavoidable take at the project level compared to the other alternatives.

Considering all environmental and cumulative consequences that apply to alternative B (modified), plus the differences analyzed above, alternative D could result in take—as defined in the Eagle Act— for bald or golden eagles on the forest, but alternative D would increase disturbance to eagles in some parts of the forest more so than the other alternatives. When these area-specific factors are taken into account, this alternative would provide the least protection for bald and golden eagles at the project level compared to the other alternatives.

Fish

Bluehead sucker, desert sucker, Little Colorado sucker, longfin dace, roundtail and headwater chub, and Sonora sucker

These species have been grouped because they are all fish that share a similar combination of the following habitats: perennial streams and Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and Montane Willow Riparian Forest. These habitats are evaluated in the Coarse Filter: Habitat section.

Desert sucker, Little Colorado sucker, roundtail and headwater chub, and Sonora sucker are Southwestern Region sensitive species.

Bluehead sucker and longfin dace are Other planning species.

Affected Environment

Distribution

Bluehead sucker is widely distributed within the Colorado and Columbia River basins. On the Coconino NF, Bluehead sucker is present in the Lower and Upper Clear Creek 5th HUC watersheds, associated with all three riparian forests (123.5 potential perennial stream miles).

Desert sucker and Sonora sucker are found within overlapping habitats in the upper Verde and West Clear Creek watersheds and occurs in the Bill Williams, Salt, Gila, San Francisco, and Verde River drainages in Arizona and New Mexico. On the Coconino NF, these species are present in the Beaver Creek, Cherry Creek-Verde River, Fossil Creek-Verde River, Grindstone Wash-Verde River, Oak Creek, Sycamore Creek and West Clear Creek 5th HUC watersheds (193.9 potential perennial stream miles).

Little Colorado sucker is endemic to the upper portions of the Little Colorado River and many of its north flowing tributaries. On the Coconino NF, Little Colorado sucker is present in East Clear Creek and associated perennial tributaries in the Lower and Upper Clear Creek 5th HUC watersheds (124.1 potential perennial stream miles).

Longfin dace is broad ranging in the lower Colorado River drainage, but it is rarely abundant in larger streams, or at elevations above 5,000 feet. On the Coconino NF, longfin dace are found in the Sycamore Creek, Beaver Creek, Oak Creek, West Clear Creek, Fossil Creek – Verde River, Grindstone Wash – Verde River, and Cherry Creek – Verde River 5th HUC watersheds (163.5 potential perennial stream miles).

A distinct population segment of roundtail chub, in combination with Headwater chub, was previously proposed by the Fish and Wildlife Service to list as threatened status under the Endangered Species Act; however, the proposed rule was withdrawn based on a thorough review of scientific and commercial data available. The former headwater chub (*Gila nigra*), has been combined with Roundtail chub (*G. robusta*) (Federal Register Vol. 82, No. 66 pp. 16981 – 16988); however, they reside on the Southwestern Region's sensitive species list as two separate species. They are grouped in this analysis because their habitats overlap. Roundtail chub is widespread in moderate to large rivers of the Colorado River Basin. In Arizona, it still occurs in the mainstem and tributaries (Fossil Creek) to the Verde and Salt Rivers. Roundtail chub are also still thought to occur in the Upper Clear Creek watershed. On the Coconino NF, roundtail chub are present in the Sycamore Creek, Oak Creek, Beaver Creek, West Clear Creek, and Fossil Creek-Verde River 5th HUC watersheds, in all riparian forest types, and in a wide range of elevations. They were historically present in Cherry Creek-Verde River, Dry Beaver, and Grindstone Wash-Verde River (350 potential perennial stream miles) (AZGFD 2015, USDI Fish and Wildlife Service 2015).

Headwater chub were historically restricted in overall range to the headwater reaches of major tributaries to the Verde River, tended to occupy lower elevations, and were only known from the Fossil Creek-Verde River 5th HUC watershed (Fossil Creek, 10.7 potential perennial stream miles). There are two existing wilderness areas and three inventoried roadless areas within the Fossil Creek and lower Verde River watersheds where this species is found. These areas provide protections to about 39 percent of the watersheds under all alternatives (USDA Forest Service 2013).

Habitat

Adult bluehead sucker occupies a variety of habitats from headwater streams to large rivers, usually in moderated to fast-flowing water over a cobble-dominated substrate. Young fish are more likely to be encountered in shallower, backwater areas (AZGFD 2013b). On the Coconino NF, bluehead sucker is associated with perennial streams, Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and Montane Willow Riparian Forest.

Desert sucker and Sonora sucker use medium to moderately large streams, at elevations ranging from 500 to 8,800 feet, and neither species occurs in reservoirs. Both are usually found in rapids and flowing pools of streams, primarily over bottoms of gravel-rubble (AZGFD 2002b). Both of these species are associated with perennial streams, Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and Montane Willow Riparian Forest.

Little Colorado sucker use small to medium-sized creeks and rivers, usually gravel-bottomed pools with substantial cover. Little Colorado sucker is associated with perennial streams, Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and Montane Willow Riparian Forest.

Longfin dace is found in shallower waters (less than 0.6 feet) of small to medium-sized streams with sand or gravel substrates. This species has a tendency to remain in open, shallow areas throughout much of the day and to congregate in shaded, deep areas when water temperatures exceed 75 °F. Longfin dace is associated with perennial streams, Cottonwood Willow Riparian Forest, and Mixed Broadleaf Deciduous Riparian Forest.

Roundtail chub occupy cool to warm water, mid-elevation streams and rivers where typical adult microhabitat consists of pools up to eight feet deep adjacent to swifter riffles and runs. Cover is usually present and consists of large boulders, tree rootwads, submerged large trees and branches, undercut cliff walls, or deep water. Smaller chub generally occupy shallower, low velocity water adjacent to overhead bank cover (AZGFD 2015).

Headwater chub occupy complex stream habitats with deeper pools and obstructions near riffles and runs with nearby cover. They are generally found in gravel/cobble substrates with small boulders.

Roundtail chub and headwater chub are associated with perennial streams, Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and Montane Willow Riparian Forest.

Risk Factors

Primary risk factors for this group of species are invasive or non-native species and rarity. Non-native species are the greatest fine filter threats to these fish species, because they can compete with or prey on native fish and they can introduce disease.

Environmental Consequences

Table 82 summarizes the viability analyses for bluehead sucker, desert sucker, Little Colorado sucker, Sonora sucker, longfin dace, roundtail chub, and headwater chub. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 82. Analysis summary for Sensitive and Other fish species

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Bluehead sucker (Other)	Perennial streams	Poor, static	M-H	Poor, toward	M-H
Desert sucker (Sensitive)	CWRF	Fair, slowly toward	M-H	Good, slowly toward	M
Little Colorado sucker (Sensitive)	MBDRF	Good, static to slowly toward	M	Good, slowly toward	M
Sonora sucker (Sensitive) F Rank = F3*	MWRF	Good, static to slowly toward	M	Good, slowly toward	M
Longfin dace (Other) F Rank = F3*	Perennial streams	Poor, static	M-H	Poor, toward	M-H
	CWRF	Fair, slowly toward	M-H	Good, slowly toward	M
	MBDRF	Good, static to slowly toward	M	Good, slowly toward	M
Roundtail chub and Headwater chub (Sensitive) F Rank = F2*	Perennial streams	Poor, static	H	Poor, toward	H
	CWRF	Fair, slowly toward	H	Good, slowly toward	M-H
	MBDRF	Good, static to slowly toward	M-H	Good, slowly toward	M-H

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
	MWRF	Good, static to slowly toward	M-H	Good, slowly toward	M-H
Management Effect		Perennial streams = 4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. CWRF, MBDRF, and MWRF = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

* F2 = Rare on the forest within its habitat - occupies a small portion of its habitat. F3 = Uncommon on the forest within its habitat.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

There is language under all alternatives that prioritizes habitat improvement and protections for projects for fish and wildlife species (1987 Plan, pages 23, 59, 64-6, and 87; FW-LndAdj-G-1; FW-Minerals-G-3; FW-RdsFac-G-7). Additionally, management applications under alternative B (modified), C, and D provide recommendations to managers regarding approaches for successful implementation of plan components, such as prioritization of work to benefit threatened and endangered species (Management Approaches for Roads and Facilities, All Riparian Areas, Stream Ecosystems, and Watersheds and Water). Efforts to protect and improve habitats for threatened and endangered and Southwestern Region Forest Sensitive species provide protections for all aquatic species within these habitats.

Alternative A

Table 82 shows that under alternative A, perennial streams would remain in poor condition with a static trend in relation to desired conditions primarily because nearly all perennial streams support non-native or invasive aquatic species, which were not present historically. Cottonwood Willow Riparian Forest would remain in fair condition and Mixed Broadleaf Deciduous Riparian Forest and Montane Willow Riparian Forest would remain in good condition. All of these riparian forest types would mostly have a static trend or slowly trend toward desired conditions. In Cottonwood Willow, some portions of the Verde River, Dry Beaver Creek, and Spring Creek, would be static due to high recreation or private land. In Mixed Broadleaf Deciduous, static trends are associated with the Oak Creek 5th code and West Clear Creek 5th code HUCs. Trends that are slowly toward desired conditions are associated with the Beaver Creek and the Fossil Creek- Lower Verde River 5th code HUCs except portions of Fossil Creek have a trend away from desired conditions where recreation use is high. Trends in Montane Willow would be static to slowly toward desired conditions, except the Upper Clear Creek 5th code HUC is trending toward desired conditions.

As shown in table 82, the likelihood that habitats on the forest would be a limiting factor for these fish species is moderate to high, depending on the habitat. These likelihoods were derived by combining these species' F Ranks of F3 or F2 with the likelihood of habitat limitation variables for each habitat: perennial streams (high), CWRF (high), MBDRF (moderate), and MWRF (moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat. Note that Fossil Creek would be an exception because historic flows have been restored, native fish populations have been re-introduced, and a fish barrier has been installed.

The management effect row in table 82 shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 4 for perennial streams, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. This is primarily because language is largely lacking for invasive and non-native aquatic species that were not present historically. These species can alter the composition, structure and processes of stream ecosystems. There is also lack of direction to implement TMDL plans which are designed to improve non-attaining and impaired waters. As described in the coarse filter: habitat section, the threat of dispersed recreation to riparian resources is not addressed forestwide in alternative A. Special areas such as the Verde Wild and Scenic River and wilderness, and the management areas within Flagstaff/Lake Mary Ecosystem Area and the Sedona-Oak Creek Planning Area most specifically address the conflicts and strategies to resolve resource damage in riparian areas. This direction mainly addresses dispersed recreations impact to specific riparian areas where there have been past conflicts and resource damage, but it provides very limited direction when previously low use areas are "discovered" and see unexpected increases in recreation, such as Fossil Creek. As a result, alternative A addresses this threat sporadically compared with alternatives B (modified), C, and D, but it does mitigate some of the areas where the conflict is most pronounced.

The management effect is classified as a 3 for Cottonwood Willow, Mixed Broadleaf Deciduous, and Montane Willow riparian forest types, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of these species than the other alternatives. Alternative A does not distinguish riparian forest types from other riparian areas nor does it distinguish between the riparian forest types yet it has some protective language. For example, alternative A would maintain or improve riparian forests and streamcourses because it has a focus on improving riparian areas in any condition, preventing damage to riparian vegetation, stream banks, and channels, and restoring degraded riparian areas to good condition as soon as possible (1987 Plan, pages 65-2, 65-8, 172, and 206-8). Other protective language includes the following: Only beneficial new special uses are allowed in riparian areas and exceptions such as utility line or roads crossing stream courses are designed to minimize the extent and magnitude of impact to riparian (1987 Plan, page 177). Aggressive fire suppression may be used to prevent resource damage utilizing methods that minimize long-term adverse impacts to riparian habitats (1987 Plan, page 177). In addition, acquisition of riparian areas through land exchange is a high priority (1987 Plan, pages 177 and 185). The plan would manage commercial uses, and recreation in some areas, to protect riparian values (1987 Plan, pages 206-10, 22, 26, and 39). However, plan language may preclude restoration of riparian forest habitat if conditions haves facilitated conifer establishment in riparian areas (1987 Plan, page 176). This may not be beneficial for riparian habitat and aquatic environments depending on site-specific circumstances. Language for mineral material excavation could allow mineral development in the riparian zone if the authorized activities are beneficial however the likelihood of beneficial mineral activities in these areas is low. Plan components in the Sedona-Oak Creek Ecosystem Area would mitigate the effects of livestock grazing and fire management activities on riparian communities (including perennial streams) however this direction does not apply forestwide. See the Coarse Filter: Habitat section for more detail.

Alternative B (modified)

Table 82 shows that under alternative B (modified) perennial streams would remain in poor condition, but the trend would be toward desired conditions. Fossil Creek and Spring Creek would be in fair to good condition because they have fish barriers to separate native from non-native fish.

Cottonwood Willow Riparian Forest would improve to good condition and trend slowly toward desired conditions except portions of the Verde River, Towel Creek, Spring Creek and Dry Beaver Creek would improve faster (i.e., have a trend toward desired conditions).

Mixed Broadleaf Deciduous Riparian Forest would remain in good condition and would slowly move toward desired conditions except portions of Fossil Creek and Wet Beaver Creek would remain static in areas of high recreation use. It would improve faster than alternative A in the Beaver Creek, Oak Creek, West Clear Creek, and Fossil Creek 5th code HUCs.

Montane Willow Riparian Forest would remain in good condition like alternative A except Upper Clear Creek 5th code HUC would improve. The trend would improve to slowly toward desired conditions.

As shown in table 82, the likelihood that habitats on the forest would be a limiting factor for these fish species is moderate to moderate-high depending on the habitat. These likelihoods were derived by combining these species’ F Ranks of F3 or F2 with the likelihood of habitat limitation variables for each habitat: perennial streams (high), and Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and Montane Willow Riparian Forest (moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat to which the species would be adapted. There would be localized exceptions such as in high recreation use areas in the Beaver Creek 5th code HUC where the likelihood that associated species would be limited would be high.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the habitats associated with these fish species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. For perennial streams, this rating is based on language regarding mitigating the effects of roads, connectivity of drainages, connectivity between streamcourses and upland habitats, and earthen stock tank locations (to minimize impacts to sensitive resources) (See FW-ConstWat-G-1 and 2, FW-RdsFac-G-2, 5, 7 and 9 and Connectivity under Wildlife and Plants Topics and Issues). Unlike alternative A, there is also plan language regarding invasive or non-native species. Detailed information on this plan language can be found in the Wildlife and Plant Topics and Issues section under Non-native or Invasive species. There are also three recommended wildernesses which would lessen the effects of roads, which can alter natural water flow patterns and alter natural sediment levels.

For Cottonwood Willow, Mixed Broadleaf Deciduous, and Montane Willow riparian forest types, this rating is primarily because there are updated desired conditions and guidelines that distinguish between the riparian forest types and that support their respective composition, structure, and function (FW-Rip-RipType-DC-1 to 6 FW-Rip-RipType-G-1 to 4). In addition, riparian functional condition would improve faster than alternative A, especially along the Verde River, Towel Creek, Spring Creek, and Dry Beaver Creek. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1 and 2; FW-Water-G-2; FW-Rip-RipType-O-1). More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3; Fw-Rip-Strm-G-2) (USDA Forest Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1 and 3).

Alternative B (modified) also provides direction that better addresses the risk factors to these species. The desired conditions under alternative B (modified) support the trend to improved stream ecosystem function, collaborative efforts to maintain stream flow, and reduce or eliminate the impacts of invasive species (FW-Invas-DC-1; FW-Invas-G-1). Plan language includes guidance for restoring natural fire regimes, acquiring lands that contain important habitat needed for species viability, incorporating recovery actions and conservation strategies for federally listed or candidate species, and incorporating design features to maintain aquatic habitats for Forest Service sensitive species populations (FW-WFP-G-1 and 2).

Alternative C

Implementation of plan components under alternative C would have similar effects to alternative B (modified) except that alternative C recommends two additional wilderness areas and six management areas that emphasize reduced human-related disturbance in the East Clear Creek watershed. Alternative C also provides recommendations for four additional new wilderness areas in the Fossil Creek-Verde watersheds. These wilderness and management areas would provide habitat benefits for these fish species through reduction of sediment input, motorized access, and damage to streamside vegetation. Some of these recommended wilderness areas overlap with existing areas or are such a distance from perennial waters, that little increase in protected perennial stream habitat is likely from implementation of these areas (USDA Forest Service 2013). However, the addition of these protected areas provides for protections on 48 percent of the East Clear Creek watersheds and 21 percent of the Fossil Creek-Verde watersheds, as opposed to the 3 percent under alternatives A, B (modified), and D.

Alternative D

Implementation of alternative D would have similar effects to alternative B (modified) except that alternative D would designate the Cottonwood Basin Geological Area (which contains no springs and smaller acreage than the area designated for both the Botanical and Geological Areas under alternative B (modified) and C). Alternative D recommends no new wilderness areas. The effects associated with managing those areas as recommended wilderness would not occur. These areas would still be managed by the other forestwide, management area, and special area direction in alternative B (modified) with the corresponding effects discussed above in the alternative B (modified) section. These small changes would not change the conditions and trends in aquatic habitats from those provided by alternatives B (modified) and C for this species.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of these fish species, although individuals may be impacted by management activities or permitted uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for desert sucker, Little Colorado sucker, roundtail and headwater chub, and Sonora sucker, which are Forest Service sensitive species. Alternatives B (modified) and D better provide for the viability of these species than alternative A because of updated plan components for management of the different riparian forests, for invasive animal species management, for updated language for water quality, and for language that addresses endemic species. Although alternative C would have the same effects as alternatives B (modified) and D, it would contribute slightly more to the viability of these species due to the additional protection provided in recommended wilderness in the watersheds for this species. Finally, alternatives B (modified), C, and D provide language that guides partnership development, water rights acquisition, as well as language that supports sustainability of perennial stream habitat, addresses invasive species, and provides for species viability.

Frogs and toads

Arizona toad, lowland leopard frogs, northern leopard frogs

These species are grouped together because they are all amphibians and share similar habitats and threats. Cottonwood Willow Riparian Forests, Mixed Broadleaf Deciduous Riparian Forests, Montane Willow Riparian Forests, Wetlands, Perennial streams, Ephemeral, and Intermittent Streamcourses, and Springs are more fully evaluated in the Coarse Filter: Habitat section.

Affected Environment

Arizona toad is classified as an Other planning species. Lowland leopard frogs and northern leopard frogs are Southwestern Region sensitive species. Arizona toad and lowland leopard frogs are endemic species.

Distribution

Arizona toads occur in riparian areas in the southwest. On the Coconino NF, they are known from the East Clear Creek area. Historically they were found on West Clear Creek and the Verde River.

Lowland leopard frogs are only known to occur in Fossil Creek, Walker Creek, and possibly in Oak Creek Canyon (only tadpoles observed) on the Coconino NF. Off the forest, lowland leopard frogs are currently known to occur in Spring Creek but only on the private land parcel, Josephine Tunnel (private land), Page Springs Fish Hatchery (State land), and Soda Springs (private land). Historic records for lowland leopard frogs are from Spring Creek, Verde River, Josephine Tunnel (private land), Oak Creek including the Canyon, and Fossil Creek. Unsurveyed, but suitable locations below the rim are numerous and include perennial streams (Red Tank Draw), various springs (Russell, Holly), and numerous earthen livestock tanks below the rim.

The range of northern leopard frogs once included much of northern and central Arizona, but now their presence is reduced to three or four widely separated populations in east-central Arizona, in the Peach Springs area, in the Stoneman Lake area, and on the Navajo reservation. The Stoneman Lake area is on the Coconino NF and includes a wetland/earthen stock tank complex used by this frog, although historically it had a wider distribution on the forest. The Stoneman Lake population is extensive and is the only population in Arizona that is increasing in extent and numbers.

Habitat

Arizona toads are associated with Cottonwood Willow Riparian Forests, Mixed Broadleaf Deciduous Riparian Forests, Montane Willow Riparian Forests, Wetlands, and Perennial Streamcourses. Ephemeral and Intermittent Streamcourses with perennial pools are important special features used for movements between suitable habitats.

Lowland leopard frogs are associated with Perennial Streamcourses, Springs, Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and Wetlands. Ephemeral and Intermittent Streamcourses are important for movement between suitable habitats.

Northern leopard frogs are associated with Springs, Wetlands, and earthen stock tanks (constructed waters). Ephemeral and Intermittent Streamcourses are important for movement between suitable habitats. Although most earthen stock tanks were originally constructed for livestock, they also provide water and habitat for some wildlife species. They are widely distributed on the forest, having been constructed in a variety of ecosystems. Quality, size, and water permanence is influenced by many factors including geology and soil type, weather, depth, surface area, presence of aquatic or riparian plant species, presence of invertebrates, and presence of invasive, non-native species. Many earthen stock tanks were constructed in wetlands.

Risk Factors

Primary threats to these amphibian species are disease, invasive and non-native aquatic species, and their overall rarity. Leopard frogs are seldom found in association with non-natives including fish, bullfrogs, and crayfish. Arizona toads are additionally threatened by hybridization with the native Woodhouse's toad.

Human activities can spread disease, which can affect survival and reproduction of these species. Chytridmycosis is a potentially fatal infectious disease of amphibians caused by the chytrid fungus *Batrachochytrium dendrobatidis* (Bd). This disease can be spread by moving contaminated soil, water, or organisms to uncontaminated areas. Chytrid fungus has been found on the forest. Invasive and non-native aquatic species can compete with and prey on these species or modify their habitat. These species are known from only a few locations on the forest or their current population is substantially reduced from what it was historically.

The Wildlife and Plant Issues and Topics section has more detail about At-Risk Species, Connectivity, and Disease/Non-native species.

Environmental Consequences

Table 83 summarizes the viability analyses for Arizona toads, lowland leopard frogs, and northern leopard frogs. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 83. Analysis summary for frogs and toads

Species, status, and F Rank	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Condition and habitat trend relative to desired conditions	**Likelihood species is limited**	**Condition and habitat trend relative to desired conditions**	**Likelihood species is limited**
Arizona toad (Other) F Rank = F2*	CWRF	Fair, slowly toward	H	Good, slowly toward	M-H
	MBDRF	Good, static to slowly toward	M-H	Good, slowly toward	M-H
	MWRF	Good, static to slowly toward	M-H except H in Upper Clear Creek 5th code HUC	Good, slowly toward	M-H
	Wetlands	Good, toward**	M-H	Good, toward**	M-H
	Springs	Fair***, slowly toward	H	Fair***, slowly toward	H
	Perennial streams	Poor, static	H	Poor, toward	H
	Ephemeral, Intermittent Streams****	Poor, static	H	Poor, slowly toward	H
Lowland leopard frog (Sensitive) F Rank = F1*	CWRF	Fair, slowly toward	VH	Good, slowly toward	H
	MBDRF	Good, static to slowly toward	H	Good, slowly toward	H
	Wetlands	Good, toward**	H	Good, toward	H
	Perennial streams	Poor, static	VH	Poor, toward	VH
	Springs	Fair***, slowly toward	VH	Fair***, slowly toward	VH
	Ephemeral Intermittent Streams****	Poor, static	VH	Poor, slowly toward	VH
Northern leopard frog (Sensitive) F Rank = F2*	Wetlands	Good, toward**	M-H	Good, toward	M-H
	Springs	Fair***, slowly toward	H	Fair***, slowly toward	H
	Ephemeral Intermittent Streams****	Poor, static	H	Poor, slowly toward	H

Species, status, and F Rank	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Condition and habitat trend relative to desired conditions	**Likelihood species is limited**	**Condition and habitat trend relative to desired conditions**	**Likelihood species is limited**
	Constructed Waters		See discussions in alternatives below.		
Management Effect		Springs and Perennial Streams = 4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. CWRF, MBDRF, MWRF, Wetlands, and Ephemeral and Intermittent Streams = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat. F2 = Rare on the forest within its habitat - occupies a small portion of its habitat.

**For analysis of these species, wetland condition and trend are based on total acres of wetlands, which has the effect of giving greater weight to larger wetlands. The condition and trend is fair and slowly toward desired conditions when the number of individual wetlands is considered, instead of total wetland acres.

***For analysis of these species, springs were considered in fair condition. However, some springs could be in poor or good condition depending on accessibility, protection, or degree of development.

**** For analysis of these species, ephemeral and intermittent streamcourses were considered to be accessible.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Plan components in all alternatives have plan objectives or management emphasis to improve or restore riparian ecosystems, direction to use best management practices, and would employ either filter strips (alternative A) or aquatic management zones (remaining alternatives) to protect water quality and to avoid detrimental changes in water temperature, chemical composition, sediment deposits, or blockages. These plan components would maintain or improve water conditions, habitat for aquatic and riparian species, and connected downstream resources. See 1987 Plan, pages 23, 71, 72, 72-1, 172-177; FW-Rip-Wtlnds-O-1, FW-Rip-Spr-O-1, FW-Rip-RipType-O-1, and FW-WFP-O-4, FW-Rip-All-G-3, FW-Rip-Strm-G-2, FW-Water-G-4, and FW-BioPhys-Geo-G-8.

Instream flow water rights would be maintained and procured at similar levels under all alternatives (1987 Plan, pages 74 and 206 and FW-Water-G-3). Procurement of instream flow water rights would improve the extent of uninterrupted streamflows across NFS lands thereby providing greater aquatic and riparian habitat continuity and resilience.

All alternatives provide language for monitoring, including the use of aquatic macroinvertebrates as monitoring indicators for condition of waterways and riparian areas. Water quality monitoring using the Arizona Department of Environmental Quality standards is also supported under all alternatives.

Alternative A

Table 83 shows that under alternative A, Cottonwood Willow Riparian Forest would remain in fair condition and have a slow trend toward desired conditions. In Cottonwood Willow, some portions of the Verde River, Dry Beaver Creek, and Spring Creek, would be static due to high recreation or private land, such as the area around Childs, Spring Creek, Dry Beaver Creek, and private lands.

Mixed Broadleaf Deciduous Riparian Forest would remain in good condition. Static trends would be associated with the Oak Creek 5th code and West Clear Creek 5th code HUCs. The trend would be static or moving slowly toward desired conditions except in the Beaver Creek, West Clear Creek and Oak Creek 5th code HUCs and portions of Fossil Creek where recreation impacts are high. Areas of private land would remain static as well.

Montane Willow Riparian Forest would remain in good condition with a majority of the habitat either static or trending slowly toward desired conditions, except the Upper Clear Creek 5th code HUC is trending toward desired conditions.

Wetlands would remain in good condition and slowly trend toward desired condition based on total acres of wetlands. The condition would be fair and trend toward desired conditions if the evaluation is based on the number of wetlands.

Springs would remain in fair condition with a static trend relative to desired conditions. Accessible, unprotected springs would remain in poor condition, while springs that are inaccessible, protected, or undeveloped would remain in good condition.

Perennial streams would remain in poor condition and slowly trend toward desired conditions. This condition is generally due to most streams having invasive and non-native animal species which is outside of the historic variability for streams.

Ephemeral and intermittent streamcourses that are intersected by roads and are accessible would remain in poor condition with a static trend. Ephemeral and intermittent streamcourses that are inaccessible would have the same condition and trend.

Constructed waters (earthen stock tanks) would be in varying conditions. All would be accessible by motorized vehicles because vehicles are necessary for tank construction and maintenance.

They may or may not support invasive or non-native animal species. They may or may not have sufficient aquatic or riparian vegetation to shelter adults, egg, or tadpoles from predators. Tank depth and duration of water would be variable and influenced by soil suitability, location, and associated uses. Trend would be variable depending on the site-specific circumstances around each tank including water duration, location, weather, and use by livestock and wildlife.

As shown in table 83, the likelihood that habitats on the forest would be a limiting factor for these species is moderate-high to very high. These likelihoods were derived by combining these species' F Ranks of F1or F2 with the likelihood of habitat limitation variables for each habitat: Cottonwood Willow Riparian Forest (high), Mixed Broadleaf Deciduous Riparian Forest (moderate), Montane Willow Riparian Forest (moderate), wetlands (moderate, by acres), springs (high), perennial streamcourses (high), and ephemeral and intermittent streamcourses (high when accessible) (table 9 in volume IIa). There would be at least a moderate to moderate-high likelihood that earthen stock tanks could be a limiting factor to northern leopard frogs because they are designed primarily for livestock but are regularly used by a variety of wildlife species, because they may be smaller than and have shorter duration of water than more natural wetland habitat; and generally do not have the amount, distribution, or variety of food and cover that would naturally occur in a wetland environment. Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. Plan components are discussed further below and in the Coarse Filter: Habitat section by ERU or riparian forest type.

The management effect is classified as a 3 for Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, Montane Willow Riparian Forest, wetlands, and ephemeral and intermittent streamcourses, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives. Alternative A would maintain or improve riparian forests, wetlands, and ephemeral and intermittent streamcourses because it has a focus on improving riparian areas in any condition, preventing damage to riparian vegetation, streambanks, and channels, and restoring degraded riparian areas to good condition as soon as possible (1987 Plan, pages 65-2, 65-8, 172, and 206-8). Other protective language includes the following: Only beneficial new special uses are allowed in riparian areas and exceptions such as utility line or roads crossing stream courses are designed to minimize the extent and magnitude of impact to riparian areas (1987 Plan, page 177). Aggressive fire suppression may be used to prevent resource damage utilizing methods that minimize long-term adverse impacts to riparian habitats (1987 Plan, page 177). In addition, acquisition of riparian areas through land exchange is a high priority (1987 Plan, pages 177 and 185). The plan would manage commercial uses, and recreation in some areas, to protect riparian values (1987 Plan, pages 206-10, 206-22, 206-26, and 206-39).

This alternative has the least potential for improvement to riparian condition compared to the other alternatives because desired conditions for the different types of riparian areas are lacking and there is not a focus on functioning-at-risk and non-functional riparian areas (USDA Forest Service 2016b). This is some protective language, however. Alternative A emphasizes watershed condition in a general sense by management area and special area (1987 plan, pages 75, 85, 139, 145, 148, 162, 169, 172, 191, 194, 197, 206-84, 206-88, and 206-100). There is forestwide direction to maintain current satisfactory watershed conditions, improve any unsatisfactory conditions to satisfactory by 2020, and evaluate watershed condition for its effect on turbidity (1987 plan, pages 23, 72, 73, 74). Alternative A also includes several standards and guidelines related to protecting water resources and stream riparian areas that would support dispersal habitat and movement corridors. These include: procurement of instream flow water rights; protection of riparian areas though filter strips; and maintaining 80 percent crown cover, 80 percent emergent vegetation cover, and three age classes of woody riparian species (1987 Plan, page 174). There are no specific objectives for riparian habitat, but rather broadly defined goals for 80 percent riparian recovery by 2030 (1987 Plan, page 28), likely unachievable given the current rate of implementation on the forest. The existing plan includes standards and guidelines that emphasize maintenance and restoration of healthy riparian ecosystems (1987 Plan, page 65-5), that management strategies should move degraded riparian vegetation toward good condition as soon as possible and damage to riparian vegetation, stream banks, and channels should be prevented (1987 Plan, page 65-5). There are also objectives to construct 10 miles of fences per decade for the first two decades where necessary to protect key wet meadows, wetlands, and riparian regeneration from grazing (1987 Plan, page 175) and prioritize road closures where poorly designed or maintained roads are adjacent to or connected to stream courses where potential for increased runoff or sedimentation is high and where roads within streamcourses or wetlands (permanently or intermittently wet) are reducing hydrologic function (1987 Plan, page 206-71). The trend on some portions of stream riparian areas would remain static due to impacts from other resource areas (e.g., recreation, livestock) and lack of specificity with regard to forest plan guidance. Refer to Watershed section, Volume I for additional information on Watersheds and Riparian Systems.

The management effect is classified as a 4 for springs and perennial streams, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.

For springs, desired conditions and guidelines are largely lacking, therefore managers do not have clear direction when restoring or protecting springs or to maintain or restore toward desired condition of properly functioning, resilient springs and spring riparian areas (USDA Forest Service 2016b). For perennial streams, alternative A contains plan components that provide some guidance to manage introductions or occurrences of non-native animal species specifically in the Sedona/Oak Creek Ecosystem and the Flagstaff Lake Mary Ecosystem area (1987 plan, pages 206-9, 206-38, 206-72, 206-76). These areas include habitat for these species. These species can alter the composition, structure and processes of stream ecosystems.

As described in the Coarse Filter: Habitat section, the threat of dispersed recreation to riparian resources is not addressed forestwide in alternative A. Special areas, such as the Verde Wild and Scenic River and wilderness, and the management areas within Flagstaff/Lake Mary Ecosystem Area and the Sedona-Oak Creek Planning Area most specifically address the conflicts and strategies to resolve resource damage in riparian areas. This direction mainly addresses dispersed recreations impact to specific riparian areas where there have been past conflicts and resource damage, but it provides very limited direction when areas that previously received low use are "discovered" and see unexpected increases in recreation, such as Fossil Creek. As a result, alternative A addresses this threat sporadically compared with alternatives B (modified), C, and D, but it does mitigate some of the areas where the conflict is most pronounced.

Alternative A has language to follow approved or more recent conservation strategies or assessments only for certain species: for bald eagles (1987 Plan, page 206-100), Arizona leatherflower (hairy clematis) (1987 Plan, page 65-7), Arizona bugbane (1987 Plan, page 206-10) and Flagstaff pennyroyal (1987 Plan, page 65 and 206-10), but lacks this direction for other species.

Alternative A has standards and guidelines to ensure that the use of pesticides and herbicides does not cause surface water or groundwater contamination, including during site preparation for new timber stands or insect suppression projects (1987 Plan, pages 70, 73, and 121).

Plan components in alternative A protect and minimize impacts of livestock grazing to riparian areas through management and fencing but also manage impacts through seeding (1987 Plan, pages 69, 176, and 174). It also allows salting in riparian areas to improve livestock management by concentrating cattle in certain areas, a practice that could be detrimental to these amphibians and their habitat (1987 Plan, pages 68 and 175). This is offset by a standard that requires that forage use be maintained at a level that assures recovery and continued existence of listed species (1987 Plan, pages 66-1 and page 174). This is beneficial for Arizona toad and lowland leopard frogs, because they share habitat with federally listed fish species.

Alternative A would suppress fires that threaten the habitat of threatened and endangered, or sensitive species with the intent to minimize impacts to these habitats from fire (1987 Plan, page 95); however, the language does not address the techniques used to suppress wildfires, some of which (such as fire retardant) can be harmful to species or their habitat nor does it recognize the beneficial role fire plays in some ecosystems.

Plan language in alternative A focuses on removing unneeded stock tanks, restoring the area once the tank is removed, or exchanging an inefficient stock tank for a more efficient one under existing water rights. Construction and use of stock tanks is focused on improving water facilities for optimum production. Maintenance of waterlot fences would offer some protection from livestock and guidance that states open storage tanks and drinkers provide entry and escape ramps for wildlife would prevent these species from getting trapped/stuck. See 1987 Plan, pages 68, 68-1, and 69.

Alternative A does not contribute to the viability of species threatened by disease, because it lacks language regarding this threat.

Alternative B (modified)

Table 83 shows that under alternative B (modified), Cottonwood Willow Riparian Forest would improve to good condition and trend slowly toward desired conditions except portions of the Verde River, Towel Creek, Spring Creek, and Dry Beaver Creek would improve faster (i.e., have a trend toward desired conditions).

Mixed Broadleaf Deciduous Riparian Forest would remain in good condition and slowly move toward desired conditions except portions of Fossil Creek and Wet Beaver Creek would remain static in areas of high recreation use. It would improve faster than alternative A in the Beaver Creek, Oak Creek, West Clear Creek, and Fossil Creek 5th code HUCs.

Montane Willow Riparian Forest would remain in good condition and slowly move toward desired conditions. In the Upper Clear Creek 5th code HUC, Montane Willow Riparian Forest would move toward desired condition at a faster rate than alternative A.

Wetlands would remain in good condition trending toward desired condition.

Springs would remain in fair condition and slowly trend toward desired condition, like alternative A.

Perennial streams would remain in poor condition but the trend would be toward desired conditions because of updated plan components (see management effect discussion below). Ephemeral and intermittent streamcourses that are intersected by roads and are accessible would remain in poor condition, but the trend would improve to slowly toward desired conditions.

As shown in table 83, the overall likelihood that these species would be limited by their habitat on the forest is moderate-high to very high depending on the habitat. These likelihoods were derived by combining these species' F Ranks of F1 orF2 with the likelihood of habitat limitation variables for each habitat: Cottonwood Willow Riparian Forest (moderate), Mixed Broadleaf Deciduous Riparian Forest (moderate), Montane Willow Riparian Forest (moderate), wetlands (moderate, by acres), springs (high), perennial streamcourses (high), and ephemeral and intermittent streamcourses (high when accessible) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the coarse filter habitats associated with these amphibian species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For Cottonwood Willow, Mixed Broadleaf Deciduous, and Montane Willow riparian forest types, this rating is primarily because there are updated desired conditions and guidelines that support the composition, structure, and function of riparian forest types (FW-Rip-RipType-DC-1 to 6, FW-Rip-RipType-G-1 to 4). In addition, riparian functional condition would improve faster than alternative A, especially along the Verde River, Towel Creek, Spring Creek, and Dry Beaver Creek. Plan components manage for vegetation diversity and riparian function (FW-Rip-RipType-DC-1 and 2; FW-Water-G-2; FW-Rip-RipType-O-1). Plan components in the Wildlife, Fish and Plants section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1, 3).

For wetlands, this rating is primarily because there are updated desired conditions and guidelines that support wetland composition, structure, and function, connectivity between uplands and aquatic and riparian areas, and the maintenance of habitat for species (FW-Rip-Wtlnds-DC-1, 2, FW-Rip-All-DC-1, 3, 5 and G-2, 3, FW-WFP-DC-6). In addition, riparian functional condition would improve faster than alternative A. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1, 2, FW-Water-G-2, FW-Rip-RipType-O-1). More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3, Fw-Rip-Strm-G-2) (USDA Forest Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1, 3).

For springs, this rating is because alternative B (modified) has desired conditions and guidelines to guide spring management on the forest (FW-Rip-Spr-DC-1, 2, 3, 4 and FW-Rip-Spr-G-1, 2, 3, 4), whereas these are largely absent in alternative A.

For perennial, ephemeral, and intermittent streamcourses, this rating is based on language regarding mitigating the effects of roads, connectivity of drainages, connectivity between streamcourses and upland habitats, and earthen stock tank locations (to minimize impacts to sensitive resources) (see FW-ConstWat-G-1 and 2, FW-RdsFac-G-2, 5, 7 and 9). Alternative B (modified) would apply aquatic management zones or best management practices to perennial, intermittent, or ephemeral drainages to maintain the chemical, physical, and biological conditions of connected or downstream caves, karst, and lava tubes (FW-BioPhys-Geo-G-8). The water quantity or baseflows of intermittent and perennial streams would be sustained to mimic seasonal flow regimes and riparian ecosystems and corridors would promote the natural role of water, natural hydrogeomorphic processes, sediment movement and capture, woody debris recruitment and retention, and root masses, and maintain water tables (FW-Water-DC-5, FW-Rip-All-DC-1). Other updated desired conditions promote streamcourses having access to their floodplains and natural sinuosity, so flood energy can be dissipated without causing damage to the channel streambanks; promote natural disturbances in streamcourses; and provide more detailed desired conditions on the functioning of perennial and intermittent streamcourses and their floodplains (FW-Rip-Strm-DC-1, 2, 3).

Unlike alternative A, alternative B (modified) has a desired condition that promotes ephemeral and intermittent streamcourses as habitat and movement corridor for species (FW-WFP-DC-4 and 6). A management approach in Stream Ecosystems reminds managers that ephemeral streamcourses may be protected at the project level depending on downstream water quality issues. Another management approach in the same section encourages coordination with local, State, private, and other Federal agencies to ensure that natural streamcourses are maintained and not fragmented by development which would maintain their function as movement corridors. This is beneficial for dispersal and movements between suitable habitats.

Alternative B (modified) proposes three recommended wildernesses, all of which contain ephemeral streamcourses. Plan components for recommended wilderness would be beneficial for riparian habitat and connected drainages because recommended wilderness would be managed to maintain or enhance primitive and undeveloped characteristics; to preserve native species and unique features; to reduce evidence of modern human control and manipulations; and motor vehicle uses should only occur for limited administrative and permitted activities to be consistent with wilderness character (FW-RWild-DC-1 to 3; FW-RWild-G-1 and 3). However, where riparian habitats and occupied or potential sites exist, there is often a need to conduct restoration activities such as thinning to improve adjacent watershed condition and waterflow, removing non-native species, or fencing to exclude ungulate grazing. Guidelines for recommended wilderness could make it more difficult to implement some of these activities because of limitations on use of motor vehicles and direction to avoid construction of new facilities that cannot be made consistent with the area’s wilderness character. For fencing and other facilities supporting reintroduction at new sites, the cost could be increased by the need to mitigate visual impacts and projects may be harder to implement because of the potential difficulty of maintaining these structures if the area is designated by Congress.

In contrast to alternative A, plan language in alternative B (modified) promotes earthen stock ponds that are accessible to wildlife and requires that earthen stock ponds be managed to maintain water and habitat needed for species' survival and reproduction, consistent with existing water rights. See FW-ConstWat-DC-2 and G-2. This is applies to, and is particularly beneficial for, threatened, endangered, and sensitive species like the northern leopard frog.

More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3; Fw-Rip-Strm-G-2). Also, alternative B (modified) has a guideline that balances recreation activities, permitted uses, and management activities with soil function, riparian vegetation, and water quality at the stream reach scale (FW-Rip-RipType-G-3). This guideline would not apply to fine scale activities and facilities such as intermittent livestock crossing locations, water gaps, or other infrastructure used to manage impacts to riparian areas at a larger scale. This guideline is intended to protect riparian function, especially in areas of high recreation use such as Oak Creek, Beaver Creek, and Fossil Creek.

Alternative B (modified) has desired conditions that protect riparian resources including soil conditions and water quality, while recognizing the demand for and need to properly manage the public's dispersed recreation opportunities. A forestwide desired condition for dispersed recreation supports managing dispersed recreation to avoid resource damage (FW-Rec-Disp-DC-3). Several guidelines about dispersed recreation would manage trails, camping, and recreation types to prevent further resource damage to riparian resources (FW-Rec-Disp-G-1 to 5).

Plan components in alternative B (modified) specify that livestock grazing maintains desired conditions of plant communities (FW-Graz-DC-2; FW-Graz-G-2). They also protect and minimize impacts to riparian areas by recommending that livestock use be restricted to the dormant season, recommending utilization levels on woody vegetation, maintenance of adequate vegetative cover to protect streambanks, and state that riparian areas are rarely negatively impacted by livestock (FW-Graz-G-7). This would maintain riparian structure, composition, and promote proper functioning. Guidelines are in place to reduce cattle concentrations and sedimentation into connected waters by specifying that range improvements should not interfere with riparian function and rare species, and further specifies a minimum distance of salts and supplements from riparian areas (FW-Graz-G-4 and 5).

Alternative B (modified) addresses uncharacteristic flooding by maintaining natural hydrographs through time and by promoting riparian forest composition and structure that would reduce the effects of flooding (FW-Rip-Strm-DC-4, FW-Rip-RipType-DC-2). For stream riparian areas, functional riparian areas and herbaceous vegetation provide protection from uncharacteristic wildfire and flooding disturbance, resiliency, and should filter sediment and protect water quality (FW-RIP-RipType-DC-2, 3, 4). This alternative also contains a guideline protects riparian resources by recommending against issuing a lands and recreation special use permit for activities proposed to occur within 200 feet of perennial streams, springs, or waters that contribute to or support sensitive resources, such as federally listed or Southwestern Region sensitive species (FW-SpecUse-G-3).

Alternative B (modified) has objectives to restore or enhance at least 60,000 acres of terrestrial wildlife habitat during each 10-year period of the life of the plan; implement at least 10 activities to benefit sensitive species; restore 5 to 10 wetlands currently not in proper functioning condition during each 10-year period over the life of the plan; restore riparian function to at least 25 springs identified as not in proper functioning condition during each 10-year period during the life of the plan; and restore or enhance at least 70 miles of stream habitat during each 10-year period over the life of the plan (FW-Rip-Spr-O-1, FW-Rip-Wtlnds-O-1, FW-WFP-O-2, 3, 4). These improvements could contribute to the viability of these species depending on where they are implemented.

In contrast to alternative A, plan language in alternative B (modified) addresses connectivity of habitats forestwide and addresses interconnected terrestrial, riparian, and aquatic habitats through desired conditions that would promote access to new habitats, perpetuation of genetic diversity, species movements, dispersal, and migration (FW-Water-DC-4, FW-Rip-All-DC-3, FW-TerrERU-All-DC-3, FW-Rip-RipType-DC-2, FW-WFP-DC-3, 6, FW-WFP-G-13). This language would maintain or improve habitat permeability and mitigate effects to linkages. Particularly beneficial components include a guideline to design bridges, culverts, stream crossings on permanent roads, and diversion structures to allow safe passage for aquatic organisms (FW-RdsFac-G-9) and not issuing lands and recreation special-use permits for activities proposed to occur within 200 feet of perennial streams, springs, or waters that contribute to or support sensitive resources such as federally listed or Southwestern Region sensitive species (FW-SpecUse-G-3). This guidance makes an allowance for impermeable structures, e.g., to allow movement barriers where it is necessary to protect native aquatic species from non-native aquatic species. See Connectivity in Wildlife and Plant Issues and Topics.

Alternative C

Alternative C has the same effects as alternative B (modified) except it has 13 recommended wildernesses instead of only 3. Eight additional management areas are proposed to emphasize reduced human-related disturbance. The East Clear Creek MA has occupied habitat for Arizona toad and historic habitat for northern leopard frog. Hospital Ridge, Knoll Lake, and Limestone Pasture MAs lie within the East Clear Creek drainage. Thirty percent of the Montane Willow Riparian Forest habitat on the forest occurs within these four management areas.

Guidelines for these management areas would reduce disturbance from motorized dispersed camping and motor vehicle use in 30 percent of the Montane Willow Riparian Forest compared to alternatives A, B (modified), and D. This could positively affect Arizona toads by reducing riparian vegetation impacts (i.e., loss of hiding cover and habitat to which egg masses could be attached) from disturbance from recreational and motorized uses of the area.

While desired conditions and guidelines in both alternatives B (modified) and C support habitat for Arizona toads and northern leopard frogs by minimizing the potential for impacts to potential riparian habitat, alternative C has more focus on managing for ecological conditions. MA-EastClr-DC-3 envisions protection and restoration of springs, streams, and wetlands, and MA-EastClr-DC-5 calls for properly functioning wildlife habitats. In addition, for the Hospital Ridge, Knoll Lake, Limestone Pasture, and Second Chance MAs, there are desired conditions that call for ecological integrity of watersheds, headwater environments, native vegetation, and soils, envision protection and restoration of springs, streams, and wetlands, and DC-5 call for properly functioning wildlife habitats (Appendix F, MA-HospRdg-DC-1, 3, 5, 10, 12, MA-KnollLake-DC-1, 3, 5, 10, and 12, MA-Limestone-DC-1, 3, 5, 10, 12, MA-ScndChnc-DC, 1, 3, 5, 10, 11). Each of these four MAs also have three guidelines. They provide guidance to have no net increase in motorized dispersed camping corridors (G-1), to limit roads that provide motorized access (G-2), and to not allow large group recreation events and commercial tours (Appendix F, MA-HospRdg-G-1, 2, 3, MA-KnollLake-G-1, 2, 3, MA-Limestone-G-1, 2, 3, MA-ScndChnc-G-1, 2, 3). Collectively, these are expected to contribute positively to riparian and wetland habitats for these species.

Alternative D

Alternative D has the same effects as alternative B (modified), except there are no recommended wildernesses.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Arizona toads, lowland leopard frogs, and northern leopard frogs, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for lowland leopard frogs and northern leopard frogs, which are Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A, particularly because these alternatives better address connectivity, disease and non-native or invasive species, and have plan language specifically for different types of riparian areas.

High-elevation Plants: Fine Filter

Bearded gentian, blackroot sedge, bristlecone pine, common moonwort, crenulate moonwort, Dane's dwarf gentian, different-nerve sedge, graceful buttercup, reflected moonwort, and spider saxifrage

The species are grouped together for analysis because they mainly occur in the subalpine grassland portion of Montane/Subalpine Grassland, Spruce-Fir, and Alpine Tundra ERUs. These habitats are more fully evaluated in the Coarse Filter: Habitat section.

All of these species are classified as Other forest planning species except crenulate moonwort is a Southwestern Region Forest Service sensitive species.

Affected Environment

Distribution

The known distribution of bearded gentian includes portions of New Mexico, Colorado, Montana, and Arizona. It is generally found above timberline on the San Francisco Peaks.

The known distribution of blackroot sedge includes high elevations on mountain ranges throughout the Intermountain West. It occurs in meadows and dry areas with subsurface moisture, and has been collected on the San Francisco Peaks above timberline in the alpine tundra.

The known distribution of bristlecone pine is the high mountains of Colorado, New Mexico and Arizona (USDA Plants). Distribution on the Coconino NF is on the San Francisco Peaks.

The known distribution of common moonwort is from parts of Canada and throughout parts of the United States. It is found in high mountain habitats of all southwestern states although it is not common in the areas in which it occurs.

The known distribution of crenulate moonwort includes central and southern California to central Arizona and Montana. It is found on the San Francisco Peaks above tree line.

The known distribution of Dane's dwarf gentian includes portions of New Mexico, Colorado, Montana, and Arizona (AZGFD 2004). Dane's dwarf gentian is an annual plant that grows at high elevations among boulders (Mason 1998). Occurrences of Dane's dwarf gentian are generally above timberline in the Alpine Tundra ERU.

The known distribution of different-nerve sedge is in mid to high elevations throughout North America. Different-nerve sedge has been collected on the San Francisco Peaks above timberline.

Graceful buttercup is narrowly endemic to San Francisco Peaks near timberline where it grows in moist ground (Benson 1948). It often occurs in meadows or open areas in coniferous forests, including openings created by avalanches.

Reflected moonwort occurs from central Colorado southwestward through southern Utah to northern Arizona in mountain meadows and forested areas.

The known distribution of spider saxifrage is alpine tundra areas in Arizona, New Mexico, Colorado, Utah, Idaho, and Wyoming. It grows in alpine meadows and on rocky slopes.

Habitat

Common moonwort occurs in Alpine Tundra, Spruce-Fir, and the subalpine portion of Montane/Subalpine Grassland ERUs.

Bristlecone pine and reflected moonwort occur in the Spruce-fir ERU.

Graceful buttercup occurs in the Spruce-Fir and Alpine Tundra ERUs.

The occurrences of crenulate moonwort, bearded gentian, blackroot sedge, Dane's dwarf gentian, different nerve sedge, and spider saxifrage are within the Alpine Tundra ERU. On the Coconino NF, alpine tundra occurs only on the San Francisco Peaks and there are only about 939 acres of this ERU.

Risk Factors

Rarity is an inherent threat to these species due to their restricted distribution. They are vulnerable to perturbations in the environment because of their small population sizes and they are only known from the San Francisco Peaks. Off-trail hiking reduces the vigor, maintenance, and survival of tundra plant species. Avalanche abatement reduces slope stability and may result in loss of plants from landslides, if they occur where avalanche abatement occurs. Another potential risk to bristlecone pine is white pine blister rust, a non-native fungal disease that affects certain species of pine including southwestern white pine, limber pine and bristlecone pine, all of which occur on the San Francisco Peaks. This disease is not currently known to be present on the forest, but could severely impact the occurrence of white pine should it occur.

Environmental Consequences

Table 84 summarizes the viability analyses for these high-elevation plants species. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 84. Analysis summary for high-elevation fine filter plants

Species, status, and F Rank	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Condition and habitat trend relative to desired conditions	Likelihood species is limited	Condition and habitat trend relative to desired conditions	Likelihood species is limited
Blackroot sedge, Dane's dwarf gentian, different-nerve sedge, spider saxifrage (All are Other species) F Rank = F1*	AT	Good, away	H	Good, away	H
Crenulate moonwort (Sensitive), bearded gentian (Other) F Rank = F2*	AT	Good, away	M-H	Good, away	M-H
Bristlecone pine (Other) F Rank = F3*	SF	Fair, toward	M-H	Fair, toward	M-H
Common moonwort (Other) F Rank = F1*	MSG	Good at short term then Fair, away	Short term: M Long term: H	Good, toward	M
	SF	Fair, toward	VH	Fair, toward	VH
	AT	Good, away	H	Good, away	H
Graceful buttercup (Other) F Rank = F1*	SF	Fair, toward	VH	Fair, toward	VH
	AT	Good, away	H	Good, away	H

Species, status, and F Rank	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Condition and habitat trend relative to desired conditions	Likelihood species is limited	Condition and habitat trend relative to desired conditions	Likelihood species is limited
Reflected moonwort (Other) F Rank = F1*	SF	Fair, toward	VH	Fair, toward	VH
Management Effect		AT= 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. MSG = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences. SF = 4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

* F1: Very rare on the forest within its habitat – occupies a very small portion of their habitats. * F2: Rare on the forest within their habitat - occupies a small portion of their habitat. *F3: Uncommon on the forest within its habitat.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

These species occur in the same habitat as San Francisco Peaks ragwort and benefit from the actions taken to protect the ragwort as a federally threatened species (see section on San Francisco Peaks ragwort).

Plan language under all alternatives directs implementing site-specific best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). This would be beneficial for all species, because implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative groundcover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed. In addition, disturbance to plants from off-trail hiking would be low for all alternatives because there is an area closure that prohibits off-trail hiking in the habitat. Off-trail hiking would be prohibited under all alternatives (1987 Plan, page 108; SA-Wild-S-3). This is discussed further in the Wildlife and Plant Issues and Topics: Disturbance to Plants section above.

Avalanche control in the Alpine Tundra ERU associated with the Arizona Snowbowl ski area was also identified as a risk. Avalanche control is regulated by a special-use permit administered at the District level.

Habitat for all these species is in the Kachina Peaks Wilderness, although some portions of the habitats are outside the wilderness boundary. Plan language for designated wilderness would contribute to the viability of these species in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources; and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2). Overnight camping and the use of recreational livestock and pack animals are prohibited in this wilderness above treeline, as well, and would reduce the impact of recreational use on the species and their habitat (1987 Plan, page 108, SA-Wild-S-3 and 4).

All alternatives close Alpine Tundra to off-trail hiking during snow-free periods (1987 Plan, pages 108; 110; SA-Wild-S-3), prohibit horse and pack stock (except for limited administrative use) on the Humphrey’s Trail and Weatherford Trail above Doyle Saddle; prohibit camping above tree line; and prohibit recreational livestock above tree line or in the watersheds draining into the Inner Basin (1987 Plan, page 108; MA-Peaks-S-1, 3; MA-InBsn-S-1; SA-Wild-S-4). These measures protect the fragile environment of Alpine Tundra and rare plants. Ground disturbance is also reduced because the Alpine Tundra is closed to grazing and is not part of any allotment (1987 Plan, page 110; Chapter 4 of Revised Plan, Grazing Suitability, table 12). The portion of Alpine Tundra in the Inner Basin is limited to day-use foot traffic (1987 Plan page 108; MA-InBsn-G-7).

Alternative A

Table 84 shows that under alternative A, Montane/Subalpine Grassland would be in good condition in the short term and fair condition in the long term and in both cases, a trend away from desired conditions. Spruce-fir would be in fair condition and trend toward desired condition, and Alpine Tundra would be in good condition and trend away from desired conditions.

As shown in table 84, the overall likelihood that these species would be limited by their habitat on the forest is moderate to very high depending on the habitat. These likelihoods were derived by combining these high-elevation species’ F Ranks of F1, F2, and F3 with the likelihood of habitat limitation variables for each ERU: Alpine Tundra (moderate), Spruce-fir (high), and

Montane/Subalpine Grassland (low in short term, moderate in long term) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for Alpine Tundra. This means that plan components in alternative A maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. The management effect is classified as a 3 for Montane/Subalpine Grassland, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of these species than the other alternatives. The management effect is classified as a 4 for Spruce-Fir, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.

Alternative A lacks specific plan language for Alpine Tundra or Spruce-Fir ERUs. Instead, guidance is embedded within general direction for wilderness and specific direction for the Kachina Peaks Wilderness (1987 Plan, page 108).

Portions of the Alpine Tundra and Spruce-Fir ERUs overlap Management Area 15, Developed Recreation Sites. The management emphasis is developed recreation. Facility development at the Snow Bowl ski area is guided by the Ski Area Master Development Plan which is based on approved environmental analysis (1987 Plan, page 188). Standards and guidelines state that the Snow Bowl special-use authorization area would be fenced to physically exclude grazing which would be beneficial for the habitat and associated species because vegetation trampling, soil compaction, and accelerated soil erosion from livestock grazing would be avoided (1987 plan, page 190). Benefits would be limited because wildlife use can be high in the few areas with lower recreation use and the area is heavily modified as a result of ski run development and hazard tree removal. Effects of the ski area to vegetation and other ecological resources are addressed through environmental analysis for the special-use permit at the district level.

Montane/Subalpine Grassland ERU occurs in many management areas in alternative A, mainly as inclusions of small (although some are large) meadows embedded in forested ERUs. The common moonwort is associated with the subalpine portion of the Montane/Subalpine ERU, which is mainly located in the higher portions of the Hart Prairie, San Francisco Peaks and Inner Basin areas. Standards and guidelines would maintain existing mountain meadows by removing invading overstory, stabilizing gullies to raise the water table, scarify the soil, seed with appropriate grass and forage species, and increase forage production by attaining a balanced composition of cool and warm season forage species. Standards and guidelines would also control livestock grazing to allow adequate regeneration of grasses and forbs, prevent accelerated surface erosion and gully formation; and avoid or minimize roads in this MA where possible (1987 Plan, pages 120, 160). Although this language is generally beneficial for common moonwort and its habitat, soil scarification, seeding, and emphasis on forage production could negatively impact moonwort and its habitat by increasing ground disturbance and ungulate use, resulting in soil compaction or increased competition for nutrients and water.

Alternative A would address the risk of white pine blister rust in the Spruce-Fir ERU through its inclusion of plan goals to “[m]anage resources to prevent a buildup of insects and diseases to prevent or reduce serious, long-lasting hazards through integrated pest management” (1987 Plan, page 23). Standards and guidelines for insect and disease management also stipulate monitoring of insect and disease activities on all land, and evaluation of the extent control measures are needed to protect suitable or unsuitable areas (1987 Plan, page 70). Although the language in all alternatives supports managing for sustainable populations of native species, alternative A lacks forestwide language that directly addresses the significant threats of disease and invasive, non-native animals. Because of this, alternative A has a lower viability effectiveness than the other alternatives.

Small portions of the Spruce-Fir and Alpine-Tundra ERUs occur within Management Area 16, Inner Basin. Beneficial language would maintain or improve habitat or minimize ground-disturbing activities for all of these high-elevation plant species. The language includes emphasizing good watershed condition, closing the area to grazing, allowing only daytime dispersed use (hiking and mountain biking), limiting vehicle access to City and Federal use, and closing the area to recreational livestock such as llamas, mules, or horses (1987 Plan, pages 191 and 192).

Alternative B (modified)

Table 84 shows that under alternative B (modified), Montane/Subalpine Grassland would be in good condition with a trend toward desired conditions (instead of away as in alternative A); Spruce-Fir would be in fair condition and trend toward desired condition, and Alpine Tundra would improve and be in good condition and trend away from desired conditions primarily due to climate change.

As shown in table 84, the overall likelihood that these species would be limited by their habitat on the forest is moderate to very high, depending on the habitat. These likelihoods were derived by combining these high-elevation species' F Ranks of F1, F2, and F3 with the likelihood of habitat limitation variables for each ERU: Alpine Tundra (moderate), Spruce-fir (high), and Montane/Subalpine Grassland (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the coarse filter habitats associated with high elevation plant species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

In contrast to alternative A, alternative B (modified) has specific language for Alpine Tundra and Spruce-Fir ERUs that emphasizes ecological conditions, composition, structure, and natural disturbances and provides protection for endemic species like the graceful buttercup (FW-TerrERu-DC-1, 2, G-1, FW-TerrERU-SF-DC-1-11). This contributes more to the viability of these high-elevation species than alternative A.

Alternative B (modified) better addresses the threat of invasive species and disease than alternative A by supporting native species and addressing disease and invasive or non-native species forestwide. The forestwide desired conditions for non-native or invasive species (FW-Invas-DC-1 and 2) and guidelines (FW-Invas-G-1 through 3) apply to all organisms. Alternative B (modified) includes desired conditions that "[i]nvasive species are absent or exist at levels where they do not disrupt ecological functioning or affect the sustainability of native and desirable non-native species. Invasive species includes plants, animals, diseases, and insects.

(FW-Invas-DC-1).” Alternative B (modified) would better address the threat of exotic spruce aphid and white pine blister rust and the resulting loss of spruce or white pine species that would alter vegetative composition and structure and increase the risk of fire in Spruce-Fir ERU.

Alternative B (modified) has components that address rarity better than alternative A. Forestwide guidance in Wildlife, Fish and Plants provides desired conditions for properly functioning ecosystems and ecologically responsible activities that support native plants and animals (FW-WFP-DC-1) where ERUs provide the habitat components for sensitive and/or endemic species to carry out their life cycle (FW-WFP-DC-3, FW-WFP-G-10). These components are complementary to the components for all ecosystems and all terrestrial ecosystems and provide additional assurance for the viability of these species. Additional information and analysis is discussed under the At-risk topic and the Disturbance (plants) topic in the Wildlife and Plant Topics and Issues section.

Alternative C

Alternative C has the same effects as alternative B (modified).

Alternative D

Alternative C has the same effects as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives provide for the viability of crenulate moonwort, bearded gentian, blackroot sedge, bristlecone pine, Dane’s dwarf gentian, different-nerve sedge, graceful buttercup, reflected moonwort, and spider saxifrage, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for crenulate moonwort, which is a Forest Service sensitive species. Plan components in alternatives B (modified), C, and D contribute more to the viability of these species because there is updated language for the ERUs, at-risk and rare species, and for invasive and non-native animals.

Pinyon Juniper Plants

Flagstaff beardtongue, Jones’ wild buckwheat, western mousetail and Yavapai wild buckwheat

These species are grouped together because most of their occurrences are in the Pinyon Juniper ERUs. Several occur in other ERUs as well but not as frequently. All ERUs are more fully evaluated in the Coarse Filter: Habitat section. Rarity and disturbance are more fully evaluated in the At Risk Species and Disturbance to Plants topics in the Wildlife and Plant Issues and Topics section.

All of these species are classified as Other forest planning species except Flagstaff beardtongue is a Southwestern Region Forest Service sensitive species.

Affected Environment

Distribution

Flagstaff beardtongue, classified as a Southwestern Region sensitive species, is endemic to northern Arizona. On the Coconino NF, documented locations include Anderson Mesa, near Lake Mary, Luke Mountain, Mormon Lake, Stoneman Lake, along the Schnebly Hill Road, and along Oak Creek.

The known distribution of Jones' wild buckwheat, classified as an Other planning species, is northern Arizona. It occurs mostly in Coconino County, with scattered populations just entering Mohave and Navajo counties. Most occurrences on the forest are east of Flagstaff in areas such as Cosnino and Winona.

The known distribution of western mousetail, classified as an Other planning species, is restricted to Arizona and New Mexico.

Yavapai wild buckwheat is classified as an Other planning species. It is endemic to the Mogollon Rim across northern Arizona and in northern Yavapai County.

Habitat

Flagstaff beardtongue occurs in Ponderosa Pine and Pinyon Juniper Evergreen Shrub ERUs. It occurs on dry slopes, in openings and along edges of openings, and in forested areas.

Jones' wild buckwheat occurs primarily in Pinyon Juniper with Grass ERU, but also in Ponderosa Pine ERU. Its habitat is rocky limestone, sandstone flats, and outcrops.

Most occurrences of western mousetail are in Pinyon Juniper Evergreen Shrub ERU, but it also occurs in the Ponderosa Pine ERU. It is found on moist soils or soils that are periodically inundated or wet.

Yavapai wild buckwheat occurs in Pinyon Juniper with Grass ERU, where it can be found in gravelly to rocky volcanic soil and outcrops.

These habitats are more fully evaluated in the Coarse Filter: Habitat section.

Risk Factors

Rarity is an inherent threat to these species due to their restricted distribution. Disturbance to plants is also a risk from management activities, such as vegetation treatments, fire, and road work. The Wildlife and Plant Issues and Topics section above has more detail about At-risk Species and Disturbance to Plants.

Environmental Consequences

Table 85 summarizes the viability analyses for Flagstaff beardtongue, Jones' wild buckwheat, western mousetail, and Yavapai wild buckwheat. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 85. Analysis summary for pinyon juniper plants

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Flagstaff beardtongue (Sensitive) F Rank = F3*	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
	PJES	Fair, away	L-M	Fair, away	L-M
Jones' wild buckwheat (Other) F Rank = F2*	PJG	Fair, toward at short term then away at long term	M-H	Low and high objectives: Fair, toward at short term then slowly away at long term	M-H
	PP	Low objective: Poor at short term then Fair at long term, trending toward High objective: Fair, trending toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H	Low objective: Poor at short term then Fair at long term, trending toward High objective: Fair, trending toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H
Western mousetail	PJES	Fair, away	M-H	Fair, away	M-H
(Other, restricted distribution) F Rank = F2*	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Yavapai wild buckwheat (Other, endemic) F Rank = F2*	PJG	Fair, toward at short term then away at long term	M-H	Low and high objectives: Fair, toward at short term then away at long term	M-H
Management Effect		All ERUs = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All ERUs = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area	

*F2 = Rare on the forest within its habitat - occupies a small portion of its habitat. F3 = Uncommon on the forest within its habitat.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Plan language under all alternatives directs implementing site-specific best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed.

Alternative A

Table 85 shows that under all alternatives Pinyon Juniper with Grass would remain in fair condition with a trend toward desired conditions in the short term due to expected mechanical treatments and burning using wildfire for resource objectives. However, the trend for the Pinyon Juniper with Grass ERU is expected to move away from desired conditions in the long term, because generally, the treatment level is insufficient to offset the negative effects of excess regeneration and closing canopies.

Pinyon Juniper Evergreen Shrub would remain in fair condition, but would trend away from desired conditions due to departure in the fire return interval and increases in trees and shrubs. Increased density of trees, shrubs, and understory could increase competition with these species and facilitate a higher fire severity than these plants evolved with thereby degrading the habitat.

Table 85 shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term.

As shown in table 85, the likelihood that these species would be limited by their habitat on the forest is low-moderate to moderate-high depending on the habitat. These likelihoods were derived by using the process in table 9 in volume IIa and combining these species' F Rank of F3 and F2 with the likelihood of habitat limitation variables for each habitat: Pinyon Juniper with Grass (low-moderate), Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), and Pinyon Juniper Evergreen Shrub (low-moderate). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for all the habitats in this group, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of these species than the other alternatives.

For Pinyon Juniper with Grass and Pinyon Juniper Evergreen Shrub, the emphasis on the use of prescribed fire and mechanical treatments to achieve management objectives associated with range and watershed condition could maintain or improve habitat for these species (1987 Plan, pages 148 through 155; 162 through 165). However, the management effect rating of 3 is because direction is generally outdated. For example, alternative A does not distinguish between the three pinyon juniper types, which differ in composition, structure, and processes. The plan provides little direction on desired conditions for these ERUs, as they are lumped into the broad vegetation category of Pinyon Juniper, and plan direction varies only by slope. Vegetation structure, and consequently, habitat for these species, would not be equitably, or naturally, distributed across the landscape. The recommended silvicultural systems provide sufficient flexibility to move toward desired conditions; however, the direction to manage cover in Pinyon Juniper with Grass would leave too much canopy cover across the landscape to return to the desired grassland state of this ERU and areas of too much canopy cover would not favor habitat for these species.

Prescribed fire and wildfires managed for resource objectives may be used in both pinyon juniper types, but there is no provision for using wildfires managed for resource objectives in the wildland-urban interface (1987 Plan, pages 92, 155, and 165) and the language to manage wildfires for resource objectives in wilderness impedes the use of this tool (1987 Plan, pages 111–112). This would limit the restoration of fire as a natural process in the wildland-urban interface and in wilderness, and canopy cover and shrub and tree density would be expected to increase in these areas. There would also be increased potential for uncharacteristic fire in the wildland-urban interface and wilderness portions of these ERUs. There are 4,184 acres of Pinyon Juniper with Grass (0.02 percent of ERU) and 47,893 acres of Pinyon Juniper Evergreen Shrub (18 percent of the ERU) in designated wilderness. This would not be favorable for these species.

Prescribed fire and seeding may be used to achieve resource objectives in these areas (1987 Plan, page 148). However, no direction was provided on the appropriate seed mix, only stating that a mixture of warm and cool season grasses should be used. Non-native grass species in the seed mix could negatively affect Flagstaff beardtongue, Jones' wild buckwheat, Yavapai wild buckwheat, and western mousetail through competition for nutrients and water.

Forestwide plan components for soil would contribute to the viability of these species by maintaining or improving soil productivity and watershed conditions where needed (1987 Plan, page 23).

There are 639 acres of Pinyon Juniper Evergreen Shrub in the proposed West Clear Creek Research Natural Area, which is located in the West Clear Creek Wilderness. There would be no motorized or mechanized use in this research natural area and it would be managed to maintain primitive undeveloped characteristics and to preserve its suitability for designation. Primitive hiking and overnight camping would be allowed, based on carrying capacity. Alternative A promotes trailhead development at Bull Pen Ranch, about 2 miles south of the research natural area. This could increase trampling and compaction of the habitat for these species from recreation near the trail, but could decrease recreation related off-trail impacts as hikers and horseback riders use the designated trail (1987 Plan, pages 100, 107,195).

In the Ponderosa Pine ERU, alternative A provides direction that allows for a variety of stand conditions across the landscape, while mimicking natural disturbance patterns that result in irregular tree groups and canopy gaps. This would provide habitat for species such as Flagstaff beardtongue, Jones' wild buckwheat, and western mousetail. Ponderosa pine is mostly managed for Mexican spotted owls or northern goshawks under forestwide direction. Areas managed for Mexican spotted owl PACs and nest/roost characteristics tend to have higher canopy closure than areas outside of these areas. Understory in these areas may be less abundant or vigorous due to the canopy closure. Areas outside of those managed for nest/roost characteristics and Mexican spotted owl habitat outside of PACs could have better habitat for these two species in areas where natural canopy gap processes occur and natural variation includes small openings. See 1987 Plan, pages 65-2, 65-3, 65-4, 65-5.

Ponderosa pine areas outside of Mexican spotted owl habitat are managed for northern goshawks. Plan direction for northern goshawks would maintain habitat for Flagstaff beardtongue, Jones' wild buckwheat, and western mousetail because Ponderosa Pine would be managed for a mosaic of vegetation densities (overstory and understory); 40 percent of the areas in young forest, seedling/sapling or grass/forb/shrub structure would not have canopy cover guidelines; and there would be more openings than areas managed for denser stand conditions. See 1987 Plan, page 65-7, 65-9, and 65-10.

Additional management direction for ponderosa pine is in Management Area 3 (Ponderosa Pine and Mixed Conifer less 40 percent slope) and this direction has both positive and negative aspects. Direction to broadcast seed following burns using a high production multi-growing season species to attain a balanced composition of cool and warm season forage species could have a negative effect on these two species due to competition for nutrients and water with non-native species that could be a part of this seed mix. However, language to maintain open meadows in ponderosa pine, eliminate invading overstory vegetation, and stabilize gullies could improve habitat for this species. See 1987 Plan, page 120.

The Ponderosa Pine ERU is recognized as being a fire-dependent ecosystem, but suppression objectives that are designed to protect wildland-urban interface, minimize suppression costs and provide for personnel safety make the reintroduction of fire into the ecosystem challenging, so the ERU and the plants that live in it have a higher risk of being impacted by fire. See 1987 Plan, pages 93, 94, 137.

For Pinyon Juniper with Grass and Pinyon Juniper Evergreen Shrub, this rating is because alternative A does not distinguish between the three pinyon juniper types, which differ from each other in composition, structure, and processes. The revised plan provides little direction on desired conditions for these ERUs, as it is lumped into the broad vegetation category of Pinyon Juniper, and plan direction varies only by slope. Consequently, vegetation structure would not be equitably distributed across the landscape.

Alternative B (modified)

Table 85 shows that the condition and trend for the Pinyon Juniper with Grass ERU would be the same as alternative A. The condition of the Pinyon Juniper with Grass ERU would remain fair, but the trend would be toward desired conditions in the short term, then trend slowly away from desired conditions in the long term because the treatment levels (FW-TerrERU-PJ-O-1, 2) are not sufficient to offset the negative effects of excess regeneration and closing canopies.

Pinyon Juniper Evergreen Shrub would remain in fair condition and would continue to trend away from desired condition, as in alternative A.

Ponderosa Pine ERU would be similar to alternative A, remaining in poor condition with a trend toward desired conditions in the short term under low treatment objectives (50,000 acres mechanical, 150,000 acres prescribed fire). However, in the short term under the high vegetation treatment objectives (260,050 acres mechanical, 200,000 acres prescribed fire) and in the long term under both the low and high vegetation treatment objectives, the condition would improve to fair and trend toward desired conditions.

As shown in table 85, the likelihood that habitats on the forest would be a limiting factor for these species is low-moderate to moderate-high, depending on the habitat. These likelihoods were derived by combining these species' F Rank of F3 and F2 with the likelihood of habitat limitation variables for each ERU: Pinyon Juniper with Grass (low-moderate), PP (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), and Pinyon Juniper Evergreen Shrub (low-moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as 2 for all the habitats associated with these species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For Pinyon Juniper with Grass and Pinyon Juniper Evergreen Shrub, this rating is because these alternatives clearly distinguish between different Pinyon Juniper types on the forest and provides desired conditions, objectives, and guidance that are specific to the each type.

Management direction would promote properly functioning ecosystems that are resilient to natural disturbances and climate change; promote characteristic disturbances and reduce the threat of uncharacteristic disturbances; and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby, furthering sustainability and adaptability (FW-Eco-DC-1 to 4, FW-TerrERU-All-DC-2). ERU-specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-PJ-DC-5 to 9; FW-TerrERU-PJ-G-1, 2, 3, 5). Management Area direction in the Verde Valley would maintain or improve habitat for these species by requiring projects to maintain or improve watershed function and to prevent the introduction of invasive or undesirable species (MA-VerdeV-DC-3). About 62 percent of Pinyon Juniper Evergreen Shrub is in this management area.

Tree density and canopy cover are likely to increase in Pinyon Juniper Evergreen Shrub. The increases would have the negative effect of shading understory species and maintaining a greater number of small to medium sized trees than desired. Furthermore, these same changes increase the potential for a greater proportion of the ERU to burn at the high end of the range for mixed-severity fires. Shading understory species could result in reduced abundance of vegetative ground cover and accelerated erosion. Collectively, these changes could degrade habitat for Flagstaff beardtongue and western mousetail over the long term. However, there is an objective to use naturally ignited wildfires (i.e., lightning-caused fires that are managed for resource objectives) to treat at least 3,750 acres in Pinyon Juniper Evergreen Shrub within the natural fire regime during each 10-year period over the life of the plan (FW-TerrERU-PJ-O-3). This would be beneficial for Flagstaff beardtongue and western mousetail in the areas where burning creates canopy gaps and reduces tree density by allowing sunlight and precipitation to increase the vigor and abundance of understory.

Unlike alternative A, alternative B (modified) does not restrict the use of wildfires managed for resource objectives within the wildland-urban interface. Fire and vegetation management in the wildland-urban interface would favor low intensity surface fires; higher frequency of disturbance than the natural disturbance regime from prescribed burning, wildfires managed for resource objectives, and/or vegetative treatments; more area of grass/forb/shrub vegetation or early seral vegetation, more open conditions, and lower tree densities than non-wildland-urban interface areas. Wildland-urban interface areas would still be within the range of desired conditions (FW-WUI-DC-3, 4, 6, 7, and G-1). Although intended to reduce the risk of wildfire to surrounding communities and values-at-risk, conditions and activities in the wildland-urban interface could have the positive effect of maintaining habitat for these three species by stimulating flowering, seed release, germination, removing competitors, or causing a temporary increase in nutrient availability (Satterthwaite et al. 2002). Areas with increased disturbance from management activities could degrade habitat through accelerated soil erosion, soil compaction, depletion of the seedbank in the soil, and establishment of non-native species could out-compete with these species (Cione et al. 2002). Plants could respond negatively or positively to more frequent fire depending on timing (when flowering, forming seed, actively growing, or when carbohydrate reserves are relatively low), frequency, severity, duration, and extent of burning and how these factors interface with plant morphology or other existing conditions like drought or ungulate grazing (DeBano et al. 1998). Furthermore, more frequent low-severity ground fires are not the natural fire regime for Pinyon Juniper Evergreen Shrub, so composition and structure of Pinyon Juniper Evergreen Shrub in the wildland-urban interface could shift (FW-TerrERU-PJ-DC-8). The effect of these altered conditions in the wildland-urban interface on these species is dependent on the site-specific and species-specific interaction of the above-mentioned possible effects and conditions.

There are 723 acres of Pinyon Juniper Evergreen Shrub in the Davey's recommended wilderness. This recommended wilderness would be managed to maintain or enhance primitive and undeveloped characteristics; to preserve native species and unique features; to reduce evidence of modern human control and manipulations; and motor vehicle uses should only occur for limited administrative and permitted activities to be consistent with wilderness character (FW- RWild-DC-1, 2, 3, FW- RWild-G-3). This would protect Flagstaff beardtongue and western mousetail habitat by reducing some ground disturbance that could occur as result of management activities or permitted uses. Recommended wilderness would not prohibit prescribed or managed wildfires but could make them more challenging to implement because vehicle use needed to manage fire should be consistent with wilderness character and depending on site-specific conditions, this may not always be possible. Active vegetative management and vehicle use would be limited or prohibited (vehicle use) if recommended wildernesses become designated. Designation could restrict the use of vegetative treatments or fire to reach the desired conditions for the ERU. The magnitude of the effect on Flagstaff beardtongue and western mousetail habitat depends on what needs to be restored in Pinyon Juniper Evergreen Shrub in this recommended wilderness area, what tools might be needed for restoration, and whether access in the areas adjacent to the recommended wilderness area is sufficient to allow for safe use of prescribed or managed fire if needed.

For Ponderosa Pine, this rating is because alternative B (modified) emphasizes ecological conditions and composition, structure, and function of this ERU using current science, in contrast to alternative A (Reynolds et al. 2013). Particularly beneficial guidelines provide sideboards that would promote or sustain old-growth forest attributes, uneven-aged conditions, pre-settlement trees, occupancy of small wildlife species, and reduce the risk of uncharacteristic bark beetle outbreaks (FW-TerrERU-PP-G-1 to 7). Although alternative B (modified) promotes an open uneven-aged structure similar to historic conditions, it also has provisions for denser areas such as on steep slopes and in canyons and larger tree groups in areas managed for bald eagles (FW-TerrERU-PP-DC-8, 13). The treatment objectives for the Ponderosa Pine ERU address the need for ecological restoration that addresses the shift in canopy conditions away from desired conditions and the departure the historic fire regime. Implementation of these objectives and removal of restrictions on use of wildfires with resource objectives would lead to more open stand conditions and reduce the risk of uncharacteristic fire on the landscape, reducing the risks of habitat loss for species such as Flagstaff beardtongue, Jones' wild buckwheat, and western mousetail.

Rarity is a risk for Flagstaff beardtongue, Jones' wild buckwheat, western mousetail, and Yavapai wild buckwheat. Alternative B (modified) has components that address rarity better than alternative A. Forestwide guidance in Wildlife, Fish and Plants provides desired conditions for properly functioning ecosystems and ecologically responsible activities that support native plants and animals (FW-WFP-DC-1) where ERUs provide the habitat components for sensitive and/or endemic species to carry out their life cycle (FW-WFP-DC-3, FW-WFP-G-10). These components are complementary to the plan components in the sections for All Ecosystems and All Terrestrial Ecosystems and provide additional assurance for the viability of these species. Additional information and analysis is discussed under the At-risk topic in the Wildlife and Plant Topics and Issues section.

Alternative B (modified) addresses disturbance to plants and their habitat better than alternative A by adding language so roads and recreational activities and locations are managed to move toward desired conditions for other resources; so unneeded roads are decommissioned; and so temporary roads are naturalized in a timely manner (FW-RdsFac-G-1, 6, 8 and FW-Rec-All-G-1). FW-RdsFac-DC-3 may lead to temporary increases in roads to allow for management activities including restoration treatments and prescribed burning. These temporary roads could crush plants, degrade habitat, contribute to soil loss, or increase the risk of non-native plant establishment. However, these activities are needed to conduct vegetative treatments that would reduce departure from desired conditions in ERUs and reduce the risk of uncharacteristic fire. These treatments would generally open tree canopy and would improve the distribution and abundance of herbaceous understory, including habitat for rare plants. Additional information and analysis is discussed under the Disturbance (plants) topic in the Wildlife and Plant Topics and Issues section.

Alternative C

The effects to these species under alternative C would be the same as alternative B (modified) except in addition to the 47,893 acres of Pinyon Juniper Evergreen Shrub in designated wilderness, there are 50,164 acres distributed in nine recommended wildernesses: Black Mountain (5,552 acres), Cedar Bench (2,558 acres), Cimarron-Boulder (9,496 acres), Davey’s (723 acres), Deadwood Draw (9,804 acres), Hackberry (15,890 acres), Railroad Draw (8 acres), Tin Can (2,652 acres), and Walker Mountain (3,480 acres).

In addition to the 4,184 acres of Pinyon Juniper with Grass in designated wilderness, there are 3,618 acres distributed in Strawberry Crater recommended wilderness area.

In addition to the 31,087 acres of Ponderosa Pine in designated wilderness, there are 4,462 acres distributed in seven recommended wildernesses: Abineau (68 acres), Barbershop (849 acres), Deadwood Draw (245 acres), East Clear Creek (1,240 acres), Railroad Draw (1,205 acres), Strawberry Crater (29 acres), and Tin Can (826 acres).

Recommended wilderness would protect habitat for Flagstaff beardtongue, Jones’ wild buckwheat, Yavapai wild buckwheat, and western mousetail by reducing some ground disturbance that could occur as result of management activities or permitted uses. Recommended wilderness would not prohibit prescribed or managed wildfires, but could make them more challenging to implement because vehicle use needed to manage fire should be consistent with wilderness character and, depending on site-specific conditions, this may not always be possible. Active vegetative management and vehicle use would be limited or prohibited (vehicle use) if recommended wildernesses become designated. If all proposed wildernesses are designated, nearly 40 percent of Pinyon Juniper Evergreen Shrub ERU, nearly 3 percent of Pinyon Juniper with Grass, and nearly 4 percent of Ponderosa Pine would be in wilderness areas. Designation could restrict the use of vegetative treatments or fire to reach the desired conditions for the ERU.

The magnitude and extent of the effect on habitat is variable and depends on what and how much needs to be restored in the recommended wilderness areas, what tools might be needed for restoration, accessibility in the recommended wilderness areas, whether access in the areas adjacent to the recommended wilderness area is sufficient to allow for safe use of prescribed or managed fire if needed, and other site-specific factors. Some areas may be left untreated and may have a greater risk of experiencing uncharacteristic wildfires with higher than desired fire severity and a decreased likelihood of attaining the desired condition. This would potentially have the greatest impact on Flagstaff beardtongue and western mousetail because nearly 40 percent of its Pinyon Juniper Evergreen Shrub habitat could be in designated wilderness or a combination of recommended and designated wilderness.

Alternative D

The effects to these species under alternative D would be the same as alternative B (modified) except there is no recommended wilderness.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Flagstaff beardtongue, Jones' wild buckwheat, western mousetail and Yavapai wild buckwheat, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Flagstaff beardtongue, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A, primarily because of updated plan components for Pinyon Juniper vegetation types and Ponderosa Pine, for rare and at-risk species, and for ground-disturbing activities. The components acknowledge the roles of composition, structure, and function and natural disturbances, and promote resiliency to natural and human-caused disturbances.

Ponderosa Pine Plants

Creeping milkvetch, Hairy clematis, Flagstaff cinquefoil, James rubberweed

These species are grouped together because most of their occurrences are in the Ponderosa Pine ERU. Several occur in other ERUs as well, but not as frequently. All ERUs are more fully evaluated in the Coarse Filter: Habitat section. Rarity and disturbance are more fully evaluated in the At-risk Species and Disturbance to Plants topics in the Wildlife and Plant Issues and Topics section.

All of these species are classified as Other forest planning species except hairy clematis is a Southwestern Region Forest Service sensitive species.

Affected Environment

Distribution

Creeping milkvetch is endemic and classified as an Other planning species. It is known from Coconino and Yavapai Counties, Arizona and is found around Flagstaff and the adjacent Mogollon Rim (Springer et al. 2009).

The distribution for hairy clematis, a Southwestern Region sensitive species, includes much of the western United States, but it is rare within the planning unit.

Flagstaff cinquefoil, classified as an Other planning species, is known only from south and east of Flagstaff, Arizona. Flagstaff cinquefoil grows along roadways and on private land near Mountain Dell and University Heights. It is also known from locations on the forest including near the top of Pumphouse Wash, Bar M Canyon, and Sandy's Canyon trailhead.

James rubberweed, classified as an Other planning species, is endemic to northern Arizona.

Habitat

Creeping milkvetch is typically associated with the Ponderosa Pine ERU on dry slopes and flats.

Many of the known locations of hairy clematis are in the same general area as Flagstaff pennyroyal; near the Lake Mary area. It generally shares the same affinity for limestone soils, but is not as tightly tied to a specific soil type as Flagstaff pennyroyal. A few groups have been found on basalt soils in the Fort Valley area and near Woods Canyon. Extremely heavy shade reduces growth and reproduction, while full sun can dry seeds and plants (Maschinski and Phillips 1993).

Flagstaff cinquefoil occurs in Ponderosa Pine ERU.

James rubberweed primarily occurs in forests dominated by Ponderosa Pine ERU.

Risk Factors

All of these species are considered to be rare and/or at-risk because there are few populations known and they are vulnerable to stochastic events.

They are vulnerable to perturbations in the environments such as ground-disturbing activities because of their small population sizes. Disturbance to plants is also a risk from management activities, such as vegetation treatments, fire, and road work.

Environmental Consequences

The Wildlife and Plant Issues and Topics section above has more detail about At Risk Species and Disturbance to Plants. See Coarse Filter: Habitat for more information about Ponderosa Pine. Table 86 summarizes the viability analyses for these ponderosa pine plant species. The table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that each species is limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 86. Analysis summary for ponderosa pine plant species

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Flagstaff cinquefoil (Other) Hairy clematis (Sensitive) F Rank = F1*	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: H Low objective long term: M-H High objective: M-H	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: H Low objective long term: M-H High objective: M-H
James rubberweed (Other) F Rank = F2*	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H
Creeping milkvetch (Other, Endemic) F Rank = F3*	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
Management Effect		PP = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		PP = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat, F2 = Rare on the forest within its habitat - occupies a small portion of its habitat. F3 = Uncommon on the forest within its habitat

Common to All Alternatives

All of these species are considered to be rare and/or at-risk because there are few populations known and they are vulnerable to stochastic events. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

The distribution and diversity of understory vegetation are expected to increase where open stands are created, such as in areas treated for restoration. The shift to more open canopy under all alternatives would improve the abundance and vigor of understory vegetation.

Plan language under all alternatives directs implementing site-specific best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed.

About 31,087 acres (4 percent) of Ponderosa pine are in designated wilderness. Plan language for designated wilderness provides additional protection to these species so would contribute to its viability in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised. Ground disturbance would be reduced in the habitats for these species because motorized and mechanized use in wildernesses are not allowed (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Alternative A

Table 86 shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term.

As shown in table 86, the likelihood that habitat on the forest would be a limiting factor for these species is low-moderate to high. These likelihoods were derived by combining these species' F Ranks of F1, F2, and F3 with the likelihood of habitat limitation variable for the Ponderosa Pine ERU (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Ponderosa Pine, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives.

In the Ponderosa Pine ERU, alternative A provides direction that allows for a variety of stand conditions across the landscape while mimicking natural disturbance patterns that result in irregular tree groups and canopy gaps. This would provide habitat for species such as creeping milkvetch, hairy clematis, Flagstaff cinquefoil, and James rubberweed. Ponderosa pine is mostly managed for Mexican spotted owls or northern goshawks under forestwide direction. Areas managed for Mexican spotted owl PACs and nest/roost characteristics tend to have higher canopy closure than areas outside of these areas. Understory in these areas may be less abundant or vigorous due to the canopy closure. Mexican spotted owl habitat outside of PACs and areas outside of those managed for nest/roost characteristics could have better habitat for these species in areas where natural canopy gap processes occur and natural variation includes small openings. See 1987 Plan, pages 65-2, 65-3, 65-4, 65-5.

Ponderosa pine areas outside of Mexican spotted owl habitat are managed for northern goshawks. Plan direction for northern goshawks would maintain habitat for these species because ponderosa pine would be managed for a mosaic of vegetation densities (overstory and understory). In addition, 40 percent of the area (in young forest, seedling/sapling or grass/forb/shrub structure) would not have canopy cover guidelines; and there would be more openings than in areas managed for denser stand conditions. See 1987 Plan, pages 65-7, 65-9, and 65-10. Additional management direction for ponderosa pine is in Management Area 3 (Ponderosa Pine and Mixed Conifer less than 40 percent slope), and this direction has both positive and negative aspects. Direction to broadcast seed following burns using a high production multi-growing season species to attain a balanced composition of cool and warm season forage species could have a negative effect on these species due to competition for nutrients and water with non-native species that could be a part of this seed mix. However, language to maintain open meadows in ponderosa pine, eliminate invading overstory vegetation, and stabilize gullies could improve habitat for these species. See 1987 Plan, page 120.

For Ponderosa Pine ERU, this management effect rating is also because direction to broadcast seed following burns using a high production multi-growing season species to attain a balanced composition of cool and warm season forage species could have a negative effect on these species due to competition for nutrients and water with non-native species that could be a part of this seed mix. However, language to maintain open meadows in ponderosa pine, eliminate invading overstory vegetation, and stabilize gullies could improve habitat. See 1987 Plan, page 120. The Ponderosa Pine ERU is recognized as being a fire-dependent ecosystem, but suppression objectives that are designed to protect wildland-urban interface, minimize suppression costs and provide for personnel safety make the reintroduction of fire into the ecosystem challenging, so the ERU and the plants that live in it have a higher risk of being impacted by fire. See 1987 Plan, pages 93, 94, 137.

Prescribed fire and wildfires managed for resource objectives may be used in these ERUs, but there is no provision for using wildfires managed for resource objectives in the wildland-urban interface (1987 Plan, pages 92, 155, and 165) and the language to manage wildfires for resource objectives in wilderness impedes the use of this tool (1987 Plan, pages 111−112). This plan language does not contribute to the viability of these species because it would limit the restoration of fire as a natural process in the wildland-urban interface and in wilderness, and canopy cover and shrub and tree density would be expected to increase in these areas. There would also be increased potential for uncharacteristic fire in the wildland-urban interface and wilderness portions of this ERU. This is particularly problematic where the landownership pattern is intermixed between public and private ownerships.

However, plan language for designated wilderness provides additional protection to these species and would contribute to species viability in all alternatives due to fewer ground-disturbing activities, which could damage plants, compact soil, or cause accelerated soil erosion. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources; and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Alternative B (modified)

Table 86 shows that the condition and trend for the Ponderosa Pine ERU would be similar to alternative A, remaining in poor condition with a trend toward desired conditions in the short term under low treatment objectives (50,000 acres mechanical, 150,000 acres prescribed fire). However, in the short term under the high vegetation treatment objectives (260,050 acres mechanical, 200,000 acres prescribed fire) and in the long term under both the low and high vegetation treatment objectives, the condition would improve to fair and trend toward desired conditions.

As shown in table 86, the likelihood that habitat on the forest would be a limiting factor for these species is low-moderate to high. These likelihoods were derived by combining these species' F Ranks of F1,F2, and F3 with the likelihood of habitat limitation variable for the Ponderosa Pine ERU (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. This rating is because alternative B (modified) emphasizes ecological conditions and composition, structure, and function of this ERU using current science, in contrast to alternative A (Reynolds et al. 2013). Particularly beneficial guidelines provide sideboards that would promote or sustain old-growth forest attributes, uneven-aged conditions, pre-settlement trees, occupancy of small wildlife species, and reduce the risk of uncharacteristic bark beetle outbreaks (FW-TerrERU-PP-G-1 to 7). Although alternative B (modified) promotes an open uneven-aged structure similar to historic conditions, it also has provisions for denser areas such as on steep slopes and in canyons and larger tree groups in areas managed for bald eagles (FW-TerrERU-PP-DC-8, 13). The treatment objectives for the Ponderosa Pine ERU address the need for ecological restoration that addresses the shift in canopy conditions away from desired conditions and the departure the historic fire regime. Implementation of these objectives and removal of restrictions on use of wildfires with resource objectives would lead to more open stand conditions and reduce the risk of uncharacteristic fire on the landscape, reducing the risks of habitat loss for species such as creeping milkvetch, hairy clematis, Flagstaff cinquefoil, and James rubberweed.

Unlike alternative A, alternative B (modified) does not restrict the use of wildfires managed for resource objectives within the wildland-urban interface. Fire and vegetation management in the wildland-urban interface would favor low intensity surface fires; higher frequency of disturbance than the natural disturbance regime from prescribed burning, wildfires managed for resource objectives, and/or vegetative treatments; more area of grass/forb/shrub vegetation or early seral vegetation, and more open conditions. Wildland-urban interface areas would still be within the range of desired conditions (FW-WUI-DC-3, 4, 6, 7, and G-1). Although intended to reduce the risk of wildfire to surrounding communities and values-at-risk, conditions and activities in the wildland-urban interface could have the positive effect of maintaining habitat for these species by stimulating flowering, seed release, germination, removing competitors, or causing a temporary increase in nutrient availability (Satterthwaite et al. 2002). Areas with increased disturbance from management activities could degrade habitat through accelerated soil erosion, soil compaction, depletion of the seedbank in the soil, and establishment of non-native species could out-compete this species (Cione et al. 2002). Plants could respond negatively or positively to more frequent fire depending on timing (when flowering, forming seed, actively growing, or when carbohydrate reserves are relatively low), frequency, severity, duration, and extent of burning and how these factors interface with plant morphology or other existing conditions like drought (DeBano et al. 1998). The effect of higher frequency of disturbance and more open conditions in the WUI may vary by species and would be dependent on the site-specific and species-specific interaction of the above mentioned possible effects and conditions.

There are 97 acres (less than 1 percent) of ponderosa pine in recommended wilderness in this alternative. Recommended wilderness would be managed to maintain or enhance primitive and undeveloped characteristics; to preserve native species and unique features; to reduce evidence of modern human control and manipulations; and motor vehicle uses should only occur for limited administrative and permitted activities to be consistent with wilderness character (FW- RWild-DC-1, 2, 3, FW- RWild-G-3). This would protect habitat by reducing some ground disturbance that could occur as result of management activities or permitted uses. Recommended wilderness would not prohibit prescribed or managed wildfires but could make them more challenging to implement because vehicle use needed to manage fire should be consistent with wilderness character and depending on site-specific conditions, this may not always be possible. Active vegetative management and vehicle use would be limited or prohibited (vehicle use) if recommended wildernesses become designated. Designation could restrict the use of vegetative treatments or fire to reach the desired conditions for the ERU. The magnitude of the effect on species and their habitat depends on what needs to be restored in these ERUs in recommended wilderness, what tools might be needed for restoration, and whether access in the areas adjacent to recommended wilderness is sufficient to allow for safe use of prescribed or managed fire if needed.

In contrast to alternative A, alternative B (modified) has language that better addresses species' specific threats and better provides for habitat for species with restricted ranges and distribution, i.e., rarity. Plan language in alternative B (modified) also promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10).

Alternative B (modified) addresses disturbance to plants and their habitat better than alternative A by adding language so roads and recreational activities and locations are managed to move toward desired conditions for other resources; so unneeded roads are decommissioned, and so temporary roads are naturalized in a timely manner (FW-RdsFac-G-1, 6, 8 and FW-Rec-All-G-1). A Roads and Facilities desired condition may lead to temporary increases in roads to allow for management activities including restoration treatments and prescribed burning (FW-RdsFac-DC-3). These temporary roads could crush plants, degrade habitat, contribute to soil loss, or increase the risk of non-native plant establishment. However, these activities are needed to conduct vegetative treatments that would reduce departure from desired conditions in ERUs and reduce the risk of uncharacteristic fire. These treatments would generally open tree canopy and would improve the distribution and abundance of herbaceous understory, including habitat for rare plants.

Collection of Flagstaff cinquefoil was not identified as a threat for this species. However, it has been collected by local gardeners in the past, partly based on its uniqueness and beauty. This was occurring before Flagstaff cinquefoil was officially designated as a species. Guidance in Wildlife, Fish and Plants (FW-WFP-G-15) and Forest Products (FW-FProd-G- 4) could be used to regulate collection of Flagstaff cinquefoil on lands under Forest Service jurisdiction. Collections on non-forest lands would not be affected by this guidance. This heightens the importance of conservation of this species on NFS lands, which may provide refugia for Flagstaff cinquefoil as locations on other lands are lost or depleted (FW-WFP-DC-5 and FW-WFP-G-10).

Alternative C

The effects to these species under alternative C would be the same as alternative B (modified), except there are 1,720 acres (less than 1 percent) of Ponderosa Pine in recommended wilderness in this alternative.

Alternative D

The effects to these species under alternative D would be the same as alternative B (modified), except there is no recommended wilderness.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of creeping milkvetch, hairy clematis, Flagstaff cinquefoil, and James rubberweed, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for hairy clematis, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A. These alternatives included plan components for the Ponderosa Pine ERU that provide better protection for this habitat and updated plan language for at-risk and rare species and disturbances.

Off-forest Aquatic Species

Page springsnail and Balmorhea Saddle-case caddisfly

These species are grouped together because they share similar habitats. These habitats (e.g., springs, perennial streams, Cottonwood Willow Riparian Forest, and Mixed Broadleaf Deciduous

Riparian Forest) are more fully evaluated in the Coarse Filter: Habitat section. These species' habitats and habitat management are covered under a Conservation Agreement by the State of Arizona.

Affected Environment

The Page springsnail and Balmorhea saddle-case caddisfly are both Forest Service sensitive species. They are endemic perennial species found on Arizona State lands and private lands of Page Springs hatchery and Lolo Mai springs within the lower Oak Creek watershed.

Distribution

Page springsnails are not currently present on Coconino NF lands, but exist only on privately owned springs within the Oak Creek 5th HUC watershed (Lower Oak Creek 6th HUC, less than one perennial mile of habitat).

Balmorhea Saddle-case caddisfly occurs in Arizona and Texas, and it has only been found in Page Springs and Bubbling Ponds which are parcels of private land within the forest boundaries (Stevens and Ledbetter 2014). This habitat is in the Oak Creek 5th HUC watershed.

Habitat

Page springsnails are associated with springs, perennial streams, and Cottonwood Willow Riparian Forest off the forest. They eat the periphyton attached to algae and aquatic macrophytes and are found attached to firm substrates such as rocks, vegetation, floating algal mats and submerged woody debris in association with slow to moderate flows of springs near gravel/cobble substrates (AZGFD 2015).

Balmorhea saddle-case caddisfly are associated with springs, Cottonwood Willow Riparian Forest, and Mixed Broadleaf Deciduous Riparian Forest off the forest. The larvae are thought to prefer slow-lotic, warmer water habitats with sandy substrate and spring-fed channels. Microhabitat preferences of this species are not well known (Stevens and Ledbetter 2014).

Risks

Rarity is a threat to both Page springsnail and Balmorhea Saddle-case caddisfly, because they are only known from a few locations. Page springsnail is endemic to the Page Springs and bubbling ponds habitats; while the Balmorhea Saddle-case caddisfly is restricted to these two springs as well (Stevens and Ledbetter 2014).

Environmental Consequences

Table 87 summarizes the viability analyses for the Page springsnail and Balmorhea Saddle-case caddisfly. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 87. Analysis summary for Page springsnail and Balmorhea Saddle-case caddisfly

Species, status, and F Rank	Habitat	Alternative A: Condition and habitat trend relative to desired conditions	Alternative A: Likelihood species is limited	Alternatives B (modified), C, and D: Condition and habitat trend relative to desired conditions	Alternatives B (modified), C, and D: Likelihood species is limited
Page springsnail (Sensitive) F Rank = FO*	Springs	Fair**, slowly toward	N/A	Fair**, slowly toward	N/A
	Perennial streams	Poor, static	N/A	Poor, toward	N/A
	CWRF	Fair, slowly toward	N/A	Good, slowly toward	N/A
Balmorhea Saddle-case caddisfly (Sensitive) F Rank = FO*	Springs	Fair**, slowly toward	N/A	Fair**, slowly toward	N/A
	CWRF	Fair, slowly toward	N/A	Good, slowly toward	N/A
	MBDRF	Good, static to slowly toward	N/A	Good, slowly toward	N/A
Management Effect		Springs and perennial streams = 4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Ephemeral streams, CWRF, MBDRF = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*FO = Occurs off the forest.

**For analysis, springs were considered in fair condition. However, some springs could be in poor or good condition depending on accessibility, protection, or degree of development.

Both of these species are considered to be rare because there are few populations, none of which occur on the forest. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Plan components in all alternatives have plan objectives or management emphasis to improve or restore riparian ecosystems, direction to use best management practices, and would use either filter strips (alternative A) or aquatic management zones (remaining alternatives) to protect water quality and to avoid detrimental changes in water temperature, chemical composition, sediment deposits, or blockages. These plan components would maintain or improve water conditions, habitat for aquatic and riparian species, and connected downstream resources. See 1987 Plan, pages 23, 71, 72, 72-1, 172-177; FW-Rip-Wtlnds-O-1, FW-Rip-Spr-O-1, FW-Rip-RipType-O-1, and FW-WFP-O-4, FW-Rip-All-G-3, FW-Rip-Strm-G-2, FW-Water-G-4, and FW-BioPhys-Geo-G-8.

Alternative A

Table 87 shows that under alternative A, springs would remain in fair condition and slowly toward desired conditions. Accessible, unprotected springs would remain in poor condition, while springs that are inaccessible, protected, or undeveloped would remain in good condition.

Perennial streams would remain in poor condition with a static trend in relation to desired conditions. This condition is generally due to most streams having invasive and non-native animal species that are outside of their historic variability.

Cottonwood Willow Riparian Forest would remain in fair condition and Mixed Broadleaf Deciduous Riparian Forest would remain in good condition. Both of these riparian forest types would mostly have a static trend or slowly trend toward desired conditions. In Cottonwood Willow, some portions would be static due to high recreation or private land. In Mixed Broadleaf Deciduous, static trends are associated with the Oak Creek 5th code HUC. Trends that are slowly toward desired conditions are associated with the Beaver Creek and the Fossil Creek-Lower Verde River 5th code HUCs except portions of Fossil Creek have a trend away from desired conditions where recreation use is high, but these are not habitat for these species.

As shown in table 87, no likelihood has been determined that these species would be limited by their habitat on the forest because these species are not known to occur on the forest and have an F Rank of FO.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 4 for springs and perennial streams, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. For springs, desired conditions and guidelines are largely lacking therefore managers do not have clear direction when restoring or protecting springs or to maintain or restore toward desired condition of properly functioning, resilient springs and spring riparian areas (USDA Forest Service 2016b). For perennial streams, language is largely lacking for invasive and non-native aquatic species that were not present historically. These species can alter the composition, structure and processes of stream ecosystems. As described in the Coarse Filter: Habitat section, the threat of dispersed recreation to riparian resources is not addressed forestwide in alternative A. The Sedona-Oak Creek Planning Area most specifically address the conflicts and strategies to resolve resource damage in riparian areas. This direction mainly addresses the impact of dispersed recreation to specific riparian areas where there have been past conflicts and resource damage. However, it provides very limited direction when areas that previously received low use are “discovered” and see unexpected increases in recreation, such as Fossil Creek. As a result, alternative A addresses this threat sporadically compared with alternatives B (modified), C, and D, but it does mitigate some of the areas where the conflict is most pronounced.

The management effect is classified as a 3 for Cottonwood Willow Riparian Forest and Mixed Broadleaf Deciduous Riparian Forest, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives. This is primarily because alternative A lacks or has few plan components relative to composition, structure, and function of riparian forests. This alternative has the least potential for improvement to riparian condition compared to the other alternatives because desired conditions are lacking and there is not a focus on functioning-at-risk and non-functional riparian areas (USDA Forest Service 2016b).

Alternative B (modified)

Table 87 shows that under alternative B (modified) springs would remain in fair condition with slow trend toward desired conditions, like alternative A. Perennial streams would remain in poor condition but the trend would be toward desired conditions because of updated plan components (see management effect below).

Cottonwood Willow Riparian Forest would improve to good condition and trend slowly toward desired conditions.

Mixed Broadleaf Deciduous Riparian Forest would remain in good condition and would slowly move toward desired conditions. It would improve faster than alternative A in the Oak Creek 5th code HUC.

As shown in table 87, no likelihood has been determined that these species would be limited by their habitat on the forest because these species are not known to occur on the forest and have an F Rank of FO.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the coarse filter habitats associated with these aquatic and riparian species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For springs, this rating is because alternative B (modified) has desired conditions and guidelines to guide spring management on the forest (FW-Rip-Spr-DC-1, 2, 3, 4 and FW-Rip-Spr-G-1, 2, 3, 4) whereas these are absent in alternative A.

For perennial streams, this rating is based on language regarding mitigating the effects of roads and promoting connectivity within drainages and between streamcourses and upland habitats, (See FW-RdsFac-G-2, 5, 7 and 9 and the Connectivity topic in the Wildlife and Plants Topics and Issues section). Although there are three recommended wildernesses, only the Davey’s recommended wilderness area connects to perennial water, Fossil Creek. Guidelines for recommended wilderness would lessen the effects of roads by restricting motorized use except for limited permitted and administrative use and promoting trails for mechanized and non-motorized use (SA-RWild-G-3, 5). This is beneficial for connected waters and habitat for these species because roads can alter natural water flow patterns and natural sediment levels.

More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3; Fw-Rip-Strm-G-2). Also, alternative B (modified) has a guideline that balances recreation activities, permitted uses, and management activities with soil function, riparian vegetation, and water quality at the stream reach scale (FW-Rip-RipType-G-3). This guideline would not apply to fine scale activities and facilities such as intermittent livestock crossing locations, water gaps, or other infrastructure used to manage impacts to riparian areas at a larger scale. This guideline is intended to protect riparian function, especially in areas of high recreation use such as Oak Creek.

Alternative B (modified) has desired conditions that protect riparian resources, including soil conditions and water quality, while recognizing the demand for and need to properly manage the public's dispersed recreation opportunities. A forestwide desired condition for dispersed recreation supports managing dispersed recreation to avoid resource damage (FW-Rec-Disp-DC-3) Several guidelines about dispersed recreation would manage trails, camping, and recreation types to prevent further resource damage to riparian resources (FW-Rec-Disp-G-1 to 5).

Plan components in alternative B (modified) specify that livestock grazing maintains desired conditions of plant communities (FW-Graz-DC-2; FW-Graz-G-2). They also protect and minimize impacts to riparian areas by recommending that livestock use be restricted to the dormant season, recommending utilization levels on woody vegetation, maintenance of adequate vegetative cover to protect streambanks, and state that riparian areas are rarely negatively impacted by livestock (FW-Graz-G-7). This would maintain riparian structure, composition, and promote proper functioning. Guidelines are in place to reduce cattle concentrations and sedimentation into connected waters by specifying that range improvements should not interfere with riparian function and rare species, and further specifies a minimum distance of salts and supplements from riparian areas (FW-Graz-G-4 and 5).

Alternative B (modified) addresses uncharacteristic flooding by maintaining natural hydrographs through time and by promoting riparian forest composition and structure that would reduce the effects of flooding (FW-Rip-Strm-DC-4, FW-Rip-RipType-DC-2). For stream riparian areas, functional riparian areas and herbaceous vegetation provide protection from uncharacteristic wildfire and flooding disturbance, resiliency, and should filter sediment and protect water quality (FW-RIP-RipType-DC-2, 3, 4). This alternative also contains a guideline protects riparian resources by recommending against issuing a lands and recreation special use permit for activities proposed to occur within 200 feet of perennial streams, springs, or waters that contribute to or support sensitive resources, such as federally listed or Southwestern Region sensitive species (FW-SpecUse-G-3).

For Cottonwood Willow Riparian Forest and Mixed Broadleaf Deciduous Riparian Forest, this management effect rating is primarily because there are updated desired conditions and guidelines that support the composition, structure, and function of riparian forest types (FW-Rip-RipType-DC-1 to 6, FW-Rip-RipType-G-1 to 4). In addition, riparian functional condition would improve faster than alternative A. Plan components manage for vegetation diversity and riparian function (FW-Rip-RipType-DC-1 and 2; FW-Water-G-2; FW-Rip-RipType-O-1). Plan components in the Wildlife, Fish and Plants section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1 and 3).

Unlike alternative A, alternative B (modified) specifically supports conditions for endemic, rare, or specialized species in springs. Alternative B (modified) also has language that better addresses species specific threats: i.e. rarity and invasive or non-native animals. Plan language in alternative

B (modified) promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10).

Alternative B (modified) better addresses the threat of invasive species and disease than alternative A by supporting native species and addressing disease and invasive, non-native species forestwide (FW-WFP-DC-3, FW-Eco-DC-1, FW-Water-DC-6 and G-6, FW-Rip-Strm-G-1, FW-Rip-Spr-DC-2, FW-Rip-RipType-DC2, 6, and G-2, and FW-TerrERU-All-G-3). The plan components for invasive species can be applied to any non-native plant or animal on the forest. The forestwide desired conditions for invasive species (FW-Invas-DC-1 and 2) and guidelines (FW-Invas-G-1 through 3) apply to all organisms. Unlike alternative A, invasive species guidance is incorporated in many portions of this alternative. Desired condition (FW-Rec-Dev-DC-9) states that non-native invasive plants and invasive aquatic organisms are not established or transported around these high-use areas of the forest, which is particularly beneficial for several of these species because they are adjacent to developed campgrounds. FW-Rec-Dev-G-2 provides guidance for controlling invasive species at these sites before they become established and widespread.

Alternative C

Alternative C has the same effects as alternative B (modified).

Alternative D

Alternative D has the same effects as alternative B (modified).

Findings

All of the habitat for the Page springsnail and Balmorhea Saddle-case caddisfly lies within State of Arizona or private lands. Considering indirect and cumulative effects for wildlife, fish, and plants to these habitats such as waterway development (that is outside of Forest control) and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Page springsnail and Balmorhea Saddle-case caddisfly, although individuals may be impacted by management activities or permitted uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Page springsnail and Balmorhea Saddle-case caddisfly, which are Forest Service sensitive species.

Riparian Plants

Alcove bog orchid, Arizona bugbane, and Ertter's rose

These three species are addressed together because they share similar habitat and threats. All three species are Southwestern Region sensitive species.

Affected Environment

These three species are addressed together because they share similar habitat. They occur in the Red Rock-Secret Mountain Wilderness, the Oak Creek Research Natural Area, and West Fork of Oak Creek. Their ranges are slightly different.

Alcove bog orchid is uncommon throughout its range and endemic to the Colorado Plateau. It was added to the Region 3 sensitive species list in 2007.

Arizona bugbane was proposed for listing as threatened species in 1979 and again in 1982 and has been previously managed using a Conservation Strategy (1995). The strategy has currently lapsed but is under revision.

Ertter’s rose is a recently recognized variety of the more common woods rose.

Distribution

Alcove bog orchid is endemic to the Colorado and Green rivers and their tributaries in eastern Utah, northwestern Colorado, and northern Arizona. Known occurrences of this species on the forest include the West Fork of Oak Creek.

Arizona bugbane occurs only in northern and central Arizona. All known locations are on NFS lands on Coconino, Kaibab and Tonto National Forests. Locations of this species include the tributaries of Oak Creek, including West Fork, Pumphouse and James Canyons and the West Clear Creek drainage. Most, but not all, of the documented occurrences of Arizona bugbane on the Coconino NF are in wildernesses.

Ertter’s rose is narrowly endemic with distribution limited to the West Fork of Oak Creek and the adjacent main portion of Oak Creek Canyon and perhaps nearby canyons.

Habitat

Alcove bog orchid habitat includes seeps, hanging gardens, and stream edges in desert shrub communities. Typical sites are shaded for most of the day. It is associated with Mixed Broadleaf Deciduous Riparian Forest and springs.

Arizona bugbane is a perennial plant that grows along canyon bottoms and lower canyon slopes in association with Douglas-fir, white fir, big tooth maple, Rocky Mountain maple, and sometimes aspen. Some populations occur at seeps and springs, in drainages and on shaded north slopes, growing in moist, loamy soil of the ecotone between the coniferous forest and riparian habitat. It is associated with Mixed Broadleaf Deciduous Riparian and Montane Willow Riparian Forests.

Ertter’s rose grows on well-drained slopes and in riparian forests and creek beds at elevations of 5,300 feet in the mouth of West Fork of Oak Creek to 7,000 feet at the rim. It is associated with Mixed Broadleaf Deciduous Riparian and Montane Willow Riparian Forest.

Risk Factors

Threats to all three species are disturbance to plants and rarity. Some of the documented locations are in the “mouth of West Fork,” which is heavily used by recreationists, while others are in most remote locations of the West Fork drainage and are in the Red Rock-Secret Mountain Wilderness and the Oak Creek Research Natural Area. In addition, the West Fork of Oak Creek and segments of West Clear Creek have been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System. In accessible locations, recreation use could trample plants and habitat, compact soil or cause accelerated erosion.

Environmental Consequences

Table 88 summarizes the viability analyses for alcove bog orchid, Arizona bugbane and Ertter's rose. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 88. Analysis summary for alcove bog orchid, Arizona bugbane, and Ertter's rose

Species and status	Habitat	Alternative A: Habitat condition and trend relative to desired conditions	Alternative A: Likelihood species is limited	Alternatives B (modified), C, and D: Habitat condition and trend relative to desired conditions	Alternatives B (modified), C, and D: Likelihood species is limited
Alcove bog orchid (Sensitive) F Rank =F2*	MBDRF	Oak Creek 5th code HUC is Fair to Good, static to slowly toward	H to M-H	Oak Creek 5th code HUC is Good, slowly toward	M-H
	Springs	Fair**, slowly toward	H	Fair**, slowly toward	H
Arizona bugbane (Sensitive) F Rank = F2*	Canyons in MBDRF	Oak Creek 5th code HUC is Fair to Good, static to slowly toward	H to M-H	Oak Creek 5th code HUC is Good, toward	M-H
	Canyons in MWRF	Good, static to slowly toward	M-H	Good, slowly toward	M-H
Ertter's rose (Sensitive) F Rank = F1*	MBDRF	Oak Creek 5th code HUC is Fair to Good, static to slowly toward	VH to H	Oak Creek 5th code HUC is Good, toward	H
	MWRF	Good, static to slowly toward	H	Good, slowly toward	H
Management Effect		MBDRF, MWRF = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences. Springs = 4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.		All = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat. F2 = Rare on the forest within its habitat - occupies a small portion of its habitat.

**For analysis, springs were considered in fair condition. However, some springs could be in poor or good condition depending on accessibility, protection, or degree of development.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

The known occurrences of alcove bog orchid and Ertter's rose on the forest are in the Red Rock-Secret Mountain Wilderness. Arizona bugbane occurs in the West Clear Creek and Red Rock-Secret Mountain Wildernesses. Plan language for designated wilderness would contribute to the viability of these species in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (pages 105, 108-1 through 108-4and SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Some locations of alcove bog orchid, Arizona bugbane, and Ertter's rose are within the Oak Creek Research Natural Area. Plan components preserving the natural conditions of the research natural area (Pages 25 and 194, SA-RNABotGeo-DC-1 through 4), and would thus, preserve the habitat and contribute to the viability of these three species.

Some locations of alcove bog orchid, Arizona bugbane, and Ertter's rose are within the segment of West Fork of Oak Creek and the segments of West Clear Creek (bugbane only) that are eligible for inclusion in the National Wild and Scenic Rivers System. These species and their habitat would benefit from plan language that would manage recreation and other activities along eligible rivers and their corridors to protect and enhance the free-flowing condition and outstandingly remarkable values consistent with the classification (SA-WSR-DC-1 and 3, G-1). Alternative A lacks guidance for rivers determined to be eligible for designation as a wild and scenic river but policy directs that rivers found to be eligible and suitable must be protected as far as possible to the same extent as a designated study river (FSM 2354.21).

Recreational uses such as hiking and camping in West Fork pose a localized threat to individuals of these species. All alternatives would prohibit overnight camping in the research natural area (Page 108-3, SA-RNABotGeo-S -1). All alternatives provide for managing trails in the West Fork area (Page 108-2, and FW-Rec-Trails-DC -4 and 11). The direction in alternative A is specific to West Fork and provided the impetus for consolidating multiple user created trails into one maintained trail in the area. The forestwide desired conditions in alternative B (modified) provide for managing user damage to trails and keeping users on maintained trails while reducing the proliferation of social trails. All of these mitigate the potential effects of recreation to alcove bog orchid.

Alternative A

Table 88 shows that under alternative A, Mixed Broadleaf Deciduous Riparian Forest would be in fair to good condition and Montane Willow Riparian Forest would remain in good condition. Both of these riparian forest types would mostly have a static trend or slowly trend toward desired conditions. In Mixed Broadleaf Deciduous Riparian Forest, static trends are associated with the Oak Creek 5th code and West Clear Creek 5th code HUCs. In general, spring would be in fair condition and slowly trend toward desired condition. Springs along West Fork are in good condition with a static trend.

As shown in table 88, the likelihood that these species would be limited by their habitat on the forest is moderate-high to very high depending on the habitat. These likelihoods were derived by combining these species' F Ranks with the likelihood of habitat limitation variables for each habitat: Mixed Broadleaf Deciduous (moderate), Montane Willow (moderate), and springs (high) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row in table 88 shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Mixed Broadleaf Deciduous Riparian Forest and Montane Willow Riparian Forest, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives. The management effect is classified as a 4 for springs because there would be a decline in habitat quality as a result of management or lack of management that result from plan components. Alternative A does not distinguish riparian forest types from other riparian areas nor does it distinguish between the riparian forest types. It lacks plan components relative to composition, structure, and function. In addition, this alternative has the least potential for improvement to riparian condition compared to the other alternatives. Guidance for springs in alternative A is included in the Riparian section of the plan (MA 12 Riparian and Open Water) with no direction to maintain springs in their natural conditions.

Alternative B (modified)

Rarity is a risk for these species. Alternative B (modified) has components that address rarity better than alternative A. This is due to more forestwide guidance to address rare habitats and species. This is discussed in the At-risk section under Wildlife and Plant Issues and Topics.

Table 88 shows that under alternative B (modified), Mixed Broadleaf Deciduous Riparian Forest would remain in good condition and would move toward desired conditions. Montane Willow Riparian Forest would remain in good condition and would slowly move toward desired conditions. Springs would be in fair condition in general and slowly trend toward desired conditions.

As shown in table 88 the likelihood that these species would be limited by their habitat on the forest is moderate-high to high depending on the habitat. These likelihoods were derived by combining these species' F Ranks of F2 and F1 with the likelihood of habitat limitation variables for each habitat: Mixed Broadleaf Deciduous (moderate), Montane Willow (moderate), and springs (high) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the habitats. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For Mixed Broadleaf Deciduous Riparian Forest and Montane Willow Riparian Forest, this rating is primarily because there are updated desired conditions and guidelines that distinguish between the riparian forest types and that support their respective composition, structure, and function (FW-Rip-RipType-DC-1 to 6 FW-Rip-RipType-G-1 to 4). In addition, riparian functional condition would improve faster than alternative A. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1 and 2; FW-Water-G-2; FW-Rip-RipType-O-1). More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3; FW-Rip-Strm-G-2) (USDA Forest

Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1 and 3).

Forestwide desired conditions for springs (FW-Rip-Spr-DC 5) provide particularly beneficial guidance to preserve the physical and biological components of springs that provide habitat for narrowly endemic species and those with restricted distributions such as alcove bog orchid. Forest-wide guidance for biophysical features would protect the physical and geological properties of cliffs and the plants and animals that depend on them (FW-BioPhy-Geo-DC-1, FW-BioPhy-Geo-DC 6). Desired conditions in Wildlife, Fish and Plants also refer to the unique habitat provided by cliffs. FW-WFP –DC-5 provides direction for preserving the composition, structure and function of the ERUs and the physical features including cliffs and rock piles that provide habitat and refugia for the plants and animals that depend on them.

There is no habitat for this species in any of the wildernesses recommended in this alternative, and therefore, no impact.

Alternative C

Alternative C has the same effects as alternative B (modified). There is no habitat for this species in any of the wildernesses recommended in this alternative and therefore no impact.

Alternative D

Alternative D has the same effects as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives will provide for the viability of the alcove bog orchid, Arizona bugbane, and Ertter’s rose, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for alcove bog orchid, Arizona bugbane, and Ertter’s rose, which are Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A, primarily because they contain plan components for riparian forests and springs and updated plan language for at-risk and rare species.

Bebb’s willow, Blumer’s dock, and Cochise sedge

These three species are addressed together because they mostly share similar habitat and threats. All three species are Southwestern Region sensitive species.

Affected Environment

Distribution

Bebb’s willow as a species is widespread and not considered especially rare. It is of special interest for the Coconino NF because it represents the southernmost example of a Bebb’s willow dominated riparian forest community. Similar communities are hundreds of miles to the north. The Bebb’s willow riparian community is in the Fern Mountain Botanical Area which was established with the approval of the current plan (alternative A) and adjacent Hart Prairie Preserve which is managed by the Nature Conservancy. The estimated population in this area is approximately 1,300 plants. Conservation of Bebb's willow is the focus of the Fern Mountain Botanical Area. Locations elsewhere on the forests are comprised of single plants or small groups, not the unique riparian scrub community at Hart Prairie. Bebb's willow has been documented in the Hart Prairie area, Kehl Springs, Merritt Draw, Mormon Lake Area, Upper West Fork and Fernow Draw on the Coconino NF.

Blumer's dock is a large, long-lived herbaceous perennial plant occurring in New Mexico and Arizona. Known locations include the Hart Prairie area, Barbershop Canyon, and East Clear Creek.

Cochise sedge is endemic to southeastern Arizona and southwestern New Mexico. Cochise sedge has been reported from Fossil Creek and the West Clear Creek areas on the Coconino NF. Many actions such as regulating the number of visitors, controlling parking and public sanitation have already been initiated in Fossil Creek. Although these actions are not incorporated into the current plan (alternative A), these analyses were conducted under the guidance of the current plan.

Habitat

Bebb's willow and Blumer's dock are associated with Montane Willow Riparian Forest and springs. The habitat for Blumer's dock is mid- to high-elevation wetlands with moist, organic soil adjacent to perennial springs or streams in canyons or meadows. Cochise sedge is associated with Mixed Broadleaf Deciduous Riparian Forest, Montane Willow Riparian Forest, and springs. It generally occurs in shady areas and in moist soils. The springs where Cochise sedge is present are in remote areas so are considered inaccessible consequently the likelihood that springs would be limiting to this species is low.

Risk Factors

Threats to all three species are disturbance to plants and rarity. Water diversion is an additional threat to Bebb's willow and Blumer's dock. Herbivory is an additional threat to Bebb's willow.

Environmental Consequences

Table 89 summarizes the viability analyses for Bebb's willow, Blumer's dock, and Cochise sedge. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 89. Analysis summary for Bebb's willow, Blumer's dock, and Cochise sedge

Species and status	Habitat	Alternative A: Habitat condition and trend relative to desired conditions	Alternative A: Likelihood species is limited	Alternatives B (modified), C, and D: Habitat condition and trend relative to desired conditions	Alternatives B (modified), C, and D: Likelihood species is limited
Bebb's willow and Blumer's dock	MWRF	Good, static to slowly toward	H	Good, slowly toward	H
(Sensitive) F Rank = F1*	Springs	Fair**, slowly toward	VH	Fair**, slowly toward	VH
Cochise sedge (Sensitive) F Rank = F1*	MBDRF	Good, static to slowly toward; West Clear Creek 5th code HUC is Good and static; portions of Fossil Creek where recreation impacts occur are trending away.	H	Good, slowly toward; West Clear Creek 5th code HUC is Good and slowly toward; and Fossil Creek 5th code HUC is Good, toward.	H
	MWRF	Good, static to slowly toward	H	Good, slowly toward	H
	Springs	Good**, toward	H	Good**, toward	H
Management Effect		MBDRF, MWRF= 3: Plan components maintain or improve protection and management for **some** habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences. Springs =4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.		All = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat

**For analysis, springs were considered in fair condition for Bebb's will and Blumer's dock. However, some springs could be in poor or good condition depending on accessibility, protection, or degree of development. Cochise sedge occurs in inaccessible areas, so the springs were considered to be in good condition for that analysis.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Particularly beneficial plan language for Bebb's willow follows. Most of the known Bebb's willow plants on the forest are within the Fern Mountain Botanical Area, which is managed as a special area in all alternatives (pages 82, 193-196; SA-RNABotGeo-DC-5, SA-RNABotGeo-DC-6, SA-RNABotGeo-G-1, SA-RNABotGeo-G-3). The plan direction for all alternatives is protective and similar, but more flexible in alternatives B (modified), C and D.

Some populations of Cochise sedge occurs in the Fossil Creek and West Clear Creek Wildernesses. Plan language for designated wilderness would contribute to the viability of this species in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (pages 105, 108-1 through 108-4and SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Alternative A

Table 89 shows that under alternative A, Mixed Broadleaf Deciduous Riparian Forest and Montane Willow Riparian Forest would remain in good condition. These riparian forest types would mostly have a static trend, slow trend, or trend toward desired conditions. In Mixed Broadleaf Deciduous Riparian Forest, static trends are associated West Clear Creek 5th code HUCs. Trends that are slowly toward desired conditions are associated with the Fossil Creek-Lower Verde River 5th code HUCs except portions of Fossil Creek have a trend away from desired conditions where recreation use is high. Trends in Montane Willow Riparian Forest would be static to slowly toward desired conditions. In general, springs would be in fair condition and slowly trend toward desired condition.

As shown in table 89, the likelihood that the Bebb's willow, Blumer's dock and Cochise sedge would be limited by its habitat on the forest is high to very high and varies slightly by habitat. These likelihoods were derived by combining the F Ranks of F1 for each of these species with the likelihood of habitat limitation variables for each habitat: Mixed Broadleaf Deciduous (moderate), Montane Willow (moderate), and springs (high when accessible and unprotected) (table 9 in volume IIa). The likelihood that Cochise sedge would be limited by springs is high, because Cochise sedge occurs in remote inaccessible areas, so habitat quality is assumed to be good and springs are classified as rare.

The management effect row in table 89 shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Mixed Broadleaf Deciduous Riparian Forest and Montane Willow Riparian Forest habitats, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives. Alternative A does not distinguish riparian forest types from other riparian areas nor does it distinguish between the riparian forest types. It lacks plan components relative to composition, structure, and function. In addition, this alternative has the least potential for improvement to riparian condition compared to the other alternatives.

Alternative A would maintain or improve riparian forests and streamcourses because it has a focus on improving riparian areas in any condition, preventing damage to riparian vegetation, stream banks, and channels, and restoring degraded riparian areas to good condition as soon as possible (1987 Plan, pages 65-2, 65-8, 172, and 206-8). Other protective language includes the following: Only beneficial new special uses are allowed in riparian areas and exceptions such as utility line or roads crossing stream courses are designed to minimize the extent and magnitude of impact to riparian (1987 Plan, page 177). Aggressive fire suppression may be used to prevent resource damage utilizing methods that minimize long-term adverse impacts to riparian habitats (1987 Plan, page 177). In addition, acquisition of riparian areas through land exchange is a high priority (1987 Plan, pages 177 and 185). The plan would manage commercial uses, and recreation in some areas, to protect riparian values (1987 Plan, pages 206-10, 22, 26, and 39).

Plan components in alternative A (Forestwide Range and Forestwide Riparian) protect and minimize impacts to riparian areas through management and fencing, but they also manage impacts through seeding (1987 Plan, pages 69, 176, and 174). However, it also allows salting to improve livestock distribution. Salting could be used in riparian areas to improve livestock management by concentrating cattle in certain areas, a practice which could be detrimental to associated species and their habitat and salting could be used in upland areas to distribute livestock outside of riparian areas (1987 Plan, pages 68 and 175). This is offset by a standard that requires that forage use be maintained at a level that assures recovery and continued existence of listed species (1987 Plan, pages 66-1 and 174) and specific objectives to protect riparian areas and allow them to recover in the first 20 years of the plan (1987 Plan, page 175). Also, alternative A promotes the establishment of allowable use guidelines with allotment-specific environmental analysis or with the use of a table based on range condition and management strategy (1987 Plan, page 66-1). However, the range condition classes in the table are no longer used and the currently used overall approach for grazing utilization is adaptive management based on objectives established in site-specific environmental analysis. Problem areas would be addressed through the allotment management plan process or monitoring. Permitted use and capacities would be balanced by increasing or decreasing livestock numbers, changing management intensity levels, initiating changes in livestock class, season of use, and rotation patterns (1987 Plan, page 67), which are many of the same techniques implemented on the ground. Alternative A uses outdated language such as full capacity range and has less of an ecological approach to understory conditions than the other alternatives (1987 Plan, page 67).

Ecosystem conditions in designated wilderness would be protected by prohibiting bicycles and stopping motorized vehicle intrusions and firewood cutting (1987 Plan, pages 106 to 107). Fire-adapted ecosystems adjacent to riparian habitat would be allowed to burn naturally, provided prescribed conditions are met (1987 Plan, page 94). This could reduce the risk of uncharacteristic fire and flooding to these habitats.

The management effect is classified as a 4 for springs because there would be a decline in habitat quality as a result of management or lack of management that result from plan components. Alternative A does not distinguish riparian forest types from other riparian areas, nor does it distinguish between the riparian forest types. It lacks plan components relative to composition, structure, and function. In addition, this alternative has the least potential for improvement to riparian condition compared to the other alternatives. Guidance for springs in alternative A is included in the Riparian section of the plan (MA 12 Riparian and Open Water) with no direction to maintain springs in their natural conditions.

Alternative B (modified)

Table 89 shows that under alternative B (modified), Mixed Broadleaf Deciduous Riparian Forest would remain in good condition and would slowly move toward desired conditions except portions of Fossil Creek and Wet Beaver Creek would remain static in areas of high recreation use. It would improve faster than alternative A in the West Clear Creek, and Fossil Creek 5th code HUCs.

Montane Willow Riparian Forest would remain in good condition, like alternative A, and slowly improve toward desired conditions, faster than alternative A.

Springs would remain in fair condition and slowly trend toward desired conditions.

As shown in table 89, the likelihood that Bebb's willow, Blumer's dock and Cochise sedge would be limited by their habitat on the forest is high to very high, depending on the habitat. These likelihoods were derived by combining the species' F Rank of F1 with the likelihood of habitat limitation variables for each ERU: Mixed Broadleaf Deciduous Riparian Forest (moderate), Montane Willow Riparian Forest (moderate), and springs (high) (table 9 in volume IIa). The likelihood that Cochise sedge would be limited by springs is high because Cochise sedge occurs in remote inaccessible areas, so habitat quality is assumed to be good and springs are classified as rare.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the habitats associated with these species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For Mixed Broadleaf Deciduous and Montane Willow riparian forest types, this rating is primarily because there are updated desired conditions and guidelines that distinguish between the riparian forest types and that support their respective composition, structure, and function (FW-Rip-RipType-DC-1 to 6 FW-Rip-RipType-G-1 to 4). In addition, riparian functional condition would improve faster than alternative A. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1 and 2; FW-Water-G-2; FW-Rip-RipType-O-1). More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3; Fw-Rip-Strm-G-2) (USDA Forest Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1 and 3).

Also, alternative B (modified) has a guideline that balances recreation activities, permitted uses, and management activities with soil function, riparian vegetation, and water quality at the stream reach scale (FW-Rip-RipType-G-3). This guideline would not apply to fine scale activities and facilities such as intermittent livestock crossing locations, water gaps, or other infrastructure used to manage impacts to riparian areas at a larger scale. This guideline is intended to protect riparian function, especially in areas of high recreation use such as Oak Creek, Beaver Creek, and Fossil Creek and would be beneficial for these species because it could reduce trampling or mortality from these activities or uses.

Plan components in alternative B (modified) specify that livestock grazing maintains desired conditions of plant communities (FW-Graz-DC-2; FW-Graz-G-2). They also protect and minimize impacts to riparian areas by recommending that livestock use be restricted to the dormant season, recommending utilization levels on woody vegetation, maintenance of adequate vegetative cover to protect streambanks, and state that riparian areas are rarely negatively impacted by livestock (FW-Graz-G-7). This would maintain riparian structure, composition, and promote proper functioning. Guidelines are in place to reduce cattle concentrations and sedimentation into connected waters by specifying that range improvements should not interfere with riparian function and rare species, and further specifies a minimum distance of salts and supplements from riparian areas (FW-Graz-G-4 and 5).

Forestwide desired conditions for springs (FW-Rip-Spr-DC 5) provide particularly beneficial guidance to preserve the physical and biological components of springs that provide habitat for narrowly endemic species and those with restricted distributions.

SA-WSR-DC-1 helps retain the values for the wild and scenic rivers, including botanical values. Retaining the free-flowing conditions and the outstandingly remarkable values of the area will benefit Cochise sedge.

Alternative C

Alternative C has the same effects as alternative B (modified).

Alternative D

Alternative D has the same effects as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Bebb’s willow, Blumer’s dock and Cochise sedge, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Bebb’s willow, Blumer’s dock and Cochise sedge, which are Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A, primarily because they contain plan components for riparian forests and springs and updated plan language for at-risk and rare species.

Wetland Plants

Bollander’s quillwort and pond lily

These species are grouped together due to the similarity of these species (and their habitat). Wetlands are more fully evaluated in the Coarse Filter: Habitat section.

Affected Environment

Distribution

The known distribution of Bollander’s quillwort, classified as an Other planning species, is most of the western United States, including California, Oregon, Idaho, Wyoming, Montana, Utah, Colorado, New Mexico, and Arizona. The known location occurrence on the Coconino NF is Dude Lake on the Mogollon Rim Ranger District.

The pond lily, classified as an Other planning species, has a large range, occurring in many parts of the United States, but the species is rare on the forest. Known occurrences on the Coconino/Kaibab National Forest boundary are in the upper reaches of Sycamore Canyon.

Habitat

Both Bollander's quillwort and pond lily occur in wetlands. Bollander's quillwort is a small aquatic plant found in ponds, lake margins, and sometimes on mud.

Risk Factors

Rarity is an inherent threat to these species due to their restricted distribution. They are vulnerable to perturbations in the environments such as ground-disturbing activities because of their small population sizes. Disturbance is also a risk from ground-disturbing management activities. The Wildlife and Plant Issues and Topics section above has more detail about At-risk Species and Disturbance to Plants.

Environmental Consequences

Table 90 summarizes the viability analyses for Bollander's quillwort and pond lily. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species' viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 90. Analysis summary for Bollanders' quillwort and pond lily

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Bollander's quillwort Pond lily (Other) F Rank = F1*	Wetlands	Good**, toward	H	Good, toward	H
Management Effect		Management Effect = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		Management Effect = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat,

**For analysis, wetland condition and trend are based on total acres of wetlands, which has the effect of giving greater weight to larger wetlands. The condition and trend is fair and slowly toward desired conditions when of individual wetlands is considered, instead of total wetland acres.

Common to All Alternatives

These species are considered to be rare and/or at-risk because there are few populations known and they are vulnerable to stochastic events. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). Additional information and analysis is discussed under the At-risk topic in the Wildlife and Plant Topics and Issues section.

All alternatives address the threat of invasive plants. Invasive plants can increase as a consequence of ground disturbance and once established could compete with these species for water and nutrients or could alter the fire regime. All alternatives address the threat of invasive plants by pointing to the Final Environmental Impact Statement for the Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005). This direction includes best management practices, among other guidance, which would help prevent, mitigate, and reduce the threat of invasive plants. All alternatives prioritize treatments, call for incorporating control measures in project planning and implementation, and emphasize coordination with partners (pages 23, 69, 70, 182, 206-14, 206-76, 206-101, 201-116, FW-Invas-DC-1 to 3, FW Invas-G-1, 2, 3, FW-Invas-MgtApp, FW-WFP-DC-10, FW-Graz-MgtApp, FW-RdsFac-G-8 ,FW-Rec-Dev-DC-9, FW-Rec-Dev-G-2, FW-TerrERU-Grass-DC-2). Additional information and analysis is discussed under the Non-native Species and Disease topic in the Wildlife and Plant Topics and Issues section.

Plan components in all alternatives have plan objectives or management emphasis to improve or restore riparian ecosystems, direction to use best management practices, and would employ either filter strips (alternative A) or aquatic management zones (remaining alternatives) to protect water quality and to avoid detrimental changes in water temperature, chemical composition, sediment deposits, or blockages. These plan components would maintain or improve water conditions, habitat for aquatic and riparian species, and connected downstream resources. See 1987 Plan, pages 23, 71, 72, 72-1, 172-177; FW-Rip-Wtlnds-O-1, FW-Rip-Spr-O-1, FW-Rip-RipType-O-1, and FW-WFP-O-4, FW-Rip-All-G-3, FW-Rip-Strm-G-2, FW-Water-G-4, and FW-BioPhys-Geo-G-8.

All alternatives would not allow permanent salt within one-quarter mile of the edge of any riparian area except alternatives B (modified), C, and D would broaden this guideline to apply to salts, minerals, and other supplements with the intention to protect sensitive resources from excessive trampling, compaction, salinization, and other impacts (1987 Plan, page 175, FW-Graz-G-5).

Alternative A

Table 90 shows that under alternative A, wetlands would remain in good condition and trend toward desired condition based on total acres of wetlands. The condition would be fair and trend toward desired conditions if the evaluation is based on the number of wetlands.

As shown in table 90, the likelihood that habitat on the forest would be a limiting factor for Bollander’s quillwort and pond lily is high for wetlands. This likelihood was derived by combining the species’ F Rank of F1 with the likelihood of habitat limitation variable for wetlands (moderate, by acres). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is a 3 for wetlands, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives.

Alternative A would maintain or improve riparian forests and streamcourses because it has a focus on riparian recovery, preventing damage to riparian vegetation, stream banks, and channels, and restoring degraded riparian areas to good condition as soon as possible (1987 Plan, pages 65-8, 172, 174). In support of this, alternative A would also construct 10 miles of fences per decade for the first two decades where necessary to protect key wet meadows, wetlands, and riparian regeneration from grazing (1987 Plan, page 175). Other protective language includes the following: Only beneficial new special uses are allowed in riparian areas and exceptions such as utility line or roads crossing streamcourses are designed to minimize the extent and magnitude of impact to riparian areas (1987 Plan, page 177). Aggressive fire suppression may be used to prevent resource damage, utilizing methods that minimize long-term adverse impacts to riparian habitats (1987 Plan, page 177). In addition, acquisition of riparian areas through land exchange is a high priority (1987 Plan, pages 177 and 185). The plan would manage commercial uses, and recreation in some areas, to protect riparian values (1987 Plan, pages 206-10, 22, 26, and 39).

However, much of the plan language for wetlands in alternative A is outdated and does not include current science about vegetative condition and natural disturbances. This alternative has less potential for improvement to riparian condition compared to the other alternatives primarily because alternative A does not distinguish between the various riparian areas differentiated in alternative B (modified), and lacks plan components relative to composition, structure, and function.

Alternative B (modified)

Table 90 shows that under alternative B (modified), wetlands would remain in good condition, and the trend would be toward desired condition regardless of whether the wetlands are evaluated based on the total acres of wetlands or the number of wetlands.

As shown in table 90, the likelihood that these species would be limited by the quality of their habitat on the forest is high. This likelihood was derived by combining these species' F Rank of F1 with the likelihood of habitat limitation variables for wetlands (moderate, by acres) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect for wetlands is 2. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. This rating is primarily because there are updated desired conditions and guidelines that support wetland composition, structure, and function, connectivity between uplands and aquatic and riparian areas, and the maintenance of habitat for species (FW-Rip-Wtlnds-DC-1, 2, FW-Rip-All-DC-1, 3, 5, FW-Rip-All-G-2, 3, FW-WFP-DC-6). In addition, riparian functional condition would improve faster than alternative A. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1, 2, FW-Water-G-2, FW-Rip-RipType-O-1). More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3, FW-Rip-Strm-G-2) (USDA Forest Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1, 3).

Alternative C

The effects to wetland plants under alternative C would be the same as alternative B (modified) except Bollander's quillwort occurs in the Blue Ridge Management Area, which has management direction in addition to that found in the revised plan. This additional management direction includes beneficial guidance for wetlands that emphasizes the ecological integrity of watersheds and native vegetation, protected and restored wetlands, low disturbance recreation activities that do not negatively impact soil conditions or hydrologic flow, and reduced disturbance from public motorized access (MA-BlueRidge-DC-1, 3, 10, G-1, 2, 3). This plan language could improve degraded conditions where they occur and reduce potential negative impacts such as accelerated erosion and sedimentation into water from recreation.

Alternative D

The effects to wetland plants under alternative D would be the same as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Bollander's quillwort and pond lily, although individuals may be impacted by site-specific activities or uses. Alternatives B (modified), C, and D would provide better protection than alternative A, primarily because they contain updated plan components for wetlands that better address wetland composition, structure, and function and connectivity between wetlands and upland environments. Alternative C would provide slightly better protection than alternative B (modified) because of additional emphasis on wetlands and watersheds and reduced disturbance from recreation, motorized use, or large group events

Verde Formation Plants

Heath-leaf wild buckwheat, Ripley's wild buckwheat, Rusby's milkwort, Verde breadroot, Verde four-nerve daisy, Verde Valley Sage

Soil is a limiting factor for plant communities on the Verde Formation, a soil type consisting of white Tertiary (Miocene and Pliocene) limestone lakebed deposits that are high in lithium, nitrates, and magnesium. The composition of the Verde Formation helps rare plant species avoid competition from more common species and functions to retain water in wet periods to provide for recruitment. The Verde Formation occupies about 70 percent of the Desert Communities and about 53 percent of the Semi-desert grasslands ERUs. This important formation defines a large portion of the plant life in the Verde Valley area. The harsh soils serve an important function in excluding more common species. The soils of the Verde Formation are generally not suited to intensive disturbance (see Soil Report).

These species have been grouped due to their strong affinity to the Verde Formation, a significant and defining feature in the Verde Valley. It strongly influences the plant community in the areas where it exists (see Desert Communities and Semi-desert Grassland ERUs in the Coarse Filter: Habitat section and Arizona cliffrose in the Fine Filter: Threatened and Endangered Species section). Desert Communities (including Verde Formation), Semi-desert Grassland (including Verde Formation), and Pinyon Juniper Evergreen Shrub ERUs are more fully evaluated in the Coarse Filter: Habitat section.

Heath-leaf wild buckwheat, Ripley's wild buckwheat, Rusby's milkwort, and Verde Valley sage are members of the plant community associated with Arizona cliffrose, the only endangered plant species on the forest. Verde breadroot occurs on the Verde Formation, but farther east near the Camp Verde area. The Arizona cliffrose is more fully evaluated in the Fine Filter: Threatened and Endangered Species section.

All but one of these species is a Southwestern Region sensitive species. The Verde four-nerve daisy is in the Other species category.

Affected Environment

Distribution

Heathleaf wild buckwheat is narrowly endemic and occurs only in northern and central Arizona.

Ripley's wild buckwheat is narrowly endemic and occurs only in northern and central Arizona.

Rusby's milkwort is narrowly endemic to north-western and central Arizona, from the Peach Springs to Kingman area, Fraziers Well, Verde Valley, Chino Valley, and Lime Creek near its confluence with the Verde River.

Verde breadroot is narrowly endemic. All the documented locations are on the Verde Formation near Camp Verde, Arizona.

Verde four-nerve daisy is narrowly endemic and only occurs on a series of four low hills east of Camp Verde.

Verde Valley sage is narrowly endemic, growing on the Verde Formation in central Arizona.

Habitat

Heathleaf wild buckwheat, Ripley's wild buckwheat, and Verde four-nerve daisy are associated with Desert Communities ERU and the Verde Formation in that ERU. Heathleaf wild buckwheat and Ripley's wild buckwheat grow on low arid hillsides associated with a unique white outcrop, which appears to be a shallow gravelly loam that develops over white Tertiary limestone lakebed deposits high in lithium and magnesium (Verde Formation). Verde four-nerve daisy grows in the gypsum, marl, and gravel substrates of four low hills east of Camp Verde.

Rusby's milkwort and Verde Valley sage occurs on the Desert Communities, Semi-desert Grasslands, and Pinyon Juniper Evergreen Shrub ERUs, as well as the Verde Formation in the Desert Communities and Semi-desert Grasslands ERUs.

Verde breadroot grows on the Verde Formation in Desert Communities and Semi-desert Grasslands ERUs.

Risk Factors

Threats to these species are disturbance to plants and rarity. Excessive disturbance of Verde Formation soils could result in accelerated erosion, soil compaction, or an increase in soil pH. The main threat to the Verde Formation ecosystem is dispersed recreation off of designated trails due to increasing recreation demand in the Verde Valley. Social trails and off-trail activities on this type of soil can remove vegetation and accelerate erosion more rapidly than on other sites within Desert Communities and Semi-desert Grasslands. In addition, off-trail mountain biking entering the 1,208-acre Verde Valley Botanical Area from Dead Horse State Park has led to a proliferation of social trails that has accelerated erosion within the botanical area and habitat for associated plant species (see Desert Communities ERU). Rarity is an inherent threat to these species due to their restricted distribution.

Environmental Consequences

Table 91 summarizes the viability analyses for heathleaf wild buckwheat, Ripley's wild buckwheat, Verde breadroot, Verde four-nerve daisy, Rusby's milkwort, and Verde Valley sage. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 91. Analysis summary for species associated with the Verde Formation

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Heathleaf wild buckwheat	DC	Poor, away	VH	Poor away	VH
(Sensitive) Narrowly Endemic Ripley's wild buckwheat (Sensitive) Narrowly Endemic Verde four-nerve daisy (Other) Narrowly Endemic F Rank =F1*	Verde Formation soil in DC	Fair, static	H	Fair, slowly toward	H
Rusby's milkwort (Sensitive) Narrowly Endemic Verde Valley sage (S) Narrowly Endemic F Rank = F2*	DC	Poor, away	H	Poor, away	H
	SDG	Poor, away	H	Poor, slightly toward	H
	PJES	Fair, away	M-H	Fair, away	M-H
	Verde Formation soil in DC	Fair, static	M-H	Fair, slowly toward	M-H
	Verde Formation soil SDG	Poor, slowly toward	H	Poor, slowly toward	H
Verde breadroot (Sensitive) F Rank = F1*	DC	Poor, away	VH	Poor away	VH
	SDG	Poor, away	VH	Poor, slightly toward	VH
	Verde Formation soil in DC	Fair, static	H	Fair, slowly toward	H
	Verde Formation soil SDG	Poor, slowly toward	VH	Poor, slowly toward	VH
Management Effect		All habitats = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat, F2 = Rare on the forest within its habitat - occupies a small portion of its habitat.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Plan language under all alternatives directs implementing site-specific best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils (such as the Verde Formation) that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed.

Heath-leaf wild buckwheat, Ripley’s wild buckwheat, Rusby’s milkwort and Verde Valley sage occur in the Verde Valley Botanical Area. The botanical area was established with the adoption of the current plan (Alternative A). Botanical areas serve as places for study for the unique plants or plant communities for which they were established while protecting the unique physical and biological features within them (1987 Plan, page 194, SA-RNABotGeo-DC-5 and 6). This added protection will protect the occurrences of these species within the boundary of the botanical area.

Alternative A

Table 91 shows that Desert Communities would remain in poor condition and trend away from desired conditions due to increased density of shrubs and understory species. The Verde Formation soil in the Desert Communities ERU would remain in fair condition and have a static trend related to desired conditions due to continued drought. Under current grazing strategies and restricted cross-country off-highway vehicle travel, soil organics and vegetative production should very slowly move toward desired condition with normal precipitation.

Semi-desert Grasslands would remain in poor condition and trend away from desired conditions due to continued increases in shrubs and trees and increased fragmentation from urbanization. The Verde Formation in the Semi-desert Grasslands ERU in would remain in poor condition because it is still recovering from legacy grazing practices, improperly located roads, and lack of fire. It would trend slowly toward desired conditions due to implementation of improved grazing strategies and closure of roads.

Pinyon Juniper Evergreen Shrub would remain in fair condition, but would trend away from desired conditions due to departure in the fire return interval, increases in trees and shrubs, and decreases in understory that helps hold soil in place and helps to carry fire. Increased density of trees, shrubs, and understory could increase competition with these species and facilitate a higher fire severity than these plants evolved with thereby degrading the habitat.

As shown in table 91, the likelihood that these species would be limited by the quality of their habitat is moderate-high to very high depending on the habitat. These likelihoods were derived by combining these species’ F Ranks of F1 or F2 with the likelihood of habitat limitation variables for each ERU: Desert Communities (high), Verde Formation soil in Desert Communities (moderate), Semi-desert Grassland and Verde Formation soil in Semi-desert Grassland (high), and Pinyon Juniper Evergreen Shrub (low-moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for all the habitats in this group, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives. This is primarily because alternative A provides outdated direction for Desert Communities and for a large portion of Semi-desert Grassland (in the Verde Valley MA). This outdated direction emphasizes range and forage improvement rather than composition, structure, and natural processes as in the desired conditions. This alternative also emphasizes using methods such as soil scarification and broadcast seeding which could facilitate the establishment of invasive plant species which compete with native species and can facilitate the spread of wildfire to which Desert Communities is not adapted.

A plan component in the Verde Valley MA that recommends review of soil potential for revegetation and erosion potential prior to treatment is positive however for areas containing the Verde Formation. Mitigation measures could be employed to avoid severe impairment of soil productivity. Another positive plan component in this same MA would improve conditions on prioritized watersheds in unsatisfactory condition in the Verde Valley MA. This could move degraded areas toward desired conditions depending on the methods used.

Alternative A also does not distinguish between nor provide desired conditions for the three pinyon juniper types which differ from each other in composition, structure, and processes. There is one broad vegetation category of Pinyon Juniper and plan direction varies by slope. Consequently, managers lack specific guidance for the Pinyon Juniper Evergreen Shrub ERU, which supports Rusby's milkwort and Verde Valley sage.

The suitability of mechanized use in botanical areas is not explicitly addressed in alternative A resulting in vague direction to managers. It is unclear as to whether mechanized use is prohibited, is allowed only on trails, or is allowed on and off trail in these areas. Consequently, mechanized use could damage vegetation or contribute to accelerated soil erosion within localized areas in botanical areas.

Alternative B (modified)

Table 91 shows that Desert Communities and Pinyon Juniper Evergreen Shrub ERUs would have the same condition and trend as alternative A. Verde Formation soils in Desert Communities would have a fair condition and would slowly trend toward desired conditions.

Like alternative A, Semi-desert Grassland ERU would remain in poor condition but unlike alternative A, this ERU would trend slightly toward desired conditions due to plan objectives that would restore or improve at least 3,500 acres of Semi-desert Grassland ERU during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-1). The plan objective would remove tree and shrub cover and create more open conditions. Increased fragmentation from urbanization would be expected to continue.

The condition and trend of Verde Formation soil in Semi-desert Grasslands ERUs would be the same as alternative A (poor, slowly toward).

As shown in table 91, the likelihood that these plant species associated with Verde Formation soil would be limited by habitat quality is moderate-high to very high, the same as alternative A. These likelihoods were derived by combining these species' F Ranks of F1 or F2 with the likelihood of habitat limitation variables for each ERU.

The management effect is classified as a 2 for all the habitats in this group, which means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. This rating is due to this alternative containing explicit and updated direction on the composition, structure, and processes for Desert Communities, Semi-desert Grasslands, and PJES. This direction and the anticipated effects are discussed in greater detail by ERU in the Coarse Filter: Habitat section. Alternative B (modified) also distinguishes between the grassland and pinyon juniper habitats on the forest.

There are no specific components for soil for the Desert Communities or Semi-desert Grasslands ERUs, but the forestwide guidance for soil applies and would be beneficial for Verde Formation soil. Application of the desired condition for soil (FW-Soil DC-1 to 4) would improve soil condition slowly over time when used in project planning. One of the desired conditions (FW-Soil-DC-1) provides for proper soil function, water distribution and nutrient cycling for all vegetation. Forestwide soil guidelines would avoid excessive ground disturbance, limit accelerated erosion, and minimize bringing more calcareous soil to the surface, which could limit soil plant nutrient availability (FW-Soil-G-1, 2, 3).

Alternative B (modified) also includes more general plan components that could improve the habitat quality for these species. The plan components for all ecosystems (FW-Eco-DC-1-4) and All Terrestrial ERUs (FW-TerrERU-All-DC-2) provide desired conditions for ecosystems across the forest to assure proper function and are resilient to the frequency, extent, intensity, and severity of disturbances. Forestwide guidance in Wildlife, Fish, and Plants provides desired conditions for properly functioning ecosystems and ecologically responsible activities that support native plants and animals (FW-WFP-DC-1) where ERUs provide the habitat components for sensitive and/or endemic species to carry out their life cycle (FW-WFP-DC-3, FW-WFP-G-10). These components are complementary to the components for all ecosystems and all terrestrial ecosystems and provide additional assurance for the viability of these species.

Unlike alternative A, mechanized use in botanical and geological areas is not suitable except mechanized travel would be suitable on routes designated for mechanized travel. This plan language is intended to limit soil and vegetation impacts to the trail prism (see Chapter 4 Recreation and Transportation Suitability). Subsequent environmental analysis would need to be done for this direction to take effect. This suitability recommendation is considered to be protective of the special features including plants and their habitat because impacts to the plant species would be evaluated during the environmental analysis and impacts would be limited to the trail prism. This direction applies to the Verde Valley Botanical Area (1,029 acres of Desert Communities) and the proposed Cottonwood Basin Geological and Botanical Area (178 acres of Desert Communities). Currently only the Verde Valley Botanical Area has designated trails whereas there are none in the proposed Cottonwood Basin Geological and Botanical Area which also has most of the occurrences of Bigelow's onion on the forest (SEINet 2016). This alternative has specific guidance restricting travel to foot traffic within the Cottonwood Basin Geological and Botanical Area (SA-RNABotGeo-G-7). Designation of this area will preserve this unique botanical community and help protect the area from such threats as illegal off-road vehicle use. This guidance would remove vehicle travel and would better protect the unique rock formations and plants occurring in this area.

Unlike alternative A, mechanized use in botanical and geological areas is not suitable except mechanized travel would be suitable on routes designated for mechanized travel. This plan language is intended to limit soil and vegetation impacts to the trail prism (see Chapter 4 Recreation and Transportation Suitability). Subsequent environmental analysis would need to be done for this direction to take effect. This suitability recommendation is protective of the special features including plants and their habitat because impacts to the plant species would be evaluated during the environmental analysis and impacts would be limited to the trail prism. This direction applies to the Verde Valley Botanical Area (1,029 acres of Desert Communities) which contains all the Verde Formation species except the Verde four-nerve daisy.

Alternative C

Alternative C has the same effects as alternative B (modified) except the following. Unlike alternative A and alternative B (modified), mechanized use in botanical and geological areas would not be suitable even on routes designated for mechanized travel. This plan language would limit soil and vegetation impacts that occur as a result of mechanized use but not impacts from horseback use or hiking that might also occur on these trails. Subsequent environmental analysis would need to be done for this direction to take effect. This suitability recommendation is protective of the special features including plants and their habitat because impacts to the plant species would be evaluated during the environmental analysis. This direction applies to the Verde Valley Botanical Area (1,029 acres of Desert Communities) which contains all the Verde Formation species except the Verde four-nerve daisy.

Alternative D

Alternative D has the same effects as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of heath-leaf wild buckwheat, Ripley’s wild buckwheat, Rusby’s milkwort, Verde four-nerve daisy, Verde breadroot and Verde Valley sage, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for heath-leaf wild buckwheat, Ripley’s wild buckwheat, Rusby’s milkwort, Verde breadroot and Verde Valley sage, which are Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of these species than alternative A. Reasons include the focus on structure, function, and resiliency for all ERUs, additional language that addresses rarity and provides for endemic species and species with restricted distributions.

Volcanic Soil Plants

Sunset Crater beardtongue, Diamond Valley suncup, and serrate phacelia

Affected Environment

Distribution

Sunset Crater beardtongue is narrowly endemic and classified as a Forest Service sensitive species. It is limited to the Sunset Crater volcanic field near Flagstaff, including the Coconino NF and Sunset Crater National Monument. It also occurs within the Cinder Hills OHV area.

The known distribution of Diamond Valley suncup, classified as an Other planning species, is from southern Utah into northern Arizona, where it occurs in Mohave and Coconino counties.

Serrate phacelia, classified as an Other planning species, has an unusually disjunct distribution; it is found near Flagstaff, Arizona, and in New Mexico in the Zuni-Bandera Volcanic Field (AZGFD 2003c). It is found on the forest and Sunset Crater Volcanoes National Monument and it also occurs within the Cinder Hills OHV area.

Habitat

The Sunset Crater beardtongue occurs in the Ponderosa Pine, Pinyon Juniper with Grass, and Pinyon Juniper Woodland ERUs. Additional information on these habitats can be found in the Coarse Filter: Habitat section. The soil in the Ponderosa Pine ERU in which Sunset Crater beardtongue grows is typically a layer of cinders 2 to 5 inches deep with a layer of silty soil below, important for water retention at the root level of this species.

Diamond Valley suncup occurs in Ponderosa Pine ERU in volcanic soils.

Serrate phacelia occurs in Ponderosa Pine ERU, in deep cindery soil in the Sunset Crater volcanic field. This forb is more resilient to soil disturbance than some of the perennial species that occur in this volcanic field because it is an annual and occurs on both steep and flat terrain. Natural disturbances in this cinder soil include wind and natural movement due to steep slopes.

Risk Factors

Dispersed recreation impacts are a threat to the cinder soil habitat used by these species. Rarity is an inherent threat to these species due to their restricted distributions.

Environmental Consequences

The Wildlife and Plant Issues and Topics section above has more detail about At Risk Species and Disturbance to Plants. See Coarse Filter: Habitat for more information about the habitats.

Table 92 summarizes the viability analyses for Sunset Crater beardtongue, Diamond Valley suncup, and serrate phacelia. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 92. Analysis summary for Sunset Crater beardtongue, Diamond Valley suncup, and serrate phacelia

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Sunset Crater beardtongue (Sensitive) F Rank = F2*	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H
	PJG	Fair, toward at short term then away at long term	M-H	Low and high objectives: Fair, toward at short term then away at long term	M-H
	PJW	Good, static	M	Good, static	M
Diamond Valley suncup (Other) F Rank = F1*	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: H Low objective long term: M-H High objective: M-H	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: H Low objective long term: M-H High objective: M-H
Serrate phacelia (Other) F Rank = F3*	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
Management Effect		PP, PJG, PJW = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat. *F2 = Rare on the forest within its habitat – occupies a small portion of its habitat. F3 = Uncommon on the forest within its habitat.

Common to All Alternatives

These species are considered to be rare and/or at-risk because there are few populations known and they are vulnerable to stochastic events. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

All alternatives address the threat of invasive plants. Invasive plants can increase as a consequence of ground disturbance and once established could compete with this species for water and nutrients or could alter the fire regime. All alternatives address the threat of invasive plants by pointing to the Final Environmental Impact Statement for the Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005). This direction includes best management practices, among other guidance, which would help prevent, mitigate, and reduce the threat of invasive plants. All alternatives prioritize treatments, call for incorporating control measures in project planning and implementation, and emphasize coordination with partners (1987 Plan, pages 23, 69, 70, 182, 206-14, 206-76, 206-101, 201-116, FW-Invas-DC-1 through 3, FW Invas G 1-3, FW-Invas-MgtApp, FW-WFP-DC-10, FW-TerrERU-IC-DC-3, FW-Graz-MgtApp, FW-RdsFac-G-8, FW-Rec-Dev-DC-9, FW-Rec-Dev-G-2, FW-Rip-Spr-G-3, FW-TerrERU-Grass-DC-2). More detailed analysis is in the Wildlife and Plant Issues and Topic section called Non-native Species and Disease.

Plan language under all alternatives directs implementing site-specific best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils (such as the Verde Formation) that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed. This will mitigate impacts to these species where implemented.

All alternatives restrict vehicle travel to designated routes forestwide except in the designated Cinder Hills Off-highway Vehicle Area (MA 13 for alternative A). The OHV area includes a large portion of the Sunset Crater volcanic field, so as a result, species living there are subjected to the impacts of OHV use such as habitat destruction, physical crushing of plants, and introduction of non-native invasive weeds. Sunset Crater beardtongue and serrate phacelia are known to occur in the OHV area. There are no documented occurrences of Diamond Valley suncup in MA 13, but it occurs in nearby Sunset Crater National Monument, so is likely to occur there as well.

All alternatives include the Strawberry Crater Wilderness where Sunset Crater beardtongue and serrate phacelia occur. Plan language for designated wilderness would contribute to the viability of these species in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area;

management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 107, 108-1 through 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Alternative A

Table 92 shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine ERU would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term.

Table 92 shows that Pinyon Juniper Woodlands ERU would be in good condition with a static trend relative to desired conditions under all alternatives.

Table 92 shows that under all alternatives, the habitat condition and trend for Pinyon Juniper with Grass would remain in fair condition, but would trend toward desired conditions in the short term due to expected mechanical treatments and burning using wildfire for resource objectives. However, the trend for the Pinyon Juniper with Grass ERU is expected to move away from desired conditions in the long term, because generally, the treatment level is insufficient to offset the negative effects of excess regeneration and closing canopies.

As shown in table 92, the overall likelihood that the volcanic soil plant species would be limited by the quality of their habitat on the Forest is low-moderate to high. These likelihoods were derived by using the process in table 9 in volume IIa and combining the species' F Ranks of F1, F2, or F3 with the likelihood of habitat limitation variables for each ERU: Pinyon Juniper with Grass (low-moderate), Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), and Pinyon Juniper Woodland (low). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Pinyon Juniper with Grass, Pinyon Juniper Woodland and Ponderosa Pine, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives.

In alternative A, the management emphasis is on off-highway vehicle recreation opportunities in Management Area 13, the Cinder Hills Off-Highway Vehicle Area (1987 Plan, pages 178-181). Off-highway vehicles can degrade the habitat for these species through accelerated erosion and can damage or kill individual plants. To offset this, guidelines in alternative A support closing areas or limiting future access in the future based on locations of sensitive plant species and support monitoring of Sunset Crater beardtongue (1987 Plan, pages 180-182). Although the guidelines are protective for sensitive plant species, limitations on future access and area closures have not occurred due to the popularity of the area.

Alternative A also does not distinguish between nor provide desired conditions for the three pinyon juniper types, which differ in composition, structure, and processes. There is one broad vegetation category of Pinyon Juniper and plan direction varies by slope. Consequently, vegetation structure would not be equitably distributed across the landscape. As a result the unique composition and structure of Pinyon Juniper with Grass and Pinyon Juniper Woodland is not addressed in this alternative.

In the Ponderosa Pine ERU, alternative A provides direction that allows for a variety of stand conditions across the landscape, while mimicking natural disturbance patterns that result in irregular tree groups and canopy gaps. This would provide habitat for species such as Sunset Crater beardtongue.

The Ponderosa Pine ERU is recognized as being a fire-dependent ecosystem, but suppression objectives that are designed to protect wildland-urban interface, minimize suppression costs and provide for personnel safety make the reintroduction of fire into the ecosystem challenging, so the ERU and the plants that live in it have a higher risk of being impacted by fire.

Alternative B (modified)

Table 92 shows that the condition and trend for the Ponderosa Pine ERU would be similar to alternative A, remaining in poor condition with a trend toward desired conditions in the short term under low treatment objectives (50,000 acres mechanical, 150,000 acres prescribed fire). However, in the short term under the high vegetation treatment objectives (260,050 acres mechanical, 200,000 acres prescribed fire) and in the long term under both the low and high vegetation treatment objectives, the condition would improve to fair and trend toward desired conditions.

Like alternative A, the Pinyon Juniper Woodland ERU would be in good condition with a static trend relative to desired conditions.

Table 92 shows that the condition and trend for the Pinyon Juniper with Grass ERU would be the same as alternative A. The condition of the Pinyon Juniper with Grass ERU would remain fair, but the trend would be toward desired conditions in the short term, then trend slowly away from desired conditions in the long term because the treatment levels (FW-TerrERU-PJ-O-1, 2) are not sufficient to offset the negative effects of excess regeneration and closing canopies.

As shown in table 92, the overall likelihoods that habitat would be limiting to these species is the same as alternative A.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. In contrast to alternative A, the management effect is classified as a 2 for Pinyon Juniper with Grass, Pinyon Juniper Woodland, and Ponderosa Pine, which means that plan components in alternative B (modified) maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute more to the viability of this species than alternative A.

This rating is because these alternatives clearly distinguish between different Pinyon Juniper types on the forest and provides desired conditions, objectives and guidance that are specific to the each type. Desired conditions would promote all age classes of pinyon and juniper to assure sustainability over time and promote mid to older age classes distributed in a manner that reflects natural disturbance regimes. Management direction would promote properly functioning ecosystems that are resilient to natural disturbances and climate change; promote characteristic disturbances and reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby, furthering sustainability and adaptability (FW-Eco-DC-1-4, FW-TerrERU-All-DC-2). ERU specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-PJ-DC-5-9; G-1-3, 5). There is additional direction for these ERUs within the wildland-urban interface. Within wildland-urban interface, fire and vegetation management would favor low-intensity surface fires (FW-WUI-DC-8). This is intended to mitigate the risks to surrounding communities. This would benefit habitat in Pinyon Juniper with Grass because it is generally consistent with the natural fire regime. It would be inconsistent with the fire regimes in Pinyon Juniper Woodland and could result in the habitat having increased vulnerability to uncharacteristic fires in localized areas of the wildland-urban interface.

Rarity is a risk for Sunset Crater beardtongue, Diamond Valley suncup, and serrate phacelia. Alternative B (modified) has components that address rarity better than alternative A. This is due to more forestwide guidance to address rare habitats and species. This is discussed in the At-risk section under Wildlife and Plant Issues and Topics.

Alternative B (modified) addresses disturbance to plants and their habitat better than alternative A. Although all alternatives provide mitigations for effects to these species from management actions, the mitigations are stronger in alternative B (modified). (See table 92.) Disturbance to Plants and At-risk species are further addressed in the Wildlife and Plant Issues and Topics section above.

Alternative B (modified) distinguishes between the different Pinyon Juniper types on the forest and provides desired conditions, objectives and guidance that are specific to the each type. Management direction would promote properly functioning ecosystems that are resilient to natural disturbances and climate change; promote characteristic disturbances and reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems thereby furthering sustainability and adaptability (FW-Eco-DC-1-4, FW-TerrERU-All-DC-2). ERU specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-PJ-DC-5 to 9; G-1, 2, 3, 5).

Alternative B (modified) provides plan components to promote properly functioning and resilient ecosystems, promote characteristic disturbances, reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems thereby furthering sustainability and adaptability (FW-Eco-DC-1, 2, 3, 4, FW-TerrERU-All-DC-2).

In alternative B (modified) removal of restrictions on use of wildfires with resource objectives would lead to more open stand conditions and reduce the risk of uncharacteristic fire on the landscape, reducing the risks of habitat loss for these species.

Like alternative A, alternatives B (modified), C, and D emphasize off-trail motorized recreation in the Cinder Hills OHV Area, which could damage individual plants or populations. These alternatives also emphasize clearly marked boundaries to prevent off-road driving outside the designated area or in adjacent Sunset Crater Volcano National Monument (1987 Plan, pages 179 and 181 and MA-VolcanWd-DC-1). This would contribute to the viability of plants outside this designated area. These alternatives would maintain the habitat for this species better than alternative A outside the OHV area by maintaining the integrity, form, and process associated with volcanic features (MA-VolcanWd-DC-1 and G-1).

Soil is a factor for these species. There is high soil disturbance from off-highway vehicles in the Cinder Hills Off-Highway Vehicle Area, but off-highway vehicle use does not occur in the adjoining habitat for this species. The forestwide guidance for soil in alternative B (modified) protects soil better than alternative A.

One of the three wildernesses recommended in this alternative has habitat for all three of these species, because it contains ponderosa pine and the appropriate cinder soils. There are 29 acres of ponderosa pine in the recommended wilderness that would be added to Strawberry Crater Wilderness. This would reduce disturbance on an additional 29 acres of the cinder soil habitat needed by these species by emphasizing non-motorized use and only having limited motor vehicle use for administrative and permitted activities (SA-RWild-G-3 and 5).

Alternative C

Alternative C has the same effects as alternative B (modified).

Alternative D

Alternative D is the same as alternative B (modified), except there is no recommended wilderness.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Sunset Crater beardtongue, Diamond Valley suncup, and serrate phacelia, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Sunset Crater beardtongue, which is a Forest Service sensitive species. Alternatives B (modified), C, and D would contribute more to the viability of these species than alternative A, because of the improved plan components for soil, ERUs, recommended wilderness, for at-risk and rare species. The plan components in alternatives B (modified), C, and D focus on structure, function and resiliency for all ERUs and change the emphasis on management in Ponderosa Pine to acknowledge the role of structure, function, and resiliency that would benefit all organisms, including rare plants such as Sunset Crater beardtongue, Diamond Valley suncup, and serrate phacelia. Guidance in the Ponderosa Pine, Pinyon Juniper with Grass, and Pinyon Juniper Woodlands ERUs acknowledges the presence of understory vegetation and provides for it as well.

Fine Filter Individual Species

Allen's lappet-browed bat

Allen's lappet-browed bat is a Southwestern Region sensitive species with restricted distribution.

Affected Environment

Distribution

Allen's lappet-browed bats occurs from central Mexico north through the southwestern United States, including Arizona, New Mexico, southern Nevada, and southern Utah. There are at least 13 occupied roosts known on the forest.

Habitat

Allen's lappet-browed bats are associated with cliffs and caves, as well as the Ponderosa Pine, Mixed Conifer Frequent Fire, and Mixed Conifer Infrequent Fire ERUs (in which they roost in large trees and snags with exfoliating bark). In a study on Coconino NF, researchers found this species exclusively used ponderosa pine snags for maternity roosts. Snags were typically large-diameter with exfoliating bark, with high surrounding basal areas and high surrounding snag and log densities (Rabe et al.1998).

Risk Factors

Primary risk factors are disturbance to roosts and rarity. Individuals and colonies may be impacted by disturbance to active maternity or winter roosts in caves by activities such as dispersed recreation, caving, and climbing.

Environmental Consequences

Table 93 summarizes the viability analysis for Allen's lappet-browed bat. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 93. Analysis summary for Allen's lappet-browed bat

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Allen's lappet-browed bat (Sensitive) Restricted distribution F Rank =F3*	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
	MCFF	Fair, toward at short term then Fair, static at long term	M	Low objective: Fair, toward at short term then Fair, static at long term High objective: Good, toward at short term then Good, static at long term	Low objective: M High objective: L
	MCIF	Fair, away at short term then Poor, away at long term	Short term: M Long term: M-H	Fair, static	M
	Cliffs	Good, static	L	Good, static	L
	Caves (Assuming Moderate)	Fair, static	M	Fair, static	M
Management Effect		PP, MCFF, MCIF, caves = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences. Cliffs = 4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

* F3 = Uncommon on the forest within its habitat

Common to All Alternatives

All alternatives would provide for the large trees and large snags with exfoliating bark needed for roosting. Plan language in alternative A retains snags in Mexican spotted owl PACs, steep slopes, restricted habitat (mixed conifer, pine-oak and riparian forests outside of PACs and steep slopes), and in northern goshawk habitat (1987 Plan, pages 65-2, 65-3, 65-5, 65-7). Plan language promotes snags 18 inches d.b.h. or greater outside of goshawk post-fledging family areas with 3 snags per acre in spruce-fir and mixed conifer, 2 snags per acre in ponderosa pine; greater density of snags near meadows, riparian areas, and key water sources; protection of snags during fuel treatments (1987 Plan, pages 65-9, 70-3, 95). Other large snags would be provided in potential nest sites for osprey (1987 Plan, pages 124) and large trees and snags would be protected during fuel treatments in the Flagstaff Lake Mary Ecosystem Analysis Area (1987 Plan, page 206-73, 206-101). Current and future large trees are promoted by reducing competition and protecting them during prescribed fires (1987 Plan, pages 65-5, 206-73, and 206-75).

Plan language in alternatives B (modified), C, and D promotes snags 18 inches or greater at d.b.h. at an average 1 to 2 snags per acre, old-growth structure (include old trees and snags) throughout the landscape, characteristic disturbances to produce snags, development of old-growth structure where it is lacking, protection of existing and developing old-growth structure, and preference for presettlement trees and large tall snags near openings and within groups (FW-TerrERU-PP-DC-5, 6, 9, G-1, 2, 3, 5; FW-TerrERU-MC-MCFF-DC-2, 3, 4; FW-TerrERU-MC-MCIF-DC-2, 3; FW-TerrERU-MC-All-G-2, 3).

All alternatives have seasonal closures in habitat for Allen's lappet-browed bat that would provide snag-roosting and foraging habitat with reduced disturbance from motorized activities. This would be beneficial for reproduction and survival. The seasonal closures are Pine Grove, Rattlesnake, and Woody Ridge (1987 Plan, pages 59, 206-114, Off-Road Driving Management Plan (map) for Land and Resource Management Planning (Revised May 1991); FW-Rec-Disp-G-6, MA-PineBelt-DC- 5,6,7,8, MA-LkMary-DC-4, MA-PineBelt-S-1, 2, 3, 4, and MA-LkMary-S-1).

All alternatives would manage caves used by bat colonies to maintain or enhance bat populations (1987 Plan, page 51-1, FW-BioPhys-Gio-G-6); provide appropriate protection from projects or activities or enhancement to sensitive species habitat (which includes Allen's lappet-browed bat) (1987 Plan, page 64-1); and to apply timing restrictions to projects and activities that potentially negatively affect sensitive species (FW-WFP-G-8). The intent is to avoid impacts to survival or successful reproduction. This latter language would apply to snag roosts or cliffs as appropriate.

All alternatives have guidelines that would protect the habitat for this species in the vicinity of Walnut Canyon. These would be beneficial for the survival and reproduction of these species and would benefit the habitat for their prey species. Alternative A includes a guideline to protect the natural and cultural resources in the wildland-urban interface and the lands surrounding the (Walnut Canyon) national monument (1987 Plan, page 206-109). Alternatives B (modified), C, and D include a guideline for activities and uses on the forest to be managed to protect cultural sites and to preserve habitat for disturbance-sensitive species both on the forest and within Walnut Canyon National Monument (MA-Walnut-G-1).

All alternatives would protect caves and areas immediately adjacent from unnatural disturbances such as seismic disturbances and drilling. All alternatives would evaluate or utilize a 300-foot buffer around caves to protect cave and karst resources and ecology, Collectively these plan components would maintain the microclimate, airflow, chemical, physical, and biological conditions within the cave necessary for bat roosting, overwintering, reproduction and survival (1987 Plan, pages 51-1, 51-2; FW-BioPhys-Geo-G-2, 3, and 4).

Alternative A

Table 93 shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine ERU would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term.

Table 93 shows that Mixed Conifer with Frequent Fire would remain in fair condition and trend toward desired conditions in the short term. In the long term, the trend would become static as treatment levels would not be able to keep up with growth and regeneration; seedlings and saplings would make gains through excess regeneration where openings are created and medium and large trees would lose ground in open stands as canopy gaps are filled in.

Mixed Conifer with Infrequent Fire would remain in fair condition and continue trending away from desired conditions in the short term due contradictory direct related to the management of wildfires in wilderness areas. In the long term, the condition would become poor and the trend would continue to move away from desired conditions.

Cliffs would remain in good condition with a static trend related to desired conditions. Generally, caves would remain in fair condition with a static trend related to desired conditions. However, caves that are inaccessible and rarely visited would be in good condition, while caves that are accessible and receive a high level of visitation would be in poor condition.

As shown in Table 93, the likelihood that this species would be limited by habitat quality is low to moderate-high depending on the habitat. These likelihoods were derived by combining this species' F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), Mixed Conifer with Frequent Fire (moderate), Mixed Conifer with Infrequent Fire (moderate in short term and high in the long term), cliffs (low), and caves in fair condition (moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for the Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs and caves, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives.

Old-growth structure (old large trees and snags) is an important element of habitat for Allen's lappet-browed bat. Alternative A contains outdated language for old growth as well as updated language that reflects more recent science. The outdated plan language would allocate old growth as 100- to 300-acre stands over no less than 20 percent of each forested ecosystem management area (1987 Plan, page 129). Some of the updated language would have allocations consisting of landscape percentages meeting old-growth conditions and not specific acres. This former strategy would result in lower habitat quality for large tree and snag dependent species compared to alternative B (modified) because it would result in less vertical structure and age class diversity; tend to maintain a more continuous canopy that would be conducive to crown fires; and result in more even-aged conditions. This structure and age class diversity does not reflect frequent low-severity fires characteristic of Ponderosa Pine and Mixed Conifer with Frequent Fire ERUs and does not reflect desired conditions. During wildfires, there is likely to be more area in mixed severity condition with 25 percent to 75 percent loss of dominant overstory, compared to a loss of 25 percent or less which is characteristic of low-severity fires. Old-growth stands would be less resilient to endemic levels of disturbances. Habitat in these 100-300 acre areas would be at higher risk from uncharacteristic fire and have higher susceptibility to insects and disease compared to alternative B (modified). Uncharacteristic fire could remove roosting habitat by incinerating large trees and snags. Die-off from insects and disease could result in a beneficial short-term increase in roosting habitat but have a negative long-term effect of reducing the number of large live trees, and losing snags through windthrow because the stands may be opened up.

In addition to the plan language under Common to All Alternatives, plan language in Management Area 3 (ponderosa pine and mixed conifer less than 40 percent slope) promotes managing for an average of 200 snags (including potential snags) per 100 acres over at least 50 percent of the forested land within 10K blocks, but minimum diameter for a ponderosa pine/mixed conifer snag is greater than 12 inches d.b.h. (1987 Plan, page 126, 127, 143), which at the small end is likely too small for use by Allen's lappet-browed bats. Snags would generally not be available for firewood unless designated because of being surplus to wildlife needs (1987 Plan, page 126), recently dead and poor risk trees and snags with certain characteristics in excess of planned snag densities may be harvested (1987 Plan, pages 130, 132, 147), which may include trees of suitable size and structure for this species.

The management effect is classified as a 4 for cliffs, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Alternative A lacks plan components specific to cliffs and the habitats they provide. Most of the guidance for cliffs is limited to visual quality and the importance of cliffs to archaeology. (1987 Plan, pages 206-43 and 206-46).

Alternative B (modified)

Table 93 shows that the Ponderosa Pine ERU, cliffs, and caves would have the same condition and trend as alternative A.

Like alternative A, under the low treatment objectives (2,900 acres mechanical, 8,000 acres prescribed fire) Mixed Conifer with Frequent Fire ERU would remain in fair condition with a trend toward desired conditions in the short term. In the long term, Mixed Conifer with Frequent Fire would be in fair condition with a static trend. Under the high treatment objectives (15,000 mechanical, 8,000 prescribed fire), Mixed Conifer with Frequent Fire ERU would improve to good condition with a trend toward desired conditions in the short term, then a static trend relative to desired conditions in the long term. In addition, at least 7,500 acres of Mixed Conifer with Frequent Fire would be managed using wildfires for resource objectives within the natural fire regime, during each 10-year period over the life of the plan (FW-TerrERU-MC-MCFF-O-1, 2, 3).

The Mixed Conifer with Infrequent Fire ERU would remain in fair condition, but the trend would improve to static relative to desired conditions. Although there are no plan objectives for treatment in this ERU, activities and uses would follow the revised plan and would maintain or move toward desired conditions.

As shown in table 93, the likelihood that this species would be limited by habitat quality is low to moderate. These likelihoods were derived by combining this species' F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), Mixed Conifer with Frequent Fire (moderate under the low treatment objective, low under the high treatment objective), Mixed Conifer with Infrequent Fire (moderate), cliffs (low), and caves in fair condition (moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect is classified as a 2 for all the habitats in this group, which means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. For the Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs, this rating is due to this alternative containing explicit and updated direction on the composition, structure, and processes of these ERUs based on current science.

For cliffs and caves, this rating is due to this alternative containing explicit and updated direction related to maintaining the integrity and function of these biophysical features and the specialized habitat they provide. For example, plan components in alternative B (modified) would apply forestwide rather than specific areas like in alternative A. Desired conditions promote cliffs and caves to be generally undisturbed by human activities, promote maintenance of their geological, hydrological, and biological resources (FW-BioPhys-Geo-DC-1), and promote specialized habitats for a variety of plant and animals species (FW-BioPhys-Geo-DC-6). A guideline in the section for Geological Features states that projects should be designed and uses should be managed to maintain the integrity and function of cliffs and caves, and where alteration of these resources cannot be avoided, they should be mitigated to mimic pre-disturbance conditions and function (FW-BioPhys-Geo-G-1).

Other beneficial desired conditions for cave-dwelling species like Allen's lappet-browed bat would provide specialized niches for roosting and overwintering, disease within natural levels, and protection and maintenance of subterranean microclimate and ecology. See FW-BioPhys-Geo-DC- 3, 4 and G-8. Beneficial guidelines include maintenance and protection of the chemical, physical, and biological conditions of cave resources and protection of endemic cave species (FW-BioPhys-Geo-G-2, 4, and 7), management of caves to prevent disturbance and spread of disease, and the use of wildlife-friendly gates that meet Bat Conservation International recommendations (FW-BioPhys-Geo-G- 5 and 6). This guideline would be beneficial in reducing disturbance, which is a risk factor for this species.

A guideline in alternative B (modified) addresses species-specific threats and rarity better than alternative A. Plan language in alternative B (modified) promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5); provides the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3); requires that projects and activities be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species … where they are likely to occur (FW-WFP-G-10); and requires projects to include measures that minimize the negative impact of pesticides and other chemicals to species and their habitat, including chemical-free buffers around bat roosts, riparian, or aquatic habitat (FW-WFP-G-4).

Alternative B (modified) removes the language that is present in alternative A about 100- to 300 acre stands of old growth. Instead plan language promotes natural levels of disturbance, frequent low-severity fires, old-growth structure distributed throughout the landscape, and uneven-aged forest with all age classes present, including old growth (FW-TerrERU-PP-DC-2, 3, 6, FW-TerrERU-MC-MCFF-2, 4, 7, FW-TerrERU-MC-MCIF-DC-2, 4, G-2, 3). Guidelines require that old-growth forest attributes be protected from uncharacteristic natural disturbances; that development of old-growth conditions be encouraged in areas where it is lacking, and that preference for retention be given to pre-settlement trees (FW-TerrERU-PP-G-1, 2, and 3). Collectively, these plan components would allow for the recruitment and sustainability of large trees, old trees, and old-growth structure over time, which provides roosting and foraging habitat for Allen’s lappet-browed bat and reduces susceptibility to uncharacteristic fire or uncharacteristic outbreaks of insect and disease.

Alternative B (modified) recommends three wildernesses. Abineau and Strawberry contain suitable habitat for this species: Mixed Conifer Infrequent Fire (347 acres) and Ponderosa Pine (97 acres). Recommended wilderness would be managed to maintain or enhance primitive and undeveloped characteristics; to preserve native species and unique features; to reduce evidence of modern human control and manipulations; and motor vehicle uses should only occur for limited administrative and permitted activities to be consistent with wilderness character (FW- RWild-DC-1, 2, 3, FW- RWild-G-3). This could enhance survival or reproduction through reduced disturbance. Recommended wilderness would not prohibit prescribed or managed wildfires, but could make them more challenging to implement because vehicle use needed to manage fire should be consistent with wilderness character, and depending on site-specific conditions, this may not always be possible. Active vegetative management and vehicle use would be limited or prohibited (vehicle use only) if recommended wildernesses become designated. Designation could restrict the use of vegetative treatments or fire to reach the desired conditions for the ERU. The magnitude of the effect on species and habitat depends on what needs to be restored in these ERUs in recommended wilderness, what tools might be needed for restoration, and whether access in the areas adjacent to recommended wilderness areas is sufficient to allow for safe use of prescribed or managed fire if needed.

Alternative C

Alternative C has the same effects as alternative B (modified) except for the following.

It has the same effects as alternative A for designated old growth.

Alternative C would have the least disturbance of any alternative because of the recommended wilderness areas, areas classified as not-suitable for recreational shooting, and management areas that emphasize reduced disturbance to wildlife habitat.

With regard to recommended wilderness areas, alternative C has the same effects as alternative B (modified), except it recommends 13 wildernesses. Of those, Abineau, Barbershop, Davey’s, Deadwood Draw, East Clear Creek, Railroad Draw, Strawberry Crater, and Tin Can contain suitable habitat for this species: ponderosa pine (4,462 acres), Mixed Conifer Frequent Fire (283 acres) and Mixed Conifer Infrequent Fire (347 acres).

Alternative C is the only alternative that has areas designated as not suitable for recreational shooting. Recreational shooting refers to target shooting, not shooting for hunting. These areas include recommended and designated research natural areas, botanical and geological areas, and the following management areas: Anderson Mesa, Blue Ridge, Hospital Ridge, Jack's Canyon, Knoll Lake, Limestone Pasture, Pine Grove, Second Chance, Walnut Canyon, Sedona Neighborwoods, and Long Valley. The designation of areas as not suitable for recreational shooting would reduce, but not eliminate disturbance for foraging or roosting bats. About 27 percent of the forest could be designated as not suitable and these acres do not include areas that might already be excluded from recreational shooting by law. Areas designated as not suitable do not automatically become no recreational shooting areas. Subsequent environmental analysis (including public review and comment) and decisions need to be done to make this official.

Alternative C is the only alternative with guidance to reduce motorized disturbance to wildlife habitat in certain management areas: Anderson Mesa, Blue Ridge, East Clear Creek, Hospital Ridge, Jack's Canyon, Knoll Lake, Limestone Pasture, Pine Grove, and Second Chance. Desired conditions promote low-disturbance non-motorized recreational activities. Guidelines require no net increase in the area of motorized dispersed camping corridors; limitations on the roads that provide public motorized access; and a ban on large group recreation events and large commercial tours, except in support of research. They would reduce human disturbance in those areas where the area is not already protected by or in addition to existing designations such as wild and scenic rivers or inventoried roadless areas. This plan language would reduce but not eliminate disturbance to roosts because motorized administrative use, including permitted uses, would be allowed. This plan language could increase survival or reproduction, depending on proximity of roosts to potential disturbances or other site-specific circumstances.

Alternative D

Alternative D has the same effects as alternative B (modified) except there are no recommended wildernesses, which could provide areas of reduced disturbance for cliff-dwelling species.

Findings

Considering cumulative effects for wildlife and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Allen's lappet-browed bats, although individuals may be impacted by management activities or permitted uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Allen's lappet-browed bats, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for viability of this species than alternative A, primarily because they contain plan components for cliffs and updated plan language for at-risk and rare species. Alternative A would provide for lower viability of this species than the other alternatives because it generally lacks direction for cliffs; however, it does have an overarching goal to maintain viability for wildlife (which includes plants) and fish species.

Arizona phlox

Affected Environment

Distribution

The known distribution of Arizona phlox, a Forest Service sensitive species, is northern Arizona, where it occurs in Coconino, Mohave, and Yavapai Counties. The distribution of Arizona phlox was once thought to be limited to desert habitats, but recent surveys indicate is it more widespread than initially thought. The documented occurrences of Arizona phlox are fairly broad and scattered across several ERUs within the forest.

Habitat

The occurrences of Arizona phlox are in the Desert Communities, Semi-desert Grassland, Pinyon Juniper Woodland, and Ponderosa Pine ERUs.

Risk Factors

Rarity is a threat because this endemic species is only found in three counties in northern Arizona. Disturbance to plants is a concern because its populations may co-occur with management activities such as fire and vegetation treatments.

Environmental Consequences

For additional information see Coarse Filter: Habitat and the Wildlife and Plant Issues and Topic section on At Risk Species and Disturbance to Plants.

Table 94 summarizes the viability analysis for Arizona phlox. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 94. Analysis summary for Arizona phlox

Species and status	Habitat	Alternative A: Habitat condition and trend relative to desired conditions	Alternative A: Likelihood species is limited	Alternatives B (modified), C, and D: Habitat condition and trend relative to desired conditions	Alternatives B (modified), C, and D: Likelihood species is limited
Arizona phlox	DC	Poor, away	M-H	Poor away	M-H
(Sensitive, Endemic)	SDG	Poor, away	M-H	Poor, slightly toward	M-H
F Rank =F3*	PJW	Good, static	L	Good, static	L
	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, trending toward	Low objective short term: M Low objective long term: L-M High objective: L-M

Management Effect	DC, SDG, PJW, and PP = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.	All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

*F3 = Uncommon on the forest within its habitat

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Plan language under all alternatives directs implementing site-specific best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed.

All alternatives address the threat of invasive plants. Invasive plants can increase as a consequence of ground disturbance and once established would compete with this species for water and nutrients or could alter the fire regime. All alternatives address the threat of invasive plants by pointing to the Final Environmental Impact Statement for the Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005). This direction includes best management practices, among other guidance, which would help prevent, mitigate, and reduce the threat of invasive plants. All alternatives prioritize treatments, call for incorporating control measures in project planning and implementation, and emphasize coordination with partners (1987 Plan, pages 23, 69, 70, 182, 206-14, 206-76, 206-101, 201-116, FW-Invas-DC-1 through 3, FW Invas- G- 1, 2, -3, FW-Invas-MgtApp, FW-WFP-DC-10, FW-Graz-MgtApp, FW-RdsFac-G-8 ,FW-Rec-Dev-DC-9, FW-Rec-Dev-G-2, FW-TerrERU-Grass-DC-2). Additional information and analysis is discussed under the Non-native Species and Disease topic in the Wildlife and Plant Topics and Issues section.

About 877 acres (1 percent) of Desert Communities, about 3,640 acres of Semi-desert Grassland (4 percent), about 5,200 acres (7 percent) of Pinyon Juniper Woodland, and 31,087 acres (4 percent) of Ponderosa pine are in designated wilderness. Plan language for designated wilderness provides additional protection to these species so would contribute to their viability in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised. Ground disturbance would be reduced in the habitats for these species because motorized and mechanized use in wildernesses are not allowed (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Alternative A

Table 94 shows that under alternative A, Desert Communities would remain in poor condition and trend away from desired conditions due to increased density of shrubs and understory species. Semi-desert Grasslands would also remain in poor condition and trend away from desired conditions due to continued increases in shrubs and trees and increased fragmentation from urbanization. Pinyon Juniper Woodland would remain in good condition with a static trend toward relative to desired conditions.

Table 94 shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine ERU would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term. The distribution and diversity of understory vegetation are expected to increase where open stands are created, such as in areas treated for restoration. The shift to more open canopy under all alternatives would improve the abundance and vigor of Arizona phlox and other understory vegetation.

As shown in table 94, the likelihood that habitat on the forest would be a limiting factor for this species is low to moderate-high. This likelihood was derived by combining this species' F Rank of F3 with the likelihood of habitat limitation variable for Desert Communities (high), Semi-desert Grassland (high), Pinyon Juniper Woodland (low) and Ponderosa Pine ERUs (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for all habitats, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives.

The reasons for this management effect rating are listed below. Alternative A provides outdated direction for Desert Communities and for a large portion of Semi-desert Grassland (in the Verde Valley MA). This outdated direction emphasizes range and forage improvement rather than composition, structure, and natural processes. Plan direction also emphasizes using methods such as soil scarification and broadcast seeding, which could facilitate the establishment of invasive plant species that compete with native species and can facilitate the spread of wildfire to which Desert Communities is not adapted. In the portions of Desert Communities and Semi-desert Grassland that overlaps the Verde Valley Management Area, the current forest plan emphasizes watershed condition and range management. Range management focuses on less than satisfactory range conditions, broadcast seeding following burning to increase production, and forage improvement. The direction for soil in this alternative focuses on achieving range improvement by identifying areas suitable for soil scarification and seeding of early seral species to a “more productive state” and to evaluate soils to determine the best species to promote stabilization (1987 Plan, page 166, 168, 169). This direction does not move this ERU toward the ecologically based desired conditions in alternative B (modified). Scarification and seeding would disturb the soil surface and lead to increased erosion and lead to the establishment of non-native species like Lehmann love grass (*Eragrostis lehmanniana*) that competes with native plants like Arizona phlox and facilitates fire spread. However, vegetative treatments to improve these habitats would be reviewed for soil potential for revegetation and erosion potential prior to treatment. In the portion of these habitats that overlap the Savannah Management Area, the current plan promotes an open vegetation structure, using prescribed fire and mechanical treatments, and would increase the area occupied by grasses and forbs, while decreasing the area occupied by shrubs and trees in comparison to recent historic levels (1987 plan, page 206-50). This could improve the survival of Arizona phlox.

The current forest plan contains outdated direction for managing desert soils. The direction for soil in MA 11 (Verde Valley Management Area) focuses on achieving range improvement by identifying areas suitable for soil scarification and seeding of early seral species to a “more productive state” and to evaluate soils to determine the best species to promote stabilization (1987 Plan, page 169). This direction does not move this ERU toward the ecologically based desired conditions in alternative B (modified). Scarification would disturb the soil surface in the Verde Formation, a soil type in Desert Communities and Semi-desert Grassland and lead to increased erosion. Scarification and seeding of early seral species can introduce non-native species like Lehmann love grass (*Eragrostis lehmanniana*) that compete with native plants and facilitate fire spread.

A plan component in the Verde Valley MA that recommends review of soil potential for revegetation and erosion potential prior to treatment is positive however for areas containing the Verde Formation. Mitigation measures could be employed to avoid severe impairment of soil productivity. Another positive plan component in this same MA would improve conditions on prioritized watersheds in unsatisfactory condition in the Verde Valley MA. This could move degraded areas toward desired conditions depending on the methods used (1987 plan, pages 168 and 169).

For Pinyon Juniper Woodland, this management effect rating is because alternative A also does not distinguish between nor provide desired conditions for the three pinyon juniper types, which differ in composition, structure, and processes. There is one broad vegetation category of Pinyon Juniper. The different pinyon juniper types are differentiated on the basis of slope. Consequently, vegetation structure, and consequently habitat for these species, would not be equitably, or naturally, distributed across the landscape and managers lack specific guidance for the Pinyon Juniper Woodland ERU. The emphasis on the use of prescribed fire and mechanical treatments to achieve management objectives associated with range and watershed condition could maintain or improve habitat for these species (1987 Plan, pages 148 through 155; 162 through 165).

Prescribed fire and wildfires managed for resource objectives may be used in these ERUs, but there is no provision for using wildfires managed for resource objectives in the wildland-urban interface (1987 Plan, pages 92, 155, and 165) and the language to manage wildfires for resource objectives in wilderness impedes the use of this tool (1987 Plan, pages 111−112). This does not contribute to the viability of these species because this would limit the restoration of fire as a natural process in the wildland-urban interface and in wilderness, and canopy cover and shrub and tree density would be expected to increase in these areas. There would also be increased potential for uncharacteristic fire in the wildland-urban interface and wilderness portions of these ERUs. This is particularly problematic in Semi-desert Grassland because the landownership pattern is intermixed between public and private ownerships. However, plan language for designated wilderness provides additional protection to these species and would contribute to species viability in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Desert Communities and Semi-Desert Grassland ERUs occur within the Verde Valley Botanical Area, which is within MA 17 (special areas) of this alternative. Plan components in alternative A are generally protective of the composition, structure, and function of the different vegetation types within botanical areas. For example, existing conditions and natural processes would be maintained; natural events would not be rehabilitated; and off-road driving would be prohibited (1987 Plan, page 194). Visitors should be limited in some areas, depending on carrying capacity and the uniqueness and ecological condition of these areas should be protected and maintained, including in allotment management plans. In addition, timber harvest and firewood cutting is prohibited (1987 Plan, page 195). Other protective measures include: Special-use authorizations that would or could adversely affect the areas would not be allowed; adjacent roads would be managed to prevent vehicular intrusion, and road access would be blocked and obliterated. Fire suppression tactics would minimize damage to character of the areas and prescribed fire with planned ignitions may be used as a management tool provided it is a compatible use (1987 Plan, page 196). Collectively, these standards and guidelines mitigate the soil disturbance and plant damage that can result from these activities and maintain the conditions and characteristics for which this botanical area was established. Mechanized use in botanical areas is not explicitly addressed, resulting in vague direction to managers. It is unclear as to whether mechanized use is prohibited, is allowed only on trails, or is allowed on and off trail in these areas. Consequently, mechanized use could damage vegetation or contribute to accelerated soil erosion within localized areas in this ERU.

In the Ponderosa Pine ERU, alternative A provides direction that allows for a variety of stand conditions across the landscape, while mimicking natural disturbance patterns that result in irregular tree groups and canopy gaps. Gaps and more open areas would provide habitat for Arizona phlox. Ponderosa pine is mostly managed for Mexican spotted owls or northern goshawks under forestwide direction. Areas managed for Mexican spotted owl PACs and nest/roost characteristics tend to have higher canopy closure than areas outside of these areas. Understory in these areas may be less abundant or vigorous due to the canopy closure. Areas outside of those managed for nest/roost characteristics and Mexican spotted owl habitat outside of PACs could have better habitat for Arizona phlox in areas where natural canopy gap processes occur and natural variation includes small openings. See 1987 Plan, pages 65-2, 65-3, 65-4, 65-5.

Ponderosa pine areas outside of Mexican spotted owl habitat is managed for northern goshawks. Plan direction for northern goshawks would maintain habitat for these species because Ponderosa Pine would be managed for a mosaic of vegetation densities (overstory and understory); 40 percent of the areas in young forest, seedling/sapling or grass/forb/shrub structure would not have canopy cover guidelines; and there would be more openings than in areas managed for denser stand conditions. See 1987 Plan, pages 65-7, 65-9, and 65-10. Additional management direction for ponderosa pine is in Management Area 3 (Ponderosa Pine and Mixed Conifer less than 40 percent slope) and this direction has both positive and negative aspects. Direction to broadcast seed following burns using a high production multi-growing season species to attain a balanced composition of cool and warm season forage species could have a negative effect on these two species due to competition for nutrients and water with non-native species that could be a part of this seed mix. However, language to maintain open meadows in ponderosa pine, eliminate invading overstory vegetation, and stabilize gullies could improve habitat for this species. See 1987 Plan page 120.

The Ponderosa Pine ERU is recognized as being a fire-dependent ecosystem, but suppression objectives that are designed to protect wildland-urban interface, minimize suppression costs, and provide for personnel safety make the reintroduction of fire into the ecosystem challenging, so the ERU and the plants that live in it have a higher risk of being impacted by fire. See 1987 Plan, pages 93, 94, 137.

Alternative B (modified)

The condition and trend of Desert Communities, Pinyon Juniper Woodland, and Ponderosa Pine would be the same as for alternative A (table 94). Condition of Semi-desert Grassland would remain poor, same as alternative A, but the trend would improve to slightly toward desired conditions.

As shown in table 94, the likelihood that habitats on the forest would be a limiting factor for Arizona phlox ranges from low to moderate-high depending on the habitat. These likelihoods were derived by combining the F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Desert Communities (high), Semi-desert Grassland (high), Pinyon Juniper Woodland (low), and Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as 2 for all the habitats associated with Arizona phlox. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

Alternative B (modified) would provide clearer direction than alternative A for Desert Communities, allowing for a greater potential to reduce ERU departure and move toward desired conditions (FW-Eco-DC-1, FW-Eco-DC-4, FW-TerrERU-All-DC-1 to 3; FW-TerrERU-DC-DC-1 to 4). Soil desired conditions would promote proper functioning soils, soil protection and stabilization, and nutrient cycling (FW-Soil-DC-1 to 4). Forestwide soil guidelines would avoid excessive ground disturbance, limit accelerated erosion, and minimize bringing more calcareous soil to the surface (FW-Soil-G-1 to 3). Bringing calcareous soil to the surface would limit soil plant nutrient availability. About 97 percent of Desert Communities ERU occurs within the Verde Valley Management Area. Desired conditions and guidelines would maintain or improve conditions in Desert Communities ERU by promoting watershed function and balancing recreational opportunities and dispersed recreation with resource protection and/or maintaining or moving toward other desired conditions (MA-VerdeV-DC-4 and MA-VerdeV-G-1 and 2).

Table 94 shows that like alternative A, Semi-desert Grassland ERU would remain in poor condition, but unlike alternative A, this ERU would trend toward desired conditions due to plan objectives that would restore or improve at least 3,500 acres of Semi-desert Grassland ERU during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-1). The plan objective would remove tree and shrub cover and create more open conditions that could favor these species. This alternative distinguishes between the grassland habitats on the forest and containing explicit and updated direction on the composition, structure, and processes for this ERU (FW-TerrERU-Grass-DC-4, 8), compared to alternative A, which has a more forage-based approach. Alternative B (modified) also provides plan components to promote properly functioning and resilient ecosystems, promote characteristic disturbances, reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby, furthering sustainability and adaptability (FW-Eco-DC-1, 2, 3, 4, FW-TerrERU-All-DC-2). ERU-specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-Grass-DC-1 to 5, 7, 8, 9, FW-TerrERU-Grass-G-2). These plan components would maintain and improve habitat for Arizona phlox.

For Pinyon Juniper Woodland, alternative B (modified) distinguishes between the different Pinyon Juniper types on the forest and provides desired conditions, objectives, and guidance that are specific to the each type. Management direction would promote properly functioning ecosystems that are resilient to natural disturbances and climate change; promote characteristic disturbances and reduce the threat of uncharacteristic disturbances; and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby, furthering sustainability and adaptability (FW-Eco-DC-1-4, FW-TerrERU-All-DC-2). ERU-specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-PJ-DC-5-9; G-1-3, 5). This plan language would also be beneficial for Arizona phlox.

For Ponderosa Pine, this rating is because alternative B (modified) emphasizes ecological conditions and composition, structure, and function of this ERU using current science, in contrast to alternative A (Reynolds et al. 2013). Alternative B (modified) promotes an open uneven-aged structure similar to historic conditions, yet it also has provisions for denser areas such as on steep slopes and in canyons (FW-TerrERU-PP-DC-8, 13). The treatment objectives and desired conditions for the Ponderosa Pine ERU address the need for restoring the fire regime and canopy conditions toward desired conditions. Implementation of these objectives and removal of restrictions on use of wildfires with resource objectives would lead to more open stand conditions and reduce the risk of uncharacteristic fire on the landscape, reducing the risks of habitat loss for species such as Arizona phlox.

Unlike alternative A, alternative B (modified) does not restrict the use of wildfires managed for resource objectives within the wildland-urban interface. Fire and vegetation management in the wildland-urban interface would favor low-intensity surface fires; higher frequency of disturbance than the natural disturbance regime from prescribed burning, wildfires managed for resource objectives, and/or vegetative treatments; more area of grass/forb/shrub vegetation or early seral vegetation, and more open conditions. Wildland-urban interface areas would still be within the range of desired conditions (FW-WUI-DC-3, 4, 6, 7, and G-1). Although intended to reduce the risk of wildfire to surrounding communities and values-at-risk, conditions and activities in the wildland-urban interface could have the positive effect of maintaining habitat for Arizona phlox by stimulating flowering, seed release, germination, removing competitors, or causing a temporary increase in nutrient availability (Satterthwaite et al. 2002). Areas with increased disturbance from management activities could degrade habitat through accelerated soil erosion, soil compaction, depletion of the seedbank in the soil, and establishment of non-native species could out-compete this species (Cione et al. 2002). Plants could respond negatively or positively to more frequent fire depending on timing (when flowering, forming seed, actively growing, or when carbohydrate reserves are relatively low), frequency, severity, duration, and extent of burning and how these factors interface with plant morphology or other existing conditions like drought (DeBano et al. 1998). Furthermore, more frequent low-severity ground fires are not the natural fire regime for Desert Communities, Semi-desert Grassland, or Pinyon Juniper Woodland, so composition and structure of these ERUs in wildland-urban interface could shift. The effect of these altered conditions in the wildland-urban interface on these species is dependent on the site-specific and species-specific interaction of the above-mentioned possible effects and conditions.

In contrast to alternative A, alternative B (modified) has language that better addresses species-specific threats and better provides for habitat for species with restricted ranges and distribution: i.e., rarity. Plan language in alternative B (modified) also promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10). Additional information and analysis is discussed under the At Risk topic in the Wildlife and Plant Topics and Issues section.

Alternative B (modified) addresses disturbance to plants and their habitat better than alternative A by adding language so roads and recreational activities and locations are managed to move toward desired conditions for other resources; so unneeded roads are decommissioned, and so temporary roads are naturalized in a timely manner (FW-RdsFac-G-1, 6, 8 and FW-Rec-All-G-1). A Roads and Facilities desired condition may lead to temporary increases in roads to allow for management activities including restoration treatments and prescribed burning (FW-RdsFac-DC-3). These temporary roads could crush plants, degrade habitat, contribute to soil loss, or increase the risk of non-native plant establishment. However, these activities are needed to conduct vegetative treatments that would reduce departure from desired conditions in ERUs and reduce the risk of uncharacteristic fire. These treatments would generally open tree canopy and would improve the distribution and abundance of herbaceous understory, including habitat for rare plants. Additional information and analysis is discussed under the Disturbance (plants) topic in the Wildlife and Plant Topics and Issues section.

There are 132 acres (less than 1 percent) of Semi-desert Grassland, 1,467 acres (2 percent) of Pinyon Juniper Woodland, and 97 acres (less than 1 percent) of Ponderosa Pine in recommended wilderness in this alternative. Recommended wilderness would be managed to maintain or enhance primitive and undeveloped characteristics; to preserve native species and unique features; to reduce evidence of modern human control and manipulations; and motor vehicle uses should only occur for limited administrative and permitted activities to be consistent with wilderness character (FW- RWild-DC-1, 2, 3, FW- RWild-G-3). This would protect habitat by reducing some ground disturbance that could occur as result of management activities or permitted uses. Recommended wilderness would not prohibit prescribed or managed wildfires, but could make them more challenging to implement because vehicle use needed to manage fire should be consistent with wilderness character and depending on site-specific conditions, this may not always be possible. Active vegetative management and vehicle use would be limited or prohibited (vehicle use) if recommended wildernesses become designated. Designation could restrict the use of vegetative treatments or fire to reach the desired conditions for the ERU. The magnitude of the effect on species and their habitat depends on what needs to be restored in these ERUs in recommended wilderness, what tools might be needed for restoration, and whether access in the areas adjacent to recommended wilderness areas is sufficient to allow for safe use of prescribed or managed fire if needed.

Unlike alternative A, mechanized use in botanical and geological areas is not suitable except mechanized travel would be suitable on routes designated for mechanized travel. This plan language is intended to limit soil and vegetation impacts to the trail prism (see Chapter 4 Recreation and Transportation Suitability). Subsequent environmental analysis would need to be done for this direction to take effect. This suitability recommendation is considered to be protective of the habitat because impacts to the plant species would be evaluated during the environmental analysis and impacts would be limited to the trail prism. This direction applies to the Verde Valley Botanical Area (1,029 acres of Desert Communities, 162 acres of Semi-desert Grassland) and the proposed Cottonwood Basin Geological and Botanical Area (178 acres of Desert Communities, 575 acres of Semi-desert Grassland). Currently, only the Verde Valley Botanical Area has designated trails whereas there are none in the proposed Cottonwood Basin Geological and Botanical Area. This alternative has specific guidance restricting travel to foot traffic within the Cottonwood Basin Geological and Botanical Area (SA-RNABotGeo-G-7). Designation of this area would preserve this unique botanical community and help protect the area from such threats as illegal off-road vehicle use. This guidance would remove vehicle travel and would better protect the unique rock formations and plants occurring in this area.

Alternative C

The effects to these species under alternative C would be the same as alternative B (modified) except for the following. The effects to these species under alternative C would be the same as alternative B (modified) except there would be 949 acres of Desert Communities (2 percent), 12,041 acres of Semi-desert Grassland (13 percent), 13,600 acres of Pinyon Juniper Woodland (18 percent), and 1,720 acres (less than 1 percent) of Ponderosa Pine in recommended wilderness. In alternative C, mechanized use in botanical and geological areas is not suitable, even on designated routes. This plan language is intended to limit soil and vegetation impacts to the trail prism. Subsequent environmental analysis would need to be done for this direction to take effect. This suitability recommendation is considered to be the most protective of the special features including plants and their habitat because impacts to the plant species would be evaluated during the environmental analysis. As in alternative B (modified), this direction applies to the Verde Valley Botanical Area and the proposed Cottonwood Basin Geological and Botanical Area.

Alternative D

The effects to these species under alternative D would be the same as alternative B (modified) except there is no recommended wilderness and only the Cottonwood Basin Geological Area would be designated (only 185 acres of Semi-desert Grassland).

Findings

Considering cumulative effects for wildlife, fish, and plant and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Arizona phlox, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Arizona phlox, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A. These alternatives include updated plan language for all habitats, geological and botanical areas, disturbance, and at-risk and rare species. Alternative C would contribute more to the viability of this species due to having more recommended wilderness and no mechanized use in botanical and geological areas.

Arizona sneezeweed

Affected Environment

Distribution

The known distribution of Arizona sneezeweed, a Forest Service sensitive species, is northern Arizona. Arizona sneezeweed ranges from the Mormon Lake area southeastward to the White Mountains area.

Habitat

The occurrences of Arizona sneezeweed are associated with the montane portion of Montane/Subalpine Grassland and Ponderosa Pine ERUs, wetlands, and springs in areas from Mormon Lake southward. These are generally in openings in the forest. This endemic species may also be found in ephemeral drainages and near ponds and earthen stock tanks.

Risk Factors

Primary threats are rarity, invasive plant species, and disturbance.

Arizona sneezeweed is considered to be rare and/or at-risk because there are few populations known, populations are relatively small, and it has a restricted distribution. Consequently, individuals and populations are vulnerable to stochastic events and to disturbance from management activities, such as vegetation treatments, fire, and road work, which could damage or remove plants.

Non-native invasive plants are a concern because some populations co-occur with leafy spurge, which is an extremely aggressive non-native invasive plant that is a high priority for treatment. Leafy spurge competes for water and nutrients with Arizona sneezeweed and can negatively impact survival or reproduction.

Environmental Consequences

For additional information see Coarse Filter: Habitat and the Wildlife and Plant Issues and Topic section on At Risk Species, Non-native or Invasive Species, and Disturbance to Plants.

Table 95 summarizes the viability analysis for Arizona sneezeweed. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that Arizona sneezeweed is limited by habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 95. Analysis summary for Arizona sneezeweed

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Arizona sneezeweed (Sensitive) F Rank = F2*	MSG	Good, away at short term then Fair, Away	Short term: M Long term: M-H	Good, toward	M
	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H
	Wetlands	By acres: good**, toward	M-H	Good**, toward	M-H
	Springs	Fair***, slowly toward	H	Fair***, slowly toward	H
Management Effect		MSG, PP and Wetlands = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences. Springs = 4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Where applicable, plan components address few identified fine filter species threats and needs		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F2 = Rare on the forest within its habitat - occupies a small portion of its habitat. ** Used “fair” value for likelihood of species limitation rating for springs.

**For analysis of these species, wetland condition and trend are based on total acres of wetlands, which has the effect of giving greater weight to larger wetlands. The condition and trend is fair and slowly toward desired conditions when the number of individual wetlands is considered, instead of total wetland acres.

***For analysis of these species, springs were considered in fair condition. However, some springs could be in poor or good condition depending on accessibility, protection, or degree of development.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Non-native invasive plants are a particular risk to this species especially in Brolliar Park. Brolliar Park is a montane grassland that contains large groups of Arizona sneezeweed and is also one of the locations of leafy spurge, one of the priority non-native invasive plants on the forest. Treatment of this invasive species has been ongoing for many years and will continue under all alternatives. The presence of this non-native weed and its associated treatment are sources of added disturbance at this site. Mitigations for disturbance from treatment are implemented to the extent possible yet disturbance is necessary to achieve control of leafy spurge in this area and across the forest.

All alternatives address the threat of invasive plants. Invasive plants can increase as a consequence of ground disturbance and once established could compete with Arizona sneezeweed for water and nutrients or could alter the fire regime. All alternatives address the threat of invasive plants by pointing to the Final Environmental Impact Statement for the Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005). This direction includes best management practices, among other guidance, which would help prevent, mitigate, and reduce the threat of invasive plants. All alternatives prioritize treatments, call for incorporating control measures in project planning and implementation, and emphasize coordination with partners (1987 Plan, pages 23, 69, 70, 182, 206-14, 206-76, 206-101, 201-116; FW-Invas-DC-1 through 3, FW-Invas G-1, 2, 3, FW-Invas-MgtApp, FW-WFP-DC-10, FW-TerrERU-IC-DC-3, FW-Graz-MgtApp, FW-RdsFac-G-8, FW-Rec-Dev-DC-9, FW-Rec-Dev-G-2, FW-Rip-Spr-G-3, FW-TerrERU-Grass-DC-2). More detailed analysis is in the Wildlife and Plant Issues and Topic section called Non-native Species and Disease.

Plan language under all alternatives directs implementing site-specific best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed.

Alternative A

Table 95 shows that Montane/Subalpine Grassland would remain in good condition in the short term, but move to fair condition in the long term, and continue trending away from desired conditions.

The table also reflects that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine ERU would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term.

Wetlands would be in good condition and trend toward desired conditions. Springs would generally be in fair condition with a trend slowly toward desired conditions, but could vary from good condition to poor condition depending on access, protection, and the degree of development of the individual spring.

As shown in table 95, the likelihood that Arizona sneezeweed would be limited by its habitat on the forest is moderate to high, depending on the habitat. These likelihoods were derived by combining Arizona sneezeweed's F Rank of F2 with the likelihood of habitat limitation variables for each habitat: Montane/Subalpine Grassland (low in the short term, moderate in the long term), Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), wetlands (moderate considering the total acres of wetlands), and springs (high) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Montane/Subalpine Grassland, Ponderosa Pine, and wetlands, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives. The management effect for springs is classified as a 4, which means that a decline in habitat quality could occur as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.

Alternative A does not distinguish between the different grassland types, which differ in terms of precipitation patterns, composition, soil types, elevation, and structure. In the older sections of the current plan, guidance for composition is focused on a balanced composition of cool and warm season grasses. More recently amended sections of the plan, such as in the Flagstaff-Lake Mary Ecosystem Area, have a more ecological approach to composition by promoting diverse healthy populations of native plants and animals with a natural variety of plant species, age classes, and structures, but this guidance is limited to the FLEA analysis area and does not apply forestwide.

Portions of alternative A provide outdated direction for ponderosa pine. This outdated direction emphasizes timber production for most of the ponderosa pine forest (MA 3) rather than composition, structure, and natural processes as in the desired conditions. Fire is mentioned in the context of wildfires with acknowledgement of natural regeneration.

Alternative A provides direction that allows for a variety of stand conditions across the landscape, while mimicking natural disturbance patterns that result in irregular tree groups and canopy gaps. Uneven-aged management is emphasized and standard prescription guidelines are provided for ponderosa pine under various scenarios but stocking rates and tree densities supported by alternative A are above the rates and densities supported by historic reconstructions so alternative A supports higher tree densities than desired and leads to increased potentials for uncharacteristic fire and insect and disease.

The Ponderosa Pine ERU is recognized as being a fire-dependent ecosystem, but suppression objectives that are designed to protect wildland-urban interface, minimize suppression costs and provide for personnel safety make the reintroduction of fire into the ecosystem challenging.

Alternative A does not distinguish between the various riparian types differentiated in alternative B (modified), and lacks plan components relative to composition, structure, and function. In addition, this alternative has the least potential for improvement to riparian condition compared to the other alternatives. Plan language for wetlands is outdated and does not include current science about vegetative condition and natural disturbances. It lacks comprehensive desired conditions for composition, structure, and function of wetlands. Alternative A does not distinguish between the various riparian types differentiated in alternative B (modified) and lacks plan components relative to composition, structure, and function. In addition, this alternative has the least potential for improvement to riparian condition compared to the other alternatives.

Springs are important habitat for Arizona sneezeweed. Guidance for springs in alternative A is included in the Riparian section of the plan (MA 12 Riparian and Open Water) with no direction to maintain springs in their natural conditions. This direction is outdated and inadequate to protect the specialized spring habitat needed by Arizona sneezeweed.

Alternative B (modified)

Table 95 shows that condition and trend for Montane/Subalpine Grassland would improve to good with a trend toward desired condition under alternative B (modified). Like alternative A, Ponderosa Pine would remain in poor condition with a trend toward desired conditions in the short term under low treatment objectives (50,000 acres mechanical, 150,000 acres prescribed fire). However, in the short term under the high vegetation treatment objectives (260,050 acres mechanical, 200,000 acres prescribed fire) and in the long term under both the low and high vegetation treatment objectives, the condition would improve to fair and trend toward desired conditions.

Wetlands would have good condition and a trend toward desired condition, the same as alternative A. Springs would remain in the same condition as in alternative A with a static trend relative to desired conditions.

As shown in table 95, the likelihood that Arizona sneezeweed would be limited by its habitat on the forest is moderate to high, depending on the habitat. These likelihoods were derived by combining Arizona sneezeweed’s F Rank of F2 with the likelihood of habitat limitation variables for each habitat: Montane/Subalpine Grassland (Low), Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), wetlands (moderate considering the total acres of wetlands), and springs (high) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all habitats. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. This rating is due to these alternatives containing explicit and updated direction for montane/subalpine grasslands, ponderosa pine, wetlands and springs.

Rarity is a risk for these species. Alternative B (modified) has additional components that better provide for rare species than alternative A. Desired conditions in the Wildlife, Fish, and Plant section includes language for species that are endemic or have restricted distribution. The plan language would provide for the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10). This is further discussed in the At Risk section under Wildlife and Plant Issues and Topics.

Alternative B (modified) distinguishes between different grassland types on the forest and provides updated and improved plan direction that would guide future projects. Alternative B (modified) provides plan components to promote properly functioning and resilient ecosystems, promote characteristic disturbances, reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby, furthering sustainability and adaptability (FW-Eco-DC-1, 2, 3, 4, FW-TerrERU-All-DC-2). ERU-specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-Grass-DC-1 through 5, 7, 8, 9, FW-TerrERU-Grass-G-2). These plan components provide better direction for the grassland habitats and species that use them, including Arizona sneezeweed.

In alternative B (modified), treatment objectives in the Ponderosa Pine ERU would create more open conditions that favor this species and facilitate a frequent low-severity fire regime to which this species is adapted. Implementation of plan objectives and removal of restrictions on the use of wildfires with resource objectives in wildland-urban interface and in wilderness would also reduce the risk of uncharacteristic fire on the landscape and benefit habitat for this species. This plan language could facilitate the use of prescribed fire or wildfire for restoration or fuels reduction however these activities would still need to maintain wilderness characteristics and comply with regulations associated with wilderness.

Plan components for wetlands and springs are updated in alternative B (modified). Desired conditions and guidelines support wetland composition, structure, and function, connectivity between uplands and aquatic and riparian areas, and the maintenance of habitat for species (FW-Rip-Wtlnds-DC-1, 2, FW-Rip-All-DC-1, 3, 5 and G-2, 3, FW-WFP-DC-6). In addition, riparian functional condition would improve faster than alternative A. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1, 2, FW-Water-G-2, FW-Rip-RipType-O-1). More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3, Fw-Rip-Strm-G-2) (USDA Forest Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1, 3).

For alternative B (modified) the forestwide desired conditions for springs (FW-Rip-Spr-DC-1 and 5) provide for proper function for the biotic and abiotic factors needed by Arizona sneezeweed. These desired conditions provide better guidance for the rare, but important habitats for species such as Arizona sneezeweed that inhabit them.

There is no habitat for this species in any of the wildernesses recommended in this alternative, and therefore, no impact.

Alternative C

Alternative C is the same as alternative B (modified). There is no habitat for this species in any of the wildernesses recommended in this alternative, and therefore, no impact.

Alternative D

Alternative D is the same as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Arizona sneezeweed, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Arizona sneezeweed, which is a Forest Service sensitive species. Alternatives B (modified), C, and D provide better protection for Arizona sneezeweed than alternative A, primarily because guidance for springs, Montane/Subalpine Grassland, and wetlands is outdated or insufficient for managers in alternative A. The shift in emphasis from timber production to ecosystem resiliency in ponderosa pine would better provide for the viability for this species under alternatives B (modified), C and D. Plan direction that defines and provides guidance for grasslands, wetlands and springs would also contribute to the viability of this species.

Arizona sunflower

Affected Environment

Arizona sunflower is a Southwestern Region sensitive species.

Distribution

Arizona sunflower is an herbaceous perennial with long creeping roots that function like rhizomes. Its habitat and range include dry, frequently sandy soil, west central New Mexico to east central Arizona (Heiser et al. 1969). There is only one documented location on Coconino NF from the east side of Soldier Lake on Anderson Mesa (Frost 1945), but there may be other undetected locations.

Habitat

The documented location of this species on the Coconino NF is in the Pinyon Juniper Woodland ERU.

Risk Factors

Rarity is an inherent threat to Arizona sunflower due to its restricted distribution. It is considered to be rare and/or at-risk because there is only one occurrence on the forest and it may be vulnerable to stochastic events.

Environmental Consequences

For additional information see Coarse Filter: Habitat and the Wildlife and Plant Issues and Topic section on At-risk Species.

Table 96 summarizes the viability analysis for Arizona sunflower. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 96. Analysis summary for Arizona sunflower

Species and status	Habitat	Alternative A		Alternatives B (mod), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Arizona sunflower (Sensitive) F Rank = F1*	PJW	Good, static	M	Good, static	M
Management Effect		3 = Plan components maintain or improve protection and management for **some** habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		2 = Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat.

Common to All Alternatives

Table 96 shows that Pinyon Juniper Woodland would be in good condition with a static trend relative to desired conditions in all alternatives. The likelihood that this species would be limited by its habitat is moderate.

Arizona sunflower is considered to be rare and/or at-risk because there is only one population on the forest and it may be vulnerable to stochastic events. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

All alternatives address the threat of invasive plants. Invasive plants can increase as a consequence of ground disturbance, and once established, could compete with this species for water and nutrients or could alter the fire regime. All alternatives address the threat of invasive plants by pointing to the Final Environmental Impact Statement for the Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005). This direction includes best management practices, among other guidance, which would help prevent, mitigate, and reduce the threat of invasive plants. All alternatives prioritize treatments, call for incorporating control measures in project planning and implementation, and emphasize coordination with partners (pages 23, 69, 70, 182, 206-14, 206-76, 206-101, 201-116, FW-Invas-DC-1 through 3, FW Invas G 1-3, FW-Invas-MgtApp, FW-WFP-DC-10, FW-TerrERU-IC-DC-3, FW-Graz-MgtApp, FW-RdsFac-G-8 ,FW-Rec-Dev-DC-9, FW-Rec-Dev-G-2, FW-Rip-Spr-G-3, FW-TerrERU-Grass-DC-2). More detailed analysis is in the Wildlife and Plant Issues and Topic section called Non-native Species and Disease.

Alternative A

Table 96 shows that under alternative A Pinyon Juniper Woodland would remain in good condition with a static trend relative to desired conditions.

As shown in table 96, the likelihood that habitat on the forest would be a limiting factor for Arizona sunflower is moderate. This likelihood was derived by combining this species' F Rank of F1 with the likelihood of habitat limitation variable for Pinyon Juniper Woodland (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

Table 96 shows that the management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Pinyon Juniper Woodland, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives. This is primarily because alternative A does not distinguish between nor provide desired conditions for the three pinyon juniper types, which differ from each other in composition, structure, and processes. There is one broad vegetation category of Pinyon Juniper and plan direction varies by slope. Consequently, vegetation structure would not be equitably distributed across the landscape. As a result, Pinyon Juniper Woodland's unique composition and structure is not addressed in this alternative. Under alternative A, the habitat for Arizona sunflower is within Management Area 7 (Pinyon Juniper Woodland less than 40 percent slope). This management area emphasizes fuel wood, watershed, grazing and wildlife, and has no specific direction for rare species.

Alternative B (modified)

Table 96 shows that the Pinyon Juniper Woodland would have the same condition and trend as alternative A. Table 96 also shows that the likelihood that habitat on the forest would be a limiting factor for Arizona sunflower is moderate, the same as alternative A. This likelihood was derived by combining this species' F Rank of F1 with the likelihood of habitat limitation variable for Pinyon Juniper Woodland (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for Pinyon Juniper

Woodland. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

Rarity is a risk for this species. Alternative B (modified) has additional components that better provide for rare species than alternative A. Desired conditions in the Wildlife, Fish, and Plant section includes language for species that are endemic or have restricted distribution. The plan language would provide for the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10). This is further discussed in the At-risk section under Wildlife and Plant Issues and Topics.

In addition to the guidance in the Pinyon Juniper Woodland ERU, Arizona sunflower is in the Anderson Mesa MA in alternative B (modified). This MA is designed to highlight wildlife-based recreation. It provides solitude for activities such as hunting, fishing, and wildlife viewing as well as hiking, mountain biking, motorized recreation, rock climbing, and horseback riding. This alternative includes a desired condition for roads and trails in the Anderson Mesa MA to not be dominant features on the landscape (MA-AMesa-DC-1). This additional guidance may provide added protection to the habitat of Arizona sunflower as compared to alternative A.

Table 96 summarizes and compares the analyses for Arizona sunflower. This table shows that under alternative B (modified), Pinyon Juniper Woodland would remain in good condition and would remain static. The likelihood that Arizona sunflower would be limited by its habitat on the forest is moderate for Pinyon Juniper Woodland. This likelihood was derived by combining this species' F Ranks of F1 with the likelihood of habitat limitation variable for the ERU which is Low (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

Alternative C

The effects under alternative C would be similar to alternative B (modified). Alternative C would provide slightly more protection, because in addition to the Anderson Mesa MA desired condition discussed above, alternative C includes a guideline to manage road densities in the Anderson Mesa MA to not exceed an average of 1 mile of road per square mile (Appendix F, MA-AMesa-G-3). The reduced road density could be beneficial to rare species such as Arizona sunflower by reducing the levels of disturbance and soil erosion that are associated with roads.

Alternative D

The effects of alternative D are similar to alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would maintain the viability of Arizona sunflower, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Arizona sunflower, which is a Forest Service sensitive species. Alternatives B (modified), C, and D provide a higher level of protection than alternative A, primarily because the guidance for Pinyon Juniper Woodland ERU is absent in alternative A, and these alternatives better address species with restricted distributions. Components that protect the Pinyon Juniper Woodland ERU also protect the habitat of Arizona sunflower. The desired condition for reduced road densities in the Anderson Mesa Management Area also provide protection.

Black dropseed

Affected Environment

Distribution

The known distribution of black dropseed, classified as an Other planning species, is central Arizona.

Habitat

Black dropseed occurs in the Great Basin Grassland, Montane/Subalpine Grassland, Pinyon Juniper with Grass, Pinyon Juniper Evergreen Shrub, and Ponderosa Pine ERUs. It grows on rocky slopes and in dry meadows of open yellow pine and oak-pine forests and pinyon juniper woodlands.

Risk Factors

Rarity is an inherent threat to this endemic species due to its restricted distribution. Disturbance to plants is also a risk from management activities, such as vegetation treatments, fire, and road work.

Environmental Consequences

For additional information see Coarse Filter: Habitat and the Wildlife and Plant Issues and Topic section on At-risk Species.

Table 97 summarizes the viability analysis for black dropseed. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 97. Analysis summary for black dropseed

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Black dropseed (Other) F Rank =F3*	GBG	Good, away at short term then Fair, away at long term	Short term: L Long term: M	Low and high objectives: Good, static	L
	MSG	Good, away at short term then Fair, Away	Short term: M Long term: M	Good, toward	L
	PJES	Fair, away	L-M	Fair, away	L-M
	PJG	Fair, toward at short term then Fair, away at long term	L-M	Low and high objectives: Fair, toward at short term then Fair, slowly away at long term	L-M
	PP	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor at short term then Fair at long term, toward High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
Management Effect		All ERUs = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All ERUs = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area	

*F3 = Uncommon on the forest within its habitat

Common to All Alternatives

This species is considered to be rare and/or at-risk because there are few populations known and they are vulnerable to stochastic events. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

All alternatives address the threat of invasive plants. Invasive plants can increase as a consequence of ground disturbance, and once established, could compete with native plants for water and nutrients or could alter the fire regime. All alternatives address the threat of invasive plants by pointing to the Final Environmental Impact Statement for the Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005). This direction includes best management practices, among other guidance, which would help prevent, mitigate, and reduce the threat of invasive plants. All alternatives prioritize treatments, call for incorporating control measures in project planning and implementation, and emphasize coordination with partners (1987 Plan, pages 23, 69, 70, 182, 206-14, 206-76, 206-101, 201-116; FW-Invas-DC-1, 2, 3, FW Invas-G-1, 2, 3, FW-Invas-MgtApp, FW-WFP-DC-10, FW-TerrERU-IC-DC-3, FW-Graz-MgtApp, FW-RdsFac-G-8, FW-Rec-Dev-DC-9, FW-Rec-Dev-G-2, FW-Rip-Spr-G-3, FW-TerrERU-Grass-DC-2). More detailed analysis is in the Wildlife and Plant Issues and Topic section called Non-native Species and Disease.

Plan language under all alternatives directs implementing site-specific best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils (such as the Verde Formation) that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed. This will mitigate impacts to these desert plants where implemented.

Black dropseed occurs in the West Clear Creek Wilderness. Plan language for designated wilderness provides additional protection to this species so would contribute to the viability of this species in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Alternative A

Table 97 shows that under alternative A, Great Basin Grassland would initially remain in good condition but would trend away from desired condition in the short term as trees and shrubs encroach from the periphery due to lack of fire in adjacent ERUs. In the long term, this Great Basin Grassland would be in fair condition and continue trending away from desired conditions. Montane/Subalpine Grassland remains in good condition in the short term, but moves to fair condition in the long term, and continues to trend away from desired condition as trees and shrubs encroach from the periphery due to lack of fire in adjacent ERUs.

Pinyon Juniper Evergreen Shrub would remain in fair condition and trend away from desired conditions because the fire return interval is also trending away, tree and shrub regeneration would increase. Increased density of trees, shrubs, and understory could increase competition with black dropseed and facilitate a higher fire severity than this species had evolved with thereby degrading its habitat.

Pinyon Juniper with Grass would remain in fair condition, trending toward in the short term due to expected mechanical treatments and burning using wildfire for resource objectives. However, the trend for Pinyon Juniper with Grass is expected to move away from desired condition over time because there are currently more trees per acre and greater cover due to fire exclusion and weather patterns which have favored tree germination and establishment. The expected treatment level is insufficient to offset the negative effects of excess regeneration and closing canopies. As a result, understory abundance and diversity has decreased, decreasing the potential for surface fires. Fire exclusion has also altered structural stage; stand age; canopy cover; mosaic pattern; fuel composition; and fire frequency, severity, and pattern.

Ponderosa Pine would remain in poor condition in the short term at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term.

As shown in table 97, the likelihood that black dropseed would be limited by its habitat on the forest is low to moderate depending on the habitat. These likelihoods were derived by combining the F Rank of F3 with the likelihood of habitat limitation variables for each habitat: Great Basin Grassland (low in short term, moderate in long term), Pinyon Juniper Evergreen Shrub (low-moderate), Pinyon Juniper with Grass (low-moderate), Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), and Montane/Subalpine Grassland (low in the short term, moderate in the long term) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row in table 97 shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for all habitats, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives. This is primarily because alternative A does not distinguish between the different grassland types which differ from each other in terms of precipitation patterns, composition, soil types, elevation, and structure. In the older sections of the current plan, guidance for composition is focused on a balanced composition of cool and warm season grasses. More recently amended sections of the plan, such as in the Flagstaff-Lake Mary Ecosystem Area, have a more ecological approach to composition by promoting diverse healthy populations of native plants and animals with a natural variety of plant species, age classes, and structures but this guidance is limited to the FLEA analysis area and does not apply forestwide.

Alternative A does not distinguish between the pinyon juniper types. It lacks plan components relative to composition, structure, and function for each of these unique habitats. Under the current management, the density and cover of trees in both pinyon juniper ERUs would continue to increase, resulting in the decrease of understory abundance and diversity and degradation of habitat for this species.

Alternative A provides direction that allows for a variety of stand conditions across the landscape (1987 Plan, page 65-3), while mimicking natural disturbance patterns that result in irregular tree groups and canopy gaps (1987 Plan, page 65-4). Additional specific guidance provides for tree density ranging from 120 to 325 trees per acre, depending on site class and management objectives (USDA Forest Service 2016c, page 121). A literature review of early historical inventories and reconstructions of ponderosa pine recently indicated that the historic range of variation for ponderosa pine forests on basalt soils in the Coconino NF averages between 15 and 60 trees per acre (Reynolds et al. 2013). These densities (even if adding additional understory trees that are often missed in reconstructions) are still far below the low end of the stocking range provided in the 1987 plan. Consequently, alternative A promotes higher tree densities than desired. These higher tree densities decrease the amount of openness and growing space for understory species such as black dropseed.

Plan language that limits the use of wildfires managed for resource objectives in wilderness and in wildland-urban interface would not be beneficial for many species because Ponderosa Pine is a fire-adapted ecosystem. This language eliminates one management tool that could maintain openness that would favor vegetation that prefers more open conditions and that would favor restoration of the historic fire regime in these areas. See Vegetation and Fire in volume I of the FEIS for more detail.

Alternative B (modified)

Table 97 shows that Great Basin Grassland ERU would be in good condition and the trend would improve to static relative to desired condition due to a plan objective that would restore or improve 10,800 to 12,400 acres of Great Basin Grassland during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-2).

The condition and trend of Montane/Subalpine Grasslands ERU would be good with a trend toward desired conditions due to a plan objective that would restore or improve 7,600 to 11,400 acres of Montane/Subalpine Grasslands during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-3). These plan objectives would be expected to remove tree and shrub cover and create more open conditions and suitable habitat for this species.

The condition and trend for Pinyon Juniper Evergreen Shrub would not differ from alternative A, fair with a trend away from desired conditions. The condition of Pinyon Juniper with Grass would remain fair, but the trend would be toward desired conditions in the short term, then trend slowly away from desired conditions in the long term, because the treatment levels (FW-TerrERU-PJ-O-1, 2) are not sufficient to offset the negative effects of excess regeneration and closing canopies.

Ponderosa Pine ERU would be similar to alternative A, remaining in poor condition with a trend toward desired conditions in the short term under low treatment objectives (50,000 acres mechanical, 150,000 acres prescribed fire). However, in the short term under the high vegetation treatment objectives (260,050 acres mechanical, 200,000 acres prescribed fire) and in the long term under both the low and high vegetation treatment objectives, the condition would improve to fair and trend toward desired conditions.

As shown in table 97, the likelihood that black dropseed would be limited by its habitat on the forest is low to moderate, depending on the habitat. These likelihoods were derived by combining this species F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Great Basin Grassland (low), Pinyon Juniper Evergreen Shrub (low-moderate), Pinyon Juniper with

Grass (low-moderate), Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), and Montane/Subalpine Grassland (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effects are classified as a 2, which means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

This rating is due to this alternative distinguishing between the grassland habitats on the forest and containing explicit and updated direction on the composition, structure, and processes for these ERUs (FW-TerrERU-Grass-DC-1, 4, 6, and 8), compared to alternative A, which has a more forage-based approach. There is additional guidance on when to use fire as a management tool in GBG, and protection and improvement of grasslands using soil aeration, fencing, improved grazing strategies, and location of roads or constructed waters. This would promote functional habitat and grassland composition, structure, and productivity (FW-TerrERU-G-1, 2).

Alternative B (modified) emphasizes ecological conditions and composition, structure, and function of this ERU using current science, in contrast to alternative A (Reynolds et al. 2013).

In alternative B (modified), increased treatment objectives in the Ponderosa Pine ERU address the need for ecological restoration that addresses the shift in canopy conditions away from desired conditions and the departure the historic fire regime. Reduction of canopy and high stocking levels in ponderosa pine stands would free up more resources for understory plants including black dropseed. Implementation of desired conditions for ponderosa pine and removal of restrictions on use of wildfires with resource objectives would lead to more open stand conditions and would also reduce the risk of uncharacteristic fire on the landscape, reducing the risks of habitat loss for all species including black dropseed.

Under the updated plan direction, there is an overall emphasis on ecological conditions, which would support a variety of species; properly functioning ecosystems, and restoration of desired disturbance regimes (FW-Eco-DC-1, 2). This direction would lead to decreases in tree and shrub establishment and a corresponding increase in the distribution and abundance of herbaceous species is anticipated in all of these ERUs primarily due to increased treatment levels. Alternative B (modified) provides plan components to promote properly functioning and resilient ecosystems, promote characteristic disturbances, reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems thereby furthering sustainability and adaptability (FW-Eco-DC-1, 2, 3, 4, FW-TerrERU-All-DC-2).

ERU-specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-Grass-DC-1, 2, 3, 4, 6, 7, 8; FW-TerrERU-PJ-DC-1, 3, 4, 8, 9, G-1 and 2). There is additional guidance on when to use fire as a management tool in Great Basin Grassland, and protection and improvement of grasslands using soil aeration, fencing, improved grazing strategies, and location of roads or constructed waters. This would promote functional habitat and grassland composition, structure, and productivity (FW-TerrERU-Grass-G-1, 2).These plan components provide better direction for the grassland habitats and species that use them, Alternative B (modified) has components that address rarity and endemic species like black dropseed better than alternative A. In contrast to alternative A, alternative B (modified) has language that better addresses species specific threats and better provides for habitat for species with restricted ranges and distribution. Plan language in alternative B (modified) promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10).

Alternative B (modified) addresses disturbance to plants and their habitat better than alternative A by reducing the threat of uncharacteristic disturbances and disturbance from recreational use (FW-Eco-DC-1, 2, 3; FW-Rec-All-G-1, 2; FW-Rec-Disp-DC-3, G-1; FW-Rec-Trails DC- 3, 11, G-1 and 3). Although all alternatives provide mitigations for effects to this species from management actions, the mitigations are stronger in alternative B (modified). Disturbance to Plants is further addressed in the Wildlife and Plant Issues and Topics section above.

There are 6,668 acres of potential habitat in recommended wilderness. Desired conditions would be beneficial for this species and its habitat because of the emphasis on undeveloped characteristics, ecological characteristics, native species, and little evidence of human presence or occupation (SA-RWild-DC-1, 2, 3, and 5). Black dropseed is an endemic species, but widespread throughout its narrow range, so it may be present in one or more of these areas.

Alternative C

Alternative C has the same effects as alternative B (modified) except there are about 56,115 acres of potential habitat in recommended wilderness. Black dropseed is an endemic species, but widespread throughout its narrow range, so it may be present in one or more of these areas.

Alternative D

Alternative D has the same effects as alternative B (modified), except there is no recommended wilderness.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of black dropseed, although individuals may be impacted by site-specific activities or uses. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A, primarily because they contain updated plan components for grassland and pinyon juniper habitats, and updated plan language related to disturbances to plants. While alternative A has language that addresses rare and at-risk species, plan language in the remaining alternatives is updated, has wider applicability, addresses endemic species, and contributes more to the viability of at-risk and rare species than alternative A.

California floater

Affected Environment

The California floater (Forest Service sensitive species) is a freshwater mussel with a parasitic larval phase that is dependent on native fish hosts.

Distribution

California floater is believed to have been present historically on the Coconino NF in the Beaver Creek, Cherry Creek-Verde River, Fossil Creek-Verde River, Grindstone Wash-Verde River, Lower Clear Creek, Oak Creek, Sycamore Creek, Upper Clear Creek, and West Clear Creek 5th HUC watersheds (potential of 287.8 perennial stream miles). There are presently no known extant populations on the Coconino NF (AZGFD 2012).

Habitat

California floaters are associated with springs, streams, and all three riparian forest types where they occur. They prefer shallow areas of clean, clear lakes, ponds and large rivers. It also prefers lower elevations and soft, silty substrate to burrow into. The life cycle of California floater includes a parasitic larval stage during which it is dependent upon a host fish, usually a member of the Gila genus, for food and dispersal. The adult and juvenile phases are a sedentary, filter-feeders (AZGFD 2012).

Risks

Risk factors for California floater include predation by non-native fish and introduced or invasive crayfish, and likely reduced populations of native fish larval hosts.

Environmental Consequences

Since this species has been extirpated from the Coconino NF, and there are no plans for reintroductions, there will be no effects to the California floater from implementation of any of the alternatives. If California floater are reintroduced sometime in the future, a biological evaluation will be completed.

Findings

Implementation of plan components under all alternatives would provide for the viability of California floater, although individuals may be impacted by site-specific activities or uses, if it is re-established on the forest. Consequently, none of the alternatives would lead to a trend toward Federal listing for this Forest Service sensitive species. This species is considered extirpated from the Coconino NF, with last known evidence found in 1973 (Stevens and Ledbetter 2014). It has an F-Rank of FH (occurred on the forest historically, but no known extant populations).

Common black hawk

Affected Environment

Common black hawks are classified as an Other planning species.

Distribution

On the Coconino NF, the common black hawk has been observed nesting along all main perennial streams and a few minor perennial streams below the rim. Streams where nesting has been observed include Verde River, Sycamore Creek, Oak Creek, Spring Creek, Dry Beaver Creek, Red Tank Draw, Wet Beaver Creek, Walker Creek, West Clear Creek, and Fossil Creek. There are about 31 known occupied nest sites on the forest.

Habitat

Common black hawks are associated with Cottonwood Willow, Mixed Broadleaf Deciduous, and Montane Willow riparian forest types. They mostly nest in low-elevation cottonwood/sycamore riparian zones that are supported by a permanent flowing stream.

Additional information on these associated ERUs can be found above in the Coarse Filter: Habitat section.

Risk Factors

The primary threat is that human disturbance can disrupt breeding and raising young that could result in failed reproduction or fewer young. The Wildlife and Plant Issues and Topics section above has more detail about Disturbance. For some individuals, nesting success is lower in areas where there are crayfish and a lack of native prey.

Environmental Consequences

Table 98 summarizes the viability analysis for common black hawks. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 98. Analysis summary for common black hawks

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Common black hawk (Other) F Rank = F4*	CWRF	Fair, slowly toward	M	Good, slowly toward	L-M
	MBDRF	Good, static to slowly toward	L-M	Good, slowly toward	L-M
	MWRF	Good, static to slowly toward	L-M	Good, slowly toward	L-M
Management Effect		All habitats = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

* F4 = Common on the forest within its habitat.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

As described in the Coarse Filter:Habitat section, all alternatives would employ filter strips or aquatic management zones to reduce sedimentation, soil compaction, and loss of cover from ground-disturbing activities; would maintain and procure instream flow water rights; would address the threat of invasive plants; and would allow for installation of stream barriers to separate native from non-native or invasive species.

Alternative A

Table 98 shows that under alternative A, Cottonwood Willow Riparian Forest would remain in fair condition and have a slow trend toward desired conditions. In Cottonwood Willow, some portions of the Verde River, Dry Beaver Creek, and Spring Creek, would be static due to high recreation or private land, such as the area around Childs, Spring Creek, Dry Beaver Creek, and private lands.

Mixed Broadleaf Deciduous Riparian Forest would remain in good condition. Static trends would be associated with the Oak Creek 5th code and West Clear Creek 5th code HUCs. The trend would be static or moving slowly toward desired conditions except in the Beaver Creek, West

Clear Creek and Oak Creek 5th code HUCs and portions of Fossil Creek where recreation impacts are high. Areas of private land would remain static as well.

Montane Willow Riparian Forest would remain in good condition with a majority of the habitat either static or trending slowly toward desired conditions, except the Upper Clear Creek 5th code HUC is trending toward desired conditions.

As shown in table 98, the likelihood that common black hawks would be limited by their habitat on the forest is low-moderate to moderate, depending on the habitat. These likelihoods were derived by combining the common black hawk's F Rank of F4 with the likelihood of habitat limitation variables for each habitat: Cottonwood Willow Riparian Forest (high), Mixed Broadleaf Deciduous Riparian Forest (moderate), and Montane Willow Riparian Forest (moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row in table 98 shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and Montane Willow Riparian Forest, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives.

Alternative A would maintain or improve riparian forests and streamcourses, because it has a focus on improving riparian areas in any condition, preventing damage to riparian vegetation, streambanks, and channels, and restoring degraded riparian areas to good condition as soon as possible (1987 Plan, pages 65-2, 65-8, 172, and 206-8). Other protective language includes the following: Only beneficial new special uses are allowed in riparian areas and exceptions such as utility line or roads crossing stream courses are designed to minimize the extent and magnitude of impact to riparian areas (1987 Plan, page 177). Aggressive fire suppression may be used to prevent resource damage utilizing methods that minimize long-term adverse impacts to riparian habitats (1987 Plan, page 177). In addition, acquisition of riparian areas through land exchange is a high priority (1987 Plan, pages 177 and 185). The plan would manage commercial uses, and recreation in some areas, to protect riparian values (1987 Plan, pages 206-10, 22, 26, and 39). This alternative has less potential for improvement to riparian condition compared to the other alternatives, because plan language for specific riparian forest types is lacking and there is not a focus on functioning-at-risk and non-functional riparian areas (USDA Forest Service 2016b).

Alternative A has language to follow approved or more recent conservation strategies or assessments only for certain species: for bald eagles (1987 Plan, page 206-100), Arizona leatherflower (hairy clematis) (1987 Plan, page 65-7), Arizona bugbane (1987 Plan, page 206-10) and Flagstaff pennyroyal (1987 Plan, page 65 and 206-10), but lacks this direction for other species.

Alternative A lacks language regarding invasive or non-native animal species like crayfish.

Alternative A lacks specific direction to impose timing restrictions to reduce disturbance to nesting common black hawks.

Alternative B (modified)

Table 98 shows that under alternative B (modified), Cottonwood Willow Riparian Forest would improve to good condition and trend slowly toward desired conditions except portions of the Verde River, Towel Creek, Spring Creek and Dry Beaver Creek would improve faster (i.e., have a trend toward desired conditions).

Mixed Broadleaf Deciduous Riparian Forest would remain in good condition and slowly move toward desired conditions except portions of Fossil Creek and Wet Beaver Creek would remain static in areas of high recreation use. It would improve faster than alternative A in the Beaver Creek, Oak Creek, West Clear Creek, and Fossil Creek 5th code HUCs.

Montane Willow Riparian Forest would remain in good condition and slowly move toward desired conditions. In the Upper Clear Creek 5th code HUC, MWRF would move toward desired condition at a faster rate than alternative A.

As shown in table 98, the likelihood that common black hawks would be limited by their habitat on the forest is low-moderate for all habitats. These likelihoods were derived by combining this species' F Rank of F4 with the likelihood of habitat limitation variables for each habitat: Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and Montane Willow Riparian Forest (moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row in table 98 shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the coarse filter habitats associated with these aquatic and riparian species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

Alternative B (modified) emphasizes characteristic disturbances in species habitats more so than alternative A. This supports an underlying assumption of the revised plan that sustainable populations of native species would be maintained or enhanced where the ecosystems in which they occur or evolved are functioning properly. This is also supported in fire management with a desired condition that wildland fires would not result in loss of ecosystem function (FW-Fire-DC-3). In addition, the emphasis on ecosystem function is better articulated in alternative B (modified) than alternative A. See FW-Eco-DC-1, 2, FW-Soil-DC-1, 2, FW-Water-DC-2, 3, FW-Rip-All-G-2, FW-Rip-Wtlnds-DC-1, FW-Rip-Spr-DC-1, and FW-WFP-DC-1. This would be beneficial for common black hawks.

Under alternative B (modified), projects and activities would be designed or managed to maintain or improve habitat for native species like common black hawks; to minimize the negative impact of pesticides or chemicals to species and their habitats; to protect and provide for species with restricted distributions where they are likely to occur; and would restrict project-related activities with the potential to disturb active raptor nests within 300 yards of nest sites (FW-WFP-G- 3, 4, 10, and 11). This would promote reproduction and survival of this species.

Guidelines in alternative B (modified) would prevent, control, contain, and eradicate priority infestations or populations of invasive species by incorporating measures into authorized activities, project planning and implementation (FW-Invas-G-2). This would promote survival and reproduction.

Like alternative A, alternative B (modified) has direction to follow conservation strategies, assessments or plans to improve the status of species and prevent Federal listing. Rather than restrict this to a few species, alternative B (modified) expands this direction via a forestwide guideline (FW-WFP-G-2).

Alternative B (modified) recommends 3 wilderness areas, but there is only a small amount of common black hawk habitat in Davey's and none in the other. Accordingly, the potential for recommended wilderness areas to reduce impacts from disturbance is negligible.

Alternative C

Alternative C is the same as alternative B (modified) except for the following.

There are 1,333 additional of acres of riparian forest types in recommended wilderness that could be used by common black hawks. Recommended wilderness would provide an additional area of low disturbance for this species, which would be beneficial. This is due to emphasis on the maintenance of wilderness character, preserving native species, and natural ecological systems. This includes reducing the impacts of motorized use, trail maintenance, existing structures (SA-RWild-DC-1, 2, 3 and G-1, 2, 4).

Alternative C is the only alternative that makes determinations on the suitability of recreational shooting in certain areas, such as particular management areas. Under this alternative, the Sedona Neighborwoods Management Area would be not suitable for recreational shooting. This determination would lead to decisions that result in reduced disturbance within the Sedona Neighborwoods Management Area (about 15,125 acres), which supports nesting common black hawks. These acres include areas that might already be excluded from recreational shooting by law. Areas designated as not suitable do not automatically become no recreational shooting areas. Subsequent environmental analysis (including public review and comment) and decisions need to be done to make this official.

Alternative D

Alternative D is the same as alternative B (modified), except there is no designated wilderness. The effects associated with managing those areas as recommended wilderness would not occur. These areas would still be managed by the other forestwide, management area, and special area direction in alternative B (modified) with the corresponding effects discussed above in the alternative B (modified) section. This difference between the alternatives would not result in a change in the condition or trend of the riparian habitats from those provided by alternative B (modified) for this species.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of the common black hawk, although individuals may be impacted by management activities or permitted uses. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A, because of updated plan guidance for riparian forest types. Recommended wilderness in alternative C would slightly increase areas of low disturbance for this species. Alternative C would reduce disturbance to this species the most due to management areas that are not suitable for recreational shooting and more acres of black hawk habitat in recommended wilderness.

Disturbed (Tusayan) rabbitbrush

Affected Environment

Distribution

The known distribution of disturbed rabbitbrush, a Forest Service sensitive species, is north central Arizona in Coconino County, and northeastern Arizona in Apache and Navajo counties. It occurs on the northern edge of the Coconino NF and on neighboring Kaibab NF.

Habitat

Disturbed rabbitbrush is associated with the Pinyon Juniper with Grass ERUs and is dependent on a specific soil type comprised of calcareous soil whose parent material was alluvium derived from Kaibab limestone and soil whose parent material was predominantly basalt. This unique soil type defines the range of the species. The soil type has significant quantities of calcium carbonate and commonly have a pH of 8 or more (TEUI 437 and 460). Unit 437 is derived from limestone parent material while unit 460 is derived from basalt. Soil disturbance in soil units 437 and 460 could bring excessive amounts of calcareous soil to the surface. Unit 437 also has shallow soils and a high amount of surface rock fragments. Soil condition in these soil types are assumed to be the same as in the rest of the ERU.

Risk Factors

Heavy grazing can damage or kill plants and negatively impact the survival or reproduction of disturbed rabbitbrush plants. Rarity is also a threat to this endemic species, because it is only known from the Coconino and Kaibab National Forests. Soil compaction or accelerated soil erosion from ground-disturbing activities are also threats.

Environmental Consequences

The Wildlife and Plant Issues and Topics section above has more detail about At Risk Species and Disturbance to Plants. See Coarse Filter: Habitat for more information about the habitats.

Table 99 summarizes the viability analysis for disturbed rabbitbrush. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 99. Analysis summary for disturbed rabbitbrush

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	**Likelihood species is limited**
Disturbed rabbitbrush (Sensitive) F-Rank = F1*	Calcareous soils in PJG	Fair, toward at short term then Fair, trending away at long term	M-H	Low and high objectives: Fair, toward at short term then Fair, slowly away at long term	M-H
Management Effect		PJG = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		PJG = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Plan language under all alternatives directs implementing site-specific best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed.

Alternative A

Table 99 shows that Pinyon Juniper with Grass would remain in fair condition and trend toward from desired conditions in the short term due to expected mechanical treatments and burning using wildfire for resource objectives. However, the trend for Pinyon Juniper with Grass is expected to move away from desired condition over time because there are currently more trees per acre and greater cover due to fire exclusion and weather patterns which have favored tree germination and establishment. The expected treatment level is insufficient to offset the negative effects of excess regeneration and closing canopies. As a result, understory abundance and diversity has decreased, decreasing the potential for surface fires. Fire exclusion has also altered structural stage; stand age; canopy cover; mosaic pattern; fuel composition; and fire frequency, severity, and pattern.

As shown in table 99, the likelihood that disturbed rabbitbrush would be limited by its habitat on the forest is moderate-high. This likelihood was derived by using the process in table 9 in volume IIa and combining the species' F Rank of F1 with the likelihood of habitat limitation variable for Pinyon Juniper with Grass (low-moderate). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Pinyon Juniper with Grass, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of disturbed rabbitbrush than the other alternatives. This is primarily because alternative A provides outdated direction for Pinyon Juniper with Grass ERU. Under the current management, the density and cover of trees in this ERU would continue to increase, resulting in the decrease of understory abundance and diversity and degradation of habitat for this species.

Soil is an important component of the habitat for disturbed rabbitbrush. The limiting soil type contributes to the rarity of this species. In alternative A, disturbed rabbitbrush occurs in MA 10 (Grassland and Sparse Pinyon Juniper above the Rim), with management emphasis on livestock and wildlife grazing and watershed protection. The focus on soils in this management area is mostly based on the suitability for range improvement and focuses on maintaining seral grasslands that were created by type conversion of woodlands to grasslands (through chaining). Terrestrial Ecosystems Survey (soil survey) is discussed in the context of range forage maintenance or improvement, not ecological diversity or rare plants.

Heavy grazing can be an impact on disturbed rabbitbrush plants. Alternative A allows grazing on allotments in MA 10 (Grassland and Sparse Pinyon Juniper above the Rim) with an emphasis on maintaining seral grasslands. If areas of excessive grazing overlap with plant locations, individual plants could be crushed or damaged. Alternative A promotes the establishment of allowable use guidelines with allotment-specific environmental analysis or with the use of a table based on range condition and management strategy (1987 Plan, page 66-1). However, the range condition classes in the table are no longer used and the currently used overall approach for grazing utilization is adaptive management based on objectives established in site-specific environmental analysis. Problem areas would be addressed through the allotment management plan process or monitoring. Permitted use and capacities would be balanced by increasing or decreasing livestock numbers, changing management intensity levels, initiating changes in livestock class, season of use, and rotation patterns (1987 Plan, page 67) which are many of the same techniques currently implemented on the ground. Alternative A uses outdated language such as full capacity range and has less of an ecological approach to understory conditions than the other alternatives (1987 Plan, page 67).

Alternative A does not distinguish between the three pinyon juniper types, which differ from each other in composition, structure, and processes. The plan provides little direction on desired conditions for this ERU. Plan language emphasizes the use of prescribed fire and mechanical treatments to achieve management objectives associated with range, watershed condition, and wildlife habitat (1987 Plan, pages 148 to 155 and 162 to 165). There is an emphasis on prescribed burning and individual tree removal to achieve range improvements (1987 Plan, page 164) as well as mechanical treatment of vegetation, emphasizing sustained-yield for firewood and miscellaneous convertible products (1987 Plan, p ages 148, 169). Consequently, managers lack specific guidance for the Pinyon Juniper with Grass ERU, which supports disturbed rabbitbrush.

Direction in the current forest plan for pinyon juniper is generally outdated. Different management objectives occur for slopes greater than 15 percent and slopes less than 15 percent. For example, old growth, cover, and snags are generally provided on slopes greater than 15 percent, while mechanical treatment should be managed on slopes less than 15 percent (1987 Plan, page 148). The recommended silvicultural systems provide sufficient flexibility to move toward desired conditions; however, the direction to manage cover in Pinyon Juniper with Grass would leave too much canopy cover across the landscape to return to the desired grassland state of this ERU.

Forestwide plan components for soil would contribute to the viability of associated species by maintaining or improving soil productivity and watershed conditions where needed (1987 Plan, page 23).

Alternative B (modified)

Table 99 shows that habitat condition and trend for Pinyon Juniper with Grass is the same as alternative A. The condition of Pinyon Juniper with Grass would remain fair, but the trend would be toward desired conditions in the short term, then trend slowly away from desired conditions in the long term because the treatment levels (FW-TerrERU-PJ-O-1, 2) are not sufficient to offset the negative effects of excess regeneration and closing canopies.

As shown in table 99, the likelihood that disturbed rabbitbrush would be limited by its habitat on the forest is moderate-high. This likelihood was derived by using the process in table 9 in volume IIa and combining the species' F Rank of F1 with the likelihood of habitat limitation variable for Pinyon Juniper with Grass (low-moderate). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

Management effect is a 2, because alternative B (modified) clearly distinguishes between different Pinyon Juniper types on the forest and provides desired conditions, objectives, and guidance that are specific to the each type. Management direction would promote properly functioning ecosystems that are resilient to natural disturbances and climate change; promote characteristic disturbances and reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby, furthering sustainability and adaptability (FW-Eco-DC-1 to 4, FW-TerrERU-All-DC-2). ERU-specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-PJ-DC-5-9; FW-TerrERU-PJ-G-1, 2, 3, 5).

Unlike alternative A, this alternative defines three ERUs in the pinyon juniper forest type: Pinyon Juniper with Grass, Pinyon Juniper Evergreen Shrub, and Pinyon Juniper Woodland.

Alternative B (modified) would provide clearer direction in terms of desired conditions, allowing for a greater potential to reduce ERU departure and move toward desired conditions. See FW-TerrERU-All-DC-1, 2, 3; FW-TerrERU-PJ-DC-1 to 5, FW-TerrERU-PJ-G–1, 2, 5.

The soil section has beneficial guidance to avoid disturbance that would impact the long-term soil productivity (FW-Soil-G-2). A beneficial desired condition in Wildlife, Fish and Plants (FW-WFP-DC-5), would addresses the composition, structure, function and physical components including soil for threatened, endangered, sensitive and endemic species. These components address the habitat for disturbed rabbitbrush better than the direction in alternative A.

Alternative B (modified) has a desired condition for livestock grazing that calls for permitted livestock grazing to be consistent with the desired conditions for other resources (FW-Graz-DC-2) and a guideline to manage livestock grazing to meet or move toward the desired conditions for forest resources including soil and vegetation (FW-Graz-G-2). This guidance is useful in addressing the effects of permitted livestock but does not address grazing by wildlife. Alternative B (modified) has updated language and provisions under Livestock Grazing that would reduce impacts to the understory from excessive grazing. Plan components promote permitted livestock grazing that is consistent with the desired conditions of other resources, but recognizes that conditions adjacent to livestock concentration areas may have lower levels of vegetation and higher levels of soil compaction (FW-Graz-DC-2 and 3, FW-Graz-G-2). The localized areas where this guideline would apply would be of lower habitat quality compared to areas farther from livestock concentration areas and could excessively graze any disturbed rabbitbrush plants in livestock concentration areas. Guidelines promote herbivory by permitted livestock and wildlife in balance with available forage (FW-Graz-G-1), sufficient rest from livestock grazing in burned or mechanically treated areas to ensure plant recovery and vigor and to ensure that perennial plants would not be permanently damaged by grazing (FW-Graz-G-3), and promote structural range improvements and salt and other supplements be located and used in a manner that sensitive resources (which include sensitive species) are protected from excessive trampling, compaction and other impacts (FW-Graz-G-4 and 5). These guidelines would contribute to the viability of this species by promoting grazing in balance with species needs.

In contrast to alternative A, alternative B (modified) has language that better addresses species-specific threats and better provides for habitat for species with restricted ranges and distribution. Plan language in alternative B (modified) promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10).

There is no habitat for this species in any of the wildernesses recommended in this alternative and therefore no impact.

Alternative C

Alternative C has the same effects as alternative B (modified). There is no habitat for this species in any of the wildernesses recommended in this alternative and therefore no impact.

Alternative D

Alternative D has the same effects as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of disturbed rabbitbrush, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for disturbed rabbitbrush, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A primarily because of updated plan components for soil, grazing, and at-risk and rare species. Reasons include the focus on structure, function and resiliency for all ERUs, additional language that addresses rarity and provides for endemic species and species with restricted distributions.

Flagstaff pennyroyal

Affected Environment

Flagstaff pennyroyal is a Southwestern Region sensitive species.

Distribution

There are two major populations of Flagstaff pennyroyal on the Coconino NF; the first extends between Flagstaff, Marshall Lake, Fisher Point, and south to the vicinity of Mountainaire and Lower Lake Mary. A second population is near the rim of Oak Creek Canyon and its tributaries. The estimated amount of habitat on the forest for the Flagstaff pennyroyal is greater than 700 acres with about 258 occurrences known.

Habitat

Flagstaff pennyroyal occurs on limestone substrates such as dolomitic limestone cliffs, and rock pavement in Ponderosa Pine forest in a broad range of canopy cover (0 to 86 percent). It has also been found in Interior Chaparral. Dolomitic limestone is found in certain areas of the forest such as near Lower Lake Mary, Marshall Mesa, and near the edge of Sycamore Canyon. Dolomitic limestone contains high levels of magnesium and the condition of dolomitic limestone-derived soil is assumed Soil condition is assumed to be the same as in the rest of the ERU.

Risk Factors

Major threats are rarity and disturbance. Flagstaff pennyroyal is susceptible to disturbance from activities such as road construction and maintenance, vegetative treatments, and burning, which can crush or remove plants. Rarity is an inherent threat to this species due to its restricted distribution.

Environmental Consequences

For additional information see Coarse Filter: Habitat and the Wildlife and Plant Issues and Topic section on At Risk Species and Disturbance to Plants.

Table 100 summarizes the viability analysis for Flagstaff pennyroyal. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that the species is limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 100. Analysis summary for Flagstaff pennyroyal

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Flagstaff pennyroyal (Sensitive) F Rank = F1*	PP	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: H Low objective long term: M-H High objective: M-H	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: H Low objective long term: M-H High objective: M-H
	IC	Good, away at short term then Fair, away at long term	Short term: M Long term: H	Good, away	M
	Cliffs and rocky outcrops	Good, static	M	Good, static	M
Management Effect		PP = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences. IC, Cliffs = 4: Decline in habitat quality as a result of management or lack of management that result from plan components.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat.

Common to All Alternatives

Flagstaff pennyroyal is considered to be rare and/or at-risk because there are few populations known and they are vulnerable to stochastic events. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Under all alternatives the habitat condition and trend for ponderosa pine remains fair trending toward desired condition. Interior chaparral remains in good condition with a trend away from desired conditions, and cliffs remain in good condition with a static trend compared to desired condition.

All alternatives incorporate the Management Plan for Flagstaff Pennyroyal (USDA Forest Service 1984) by reference (1987 plan, page 65; Revised Plan, Appendix D, Wildlife, Fish, and Plants, Other). The Management Plan contains mitigations that would reduce impacts from ground-disturbing management activities such as timber harvest, prescribed fire and road construction that occur in the habitat of Flagstaff pennyroyal.

Invasive plants can increase as a consequence of ground disturbance and once established could compete with Flagstaff pennyroyal for water and nutrients or could alter the fire regime. All alternatives address the threat of invasive plants by pointing to the Final Environmental Impact Statement for the Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005). This direction includes best management practices, among other guidance, which would help prevent, mitigate, and reduce the threat of invasive plants. All alternatives prioritize treatments, call for incorporating control measures in project planning and implementation, and emphasize coordination with partners (1987 Plan, pages 23, 69, 70, 182, 206-14, 206-76, 206-101, 201-116, FW-Invas-DC-1, 2, 3, FW Invas-G-1, 2, 3, FW-Invas-MgtApp, FW-WFP-DC-10, FW-TerrERU-IC-DC-3, FW-Graz-MgtApp, FW-RdsFac-G-8 ,FW-Rec-Dev-DC-9, FW-Rec-Dev-G-2, FW-Rip-Spr-G-3, FW-TerrERU-Grass-DC-2). More detailed analysis is in the Wildlife and Plant Issues and Topic section called Non-native Species and Disease.

Flagstaff pennyroyal occurs in the Red Rock – Secret Mountain Wilderness. Plan language for designated wilderness provides additional protection to this species so would contribute to the viability of this species in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2). There are restrictions on the types of activities that can occur within designated wilderness; some of which are based on the provisions of the Wilderness Act (1964) and some are based on the direction provided in the current forest plan. Mechanized and motorized use in designated wilderness is not permitted thus there would be no ground disturbance from these uses in the habitat for Flagstaff pennyroyal.

Alternative A

Table 100 shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine ERU would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term.

Interior Chaparral would be in good condition with a trend away from desired conditions in the short term. In the long term, Interior Chaparral would move to fair condition and continue trending away from desired conditions due to the threats of non-native invasive weeds and uncharacteristic wildfire.

Cliffs and rocky outcrops would remain in good condition with a static trend relative to desired condition.

As shown in table 100, the likelihood that Flagstaff pennyroyal would be limited by habitat quality on the forest is moderate to high, depending on the habitat. These likelihoods were derived by combining Flagstaff pennyroyal's F Rank of F1 with the likelihood of habitat limitation variables for each habitat: Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), Interior Chaparral (low in the short term, moderate in the long term), and cliffs and rocky outcrops (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row in table 100 shows the relative expected outcome of plan language in alternative A in terms of minimizing species viability risk. The management effect is classified as a 3 for Ponderosa Pine, which means that plan components in all alternatives maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives. The management effect is classified as a 4 for Interior Chaparral and cliffs, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Alternative A lacks plan components specific to Interior Chaparral and cliffs and the habitats they provide.

In the Ponderosa Pine ERU, alternative A provides direction that allows for a variety of stand conditions across the landscape, while mimicking natural disturbance patterns that result in irregular tree groups and canopy gaps. This would provide habitat for species such as Flagstaff pennyroyal.

The Ponderosa Pine ERU is recognized as being a fire-dependent ecosystem, but suppression objectives that are designed to protect wildland-urban interface, minimize suppression costs, and provide for personnel safety make the reintroduction of fire into the ecosystem challenging, so the ERU and the plants that live in it have a higher risk of being impacted by fire.

The management effect is classified as a 4 for the Interior Chaparral ERU, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Alternative A provides little to no direction on specific desired conditions for Interior Chaparral. The Sedona/Oak Creek Ecosystem-wide plan direction includes some beneficial guidance, but it only covers a small proportion of Interior Chaparral ERU. Sedona/Oak Creek Ecosystem-wide plan direction includes provisions to conserve or restore natural ecosystem disturbance patterns and function and to promote the natural ecological role of fire within the constraints of human health and safety, while the mosaic of vegetative conditions reduce the occurrence of catastrophic fires (1987 Plan, pages 206-9, 206-11, 206-19). The ecosystem-wide direction would reduce fire risk by prohibiting camping and campfires in the Neighborwoods, Oak Creek Canyon, and Redrock-Front Country MAs, except in designated places (1987 Plan, page 206-24).

Most of the guidance for cliffs is limited to visual quality and the importance of cliffs to archaeology (1987 Plan, pages 206-43 and 206-46). Additional language protects, improves, or maintains habitat for Forest Service sensitive species and would specify the development of a rock climbing plan that would detail mitigation measures to protect sensitive species such as Flagstaff pennyroyal (1987 plan, pages 23, 206-67, and 206-70).

Although alternative A includes language that would benefit Flagstaff pennyroyal, guidance found in alternative A is based on outdated science and information about these plants. Additionally, it lacks plan components for most rare and endemic plants, and is largely silent on direction and mitigation for many management actions.

Alternative B (modified)

Table 100 shows that the condition and trend of Ponderosa Pine ERU and cliffs and rocky outcrops are the same as under alternative A. Interior Chaparral habitat would remain in good condition in the short and long term, trending away due to the threats of non-native invasive weeds and uncharacteristic wildfire.

As shown in table 100, the likelihood that Flagstaff pennyroyal would be limited by habitat quality on the forest is moderate to high. These likelihoods were derived by combining this species' F Rank of F1 with the likelihood of habitat limitation variables for each habitat: Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), Interior Chaparral (low), and cliffs and rocky outcrops (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as 2 for all the habitats associated with Flagstaff pennyroyal. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

Plan components in alternative B (modified) better address at-risk species than alternative A. For example, desired conditions for Biophysical Features seek to maintain cliffs in generally undisturbed conditions from human activities, maintaining the cultural, archaeological, geological, hydrological, paleontological, biological, and aesthetic resources of these features (FW-BioPhy-Geo-DC-1) and acknowledge the importance of the specialized habitats for plants and animals that depend on them (FW-BioPhy-Geo-DC-6). Projects would be designed to maintain the integrity and function of caves, karst, cliffs, and talus slopes. Where alteration of these resources cannot be avoided, they would be mitigated to mimic pre-disturbance conditions and function (FW-BioPhys-Geo-G-1). Desired condition in the Wildlife, Fish and Plants section provides direction for preserving the composition, structure and function of the ERUs and the physical features including cliffs and rock piles that provide habitat and refugia for the plants and animals that depend on them (FW-WFP–DC-5).

Another desired condition would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10).

In alternative B (modified), treatment objectives in the Ponderosa Pine ERU would create more open conditions that favor this species and facilitate a frequent low severity fire regime to which this species is adapted. Implementation of plan objectives and removal of restrictions on the use of wildfires with resource objectives in wildland-urban interface and in wilderness would also reduce the risk of uncharacteristic fire on the landscape and benefit habitat for this species. This plan language could facilitate the use of prescribed fire or wildfire for restoration or fuels reduction however these activities would still need to maintain wilderness characteristics and comply with regulations associated with wilderness.

Alternative B has desired conditions and guidelines specific to the Interior Chaparral ERU whereas these are absent in alternative A. The presence and increase of invasive plant species could reinforce the trend away from desired conditions. Fire return interval is expected to remain moderately departed and trending away from the desired conditions. Vegetative quality may improve by managing wildfires for resource objectives when burning conditions permit (FW-TerrERU-All-G-2). Although alternative B (modified) lacks plan objectives for this ERU, any vegetative treatments or uses that occur in the future would maintain, improve, or not affect desired conditions and would follow the intent of the guidelines.

Alternative B (modified) addresses disturbance to plants and their habitat better than alternative A. Although all alternatives provide mitigations for effects to these species from management actions, the mitigations are stronger in alternative B (modified). See Disturbance to Plants in the Wildlife and Plant Issues and Topics section above.

Soil desired conditions would promote proper functioning soils, soil protection and stabilization, and nutrient cycling (FW-Soil-DC-1 to 4). Forestwide soil guidelines would avoid excessive ground disturbance and limit accelerated erosion (FW-Soil-G-1 to 3). This would help to protect the limestone based rock formation and associated soils needed for Flagstaff pennyroyal.

There is no habitat for this species in any of the wildernesses recommended in this alternative, and therefore, no impact.

Alternative C

Alternative C is the same as alternative B (modified). There is no habitat for this species in any of the wildernesses recommended in this alternative, and therefore, no impact.

Alternative D

Alternative D is the same as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of the Flagstaff pennyroyal, although, individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward

Federal listing for Flagstaff pennroyal, which is a Forest Service sensitive species. All alternatives provide plan components that address the threat of disturbance from human activities by protecting habitats for sensitive, rare and endemic species. All alternatives, particularly alternatives B (modified), C, and D, would also improve ponderosa pine forests for the Flagstaff pennyroyal. Alternatives B (modified), C, and D contribute more to the viability of Flagstaff pennyroyal than alternative A, because they have forestwide plan components for Interior Chaparral ERU and cliffs, which are largely absent in the current plan.

Gunnison's prairie dog

Prairie dogs are considered to be a keystone, or "strongly interactive" species (Soulé in Underwood 2007). Prairie dogs alter grasslands by modifying vegetation structure and composition, soil structure, nitrogen concentration in plant shoots, and landscape configuration. They create a mosaic of different patch structures within the grassland matrix at the landscape level and maintain grassland ecosystems by preventing encroachment of woody species.

A wide variety of wildlife species use some attribute of prairie dog colonies. Black-footed ferrets, golden eagles, and ferruginous hawks feed on prairie dogs. Prairie dog burrows are used for shelter by burrowing owls (also nesting cavities), black-footed ferrets, and many species of snakes, lizards, amphibians, and insects.

Affected Environment

Distribution

In Arizona, Gunnison's prairie dogs are found in the grasslands and to a lesser extent shrublands, north of the Mogollon Rim and south of the Colorado River. Their presence within this range is highly fragmented and widely scattered and is most likely an artifact of historic control efforts and current plague outbreaks (Hoffmeister 1986, Underwood 2007). Prairie dogs are thought to shift across the landscape but persist in the same general geographic area. On Coconino NF, they occur on the Flagstaff and Mogollon Ranger Districts as well as on lands in other ownerships.

Habitat

Prairie dogs are associated with Great Basin Grassland, Montane Subalpine Grassland, and Pinyon Juniper with Grass ERUs. They need well-drained, deep soils on generally flat slopes to dig their burrows (Wagner and Drickamer 2003, in Underwood 2007) and are adapted to living in arid, nutrient limiting environments with pronounced changes in moisture patterns and temperature extremes. They feed on grasses, sedges, forbs, and seeds.

Risk Factors

Prairie dog populations fluctuate in response to weather and sylvatic plague, the species' primary threat in Arizona. The primary factor limiting Gunnison's prairie dog population densities is sylvatic plague, a flea-transmitted disease caused by an introduced non-native bacterium (Underwood 2007). Rarity is a risk because they are disjunct from larger core distributions of species outside of Arizona and they are found in a limited number of groups at high concentration for all of their life cycle (AZGFD 2012).

Shooting of prairie dogs is authorized under a hunting license from the Arizona Game and Fish Department; which has instituted seasonal shooting closures from April 1 to June 30 to protect pregnant and lactating prairie dogs and their young (Underwood 2007, AZGFD 2017).

Environmental Consequences

Table 101 summarizes the viability analysis for Gunnison's prairie dog. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 101. Analysis summary for Gunnison's prairie dog

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Gunnison's prairie dog (Other) Restricted distribution F Rank =F3*	GBG	Good, away at short term then Fair, away at long term	Short term: L Long term: M	Low and high objectives: Good, static	L
	MSG	Good, away at short term then Fair, Away at long term	Short term: L Long term: M	Good, toward	L
	PJG	Fair, toward at short term then Fair, away at long term	L-M	Low and high objectives: Fair, toward at short term then Fair, slowly away at long term	L-M
Management Effect		All habitats = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F3 = Uncommon on the forest within its habitat

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

All alternatives support the retention of unfragmented areas such as in Deadman Wash (page 206-87, MA-PntdDsrt-DC-2, and MA-VolcanWd-DC-4), which is Gunnison's prairie dog habitat.

Alternative A

Table 101 shows that the Great Basin Grassland ERU would remain in good condition and trending away from desired conditions in the short term, because tree and shrub cover would continue to increase and understory would decrease in abundance and vigor. In the long term, the Great Basin Grassland ERU would be in fair condition and continue trending away from desired conditions.

The Montane/Subalpine Grasslands ERU would remain in good condition in the short term, then move to fair condition in the long term. The Montane/Subalpine Grasslands would continue trending away from desired conditions due to an increase in tree and shrub establishment, especially along the periphery because of a continued lack of fire's natural role in the ecosystem.

The Pinyon Juniper with Grass ERU would remain in fair condition, trending toward desired conditions in the short term due to expected mechanical treatments and burning using wildfire for resource objectives. However, the trend for the Pinyon Juniper with Grass ERU is expected to move away from desired conditions in the long term, because generally, the treatment level is insufficient to offset the negative effects of excess regeneration and closing canopies. As a result, understory abundance and diversity has decreased, decreasing the potential for surface fires. Fire exclusion has also altered structural stage; stand age; canopy cover; mosaic pattern; fuel composition; and fire frequency, severity, and pattern.

As shown in table 101, the likelihood that habitat quality would be a limiting factor on the forest for Gunnison's prairie dogs is low to moderate depending on the habitat. These likelihoods were derived by combining this species' F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Pinyon Juniper with Grass (low in the short term, moderate in the long term), Montane/Subalpine Grasslands (low in the short term, moderate in the long term), and Pinyon Juniper with Grass (low-moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for the Great Basin Grassland, Montane/Subalpine Grasslands, and Pinyon Juniper with Grass ERUs, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives.

For Great Basin Grassland and Montane/Subalpine Grasslands, this management effect rating is primarily because alternative A lacks plan language for the different grassland types, which differ from each other in terms of precipitation patterns, composition, soil types, elevation, and structure. Plan language is outdated, for example there is an emphasis on forage species rather than ecological conditions. Alternative A contains language in MA 9 - Mountain Grassland and MA 10 - Grassland and Sparse Pinyon Juniper Above the Rim to emphasize wildlife habitat in these areas (1987 Plan, pages 158 and 162), and it includes one standard and guideline to control the invasion of undesirable plant species to improve and protect wildlife values (1987 Plan, page 164). This would be beneficial for prairie dogs (which feed on native species). In the older sections of the current plan, guidance for grassland composition is focused on a balanced composition of cool and warm season grasses and forage species, which may or may not include native plant species. This language does not emphasize forbs, an important food item for prairie dogs. More recently amended sections of the plan, such as in the Flagstaff-Lake Mary Ecosystem Area, have a more ecological approach to composition by promoting diverse healthy populations of native plants and animals with a natural variety of plant species, age classes, and structures but this guidance is limited to the FLEA analysis area and does not apply forestwide. This alternative lacks specific plan language for prairie dog habitat.

For Pinyon Juniper with Grass, this management effect rating is because alternative A also does not distinguish between nor provide desired conditions for the three pinyon juniper types which differ from each other in composition, structure, and processes. There is one broad vegetation category of Pinyon Juniper. The different pinyon juniper types are differentiated on the basis of slope instead of composition, structure, and processes. Consequently, vegetation structure, and consequently habitat for these species, would not be equitably, or naturally, distributed across the landscape and managers lack specific guidance for the Pinyon Juniper with Grass ERU. The emphasis on the use of prescribed fire and mechanical treatments to achieve management objectives associated with range and watershed condition could maintain or improve habitat for Gunnison’s prairie dogs (1987 Plan, pages 148 through 155; 162 through 165). The recommended silvicultural systems provide sufficient flexibility to move toward desired conditions; however, the direction to manage cover in Pinyon Juniper with Grass would leave too much canopy cover across the landscape to return to the desired grassland state of this ERU and areas of too much canopy cover would not favor habitat for this species.

In alternative A, connectivity of habitats is primarily addressed through area-specific or habitat-specific plan language rather than forestwide language. Plan components mainly focus on cover requirements in travelways for big game species but some would indirectly maintain connections for grassland species like prairie dogs.

Alternative B (modified)

Table 101 shows that the Great Basin Grasslands ERU would remain in good condition, but the trend would improve to static relative to desired condition. Montane/Subalpine Grasslands ERU would be in good condition with a trend toward desired conditions. Like alternative A, the condition of Pinyon Juniper with Grass would remain fair with a trend toward desired conditions in the short term. In the long term, the condition would remain fair, but would trend slowly away from desired conditions because the treatment levels (FW-TerrERU-PJ-O-1, 2) are not sufficient to offset the negative effects of excess regeneration and closing canopies.

As shown in table 101, the likelihood that habitat quality on the forest would be limiting to Gunnison’s prairie dogs is low to low-moderate, depending on the habitat. These likelihoods were derived by combining this specie’s F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Great Basin Grassland (low), Montane/Subalpine Grasslands (low), and

Pinyon Juniper with Grass (low-moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect is classified as a 2 for all the habitats in this group, which means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

This management effect rating is because this alternative distinguishes between the grassland and pinyon juniper habitats on the forest and containing explicit and updated direction on the composition, structure, and processes for Great Basin Grassland, Montane/Subalpine Grasslands, and Pinyon Juniper with Grass. Under the updated plan direction, there is an overall emphasis on ecological conditions which would support a variety of species; properly functioning ecosystems, and restoration of desired disturbance regimes (FW-Eco-DC-1, 2). This direction would lead to decreases in tree and shrub establishment and a corresponding increase in the distribution and abundance of herbaceous species in all of these ERUs primarily due to increased treatment levels. For example, plan components in alternative B (modified) update desired conditions for grassland vegetation by having a more ecological approach to species composition and structure based on site potential compared to alternative A, and one desired condition that includes the presence of bare soil at the fine scale (less than 10 acres) as a natural process of prairie dog burrowing (FW-TerrERU-Grass-DC-4 and 8). Alternative B (modified) includes a management approach to specifically collaborate with partners and stakeholders on grassland restoration and connectivity. Another management approach specifically lists prairie dogs as a species to coordinate with Arizona Game and Fish Department and the Fish and Wildlife Service regarding objectives affecting wildlife conservation, education, habitat restoration, and improvement (FW-TerrERU-Grass, Management Approaches Grassland ERUs). The updated direction and the anticipated effects are discussed in greater detail by ERU in the Coarse Filter: Habitat section.

Alternative B (modified) also addresses the disease and connectivity risk factors to this species better than alternative A. This alternative includes a guideline for all Wildlife, Fish, and Plants to maintain/improve habitat for native species and prevent or reduce the likelihood of introduction or spread of invasive species (FW-WFP-G-3). This guideline would help reduce the spread of sylvatic plague among this species, which should reduce fluctuations in its population on and near the forest. Habitat connectivity is addressed in several ways. A desired condition describes a mostly contiguous land base that provides for biological diversity, retains its wildland character, and retains open space values (FW-LndAdj-DC-1). An objective would reduce barriers to movement or mortality hazards like roads by leading to the naturalization or decommissioning of 200 to 800 miles of unauthorized roads and system roads (as identified on the motor vehicle use map) (FW-RdsFac-O-1). Additional information on how this alternative addresses pathogens (non-native or invasive species) and connectivity is discussed in greater detail in the Wildlife and Plants Issues and Topics section.

Alternative C

Generally, the effects under alternative C would be the same as alternative B (modified). However, alternative C is the only alternative with management areas designed to reduce human-related disturbance, the limitation of which can be beneficial to wildlife habitat. Design features to accomplish this would include emphasis on low-disturbance non-motorized recreational activities; no net increase in the area of motorized dispersed camping corridors; limitations on the roads that provide public motorized access; and a ban on large group recreation events and large commercial tours, except in support of research. These management areas contain almost 65,000 acres of grasslands and would emphasize native species. They include Anderson Mesa, Blue Ridge, Hospital Ridge, Jack's Canyon, Knoll Lake, Limestone Pasture, Pine Grove, and Second Chance Management Areas. They would reduce human disturbance in those areas where the area is not already protected by existing designations, such as inventoried roadless areas.

Alternative D

Alternative D is the same as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Gunnison's prairie dogs. Alternatives B (modified), C, and D contribute considerably more to the viability of this species than alternative A, primarily because plan components are included to: account for the different types of grasslands and pinyon juniper on the forest and have updated guidance; account for connectivity on a forestwide basis rather than in site-specific areas; and address disease and non-native species, a primary threat to the species (this is lacking in alternative A).

MacDougal's aletes

Affected Environment

Distribution

The known distribution of MacDougal's aletes, classified as an Other planning species, is portions of Arizona, New Mexico, and Utah. On the Coconino NF, this species is known to occur in the West Fork of Oak Creek and Schnebly Hill area, where it grows in rocky ledges and crevices (Theobald et al. 1963).

Habitat

MacDougal's aletes occurs in Ponderosa Pine and Pinyon Juniper Evergreen Shrub ERUs, as well as the Mixed Broadleaf Deciduous Riparian Forest type. It grows in rock crevices, sandy ground and rocky soil from pinyon juniper to bristlecone pine communities (Springer et al. 2009).

Risk Factors

Rarity is an inherent threat to this species due to its restricted distribution, which is limited to Arizona. Disturbance to plants is also a risk from management activities, such as vegetation treatments, fire, and road work.

Environmental Consequences

The Wildlife and Plant Issues and Topics section above has more detail about At Risk Species and Disturbance to Plants. See Coarse Filter: Habitat for more information about the habitats.

Table 102 summarizes the viability analysis for MacDougal's aletes. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 102. Analysis summary for MacDougal's aletes

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
MacDougal's aletes (Other). F Rank= F1*	PJES	Fair, away	M-H	Fair, away	M-H
	PP	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: H Low objective long term: M-H High objective: M-H	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: H Low objective long term: M-H High objective: M-H
	MBDRF	Good, majority is static to slowly toward: Oak Creek 5th code HUC is Fair to Good and static	H	Good, majority is slowly toward: Oak Creek 5th code HUC is Good and toward	H
Management effect		All habitats = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

Management Effect = * F1= Very rare on the forest within its habitat – occupies a very small portion of its habitat

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Plan components in all alternatives have plan objectives or management emphasis to improve or restore riparian ecosystems, direction to use best management practices, and would employ either filter strips (alternative A) or aquatic management zones (remaining alternatives) to protect water quality and to avoid detrimental changes in water temperature, chemical composition, sediment deposits, or blockages. These plan components would maintain or improve water conditions and habitat for riparian species. See 1987 Plan, pages 23, 71, 72, 72-1, 172-177; FW-Rip-RipType-O-1, FW-WFP-O-4, FW-Rip-All-G-3, FW-Rip-Strm-G-2, FW-Water-G-4.

Instream flow water rights would be maintained and procured at similar levels under all alternatives (1987 Plan, pages 74 and 206 and FW-Water-G-3). Procurement of instream flow water rights would improve the extent of uninterrupted streamflows across NFS lands, thereby providing greater aquatic and riparian habitat continuity and resilience.

Plan language under all alternatives directs implementing site-specific best management practices best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade where soils with moderate or severe erosion hazard ratings occur or where soils are sensitive to degradation when disturbed.

Instream flow water rights would be maintained and procured at similar levels under all alternatives (1987 Plan, pages 74 and 206 and FW-Water-G-3). Procurement of instream flow water rights would improve the extent of uninterrupted streamflows across NFS lands, thereby, providing greater aquatic and riparian habitat continuity and resilience.

MacDougal’s aletes is within the segment of West Fork of Oak Creek that is eligible for inclusion in the National Wild and Scenic Rivers System. MacDougal’s aletes and its habitat would benefit from plan language that would manage recreation and other activities along eligible rivers and their corridors to protect and enhance the free-flowing condition and outstandingly remarkable values consistent with the classification (SA-WSR-DC-1 and 3, G-1). Alternative A lacks guidance for rivers determined to be eligible for designation as wild and scenic rivers, but policy directs that rivers found to be eligible and suitable must be protected as far as possible to the same extent as a designated study river (FSM 2354.21).

Some populations of MacDougal’s aletes are in the Red Rock-Secret Mountain Wilderness. Plan language for designated wilderness would contribute to the viability of this species in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

The Oak Creek Research Natural Area contains habitat for this species. Plan components preserving the natural conditions of the research natural area (Pages 25 and 194, SA-RNABotGeo-DC – 1 through 4) preserve the habitat and contribute to the viability of MacDougal’s aletes.

Recreational uses such as hiking and camping in West Fork pose a localized threat to individuals of this species. All alternatives would prohibit overnight camping in the research natural area (Page 108-3, SA-RNABotGeo-S -1). All alternatives provide for managing trails in the West Fork area (Page 108-2, and FW-Rec-Trails-DC -4 and 11). The direction in alternative A is specific to West Fork and provided the impetus for consolidating multiple user created trails into one maintained trail in the area. The forestwide desired conditions in alternative B (modified) provide for managing user damage to trails and keeping users on maintained trails while reducing the proliferation of social trails. All of these mitigate the potential effects of recreation to MacDougal's aletes.

Alternative A

Table 102 shows that under alternative A, Pinyon Juniper Evergreen Shrub would remain in fair condition and would trend away from desired conditions due to departure in the fire return interval and increases in trees and shrubs. Increased density of trees, shrubs, and understory could increase competition with this species and facilitate a higher fire severity than this species evolved with, thereby, degrading the habitat.

Table 102 also shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine ERU would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term.

Mixed Broadleaf Deciduous Riparian Forest would remain in good condition. Static trends would be associated with the Oak Creek 5th code (in which this species occurs). Trend would be static or moving slowly toward desired conditions except in the Oak Creek 5th code HUC where recreation impacts are high. Areas of private land would remain static as well.

As shown as table 102, the likelihood that habitat quality on the forest would be a limiting factor for MacDougal's aletes is moderate-high to high depending on the habitat. These likelihoods were derived by combining this species' F Rank of F1 with the likelihood of habitat limitation variables for each habitat: Pinyon Juniper Evergreen Shrub S (low-moderate), Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), and Mixed Broadleaf Deciduous Riparian Forest (moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row in table 102 shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for all habitats, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives.

For Mixed Broadleaf Deciduous Riparian Forest, alternative A would maintain or improve riparian forests because it has a focus on improving riparian areas in any condition, preventing damage to riparian vegetation, stream banks, and channels, and restoring degraded riparian areas to good condition as soon as possible (1987 Plan, pages 65-8, 172, 174, 206-8). Alternative A has guidance to construct 10 miles of fences per decade for the first two decades where necessary to protect key wet meadows, wetlands, and riparian regeneration from grazing (1987 Plan, page 175). Other protective language includes the following: Only beneficial new special uses are allowed in riparian areas and exceptions such as utility line or roads crossing streamcourses are designed to minimize the extent and magnitude of impact to riparian (1987 Plan, page 177). Aggressive fire suppression may be used to prevent resource damage utilizing methods that minimize long-term adverse impacts to riparian habitats (1987 Plan, page 177). In addition, acquisition of riparian areas through land exchange is a high priority (1987 Plan, pages 177, 185). The plan would manage commercial uses, and recreation in some areas, to protect riparian values (1987 Plan, pages 206-10, 206-22, 206-26, 206-39). Plan language for the Flagstaff/ Lake Mary Ecosystem Area guides managers to consider road closure or obliteration when there are threatened and damaged riparian areas or roads within wetlands that reduce hydrologic function (1987 Plan, 206-70, 206-71). Other beneficial plan language would protect Mixed Broadleaf Deciduous Riparian Forest by amending allotment management plans to contribute toward achieving satisfactory riparian condition (1987 Plan, pages 73, 175). Alternative A would also maintain 80 percent crown cover, 80 percent emergent vegetation cover, and three age classes of woody riparian species (1987 Plan, page 174).

However, plan language in alternative A lacks plan components relative to composition, structure, and function of the different types of riparian areas, and relative to natural disturbances and current science. Consequently, this alternative has less potential for improvement to riparian condition compared to the other alternatives. The trend on some portions of stream riparian areas would remain static due to impacts from other resource areas (e.g., recreation, livestock) and lack of specificity with regard to forest plan guidance. Refer to Watershed section, volume I, for additional information on Watersheds and Riparian Systems.

For Pinyon Juniper Evergreen Shrub, this management effect rating is because alternative A does not distinguish between the three pinyon juniper types which differ from each other in composition, structure, and processes. The plan provides little direction on desired conditions for these ERUs as it is lumped into the broad vegetation category of Pinyon Juniper, and plan direction varies only by slope. Consequently, vegetation structure would not be equitably distributed across the landscape.

For the Ponderosa Pine ERU, this management effect rating is because direction to broadcast seed following burns using a high production multi-growing season species to attain a balanced composition of cool and warm season forage species could have a negative effect on this species due to competition for nutrients and water with non-native species that could be a part of this seed mix. However, language to maintain open meadows in ponderosa pine, eliminate invading overstory vegetation, and stabilize gullies could improve habitat for this species. See 1987 Plan page 120. The Ponderosa Pine ERU is recognized as being a fire-dependent ecosystem, but suppression objectives that are designed to protect wildland-urban interface, minimize suppression costs, and provide for personnel safety make the reintroduction of fire into the ecosystem challenging, so the ERU and the plants that live in it have a higher risk of being impacted by fire. See 1987 Plan, pages 93, 94, 137.

MacDougal's aletes occurs in the West Fork of Oak Creek on the Red Rock Ranger District, a very popular hiking area. Recreational impacts that could crush plants or cause excessive soil erosion of habitat would be reduced by plan language that prohibits camping except at designated sites and that prohibits horse and pack stock use (1987 plan, pages 90, 108-2 and 3).

Alternative B (modified)

Table 102 shows that under alternative B (modified), Mixed Broadleaf Deciduous Riparian Forest would remain in good condition and slowly move toward desired conditions except it would improve faster than alternative A in the Oak Creek 5th code HUCs.

The condition and trend for the Ponderosa Pine ERU would be similar to alternative A, remaining in poor condition with a trend toward desired conditions in the short term under low treatment objectives (50,000 acres mechanical, 150,000 acres prescribed fire). However, in the short term under the high vegetation treatment objectives (260,050 acres mechanical, 200,000 acres prescribed fire) and in the long term under both the low and high vegetation treatment objectives, the condition would improve to fair and trend toward desired conditions.

Pinyon Juniper Evergreen Shrub would remain in fair condition and would continue to trend away from desired condition, like alternative A, because expected treatments would be inadequate to keep up with regeneration and tree growth. Treatments would not be expected to occur within the populations in wilderness.

Table 102 also shows that the overall likelihood habitat would be that this species would be limited by the quality of its habitat on the forest is high for Mixed Broadleaf Deciduous Riparian Forest and moderate-high for Pinyon Juniper Evergreen Shrub and Ponderosa Pine. These likelihoods were derived by combining this species’ F Rank of F1 with the likelihood of habitat limitation variables for each habitat: Mixed Broadleaf Deciduous Riparian Forest (moderate), Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), and Pinyon Juniper Evergreen Shrub (low-moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for both habitats. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For Mixed Broadleaf Deciduous Riparian Forest, this rating is primarily because there are updated desired conditions and guidelines that support composition, structure, and function of riparian forests (FW-Rip-RipType-DC-1 to 6 FW-Rip-RipType-G-1 to 4). In addition, riparian functional condition would improve faster than alternative A. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1, 2; FW-Water-G-2; FW-Rip-RipType-O-1). This would be beneficial if restoration occurs in Mixed Broadleaf Deciduous Riparian Forest or its associated watersheds. More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3; FW-Rip-Strm-G-2) (USDA Forest Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1, 3).

For Pinyon Juniper Evergreen Shrub, this management effect rating is because alternative B (modified) provides desired conditions, objectives and guidance specific to the each type of pinyon juniper on the forest. Management direction would promote properly functioning ecosystems that are resilient to natural disturbances and climate change; promote characteristic disturbances and reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby, furthering sustainability and adaptability (FW-Eco-DC-1 to 4, FW-TerrERU-All-DC-2). ERU specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-PJ-DC-5 to 9; FW-TerrERU-PJ-G-1, 2, 3, 5).

Alternative B (modified) provides for well-marked and maintained trails and promotes trail use that remains on the established trail surface and where damage to resources is minimal and within the ability of the forest to mitigate (FW-Rec-Trails-DC-1, 4, 11). This guidance provides better protection for MacDougal’s aletes than alternative A by adding desired condition language about minimal damage to associated resources.

Rarity is a risk for MacDougal’s aletes. Alternative B (modified) has components that address rarity better than alternative A. Plan language in alternative B (modified) promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10).

Alternative C

The effects to this species under alternative C would be the same as alternative B (modified).

Alternative D

The effects to this species under alternative D would be the same as alternative B (modified).

Findings

Considering the cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of MacDougal’s aletes although individuals may be impacted by site-specific activities or uses. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A. Plan components for Ponderosa Pine and Pinyon Juniper Evergreen Shrub ERU, as well as the Mixed Broadleaf Deciduous Riparian Forest type provide better protection for these habitats and updated plan language for at-risk and rare species. Alternatives B (modified), C, and D have a higher viability effectiveness than alternative A, primarily because they contain plan components for riparian forests and updated plan language for at-risk and rare species.

Metcalfe's tick trefoil

Affected Environment

Distribution

The known distribution of Metcalfe's tick trefoil, a Southwestern Region sensitive species, includes portions of New Mexico and Arizona. It is thought that Metcalfe's tick trefoil is widespread in portions of Arizona, but it is not well documented (New Mexico Rare Plant Technical Council 1999). On the Coconino NF, documented locations of Metcalfe's tick trefoil include along Huckaby Trail, Fossil Creek, and West Clear Creek Wilderness.

Habitat

Metcalfe's tick trefoil grows on rocky slopes and canyons. Occurrences of the species are in Mixed Broadleaf Deciduous Riparian Forests and Pinyon Juniper Evergreen Shrub ERUs.

Risk Factors

Rarity is a threat because of this species' limited distribution on the Coconino NF. Disturbance to plants is a concern because its habitats can be popular places for dispersed recreation. The Wildlife and Plant Issues and Topics section above has more detail about At-risk Species and Disturbance to Plants.

Environmental Consequences

Table 103 summarizes the viability analysis for Metcalf's tick-trefoil. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 103. Analysis summary for Metcalfe's tick trefoil

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Metcalfe's tick trefoil (Sensitive) F Rank = F1	MBDRF	Good, static to slowly toward	H	Good, slowly toward	H
	PJES	Fair, away	M-H	Fair, away	M-H
Management Effect		3 = Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences. Where applicable, plan components address some identified fine filter species threats and needs.		2 = Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area	

* F1= Very rare on the forest within its habitat – occupies a very small portion of its habitat

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Plan components in all alternatives have plan objectives or management emphasis to improve or restore riparian ecosystems, direction to use best management practices, and would employ either filter strips (alternative A) or aquatic management zones (remaining alternatives) to protect water quality and to avoid detrimental changes in water temperature, chemical composition, sediment deposits, or blockages. These plan components would maintain or improve water conditions and habitat for riparian species. See 1987 Plan, pages 23, 71, 72, 72-1, 172-177; FW-Rip-RipType-O-1, FW-WFP-O-4, FW-Rip-All-G-3, FW-Rip-Strm-G-2, FW-Water-G-4.

Instream flow water rights would be maintained and procured at similar levels under all alternatives (1987 Plan, pages 74 and 206 and FW-Water-G-3). Procurement of instream flow water rights would improve the extent of uninterrupted streamflows across NFS lands, thereby, providing greater aquatic and riparian habitat continuity and resilience.

Metcalfe's tick trefoil occurs in two established wildernesses, West Clear Creek and Fossil Creek. Both of these are major tributaries to the Verde River, are rugged and remote and have similar geologic formations. Plan language for designated wilderness contributes to the viability of this species in all alternatives. For example, ecosystems are functioning properly and support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Some locations of Metcalf’s tick trefoil are in segments of West Clear Creek and Fossil Creek that are eligible for inclusion in the National Wild and Scenic Rivers System. Metcalf’s tick trefoil and its habitat would benefit from plan language that would manage recreation and other activities along eligible rivers and their corridors to protect and enhance the free-flowing condition and outstandingly remarkable values consistent with the classification (SA-WSR-DC-1, 3, SA-WSR-DC-G-1). Alternative A lacks guidance for rivers determined to be eligible for designation as wild and scenic, but policy directs that rivers found to be eligible and suitable must be protected as far as possible to the same extent as a designated study river (FSM 2354.21).

Alternative A

Table 103 shows that under alternative A, Mixed Broadleaf Deciduous Riparian Forest would remain in good condition. Static trends would be associated with the Oak Creek 5th code and West Clear Creek 5th code HUCs. The trend would be static or moving slowly toward desired conditions except in the Beaver Creek, West Clear Creek and Oak Creek 5th code HUCs and portions of Fossil Creek where recreation impacts are high. Areas of private land would remain static as well.

Pinyon Juniper Evergreen Shrub would remain in fair condition, but would trend away from desired conditions due to departure in the fire return interval and increases in trees and shrubs. Increased density of trees, shrubs, and understory could increase competition with these species and facilitate a higher fire severity than these plants evolved with, thereby, degrading the habitat.

As shown in table 103, the overall likelihood that habitat quality on the forest would be a limiting factor for Metcalf’s tick-trefoil is moderate-high to high, depending on the habitat. These likelihoods were derived by combining this species’ F Rank of F1 with the likelihood of habitat limitation variables for each habitat: Mixed Broadleaf Deciduous Riparian Forest (moderate) and Pinyon Juniper Evergreen Shrub (low-moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row in table 103 shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Mixed Broadleaf Deciduous Riparian Forest and Pinyon Juniper Evergreen Shrub, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives.

For Mixed Broadleaf Deciduous Riparian Forest, alternative A would maintain or improve riparian forests because it has a focus on improving riparian areas in any condition, preventing damage to riparian vegetation, stream banks, and channels, and restoring degraded riparian areas to good condition as soon as possible (1987 Plan, pages 65-8, 172, 174, 206-8). Alternative A has guidance to construct 10 miles of fences per decade for the first two decades where necessary to protect key wet meadows, wetlands, and riparian regeneration from grazing (1987 Plan, page

175). Other protective language includes the following: Only beneficial new special uses are allowed in riparian areas and exceptions such as utility line or roads crossing streamcourses are designed to minimize the extent and magnitude of impact to riparian (1987 Plan, page 177). Aggressive fire suppression may be used to prevent resource damage utilizing methods that minimize long-term adverse impacts to riparian habitats (1987 Plan, page 177). In addition, acquisition of riparian areas through land exchange is a high priority (1987 Plan, pages 177, 185). The plan would manage commercial uses, and recreation in some areas, to protect riparian values (1987 Plan, pages 206-10, 206-22, 206-26, 206-39). Plan language for the Flagstaff/ Lake Mary Ecosystem Area guides managers to consider road closure or obliteration when there are threatened and damaged riparian areas or roads within wetlands that reduce hydrologic function (1987 Plan, 206-70, 206-71). Other beneficial plan language would protect Mixed Broadleaf Deciduous Riparian Forest by amending allotment management plans to contribute toward achieving satisfactory riparian condition (1987 Plan, pages 73, 175). Alternative A would also maintain 80 percent crown cover, 80 percent emergent vegetation cover, and three age classes of woody riparian species (1987 Plan, page 174).

However, plan language in alternative A lacks plan components relative to composition, structure, and function of the different types of riparian areas, and relative to natural disturbances and current science. Consequently, this alternative has less potential for improvement to riparian condition compared to the other alternatives. The trend on some portions of stream riparian areas would remain static due to impacts from other resource areas (e.g., recreation, livestock) and lack of specificity with regard to forest plan guidance. Refer to Watershed section, volume I, for additional information on Watersheds and Riparian Systems.

For Pinyon Juniper Evergreen Shrub, this management effect rating is because alternative A does not distinguish between the three pinyon juniper types which differ from each other in composition, structure, and processes. The Plan provides little direction on desired conditions for these ERUs as it is lumped into the broad vegetation category of Pinyon Juniper, and plan direction varies only by slope. Consequently, vegetation structure would not be equitably distributed across the landscape.

Metcalfe’s tick trefoil has been located along the popular Huckaby Trail on the Red Rock Ranger District. Recreational use such as hiking poses a minor risk of disturbance to this species and its habitat. In alternative A, this trail is in the Neighborwoods (MA 24). Guidance for trails in this area focuses on reducing user conflicts with private property and encouraging the use of designated trails (1987 Plan, pages 206-40 to 206-42). Use of designated trails could eliminate damage to the species (crushing) or its habitat (accelerated soil erosion or soil compaction).

Alternative B (modified)

Table 103 shows that under alternative B (modified), Mixed Broadleaf Deciduous Riparian Forest would remain in good condition and slowly move toward desired conditions except portions of Fossil Creek and Wet Beaver Creek would remain static in areas of high recreation use. It would improve faster than alternative A in the Beaver Creek, Oak Creek, West Clear Creek, and Fossil Creek 5th code HUCs.

Pinyon Juniper Evergreen Shrub would remain in fair condition and would continue to trend away from desired condition, like alternative A.

As shown in table 103, the overall likelihood that this species would be limited by the quality of its habitat on the forest is moderate-high to high, depending on the habitat. These likelihoods were derived by combining this species' F Rank of F1 with the likelihood of habitat limitation variables for each habitat: Mixed Broadleaf Deciduous Riparian Forest (moderate) and Pinyon Juniper Evergreen Shrub (low-moderate) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for both habitats. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For Mixed Broadleaf Deciduous Riparian Forest, this rating is primarily because there are updated desired conditions and guidelines that support composition, structure, and function of riparian forests (FW-Rip-RipType-DC-1 to 6 FW-Rip-RipType-G-1 to 4). In addition, riparian functional condition would improve faster than alternative A. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1, 2; FW-Water-G-2; FW-Rip-RipType-O-1). This would be beneficial if restoration occurs in Mixed Broadleaf Deciduous Riparian Forest or its associated watersheds. More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3; FW-Rip-Strm-G-2) (USDA Forest Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1, 3).

For Pinyon Juniper Evergreen Shrub, this management effect rating is because alternative B (modified) provides desired conditions, objectives and guidance specific to the each type of pinyon juniper on the forest. Management direction would promote properly functioning ecosystems that are resilient to natural disturbances and climate change; promote characteristic disturbances and reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems thereby furthering sustainability and adaptability (FW-Eco-DC-1 to 4, FW-TerrERU-All-DC-2). ERU specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-PJ-DC-5 to 9; FW-TerrERU-PJ-G-1, 2, 3, 5).

Alternative B (modified) provides for well-marked and maintained trails and promotes trail use that remains on the established trail surface and where damage to resources is minimal and within the ability of the forest to mitigate (FW-Rec-Trails-DC-1, 4, 11). This guidance provides better protection for Metcalfe's tick trefoil than alternative A by adding desired condition language about minimal damage to associated resources.

Rarity is a risk for Metcalf's tick-trefoil. Alternative B (modified) has components that address rarity better than alternative A. Forestwide guidance in Wildlife, Fish and Plants provides desired conditions for properly functioning ecosystems and ecologically responsible activities that support native plants and animals (FW-WFP-DC-1) where ERUs provide the habitat components for sensitive and/or endemic species to carry out their life cycle (FW-WFP-DC-3, FW-WFP-G-10). These components are complementary to the plan components in the sections for All

Ecosystems and All Terrestrial Ecosystems, and provide additional assurance for the viability of these species. Additional information and analysis is discussed under the At-risk topic in the Wildlife and Plant Topics and Issues section.

Alternative C

The effects to this species under alternative C would be the same as alternative B (modified).

Alternative D

The effects to this species under alternative D would be the same as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Metcalf's tick-trefoil, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Metcalf's tick-trefoil, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A, primarily because they contain plan components for riparian forests and Pinyon Juniper Evergreen Shrub ERU and updated plan language for at-risk and rare species.

Mogollon thistle

Affected Environment

Distribution

Mogollon thistle, a Southwestern Region sensitive species, is a narrow endemic confined to a few springs on the Mogollon Rim Ranger District. The distribution of this endemic species is limited to four documented locations. It is a subspecies of *Cirsium parryi,* which is much more widespread.

Habitat

All documented locations are associated with springs in Dane, Dane Springs, and Yeager Canyons on the Mogollon Rim Ranger District, Coconino NF (Goodwin 2005).

Risk Factors

Rarity is an inherent threat to this Forest Service sensitive species due to its restricted distribution. Non-native invasive plants are also a threat to Mogollon thistle.

Environmental Consequences

The Wildlife and Plant Issues and Topics section above has more detail about At-risk Species and Disturbance to Plants. See Coarse Filter: Habitat for more information about the habitats.

Table 104 summarizes the viability analysis for Mogollon thistle. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 104. Analysis summary for Mogollon thistle

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Mogollon thistle (Sensitive) F Rank = F1*	Springs	Good**, toward	H	Good**, toward	H
Management Effect		Springs = 4: Decline in habitat quality as a result of management or lack of management that result from plan components.		Springs = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat.

** For analysis of these species, springs were considered in good condition. However, some springs could be in poor or fair condition depending on accessibility, protection, or degree of development.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Alternative A

Spring condition can vary from good to poor, depending on access, protection, and the degree of development of the individual spring. The springs supporting occurrences of Mogollon thistle are remote and hard to access. Table 104 shows that under alternative A spring habitat for Mogollon thistle would generally be in good condition with a trend toward desired condition.

As shown in table 104, the likelihood that habitat quality on the forest would be a limiting factor for Mogollon thistle is high. This likelihood was derived by combining this species' F Rank of F1 with the likelihood of habitat limitation variable for springs (moderate for good quality) (table 9 in volume IIa).

The management effect row in table 104 shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 4 for springs, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Alternative A provides little direction on specific desired conditions for springs.

Springs are important habitat for Mogollon thistle. Guidance for springs in alternative A is included in the Riparian section of the plan (MA 12 Riparian and Open Water). However, spring management and restoration direction is nonexistent or vague and does not provide clear desired conditions or objectives to maintain or restore toward desired condition of properly functioning, resilient spring riparian areas (USDA Forest Service 2016b).

Alternative B (modified)

The springs supporting occurrences of Mogollon thistle are remote and hard to access. Table 104 shows that under alternative B (modified), like alternative A, springs would generally be in good condition with a trend toward desired conditions.

As shown in table 104, the overall likelihood that habitat on the forest would be a limiting factor for Mogollon thistle is high, like alternative A. This likelihood was derived by combining this species' F Rank of F1 with the likelihood of habitat limitation variable for springs (moderate for good quality) (table 9 in volume IIa).

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for springs. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area

Furthermore, table 104 shows that alternative B (modified) addresses rarity better than Alternative A. Mogollon thistle is a narrow endemic. Alternative B (modified) has components that address rarity better than alternative A. This is due to more forestwide guidance to address rare habitats and species. The discussion on At-risk Species in the Wildlife and Plant Issues and Topics section above covers the plan components that will support managing for sustainable populations of native plant and animal species, improve conditions for Southwestern Region sensitive species and help provide habitat for self-sustaining populations. The components in alternative B (modified) address these issues better than alternative A.

Plan components for springs are updated in alternative B (modified); describe goals for composition, structure, and processes associated with springs; and provide clearer direction for managers compared to alternative A (FW-Rip-Spr-DC-1 and 5). A particularly beneficial desired condition would provide the physical and biological habitat components needed by narrowly endemic species like Mogollon thistle. An objective to restore riparian function to at least 25 springs identified as not in proper functioning condition during each 10-year period during the life of the plan could benefit Mogollon thistles if restoration occurs within occupied or potential habitat (FW-Rip-Spr-O-1). Guidelines would require managers to maintain or improve spring discharge, maintain or procure water rights, protect the spring source, and maintain or improve soil and riparian function and native vegetation. These guidelines would maintain and protect habitat for this species (FW-Rip-Spr-G-1 to 4).

Alternative C

The effects to this species under alternative C would be the same as alternative B (modified).

Alternative D

The effects to this species under alternative D would be the same as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Mogollon thistle, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Mogollon thistle, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A, primarily because the plan components for springs provides better protection for these habitats and updated plan language for at-risk and rare species.

Mt. Dellenbaugh sandwort

Affected Environment

Distribution

Mt. Dellenbaugh sandwort, a Southwestern Region sensitive species, is endemic to northern and north-central Arizona

Habitat

The habitat for Mt. Dellenbaugh sandwort is oak and pine forests, open pine and pine-pinyon woodlands, and among junipers (HDMS 2004). On the Coconino NF, it occurs in the Semi-desert Grasslands, Interior Chaparral, Pinyon Juniper with Grass, Pinyon Juniper Evergreen Shrub, and Ponderosa Pine ERUs.

Risk Factors

Rarity is an inherent threat to this species due to its restricted distribution. Disturbance to plants is also a risk from management activities, such as vegetation treatments, fire, and road work. The Wildlife and Plant Issues and Topics section above has more detail about At-risk Species and Disturbance to Plants.

Environmental Consequences

Table 105 summarizes the viability analysis for Mt. Dellenbaugh sandwort. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 105. Analysis summary for Mt. Dellenbaugh sandwort

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Mt. Dellenbaugh sandwort (Sensitive) F Rank = F1*	SDG	Poor, away	VH	Poor, slightly toward	VH
	IC	Good, away at short term then Fair, away at long term	Short term: M Long term: H	Good, away	M
	PJG	Fair, toward at short term then Fair, away at long term	M-H	Low and high objectives: Fair, toward at short term then Fair, away at long term	M-H
	PJES	Fair, away	M-H	Fair, away	M-H
	PP	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: H Low objective long term: M-H High objective: M-H	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: H Low objective long term: M-H High objective: M-H
Management effect		SDG, PJG, PJES and PP = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences. IC = 4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F1 = Very rare on the forest within its habitat – occupies a very small portion of its habitat.

Common to All Alternatives

This species is considered to be rare and/or at-risk because there are few populations known and they are vulnerable to stochastic events. Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114;

FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Mt. Dellenbaugh sandwort occurs in the West Clear Creek Wilderness. Plan language for designated wilderness provides additional protection to this species, and would contribute to the viability of this species in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Alternative A

Table 105 shows that under alternative A, Semi-desert Grasslands would remain in poor condition and trend away from desired conditions due to continued increases in shrubs and trees and increased fragmentation from urbanization.

Interior Chaparral would remain in good condition in the short term, but move to fair condition in the long term, trending away from desired condition due to the threats of non-native invasive weeds and uncharacteristic wildfire.

Pinyon Juniper with Grass would remain in fair condition, but would trend toward desired conditions in the short term due to expected mechanical treatments and burning using wildfire for resource objectives. However, the trend for the Pinyon Juniper with Grass ERU is expected to move away from desired conditions in the long term because the treatment level is insufficient to offset the negative effects of excess regeneration and closing canopies. As a result, understory abundance and diversity would decrease, decreasing the potential for surface fires. Fire exclusion would alter structural stage; stand age; canopy cover; mosaic pattern; fuel composition; and fire frequency, severity, and pattern.

Pinyon Juniper Evergreen Shrub would remain in fair condition, but would trend away from desired conditions due to departure in the fire return interval and increases in trees and shrubs. Increased density of trees, shrubs, and understory could increase competition with these species and facilitate a higher fire severity than these plants evolved with, thereby degrading the habitat.

Ponderosa Pine would remain in poor condition in the short term at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term. Cliffs would be in good condition with a static trend related to desired conditions.

As shown in table 105, the likelihood that habitat on the forest would be a limiting factor for this species is moderate to very high depending on the habitat. These likelihoods were derived by combining this species' F Rank of F1 with the likelihood of habitat limitation variables for each habitat: Semi-desert Grassland (high), Interior Chaparral (low in short term, moderate in long term), Pinyon Juniper with Grass (low-moderate), Pinyon Juniper Evergreen Shrub (low-moderate), and Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective).

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Semi-desert Grassland, Pinyon Juniper with Grass, Pinyon Juniper Evergreen Shrub, and Ponderosa Pine, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives. For Semi-desert Grassland, this rating is primarily because alternative A provides outdated direction for Semi-desert Grasslands (in the Verde Valley MA). This outdated direction emphasizes range and forage improvement rather than composition, structure, and natural processes as in the desired conditions. Alternative A does not expressly acknowledge the different types of grasslands or their differing composition, structure, and processes. Vegetation quality is expected to trend away from desired conditions, primarily due to the lack of plan objectives in this alternative, thus tree and shrub cover would continue to increase and understory would decrease in abundance and vigor.

For Pinyon Juniper with Grass and Pinyon Juniper Evergreen Shrub, this rating is because alternative A does not distinguish between the three pinyon juniper types, which differ in composition, structure, and processes. The plan provides little direction on desired conditions for these ERUs as it is lumped into the broad vegetation category of Pinyon Juniper, and plan direction varies only by slope. Consequently, vegetation structure, including seed-bearing pinyon trees would not be equitably distributed across the landscape.

In the Ponderosa Pine ERU, alternative A provides direction that allows for a variety of stand conditions across the landscape while mimicking natural disturbance patterns that result in irregular tree groups and canopy gaps. This would provide habitat for species such as Mt. Dellenbaugh sandwort. Ponderosa pine is mostly managed for Mexican spotted owls or northern goshawks under forestwide direction. Areas managed for Mexican spotted owl PACs and nest/roost characteristics tend to have higher canopy closure than areas outside of these areas. Understory in these areas may be less abundant or vigorous due to the canopy closure. Areas outside of those managed for nest/roost characteristics and Mexican spotted owl habitat outside of PACs could have better habitat for Mt. Dellenbaugh sandwort in areas where natural canopy gap processes occur and natural variation includes small openings. See 1987 Plan, pages 65-2, 65-3, 65-4, 65-5.

Ponderosa pine areas outside of Mexican spotted owl habitat are managed for northern goshawks. Plan direction for northern goshawks would maintain habitat for Mt. Dellenbaugh sandwort because Ponderosa Pine would be managed for a mosaic of vegetation densities (overstory and understory); 40 percent of the areas in young forest, seedling/sapling or grass/forb/shrub structure would not have canopy cover guidelines; and there would be more openings than areas managed for denser stand conditions. See 1987 Plan, page 65-7, 65-9, and 65-10.

Additional management direction for ponderosa pine is in Management Area 3 (Ponderosa Pine and Mixed Conifer less than 40 percent slope) and this direction has both positive and negative aspects. Direction to broadcast seed following burns using a high production multi-growing season species to attain a balanced composition of cool and warm season forage species could have a negative effect on Mt. Dellenbaugh due to competition for nutrients and water with non-native species that could be a part of this seed mix. However, language to maintain open meadows in ponderosa pine, eliminate invading overstory vegetation, and stabilize gullies could improve habitat for this species. See 1987 Plan, page 120.

The Ponderosa Pine ERU is recognized as being a fire-dependent ecosystem, but suppression objectives that are designed to protect wildland-urban interface, minimize suppression costs and provide for personnel safety make the reintroduction of fire into the ecosystem challenging, so the ERU and the plants that live in it have a higher risk of being impacted by fire. See 1987 Plan, pages 93, 94, 137.

The management effect rating is classified as a 4 for Interior Chaparral, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Alternative A provides no direction on specific desired conditions for interior chaparral. The Sedona/Oak Creek Ecosystem-wide plan direction includes some beneficial general guidance, but it only covers a small proportion of Interior Chaparral ERU. Sedona/Oak Creek Ecosystem-wide plan direction includes provisions to conserve or restore natural ecosystem disturbance patterns and function and to promote the natural ecological role of fire within the constraints of human health and safety while the mosaic of vegetative conditions reduce the occurrence of catastrophic fires (1987 Plan, pages 206-9, 206-11, 206-19). Alternative A includes direction that impedes managing wildfire for resource objectives in wilderness and wildland-urban interface. Managing wildfire for resource objectives is one of the tools used to restore natural fire regimes and reducing the risk of uncharacteristic fire. These impediments limit the forest's ability to reintroduce fire in these areas. This negatively affects interior chaparral, which is a fire-adapted ecosystem and increases the risk of uncharacteristic fire in Interior Chaparral in these areas. It also negatively affects ponderosa pine, a fire-dependent ecosystem, and the two pinyon juniper types for the same reasons.

Alternative B (modified)

Table 105 shows that like alternative A, Semi-desert Grassland ERU would remain in poor condition, but unlike alternative A, this ERU would trend slightly toward desired conditions due to plan objectives that would restore or improve at least 3,500 acres of Semi-desert Grassland ERU during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-1). The plan objective would remove tree and shrub cover and create more open conditions that could favor this species.

Interior Chaparral ERU is expected to remain in good condition with a trend away from the desired condition. The presence and increase of invasive plant species could reinforce the trend away from desired conditions with respect to vegetation structure and composition. Fire return interval is expected to remain moderately departed and trending away from the desired conditions. Vegetative quality may improve by managing wildfires for resource objectives when burning conditions permit (FW-TerrERU-All-G-2), an option that was not available within wildland-urban interface under alternative A.

Pinyon Juniper with Grass ERU would be the same as alternative A. The condition of Pinyon Juniper with Grass would remain fair, but the trend would be toward desired conditions in the short term, then trend slowly away from desired conditions in the long term because the treatment levels (FW-TerrERU-PJ-O-1 and 2) are not sufficient to offset the negative effects of excess regeneration and closing canopies.

Pinyon Juniper Evergreen Shrub would remain in fair condition and would continue to trend away from desired condition, like alternative A.

The condition and trend for the Ponderosa Pine ERU would be similar to alternative A, remaining in poor condition with a trend toward desired conditions in the short term under low treatment objectives (50,000 acres mechanical, 150,000 acres prescribed fire). However, in the short term under the high vegetation treatment objectives (260,050 acres mechanical, 200,000 acres prescribed fire) and in the long term under both the low and high vegetation treatment objectives, the condition would improve to fair and trend toward desired conditions.

As shown in table 105, the likelihood that this species would be limited by the quality of its habitat on the forest is moderate to very high depending on the habitat. These likelihoods were derived by combining this species' F Rank of F1 with the likelihood of habitat limitation variables for each habitat: Semi-desert Grassland (high), Interior Chaparral (low), Pinyon Juniper with Grass (low-moderate), Pinyon Juniper Evergreen Shrub (low-moderate), and Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective).

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as 2 for all the habitats associated with these species. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For Semi-desert Grassland, this rating is due to this alternative distinguishing between the grassland habitats on the forest and containing explicit and updated direction on the composition, structure, and processes for these ERUs (FW-TerrERU-Grass-DC-4, 8), compared to alternative A, which has a more forage-based approach. Alternative B (modified) also provides plan components to promote properly functioning and resilient ecosystems, promote characteristic disturbances, reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby, furthering sustainability and adaptability (FW-Eco-DC-1, 2, 3, 4, FW-TerrERU-All-DC-2). ERU-specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-Grass-DC-1 to 5, 7, 8, 9, FW-TerrERU-Grass-G-2).

For Interior Chaparral ERU, this rating is due to alternative B (modified)'s specific desired conditions and guidelines for this ERU, whereas these are absent in alternative A.

For Pinyon Juniper with Grass and Pinyon Juniper Evergreen Shrub, this rating is because these alternatives clearly distinguish between different Pinyon Juniper types on the forest and provides desired conditions, objectives and guidance that are specific to the each type. Management direction would promote properly functioning ecosystems that are resilient to natural disturbances and climate change; promote characteristic disturbances and reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby furthering sustainability and adaptability (FW-Eco-DC-1 to 4, FW-TerrERU-All-DC-2) ERU specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-PJ-DC-5 to 9; FW-TerrERU-PJ-G-1, 2, 3, 5). There is additional direction for this ERU within the wildland-urban interface. Within wildland-urban interface, fire and vegetation management would favor low-intensity surface fires despite the historic fire regime that favors high-severity (and typically high-intensity) fires (FW-WUI-DC-8). This is intended to mitigate the risks to surrounding communities. A particularly beneficial plan component promotes management of plant litter and coarse woody debris in all pinyon juniper types to create conditions necessary for pinyon seed germination and survival (FW-TerrERU-PJ-DC-15).

For Ponderosa Pine, this rating is because alternative B (modified) emphasizes ecological conditions and composition, structure, and function of this ERU using current science, in contrast to alternative A (Reynolds et al. 2013). Alternative B (modified) promotes an open uneven-aged structure similar to historic conditions, yet it also has provisions for denser areas such as on steep slopes and in canyons (FW-TerrERU-PP-DC-8, 13). The treatment objectives and desired conditions for the Ponderosa Pine ERU address the need for restoring the fire regime and canopy conditions toward desired conditions. Implementation of these objectives and removal of restrictions on use of wildfires with resource objectives would lead to more open stand conditions and reduce the risk of uncharacteristic fire on the landscape, reducing the risks of habitat loss for species such as Mt. Dellenbaugh sandwort.

Rarity is a risk for Mt. Dellenbaugh sandwort. Alternatives B (modified) has components that address rarity better than alternative A. Forestwide guidance in Wildlife, Fish and Plants provides desired conditions for properly functioning ecosystems and ecologically responsible activities that support native plants and animals (FW-WFP-DC-1) where ERUs provide the habitat components for sensitive and/or endemic species to carry out their life cycle (FW-WFP-DC-3, FW-WFP-G-10). These components are complementary to the components for all ecosystems and all terrestrial ecosystems and provide additional assurance for the viability of these species. Additional information and analysis is discussed under the At-risk topic in the Wildlife and Plant Topics and Issues section.

Alternative C

The effects to this species under alternative C would be the same as alternative B (modified).

Alternative D

The effects to this species under alternative D would be the same as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Mt. Dellenbaugh sandwort, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Mt. Dellenbaugh sandwort, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A because plan components for Ponderosa Pine, Pinyon Juniper with Grass, Pinyon Juniper Evergreen Shrub, and Semi-desert Grassland ERUs provide better protection for these habitats and updated plan language for at-risk and rare species.

Northern goshawk

Northern goshawks are a Southwestern Region sensitive species.

Affected Environment

Goshawks prey on large to medium-sized birds and mammals that they capture on the ground. A long-term demographic study of a northern goshawk population on the Kaibab Plateau found that the population was stable over a 20-year period with a variable environment. The best breeding years were coincident with a record-long wet period and the worst breeding year was during the last of 3-year record drought. Six high-severity fires occurred during the study. The future status of the population was acknowledged to be uncertain due to “declining trends in breeding frequency, uncertain status of non-breeding adults, extensive temporal and spatial variation in breeding and high frequency of immigrant recruits to the breeding population.” The study concluded that “if the century-long decline in precipitation persists, especially at the increased rate seen since 1980, and manifests as deeper droughts, diminished wet periods, and weaker pulses in forest productivity, then the…goshawk population would be expected to show unambiguous evidence of decline, including reduced goshawk reproduction and survival, reduced frequency of immigration, and further habitat loss to catastrophic fire” (Reynolds et al. 2017). These trends would also be expected on the Coconino NF because precipitation trends tend to be regional, the forest shares similar habitats with the Kaibab Plateau, and in fact, is drier and lower elevation, so the potential of catastrophic fire could also be high.

Distribution

Northern goshawks are found in forested habitats throughout the northern hemisphere. They breed in high forested mountains and plateaus in Arizona, usually above 6,000 feet. The northern goshawk occurs on the Flagstaff and Mogollon Ranger Districts.

Habitat

Northern goshawks are associated with Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs. Additional information on these ERUs is available in the Coarse Filter: Habitat section. Habitat includes any associated pine or mixed conifer stringers that may extend below the rim. The goshawk is a forest habitat generalist that uses a wide variety of seral stages. It prefers stands of intermediate canopy cover, typically comprised of mature and older forests for nesting, while more open areas are used for foraging, allowing them to more easily see and pursue their prey. Large trees, snags, logs, downed woody material, and with a diverse herbaceous and understory component, are important habitat attributes for northern goshawks and their prey.

There are 83 goshawk post-fledging family areas on the Coconino NF, including 3 areas that are shared with other forests. Current total acreage of post-fledging areas managed by the Coconino NF is about 54,686 acres.

Risk Factors

The primary species threat is disturbance during the breeding season that may result in failed reproduction or fewer young. Relative rarity of the species is also a concern. A 2013 report on Coconino NF management indicator species concluded that the population trend of northern goshawks on the forest was stable to declining (USDA Forest Service 2013).

Environmental Consequences

Table 106 summarizes the viability analysis for northern goshawk. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species' viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 106. Analysis summary for northern goshawk

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Northern goshawk (Sensitive) F Rank = F3*	PP	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
	MCFF	Fair, toward at short term then Fair, static at long term	M	Low objective: Fair, toward at short term then Fair, static at long term High objective: Good, toward at short term then Good, static at long term	Low objective: M High objective: L
	MCIF	Fair, away at short term then Poor, away at long term	Short term: M Long term: M-H	Fair, static	M
Management Effect		All habitats = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F3 = Uncommon on the forest within its habitat

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). Furthermore, plan language in all alternatives contributes to the viability of northern goshawks by providing guidance for nesting, foraging, and post-fledging habitat. See 1987 Plan, pages 65-8 and 9, FW-TerrERU-PP-DC-12, FW-TerrERU-MC-MCFF-DC-9, FW-TerrERU-MC-MCIF-DC-8, and FW-TerrERU-SF-DC-10. See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

All alternatives would provide for large trees and large snags. Large trees are used by various prey species and for nesting. Large snags are important habitat for snag-dependent and cavity-dependent prey species. Plan language in alternative A retains snags in Mexican spotted owl PACs, steep slopes, restricted habitat (mixed conifer, pine-oak and riparian forests outside of PACs and steep slopes), and in northern goshawk habitat (1987 Plan, pages 65-2, 65-3, 65-5, 65-7). Plan language promotes snags 18 inches d.b.h. or greater outside of goshawk post-fledging family areas with 3 snags per acre in spruce-fir and mixed conifer, 2 snags per acre in ponderosa pine; greater density of snags near meadows, riparian areas, and key water sources; and protection of snags during fuel treatments (1987 Plan, pages 65-9, 70-3, 95). Other large snags would be provided in potential nest sites for osprey (which overlaps northern goshawk habitat in some areas) (1987 Plan, page 124) and large trees and snags would be protected during fuel treatments in the Flagstaff Lake Mary Ecosystem Analysis Area (1987 Plan, page 206-73, 206-101). Current and future large trees are promoted by reducing competition and protecting them during prescribed fires (1987 Plan, pages 65-5, 206-73, and 206-75).

Plan language in alternatives B (modified), C, and D also promotes snags 18 inches or greater at d.b.h. at an average 1 to 2 snags per acre, old-growth structure (include old trees, logs, coarse woody debris, and snags) throughout the landscape, characteristic disturbances to produce snags, development of old growth structure where it is lacking, protection of existing and developing old-growth structure, and preference for presettlement trees and large tall snags near openings and within groups (FW-TerrERU-PP-DC-5, 6, 9, G-1, 2, 3, 5; FW-TerrERU-MC-MCFF-DC-2, 3, 4; FW-TerrERU-MC-MCIF-DC-2, 3; FW-TerrERU-MC-All-G-2, 3).

Plan language in all alternatives would provide for large logs and for coarse woody debris. These two habitat elements provide cover for goshawk prey and are important for nutrient cycling and maintaining soil and forest productivity. Plan language promotes wide distribution and retention of coarse woody debris, including logs, to maintain long-term soil productivity and to contribute to the resiliency and adaptability of terrestrial ecosystems to climate change (1987 Plan, pages 65-2, 65-5, 65-7, 65-9, 65-10, 95, 185, 206-10, FW-Soil-DC-2, FW-TerrERU-All-DC-2, FW-TerrERU-AspMpl-DC-1, FW-TerrERU-PP-DC-3, 5, 6, and G-1, FW-TerrERU-MC-MCFF-DC-2, 3, 5, FW-TerrERU-MC-MCIF-DC-2, 3, 4, and 7, FW-TerrERU-MC-All-G-2, and FW-WUI-G-1).

Beneficial plan language in all alternatives includes seasonal closures, and implementation of timing restrictions to reduce disturbance to northern goshawks during the nesting season. These would have the indirect positive effects of promoting population recruitment and survival (1987 Plan, pages 65-7, 65-11, 206-73; FW-WFP-G-8). All alternatives have areas that are closed seasonally to provide recreation opportunities in areas undisturbed by vehicles and/or to provide quiet areas for wildlife. These areas total about 45, 962 acres, include northern goshawk habitat, and are existing closure orders: Pine Grove, Rattlesnake, Woods, and Woody Ridge (1987 Plan, page 59, 206-114, the Off-Road Driving Management Plan for Land and Resource Management Planning (Revised May 1991); FW-Rec-Disp-G-6, MA-PineBelt-DC-5, 6, 7, 8, MA-LkMary-DC-4, MA-PineBelt-S-1, 2, 3, 4, and MA-LkMary-S-1).

All alternatives have guidelines that would protect the habitat for this species in the vicinity of Walnut Canyon. These guidelines would be beneficial for the survival and reproduction of northern goshawks and would benefit the habitat for their prey species. Alternative A includes a guideline to protect the natural and cultural resources in the wildland-urban interface and the lands surrounding the (Walnut Canyon) national monument (1987 Plan, page 206-109). Alternatives B (modified), C, and D include a guideline for activities and uses on the forest to be managed to protect cultural sites and to preserve habitat for disturbance-sensitive species both on the forest and within Walnut Canyon National Monument (MA-Walnut-G-1).

About 31,087 acres of Ponderosa Pine, 778 acres of Mixed Conifer with Frequent Fire, and 8,193 acres of Mixed Conifer with Infrequent Fire are in designated wilderness. Plan language for designated wilderness provides additional areas of low disturbance (no mechanized or motorized use), so would contribute to goshawk viability in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised. However, because motorized and mechanized use in wilderness is not allowed in designated wilderness, needed mechanical or restoration treatments that require motorized use would be precluded and could result in increased risk of uncharacteristic fire (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2). There are about 40,058 acres of goshawk habitat in designated wilderness, which represents about 4.5 percent of northern goshawk habitat on the forest.

Alternative A

Table 106 shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine ERU would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term. The distribution and diversity of understory vegetation are expected to increase where open stands are created, such as in areas treated for restoration. The shift to more open canopy under all alternatives would improve the abundance and vigor of understory vegetation, conditions for Gambel oak and aspen, and cover and food for northern goshawk prey species. The increases in uneven-aged, multistoried stand structure, particularly in medium and very large trees, over the long term would maintain favorable conditions for northern goshawks and their prey.

Table 106 also shows that Mixed Conifer with Frequent Fire would remain in fair condition and trend toward desired conditions in the short term. In the long term, the trend would become static as treatment levels would not be able to keep up with growth and regeneration; seedlings and saplings would make gains through excess regeneration where openings are created and medium and large trees would lose ground in open stands as canopy gaps are filled in.

Mixed Conifer with Infrequent Fire would remain in fair condition and trend away from desired conditions in the short term due contradictory direct related to the management of wildfires in wilderness areas. In the long term, the condition would become poor and the trend would continue to move away from desired conditions.

As shown in table 106, the likelihood that this species would be limited by habitat quality on the forest is low-moderate to moderate-high depending on the habitat. These likelihoods were derived by combining this species' F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), Mixed Conifer with Frequent Fire (moderate), and Mixed Conifer with Infrequent Fire (moderate in short term and high in the long term) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for the Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives.

Old-growth structure (old large trees and snags) is an important habitat element for northern goshawks. Alternative A contains outdated language for old growth as well as updated language that reflects more recent science. The outdated plan language would allocate old growth as 100- to 300-acre stands over no less than 20 percent of each forested ecosystem management area (1987 Plan, page 129). Some of the updated language would have allocations consisting of landscape percentages meeting old-growth conditions and not specific acres. This former strategy would result in lower habitat quality for large tree and snag-dependent species compared to alternative B (modified), because it would result in less vertical structure and age class diversity; tend to maintain a more continuous canopy that would be conducive to crown fires; and result in more even-aged conditions. This structure and age class diversity does not reflect frequent low-severity fires characteristic of Ponderosa Pine and Mixed Conifer with Frequent Fire ERUs and does not reflect desired conditions. During wildfires in these 100- to 300-acre areas, there is likely to be more area in mixed severity condition with 25 percent to 75 percent loss of dominant overstory, compared to a loss of 25 percent or less, which is characteristic of low-severity fires. Old-growth stands would be less resilient to endemic levels of disturbances. Habitat in these 100- to 300-acre areas would be at higher risk from uncharacteristic fire and have higher susceptibility to insects and disease compared to alternative B (modified). Uncharacteristic fire could remove nesting or prey habitat by incinerating large trees and snags. Die-off from insects and disease could result in a beneficial short-term increase in snags, but have a negative long-term effect of reducing the number of large live trees, and losing snags through wind throw because the stands may be opened up and more susceptible to wind events.

In addition to the plan language under Common to All Alternatives, plan language in Management Area 3 (ponderosa pine and mixed conifer less than 40 percent slope) promotes managing for an average of 200 snags (including potential snags) per 100 acres over at least 50 percent of the forested land within 10K blocks but minimum diameter for a ponderosa pine/mixed conifer snag is greater than 12 inches d.b.h. (1987 Plan, page 126, 127, 143) which at the minimum size may be less suitable for prey species. Plan language also states that snags would generally not be available for firewood unless designated because of being surplus to wildlife needs (1987 Plan, page 126), and recently dead and poor risk trees and snags with certain characteristics in excess of planned snag densities may be harvested (1987 Plan, pages 130, 132, 147). The 10K block plan language would assure that snags are distributed across the landscape; however, harvesting excess snags and retaining small snags may negatively impact the size and quality of snags retained on the landscape. This approach does not account for the increases in fuelwood demand on the forest or illegal cutting, and this approach is outdated because 10K blocks are no longer used for analysis.

Prescribed fire and wildfires managed for resource objectives may be used in these ERUs, but there is no provision for using wildfires managed for resource objectives in the wildland-urban interface (1987 Plan, pages 92, 155, and 165) and the language to manage wildfires for resource objectives in wilderness impedes the use of this tool (1987 Plan, pages 111−112). This plan language limits the restoration of fire as a natural process in the wildland-urban interface and in wilderness, and canopy cover and shrub and tree density would be expected to increase in these areas. There would also be increased potential for uncharacteristic fire in the wildland-urban interface and wilderness portions of these ERUs. This is particularly problematic where the landownership pattern is intermixed between public and private ownerships.

Plan language in all alternatives would contribute to the survival and successful reproduction of northern goshawks by designating post-fledging family areas, nest areas, and replacement nest areas. To provide habitat while young northern goshawks are maturing, northern goshawk post-fledging family areas of approximately 420 acres in size would be designated surrounding nest areas. A minimum of six nest areas (known or replacement) would be located per territory and each nest area should generally be about 30 acres in size. Nest areas and surrounding post-fledging areas would be delineated to include the best available northern goshawk habitat and would generally comprise about 600 acres. Post-fledging family areas would have higher canopy cover and smaller opening sizes than areas outside of post-fledging family areas. See 1987 Plan, pages 65-7, 65-9, 65-10, FW-FW-TerrERU-PP-DC-12, FW-TerrERU-MC-MCFF-DC-9, FW-TerrERU-MC-MCIF-DC-8, FW-TerrERU-SF-DC-10, and WFP-G-14.

Approximately 48 percent of the post-fledging areas overlap Mexican spotted owl habitat in the Ponderosa Pine and Mixed Conifer ERUs and are managed with an emphasis on Mexican spotted owl habitat because threatened species take priority over sensitive species. In these same vegetation types, approximately 19 percent of the landscape outside of post-fledging areas is managed with an emphasis on Mexican spotted owl habitat as well. This means that these proportions of northern goshawk habitat are generally managed at higher canopy cover levels and with smaller openings than goshawk habitat outside of Mexican spotted owl habitat. Under alternative A, where northern goshawk habitat overlaps with Mexican spotted owl protected activity centers, only trees smaller than 9 inches in diameter at breast height may be cut (1987 Plan, page 65-2). Consequently, this creates more dense areas that are at higher risk of uncharacteristic fire, insects and disease, and density-related tree mortality than goshawk habitat that does not overlap with protected activity centers.

Alternative A uses vegetative structural stages (VSS) to describe northern goshawk habitat. Each vegetation structural stage coarsely describes size classes of overstory vegetation, canopy cover categories, and whether the vegetation structural stage is single or multistory (1987 Plan, pages 65-8 to 65-11). This method of describing habitat is no longer used. A crosswalk between vegetation structural stages and the modeled vegetation states is located in an appendix in the Vegetation and Fire Report (USDA Forest Service 2016c).

Alternative A recommends using site quality to identify and manage dispersal post-fledging family areas and nest habitat at 2.0- to 2.5-mile spacing across the landscape (1987 Plan, page 65-9). This language would assure that suitable nest and post-fledging family area habitat would be available for immigrating individuals and dispersing young.

Alternative A also requires goshawk surveys 0.5 mile beyond analysis boundaries prior to habitat-modifying activities (1987 Plan, page 65-7). This would assure that design features to manage or protect goshawk habitat can be incorporated early in the planning process.

Alternative A has language to follow approved or more recent conservation strategies or assessments only for certain species: for bald eagles (1987 Plan, page 206-100), Arizona leatherflower (hairy clematis) (1987 Plan, page 65-7), Arizona bugbane (1987 Plan, page 206-10) and Flagstaff pennyroyal (1987 Plan, page 65 and 206-10), but lacks this direction for most other species. For goshawks, there is direction to refer to USDA Forest Service General Technical Report RM-217 (Management Recommendations for the Northern Goshawk in the Southwestern United States) and The Northern Goshawk: Ecology and Management for supplemental and scientific information on goshawk ecology and management (1987 Plan, page 65-8).

Alternative B (modified)

Table 106 shows that the Ponderosa Pine ERU would have the same condition and trend as alternative A.

Like alternative A, under the low treatment objectives (2,900 acres mechanical, 8,000 acres prescribed fire) Mixed Conifer with Frequent Fire ERU would remain in fair condition with a trend toward desired conditions in the short term. In the long term under the low treatment objectives, Mixed Conifer with Frequent Fire would be in fair condition with a static trend relative to desired conditions. Under the high treatment objectives (15,000 acres mechanical, 8,000 acres prescribed fire), Mixed Conifer with Frequent Fire ERU would improve to good condition with a trend toward desired conditions in the short term, then a static trend relative to desired conditions in the long term. In addition, at least 7,500 acres of Mixed Conifer with Frequent Fire would be managed using wildfires for resource objectives within the natural fire regime, during each 10-year period over the life of the plan (FW-TerrERU-MC-MCFF-O-1, 2, 3).

The Mixed Conifer with Infrequent Fire ERU would remain in fair condition, but the trend would improve to static. Although there are no plan objectives for treatment in this ERU, activities and uses would follow the revised plan and would maintain or move toward desired conditions.

As shown in table 106, the likelihood that this species would be limited by habitat quality on the forest is low to moderate. These likelihoods were derived by combining this species’ F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), Mixed Conifer with Frequent Fire (moderate under the low treatment objective, low under the high treatment objective), and Mixed Conifer with Infrequent Fire (moderate). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect is classified as a 2 for all the habitats in this group, which means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. For the Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs, this rating is due to this alternative containing updated direction on the composition, structure, and processes of these ERUs based on current science and removing outdated material Plan components are discussed further below and in the Coarse Filter: Habitat section by ERU.

Plan language promotes natural levels of disturbance, frequent low-severity fires, old-growth structure distributed throughout the landscape, and the presence of uneven-aged forest with all age classes, including old growth (FW-TerrERU-PP-DC-2, 3, 6, FW-TerrERU-MC-MCFF-2, 4, 7, FW-TerrERU-MC-MCIF-DC-2, 4, G-2, 3). Old-growth structure is important to northern goshawks because large trees are used for nesting, and large trees, snags, logs and other coarse woody debris provide food, shelter, and/or nesting substrate for a variety of prey species. Alternative B (modified) removes the language that is present in alternative A about 100- to 300-acre stands of old growth. Guidelines require that old-growth forest attributes be protected from uncharacteristic natural disturbances; that development of old-growth conditions be encouraged in areas where it is lacking; and that preference for retention be given to pre-settlement trees (FW-TerrERU-PP-G-1, 2, and 3). Collectively, these plan components would allow for the recruitment and sustainability of large trees, old trees, and old-growth structure over time, which provides nesting and foraging habitat for northern goshawks and reduces susceptibility to uncharacteristic fire or uncharacteristic outbreaks of insect and disease. Alternative B (modified) also removes the language present in alternative A about 10K blocks and a minimum 12-inch d.b.h. size for snags.

Alternative B (modified) emphasizes characteristic disturbances in species habitats more so than alternative A. This supports an underlying assumption of the revised plan that sustainable populations of native species would be maintained or enhanced where the ecosystems in which they occur or evolved are functioning properly. Desired conditions in Ponderosa Pine and Mixed Conifer with Frequent Fire support this: “Frequent, low-severity fires (Fire Regime I) are characteristic in the vast majority of (these) ERUs, including throughout northern goshawk home ranges.” See FW-TerrERU-PP-DC-3, FW-TerrERU-MC-MCFF-DC-5. This would contribute to the viability of northern goshawks and their prey. This is also supported in fire management with a desired condition that wildland fires would not result in loss of ecosystem function (FW-Fire-DC-3). In addition, the emphasis on ecosystem function is better articulated in alternative B (modified) than alternative A. See FW-Eco-DC-1, 2, FW-Soil-DC-1, 2, FW-Water-DC-2, 3, FW-Rip-All-G-2, FW-Rip-Spr-DC-1, and FW-WFP-DC-1.

Alternative B (modified) also recognizes that dwarf mistletoe in mixed conifer is naturally occurring and contributes to the species and structural diversity of these ERUs. This is intended to improve foraging and nesting habitat for wildlife species such as small mammals (tree squirrels) and raptors such as northern goshawks. See FW-TerrERU-MC-All-DC-4.

Implementation of plan objectives and removal of restrictions on use of wildfires with resource objectives in wilderness and wildland-urban interface would lead to more open stand conditions in Ponderosa Pine and Mixed Conifer with Frequent Fire and reduce the risk of uncharacteristic fire or uncharacteristic outbreaks of insects and disease on the landscape, reducing the risks of habitat loss for species such as northern goshawks. Unlike alternative A, alternative B (modified) does not restrict the use of wildfires managed for resource objectives within the wildland-urban interface. Fire and vegetation management in the wildland-urban interface would favor low-intensity surface fires; higher frequency of disturbance than the natural disturbance regime from prescribed burning; wildfires managed for resource objectives, and/or vegetative treatments; more area of grass/forb/shrub vegetation or early seral vegetation; and more open conditions. Wildland-urban interface areas would still be within the range of desired conditions (FW-WUI-DC-3, 4, 6, 7, and G-1). Although intended to reduce the risk of wildfire to surrounding communities and values-at-risk, conditions and activities in the wildland-urban interface could have the positive effect of maintaining habitat for northern goshawks by stimulating seed release, germination, or causing a temporary increase in nutrient availability in the understory, which could benefit goshawk prey species (Satterthwaite et al. 2002). On the other hand, areas with increased disturbance from management activities could degrade habitat through accelerated soil erosion, soil compaction, depletion of the seedbank in the soil, and establishment of non-native species which could collectively degrade portions of prey habitat (Cione et al. 2002). Plants, and prey habitat, could respond negatively or positively to more frequent fire, depending on timing (actively growing, or when carbohydrate reserves are relatively low), frequency, severity, duration, and extent of burning, and how these factors interface with other existing conditions like drought (DeBano et al. 1998). Furthermore, more frequent low-severity ground fires are not the natural fire regime for Mixed Conifer with Infrequent Fire, so the composition and structure of this ERU in wildland-urban interface could shift. The effect of these altered conditions in the wildland-urban interface on northern goshawk habitat is dependent on the site-specific and species-specific interaction of the above-mentioned possible effects and conditions.

Unlike alternative A, alternative B (modified) has the following guideline: “Fire suppression techniques that minimize habitat and disturbance impacts should be used where there are federally listed and Southwestern Region sensitive species, consistent with public and firefighter safety” (FW-WFP-G-9). This is intended to mitigate or eliminate potential impacts to habitat or species that could occur with suppression tactics.

In contrast to alternative A, alternative B (modified) lacks plan language about harvesting conifers less than 9 inches in diameter only within those Mexican spotted owl protected activity centers treated to abate fire risk. This could reduce the area at higher risk of uncharacteristic fire, insects and disease, and density-related tree mortality in the locations where goshawk habitat overlaps with Mexican spotted owl protected activity centers.

Alternative B (modified) does not utilize the concept of vegetation structural stages in the same way as alternative A, e.g., diameter ranges of trees, open versus closed canopy, single-storied or multistory, or specific proportions of VSS classes within nesting areas, post-fledging family areas, and areas outside of post-fledging family areas (foraging areas). Instead, alternative B (modified) describes the habitats used by goshawks in terms of trees of varying age classes (FW-TerrERU-PP-DC-1, FW-TerrERU-MC-All-DC-1), areas of different openness, and single story or multistory conditions, plus there is specific guidance for nesting areas, post-fledging family areas, and foraging areas. For example, at the landscape level, the revised plan promotes a mosaic of tree groups that comprise an uneven-aged forest with all age classes present, including old growth (FW-TerrERU-PP-DC-9). It also promotes trees in structural stages that range from young to old…generally uneven-aged and open...with an arrangement of individual trees and small clumps and groups of trees interspersed with variably sized openings of understory species similar to historic patterns. Openings would range from 10 percent to 70 percent, depending on site productivity (FW-TerrERU-PP-DC-4, FW-TerrERU-MC-MCFF-DC-1, 6, 7). Plan components for Mixed Conifer with Infrequent Fire promote a habitat structure, including structural and seral stages, which is variable and reflective of natural disturbances and historic patterns (FW-TerrERU-MC-MCIF-DC-1, 2, 10). The revised plan allows for variability in patch size, among groups, within groups, interlocking crowns, and tree density within groups (FW-TerrERU-PP-DC-6, 13, FW-TerrERU-MC-MCFF-DC-6, 10, 11, FW-TerrERU-MC-MCIF-DC-4,). In addition, the revised plan emphasizes natural disturbances, tree species composition, and understory composition and structure more than alternative A (FW-TerrERU-P-PDC-2, 3, 7, 10, 11, FW-TerrERU-MC-All-DC-2, 9, 4, 5,8, FW-TerrERU-MC-MCIF-DC-2, 4, 5, 6, 7, 9) and further describes these ERUs at landscape, mid-scale, and fine scale (less than 10 acres). Implementation of these desired conditions would result in habitat conditions that are more resilient to disturbances than those described in alternative A, yet of a habitat complexity and variability that would support a variety of plant and animal species distributed in natural patterns of abundance. Habitat conditions would support nesting and post-fledging habitat for goshawks and food and cover for a variety of prey species.

Unlike alternative A, alternative B (modified) does not specifically mention dispersal post-fledging family area and nest habitat distributed at certain intervals across the landscape. Instead, plan components in alternative B (modified) promote conditions throughout goshawk habitat that would be suitable for immigrating individuals or dispersing young to establish territories. These plan components include trees in mid-aged and older forests with interlocking crowns (grouped and clumped trees) (FW-TerrERU-MC-MCIF-DC-9), variable tree density (varies by ERU), and variable group size and number depending upon age, site productivity, time since disturbance, and seral stages of groups and patches (FW-TerrERU-PP-DC-8, 13; FW-TerrERU-MC-MCFF-DC-6, 7, 10, and 11, FW-TerrERU-MC-MCIF-DC-5 and 6). Conditions may exceed these densities in areas such as steep slopes and canyons, which can be high quality habitat for goshawks or their prey. Plan components in the section on Wildlife, Fish, and Plants also support habitat for immigrating and dispersing individuals by promoting habitat at the appropriate spatial, temporal, compositional and structural levels for a wide variety of species; promoting habitat conditions that provide the resiliency and redundancy necessary for species diversity and metapopulations, and promoting terrestrial ERUS that provide the necessary habitat components for carrying out growth, reproduction, survival, dispersal and other key life cycle needs of associated native species (FW-WFP-DC-1, 2, 3).

Plan language in alternative B (modified) does not require goshawk surveys prior to habitat-modifying activities. However, plan language requires that management activities comply with species conservation agreements, assessments, strategies, or national guidelines; timing restrictions be applied to projects and activities that potentially negatively affect Southwestern Region sensitive species (like goshawks); fire suppression techniques that minimize habitat and disturbance impacts be used where there are Southwestern Region sensitive species, consistent with safety; activities be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species; new road and trails locations be designed to meet species life history requirements, and nest areas and post-fledging family areas be designated in goshawk territories (FW-WFP-G-2, 8, 9, 10, 13, and 14). This plan guidance cannot be applied without knowing the location of goshawk territories, which are determined and validated based on surveys. Surveys will benefit management and the species by identifying where this guidance needs to be applied and where it does not need to be applied.

Alternative B (modified) recommends three wildernesses. Abineau and Strawberry contain suitable habitat for this species: Mixed Conifer Infrequent Fire (347 acres) and Ponderosa Pine (97 acres). About 310 acres of a post-fledging family area overlaps Abineau. Recommended wilderness would be managed to maintain or enhance primitive and undeveloped characteristics; to preserve native species and unique features; to reduce evidence of modern human control and manipulations; and motor vehicle uses should only occur for limited administrative and permitted activities to be consistent with wilderness character (FW- RWild-DC-1, 2, 3, FW- RWild-G-3). This could enhance survival or reproduction through reduced disturbance. Recommended wilderness would not prohibit prescribed or managed wildfires, but could make them more challenging to implement because vehicle use needed to manage fire should be consistent with wilderness character, and depending on site-specific conditions, this may not always be possible. Active vegetative management and vehicle use would be limited or prohibited (vehicle use only) if recommended wildernesses become designated. Designation could restrict the use of vegetative treatments or fire to reach the desired conditions for the ERU and the risk of uncharacteristic fire or insect and disease outbreaks could increase. This could modify the quality or amount of habitat. The magnitude and extent of the effects on species and habitat depends on site-specific circumstances, such as what needs to be restored in these ERUs in recommended wilderness, what tools and access might be needed for restoration, and availability of tools and access. The number of acres of northern goshawk habitat in designated wilderness (40,058 acres) plus those in recommended wilderness (444 acres) totals about 40,502 acres or about 4.6 percent of the estimated goshawk habitat on the forest. This is a fairly small impact to the species and its habitat.

A guideline in alternative B (modified) addresses species-specific threats and rarity better than alternative A. Plan language in alternative B (modified) promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5); provides the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3); and requires that projects and activities be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species … where they are likely to occur (FW-WFP-G-10).

Alternative C

Alternative C is the same as alternative B (modified) except for the following.

It has the same effects as alternative A for the 100- to 300-acre stands of designated old growth. It has the same effects as alternative B (modified) for areas outside these 100- to 300-acre stands, which are managed to have old-growth components distributed throughout the landscape.

Alternative C would have the least disturbance to wildlife habitat of any alternative because of the recommended wilderness areas, areas classified as not-suitable for recreational shooting, and management areas that emphasize reduced disturbance to wildlife habitat. With regard to recommended wilderness areas, alternative C has the same effects as alternative B (modified), except there are 5,092 acres of goshawk habitat in recommended wilderness, compared to 444 acres in alternative B (modified). Of this, 731 acres are in post-fledging areas. The number of acres of northern goshawk habitat in designated wilderness (40,058 acres) plus those in recommended wilderness (5,092 acres) totals about 45,150 acres or about 5 percent of the estimated goshawk habitat on the forest. This is a relatively small impact to the species and its habitat.

Alternative C is the only alternative that has areas designated as not suitable for recreational shooting. The designation of management areas as not suitable for recreational shooting would result in reduced disturbance on nearly 500,000 acres of forest land, most of which is goshawk habitat. These acres do not include areas that might already be excluded from recreational shooting by law. Areas designated as not suitable do not automatically become no recreational shooting areas. Subsequent environmental analysis (including public review and comment) and decisions need to be done to make this official. These areas include designated botanical and geological areas, designated and recommended research natural areas in goshawk habitat as well as the following management areas: Anderson Mesa, Blue Ridge, Hospital Ridge, Jack’s Canyon, Knoll Lake, Limestone Pasture, Long Valley, Pinegrove, Second chance, Walnut, and Flagstaff Neighborwoods.

Alternative C is the only alternative with management areas designed to reduce disturbance to wildlife habitat. Design features to accomplish this would include low-disturbance non-motorized recreational activities; no net increase in the area of motorized dispersed camping corridors; limitations on the roads that provide public motorized access; and a ban on large group recreation events and large commercial tours, except in support of research. These management areas total about 357,707 acres and would emphasize native species including northern goshawks. They include Anderson Mesa, Blue Ridge, Hospital Ridge, Jack’s Canyon, Knoll Lake, Limestone Pasture, Pine Grove, and Second Chance Management Areas. They would reduce human disturbance in those areas where the area is not already protected by or in addition to existing designations such as wild and scenic rivers or inventoried roadless areas.

Alternative D

Alternative D is the same as alternative B (modified) except there is no recommended wilderness.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of northern goshawks, although individuals may be impacted by management activities or permitted uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for northern goshawks, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A because of updated plan guidance for the ERUs, plan objectives that would reduce the coarse filter threat of uncharacteristic fire and facilitate the growth of large trees better than alternative A. These three alternatives remove forest plan barriers to utilizing wildfire for resource benefit in designated wilderness and wildland-urban interface which could improve habitat for northern goshawks and their prey when implemented. Recommended wilderness in alternative B (modified) would slightly increase areas of low disturbance for this species. Alternative C would reduce disturbance to this species the most due to management areas that are not suitable for recreational shooting, management areas managed for reduced disturbance to wildlife, and more acres of northern goshawk habitat in recommended wilderness.

Oak Creek triteleia

Affected Environment

Distribution

The known distribution of Oak Creek triteleia, classified as an Other planning species, includes locations on the forest near Foxboro Lake on Schnebly Hill Road, in West Fork of Oak Creek, as well as near Rocky Park and Munds Park. Oak Creek triteleia is endemic to northern and central Arizona.

Habitat

Oak Creek triteleia occurs in Ponderosa Pine ERU and wetlands and springs.

Risk Factors

Rarity is an inherent threat to this species due to its restricted distribution, which is limited to Arizona. Disturbance to plants is also a risk from management activities, such as vegetation treatments, fire, and road work. The Wildlife and Plant Issues and Topics section above has more detail about At-risk Species and Disturbance to Plants.

Environmental Consequences

Table 107 summarizes the viability analysis for Oak Creek triteleia. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 107. Analysis summary for Oak Creek triteleia

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Oak Creek triteleia (Other) F Rank = F2* Endemic	PP	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M-H Low objective long term: M-H High objective: M-H
	Wetlands	Good**, toward	M-H	Good**, toward	M-H
	Springs	Fair***, slowly toward	H	Fair***, slowly toward	H
Management Effect		PP and Wetlands = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat or habitat elements is maintained or improved by providing protection, maintenance, and restoration to some occurrences. Springs = 4: Decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few.		All ERUs = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area	

*F2 = Rare on the forest within its habitat - occupies a small portion of its habitat

**For analysis, wetland condition and trend are based on total acres of wetlands, which has the effect of giving greater weight to larger wetlands. The condition and trend is fair and slowly toward desired conditions when of individual wetlands is considered, instead of total wetland acres.

***For analysis, springs were considered in fair condition. However, some springs could be in poor or good condition depending on accessibility, protection, or degree of development.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Understory vegetation in Ponderosa Pine ERU is expected to respond favorably to treatment. The shift to more open canopy would improve the abundance and vigor of understory vegetation such as Oak Creek triteleia.

Plan components in all alternatives have plan objectives or management emphasis to improve or restore riparian ecosystems, including wetlands and springs, direction to use best management practices, and would employ either filter strips (alternative A) or aquatic management zones (remaining alternatives) to protect water quality and to avoid detrimental changes in water temperature, chemical composition, sediment deposits, or blockages. These plan components would maintain or improve water conditions and associated habitats. See 1987 Plan, pages 23, 71, 72, 72-1, 172-177; FW-Rip-Wtlnds-O-1, FW-Rip-Spr-O-1, and FW-WFP-O-4, FW-Rip-All-G-3, and FW-Water-G-4. In addition, all alternatives would not allow permanent salt within ¼ mile of the edge of any riparian area except alternatives B (modified), C, and D would broaden this guideline to apply to salts, minerals, and other supplements with the intention to protect sensitive resources from excessive trampling, compaction, salinization, and other impacts (1987 Plan, page 175, FW-Graz-G-5). This would broaden the benefits to this species. Alternative A could allow temporary salting, if it is approved, and would help achieve a specific management objective for enhancement of riparian areas. This could benefit the habitat, but could result in trampling of the vegetation and soil compaction in Oak Creek triteleia locations.

All alternatives address the threat of invasive plants. Invasive plants can increase as a consequence of ground disturbance, and once established, could compete with this species for water and nutrients or could alter the fire regime. All alternatives address the threat of invasive plants by pointing to the Final Environmental Impact Statement for the Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005). This direction includes best management practices, among other guidance, which would help prevent, mitigate, and reduce the threat of invasive plants. All alternatives prioritize treatments, call for incorporating control measures in project planning and implementation, and emphasize coordination with partners (1987 Plan, pages 23, 69, 70, 182, 206-14, 206-76, 206-101, 201-116, FW-Invas-DC-1 through 3, FW Invas G 1-3, FW-Invas-MgtApp, FW-WFP-DC-10, FW-Graz-MgtApp, FW-RdsFac-G-8 ,FW-Rec-Dev-DC-9, FW-Rec-Dev-G-2, FW-TerrERU-Grass-DC-2). Additional information and analysis is discussed under the Non-native or Invasive Species topic in the Wildlife and Plant Topics and Issues section.

One known occurrence of Oak Creek triteleia is in the Red Rock-Secret Mountain Wilderness. Plan language for designated wilderness would contribute to the viability of Oak Creek triteleia in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Alternative A

Table 107 shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine ERU would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term.

Table 107 shows that under alternative A, wetlands would remain in good condition and trend toward desired condition based on total acres of wetlands.

Springs would remain in fair condition and slowly trend toward desired conditions. Accessible, unprotected springs would remain in poor condition, while springs that are inaccessible, protected, or undeveloped would remain in good condition.

As shown in table 107, the likelihood that habitat on the forest would be a limiting factor for Oak Creek triteleia is moderate-high to high. These likelihoods were derived by using the process in table 9 in volume IIa and combining the species' F Rank of F2 with the likelihood of habitat limitation variables for each habitat: PP (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), wetlands (moderate, by acres), and springs (high for fair quality).

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for the PP ERU and wetlands, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives.

Ponderosa pine is mostly managed for Mexican spotted owls or northern goshawks under forestwide direction. Areas managed for Mexican spotted owl PACs and nest/roost characteristics tend to have higher canopy closure than areas outside of these areas. Understory in these areas may be less abundant or vigorous due to the canopy closure. There are 85,975 PAC acres on the forest (nearly 11 percent of Ponderosa Pine). Forest plan direction allow harvest of conifers less than 9 inches in diameter only to abate fire risk in most PACs, which have little effect on canopy cover. Revised Recovery Plan direction for Mexican spotted owl has since revised this. Oak Creek triteleia would be expected to thrive only in more open and partially shaded habitats rather than high canopy closure areas, so plan direction that favors more shaded areas would not be beneficial for this species. Areas outside of those managed for nest/roost characteristics and areas outside of PACs (e.g., restricted areas) could have better habitat for Oak Creek triteleia in areas where natural canopy gap processes occur and natural variation includes small openings. See 1987 Plan, pages 65-2, 65-3, 65-4, 65-5.

Ponderosa pine areas outside of Mexican spotted owl and protected and restricted areas are managed for northern goshawks. Plan direction for northern goshawks would tend to be more favorable for Oak Creek triteleia because Ponderosa Pine would be managed for a mosaic of vegetation densities (overstory and understory); 40 percent of the areas in young forest, seedling/sapling or grass/forb/shrub structure would not have canopy cover guidelines; and there would be more openings. See 1987 Plan, pages 65-7, 65-9, and 65-10.

Additional management direction for ponderosa pine is in Management Area 3 (Ponderosa Pine and Mixed Conifer less than 40 percent slope) and this direction has both positive and negative aspects. Direction to broadcast seed following burns using a high-production multi-growing season species to attain a balanced composition of cool and warm season forage species could have a negative effect on this triteleia due to competition with non-native species that would be a part of this seed mix. However, language to maintain open meadows, eliminate invading overstory vegetation, and stabilize gullies could be beneficial. See 1987 Plan, page 120.

Although ponderosa pine is recognized as being a fire-dependent ecosystem, suppression objectives that are designed to protect wildland-urban interface, minimize suppression costs and provide for personnel safety make the reintroduction of fire into the ecosystem challenging so the ERU and the plants that live in it have a higher risk of being impacted by fire and higher density stands that result from lack of fire. See 1987 Plan, pages 93, 94, 137. This would provide habitat for species such as Oak Creek triteleia.

Plan language for wetlands and springs is primarily in Management Area 12, Riparian and Open Water. Riparian areas include intermittent and perennial streams, wet meadows, marshes, rivers, ponds, lakes, and seeps and springs. Alternative A would maintain or improve wetlands or springs because it has a focus on riparian recovery in general, and on preventing damage to riparian vegetation, and restoring degraded riparian areas to good condition as soon as possible (1987 Plan, pages 65-8, 172, 174). Alternative A has guidance to construct 10 miles of fences per decade for the first two decades where necessary to protect key wet meadows, wetlands, and riparian regeneration from grazing (1987 Plan, page 175). Other protective language includes the following: Only beneficial new special uses are allowed in riparian areas and exceptions such as utility line or roads crossing stream courses are designed to minimize the extent and magnitude of impact to riparian (1987 Plan, page 177). Aggressive fire suppression may be used to prevent resource damage utilizing methods that minimize long-term adverse impacts to riparian habitats (1987 Plan, page 177). In addition, acquisition of riparian areas through land exchange is a high priority (1987 Plan, pages 177 and 185). The plan would manage commercial uses, and recreation in some areas, to protect riparian values (1987 Plan, pages 206-10, 22, 26, and 39). Plan language for the Flagstaff/ Lake Mary Ecosystem Area guides managers to consider road closure or obliteration when there are threatened and damaged riparian areas or roads within wetlands that reduce hydrologic function (1987 Plan, 206-70, 206-71).

Other beneficial plan language would protect wetlands by following Executive Order 11990 to locate roads, skid trails, and decks out of wetlands, would maintain or improve wetland habitat for this species by providing waters for wildlife and livestock away from riparian and meadow communities, and would amend allotment management plans to contribute toward achieving satisfactory riparian condition (1987 Plan, pages 73, 175).

However, plan language in alternative A lacks plan components relative to composition, structure, and function of the different types of riparian areas, to natural disturbances, and to current science. Consequently, this alternative has less potential for improvement to riparian condition compared to the other alternatives.

The management effect rating is classified as a 4 for springs, which means there is a decline in habitat quality as a result of management or lack of management that result from plan components. Plan components may not exist or may be few. Managers do not have clear direction to maintain or restore springs toward desired condition of properly functioning, resilient springs and spring riparian areas when restoring or protecting springs (USDA Forest Service 2016b). Although alternative A lacks objectives for spring restoration, it does not prohibit spring restoration at the project level. Plan language in the FLEA area is beneficial for springs because roads, trails, camping and grazing would be managed to improve watershed condition particularly within springs in the FLEA area and additional outfitter/guide activities or group activities would not be placed in any spring site except in support of approved research and/or to improve safety or provide site rehabilitation however this language does not apply forestwide (1987 Plan, page 206-100, 206-110, 206-116).

Alternative B (modified)

Table 107 shows that Ponderosa Pine ERU and wetlands would have the same condition and trend as alternative A.

Springs would remain in fair condition and slowly trend toward desired conditions, like alternative A.

As shown in table 107, the likelihood that Oak Creek triteleia would be limited by the quality of its habitat on the forest is moderate-high to high, the same as alternative A. These likelihoods were derived by combining these species' F Rank of F2 with the likelihood of habitat limitation variables for each habitat: PP (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), wetlands (moderate, by acres), and springs (high for fair quality) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the coarse filter habitats associated with Oak Creek triteleia. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For PP, this rating is because alternative B (modified) emphasizes ecological conditions and composition, structure, and function of this ERU using current science, in contrast to alternative A (Reynolds et al. 2013). Alternative B (modified) promotes an open uneven-aged structure similar to historic conditions, yet also has provisions for denser areas such as on steep slopes and in canyons (FW-TerrERU-PP-DC-8, 13). The treatment objectives and desired conditions for the PP ERU address the need for restoring the fire regime and canopy conditions toward desired conditions. Implementation of these objectives and removal of restrictions on use of wildfires with resource objectives would lead to more open stand conditions and reduce the risk of uncharacteristic fire on the landscape, reducing the risks of habitat loss for species such as Oak Creek triteleia.

Unlike alternative A, alternative B (modified) does not repeat direction from the Recovery Plan for Mexican Spotted Owls, but instead directs managers to apply habitat management objectives and species protection measures from approved recovery plans (FW-WFP-G-1), reducing the need for forest plan amendments when forest plan direction conflicts with Recovery Plan direction.

For wetlands, the management effect rating of 2 reflects updated desired conditions and guidelines that support wetland composition, structure, and function, connectivity between uplands and aquatic and riparian areas, and the maintenance of habitat for species (FW-Rip-Wtlnds-DC-1, 2, FW-Rip-All-DC-1, 3, 5, FW-Rip-All-G-2, 3, FW-WFP-DC-6). In addition, riparian functional condition would improve faster than alternative A. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1, 2, FW-Water-G-2, FW-Rip-RipType-O-1). More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3, FW-Rip-Strm-G-2) (USDA Forest Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1, 3).

For springs, a management effect rating of 2 is because alternative B (modified) has desired conditions and guidelines to guide spring management on the forest (FW-Rip-Spr-DC-1 to 4 and FW-Rip-Spr-G-1 to 4), whereas these are largely absent in alternative A.

Rarity is a risk for Oak Creek triteleia. Alternative B (modified) has components that address rarity better than alternative A. Forestwide guidance in Wildlife, Fish and Plants provides desired conditions for properly functioning ecosystems and ecologically responsible activities that support native plants and animals (FW-WFP-DC-1) where ERUs provide the habitat components for sensitive and/or endemic species to carry out their life cycle (FW-WFP-DC-3, FW-WFP-G-10). These components are complementary to the components for all ecosystems and all terrestrial ecosystems and provide additional assurance for the viability of these species. Additional information and analysis is discussed under the At-risk topic and the Disturbance (plants) topic in the Wildlife and Plant Topics and Issues section.

Alternative C

The effects to Oak Creek triteleia under alternative C would be the same as alternative B (modified).

Alternative D

The effects to Oak Creek triteleia under alternative D would be the same as alternative B (modified).

Findings

Considering the cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of Oak Creek triteleia, although individuals may be impacted by site-specific activities or uses. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A. Plan components for Ponderosa Pine ERU, wetlands, and springs provide better protection for these habitats and updated plan language for at-risk and rare species.

Pronghorn

Pronghorn are categorized as an Other planning species.

Affected Environment

Pronghorn are a species of high socioeconomic interest and are a game species. There are a number of factors contributing to decline in pronghorn herds across Arizona. Suboptimal habitat quality is a significant factor. Continued urban sprawl and associated highway construction has fragmented and damaged quality pronghorn habitat (the latter continues to cause direct mortality via collision with vehicles). Grasslands historically dependent upon regular fire return intervals have been reduced in size by invasion of juniper and shrub species resulting from decades of fire suppression. Past livestock grazing and historic fencing practices have reduced habitat quality and created barriers that pronghorn cannot maneuver. Finally, persistent drought and predation has impacted pronghorn populations to varying degrees statewide. The combination of these factors has led to a reduction in habitat availability and quality and periodic declines in fawn recruitment.

Distribution

Pronghorns occur in western and central North America. They are distributed throughout Arizona in suitable habitat. They occur on all three ranger districts on the forest.

Habitat

Pronghorn are primarily associated with Great Basin Grassland, Montane Grasslands, and Semi-desert Grassland ERUs. They prefer open habitat and can also be occasionally observed in open ponderosa pine. See Coarse Filter: Habitat for more information about the habitats.

Risk Factors

Disturbance during the fawning season may negatively impact reproduction and fawn survival. Barriers to movement are also a threat, such as improperly designed or located fences.

Environmental Consequences

Table 108 summarizes the viability analysis for pronghorn. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 108. Analysis summary for pronghorn

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Pronghorn (Other) F Rank =F3*	SDG	Poor, away	M-H	Poor, slightly toward	M-H
	GBG	Good, away at short term then Fair, away at long term	Short term: L Long term: M	Low and high objectives: Good, static	L
	MSG	Good, away at short term then Fair, away at long term	Short term: L Long term: M	Good, toward	L
Management Effect		GBG, SDG, and MSG = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

* F3 = Uncommon on the forest within its habitat.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Habitat connectivity is a risk factor to this species that is addressed by all alternatives in several ways. All alternatives would provide for accessible waters, fences that provide easier passage, unroaded landscapes in Deadman Wash, open landscapes, and food and cover in grasslands (1987 Plan, pages 69, 168, 206-50 through 53, 206-87; FW-WFP-G-5, 6; FW-ConstWat-DC-2, MA-PntdDsrt-DC-2). Increased and improved habitat connectivity would positively impact the movement of this species across the landscape will enhance the survival and reproduction of this species and contribute to its. Addition information on how all of these alternatives address connectivity is discussed in greater detail in the Wildlife and Plants Issues and Topics section.

Alternative A

Table 108 shows that Semi-desert Grasslands would remain in poor condition and trend away from desired conditions due to continued increases in shrubs and trees and increased fragmentation from urbanization.

Great Basin Grasslands ERU would remain in good condition, but would trend away from desired conditions in the short term, as trees and shrubs encroach from the periphery due to lack of fire in adjacent ERUs. This would continue to increase and understory would decrease in abundance and vigor. In the long term, the Great Basin Grassland ERU would be in fair condition and continue trending away from desired conditions.

The Montane/Subalpine Grasslands ERU would remain in good condition in the short term, but move to fair condition in the long term, and continue trending away from desired conditions due to an increase in tree and shrub establishment, especially along the periphery due to a continued lack of fire's natural role in the ecosystem.

As shown in table 108, the likelihood that pronghorn would be limited by habitat quality in Semi-desert Grassland is low to moderate-high. These likelihoods were derived by combining this species' F Ranks of F3 with the likelihood of habitat limitation variables for each ERU: Semi-desert Grassland (high), Great Basin Grassland (low in short term, moderate in long term), and Montane/Subalpine Grasslands (low in short term, moderate in long term) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for the Semi-desert Grassland, Great Basin Grassland, Montane/Subalpine Grasslands habitats in this group, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives. This is primarily because alternative A does not distinguish between the different grassland types which differ from each other in terms of precipitation patterns, composition, soil types, elevation, and structure. In the older sections of the current plan, guidance for composition is focused on a balanced composition of cool and warm season grasses. More recently amended sections of the plan, such as in the Flagstaff-Lake Mary Ecosystem Area, have a more ecological approach to composition by promoting diverse healthy populations of native plants and animals with a natural variety of plant species, age classes, and structures but this guidance is limited to the FLEA analysis area and does not apply forestwide.

Alternative A lacks plan components that would impose seasonal timing restrictions to reduce disturbance during the fawning season; however, there is an existing forest order (Order No. 04-00-146) that prohibits vehicles between April 15 and June 27 on Anderson Mesa during the pronghorn fawning season.

Still, alternative A promotes the acquisition of private land in the Savannah Management Area to reduce habitat fragmentation and to improve pronghorn and grassland species habitat (1987 Plan, page 206-50) and it has other beneficial plan components as described under All Alternatives. It also reminds managers to work with the Arizona Game and Fish Department on hunting regulations in Management Unit 6B to protect and enhance the pronghorn population.

Alternative B (modified)

Table 108 shows that like alternative A, Semi-desert Grassland ERU would remain in poor condition but unlike alternative A, this ERU would trend slightly toward desired conditions due to plan objectives that would restore or improve at least 3,500 acres of Semi-desert Grassland ERU during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-1). The plan objective would remove tree and shrub cover and create more open conditions. Increased fragmentation from urbanization would be expected to continue.

Great Basin Grasslands ERU would be in good condition (like alternative A), and the trend would improve to static relative to desired condition due to a plan objective that would restore or improve 10,800 to 12,400 acres of Great Basin Grasslands during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-2).

The condition and trend of Montane/Subalpine Grasslands ERU would improve to good with a trend toward desired conditions due to a plan objective that would restore or improve 7,600 to 11,400 acres of Montane/Subalpine Grasslands during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-3).

As shown in table 108, the likelihood that these species would be limited by habitat quality is low to moderate-high. These likelihoods were derived by combining this species' F Ranks of F3 with the likelihood of habitat limitation variables for each ERU: Semi-desert Grassland (high), Great Basin Grassland (low), and Montane/Subalpine Grasslands (low) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effects are classified as a 2, which means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. This rating is due to this alternative distinguishing between the grassland habitats on the forest and containing explicit and updated direction on the composition, structure, and processes for these ERUs (FW-TerrERU-Grass-DC-4 and 8), compared to alternative A which has a more forage-based approach. Plan components are discussed further below and in the Coarse Filter: Habitat section by ERU.

Under the updated plan direction, there is an overall emphasis on ecological conditions which would support a variety of species; properly functioning ecosystems, and restoration of desired disturbance regimes (FW-Eco-DC-1, 2). This direction would lead to decreases in tree and shrub establishment and a corresponding increase in the distribution and abundance of herbaceous species is anticipated in all of these ERUs primarily due to increased treatment levels. Alternative B (modified) provides plan components to promote properly functioning and resilient ecosystems, promote characteristic disturbances, reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems thereby furthering sustainability and adaptability (FW-Eco-DC-1, 2, 3, 4, FW-TerrERU-All-DC-2). ERU specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-Grass-DC-1 through 5, 7, 8, 9, FW-TerrERU-Grass-G-2). These plan components provide better direction for the grassland habitats and species that use them,

Alternative B (modified) contributes more to the viability of this species through forestwide timing restrictions (absent in alternative A), desired conditions for the Anderson Mesa pronghorn herd (which periodically has had declines), and forestwide language to design new road and trail locations to maintain species habitats, species access, and species life history requirements. See FW-WFP-G-8 and 13, and MA-AMesa-DC-3. The forestwide language is absent in alternative A.

About 2,459 acres of pronghorn habitat is included in recommended wilderness in alternative B (modified). Recommended wilderness would promote a low disturbance setting for pronghorn by emphasizing non-motorized and non-mechanized activities on new trails, limited motor vehicle use, not expanding existing structures (SA-RWild-G-1, 2, 3, and 5). However, recommended wilderness could limit restoration of grassland habitat in these areas if motorized equipment is needed for treatments.

Alternative B (modified) draws attention to collaborative management with a management approach for all grassland ERUs reminding managers to work with the Arizona Game and Fish Department and the Fish and Wildlife Service on objectives for wildlife conservation, and habitat restoration and improvements particularly regarding grassland species such as pronghorn.

Mechanized use in botanical and geological areas is not suitable in this alternative except on trails designated for this use. There is a very small amount of pronghorn habitat in botanical and geological areas (a little over 300 acres), therefore, this would be a negligible impact to pronghorn and their habitat.

Alternative B (modified) is less prescriptive than alternative A, and as a result, it should allow management to be more responsive to site-specific needs and changing conditions over time. This would better allow the forest to practice adaptive management and to more effectively cope with a changing climate.

Alternative C

Alternative C has the same effects as alternative B (modified), except there are 14,374 acres of pronghorn habitat in recommended wilderness. This would result in more acres that promote a low disturbance setting for pronghorn by emphasizing non-motorized and non-mechanized activities on new trails, limited motor vehicle use, not expanding existing structures (SA-RWild-G-1, 2, 3, and 5). However, it would also result in more acres restoration of grassland habitat could be limited if motorized equipment is needed for treatments.

Alternative C is the only alternative with management areas designed to reduce human-related disturbance. These management areas contain almost 65,000 acres of grasslands and would emphasize native species including pronghorn. They include Anderson Mesa, Blue Ridge, Hospital Ridge, Jack’s Canyon, Knoll Lake, Limestone Pasture, Pine Grove, and Second Chance Management Areas. Plan components designed to reduce human-related disturbance would include emphasis on low-disturbance non-motorized recreational activities; no net increase in the area of motorized dispersed camping corridors; limitations on the roads that provide public motorized access; and a ban on large group recreation events and large commercial tours, except in support of research. These components would result in reduced human-related disturbance in those areas where the area is not already protected by existing designations, such as inventoried roadless areas.

Alternative D

Alternative D is the same as alternative B (modified) except alternative D would recommend no new wilderness area. The effects associated with managing those areas as recommended wilderness would not occur. These areas would still be managed by the other forestwide, management area, and special area direction in alternative B (modified) with the corresponding effects discussed above in the alternative B (modified) section.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of pronghorn, although individuals may be impacted by site-specific activities or uses. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A, because plan components account for the different types of grasslands on the forest, have updated guidance, and account for connectivity on a forestwide basis rather than in site-specific areas. Plan components in these three alternatives boost protections such as timing restrictions and encourage fence designs and road placement that promote unobstructed movement of pronghorns. These alternatives also have treatment objectives for all three grasslands, which result in improving trends, whereas alternative A lacks specific objectives for addressing grassland restoration and habitat fragmentation throughout pronghorn habitat.

Rusby's milkvetch

Affected Environment

Rusby's milkvetch is a Southwestern Region sensitive species.

Distribution

Rusby's milkvetch is a narrow endemic but plentiful throughout its range, which is limited to the San Francisco Volcanic field northwest and west of Flagstaff, Arizona. Rusby's milkvetch is a member of the large and diverse genus *Astragalus,* which contains many endemic species throughout its range.

Habitat

Habitats for Rusby's milkvetch include aspen groves, mixed conifer, ponderosa pine/Arizona fescue, and ponderosa pine/gambel oak sites in dry or temporarily moist basaltic soils. It occurs in the Ponderosa Pine, Montane/Subalpine Grasslands, Mixed Conifer Frequent Fire, and Mixed Conifer Infrequent Fire ERUs and in aspen. Aspen occurs in all of these ERUs and is addressed as a sub-ERU along with maple.

Risk Factors

The threats to the species are rarity and disturbance to plants and their habitat from management activities.

Environmental Consequences

Table 109 summarizes the viability analysis for Rusby's milkvetch. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that these species are limited by their habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 109. Analysis summary for Rusby's milkvetch

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Rusby's milkvetch (Sensitive) F Rank = F3*	PP	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
	MSG	Fair, away at short term then Fair, away at long term	Short term: L Long term: M	Good, toward	L
	MCFF	Fair, toward at short term then Fair, static at long term	M	Low objective: Fair, toward at short term then Fair, static at long term High objective: Good, toward at short term then Good, static at long term	Low objective: M High objective: L
	MCIF	Fair, away at short term then Poor, away at long term	Short term: M Long term: M-H	Fair, static	M
	Aspen	Poor, away	M-H	Poor, away	M-H

Management Effect	All habitats = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.	All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

*F3 = Uncommon on the forest within its habitat

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

All alternatives address the threat of invasive plants. Invasive plants can increase as a consequence of ground disturbance, and once established, could compete with Rusby's milkvetch for water and nutrients or could alter the fire regime. All alternatives address the threat of invasive plants by pointing to the Final Environmental Impact Statement for the Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005). This direction includes best management practices, among other guidance, which would help prevent, mitigate, and reduce the threat of invasive plants. All alternatives prioritize treatments, call for incorporating control measures in project planning and implementation, and emphasize coordination with partners (1987 Plan, pages 23, 69, 70, 182, 206-14, 206-76, 206-101, 201-116; FW-Invas-DC-1, 2, 3, FW-Invas-G-1, 2, 3, FW-Invas-MgtApp, FW-WFP-DC-10, FW-TerrERU-IC-DC-3, FW-Graz-MgtApp, FW-RdsFac-G-8 ,FW-Rec-Dev-DC-9, FW-Rec-Dev-G-2, FW-Rip-Spr-G-3, FW-TerrERU-Grass-DC-2). More detailed analysis is in the Wildlife and Plant Issues and Topic section called Non-native Species and Disease.

All alternatives provide guidance for the management of aspen, which is an early seral species in Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs. The intent of the guidance for all alternatives is similar (1987 Plan, pages 117, 118, 124-1, 129, 131, 141 to 144; FW-TerrERU-AspMpl-DC-1 to 3, FW-TerrERU-AspMpl-G-1). However, due to low commercial value and past fire suppression, the total number of acres covered and recruitment of new stands are thought to be reduced compared to historical coverage. An accelerated aspen decline on the Coconino NF was documented between 2003 and 2007, due to a combination of a significant frost event, long-term drought, and bouts of defoliation from western tent caterpillar. This has resulted in decline in aspen in all of the forested ERUs in the range of Rusby's milkvetch. The declines in aspen have not necessarily directly led to declines in Rusby's milkvetch. Instead, Rusby's milkvetch plants are sometimes observed growing directly next to dead or dying aspen.

Rusby's milkvetch occurs in the Kachina Peaks Wilderness. Plan language for designated wilderness would contribute to the viability of this species in all alternatives. For example, ecosystems would be functioning properly and would support a natural assemblage of native species indigenous to the wilderness area; management activities and permitted uses should be designed to maintain or move toward desired conditions for wilderness and other resources, and use levels should be managed to prevent wilderness values from being compromised (1987 Plan, pages 105, 108-1 to 108-4; SA-Wild-DC-2, 3, SA-Wild-G-1, 2).

Rusby's milkvetch occurs in Fern Mountain Botanical Area, which is managed as a Special Area in all alternatives (1987 Plan, pages 82, 193 to 196; SA-RNABotGeo-DC-5, SA-RNABotGeo-DC-6, SA-RNABotGeo-G-1, SA-RNABotGeo-G-3). This is an additional layer of protection for the species. The plan direction for all alternatives is similar but more flexible in alternatives B (modified), C and D. Law, policy and manual direction would apply to all alternatives.

Rusby's milkvetch grows on the volcanic soil of the San Francisco volcanic field, so it is dependent on a specific soil type. Plan language under all alternatives directs implementing site-specific best management practices for ground-disturbing projects (1987 Plan, page 71, FW-Soil-G-1, 2, and 3). Implementation of this direction would avoid or limit ground-disturbing activities that could cause loss of protective vegetative ground cover, and detrimental soil disturbance including compaction or soils with high burn severity and sensitive soils with moderate or severe erosion hazard and calcareous soils that have high wind erodibility when exposed. Where such disturbances cannot be avoided, project-specific best management practices should be developed. Finally, specific project design features would be required on projects occurring on slopes greater than 40 percent grade, where soils with moderate or severe erosion hazard ratings occur, or where soils are sensitive to degradation when disturbed.

Alternative A

Table 109 shows that at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn), Ponderosa Pine ERU would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term. The distribution and diversity of understory vegetation are expected to increase where open stands are created, such as in areas treated for restoration.

Montane/Subalpine Grasslands would remain in good condition with a trend away from desired conditions in the short term. In the long term, vegetation quality would be in fair condition and trend away from desired conditions. This decline is attributed to an increase in tree and shrub establishment, especially along the periphery due to a continued lack of fire’s natural role in the ecosystem. There would be a corresponding decline in herbaceous species.

Table 109 shows that Mixed Conifer with Frequent Fire would remain in fair condition and trend toward desired conditions in the short term. In the long term, the trend would become static as treatment levels would not be able to keep up with growth and regeneration; seedlings and saplings would make gains through excess regeneration where openings are created and medium and large trees would lose ground in open stands as canopy gaps are filled in.

Mixed Conifer with Infrequent Fire would remain in fair condition and continue trending away from desired conditions in the short term due contradictory direct related to the management of wildfires in wilderness areas. In the long term, the condition would become poor and the trend would continue to move away from desired conditions.

Aspen would remain in poor condition trending away from desired condition in all alternatives.

As shown in table 109, the likelihood that Rusby’s milkvetch would be limited by habitat quality is low-moderate to moderate-high depending on the habitat. These likelihoods were derived by combining Rusby’s milkvetch F Rank of F3 with the likelihood of habitat limitation variables for each habitat: Montane/Subalpine Grasslands (low in short term, moderate in long term), PP (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), Mixed Conifer with Frequent Fire (moderate), Mixed Conifer with Infrequent Fire (moderate in short term, high in long term), Aspen (high) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for Ponderosa Pine, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives. This is primarily because alternative A provides outdated direction for ponderosa pine. This outdated direction emphasizes timber production for most of the ponderosa pine forest (MA 3) rather than composition, structure, and natural processes as in the desired conditions. Fire is mentioned in the context of wildfires with acknowledgement of natural regeneration.

In the Ponderosa Pine ERU, alternative A provides direction that allows for a variety of stand conditions across the landscape, while mimicking natural disturbance patterns that result in irregular tree groups and canopy gaps. This would provide habitat for species such as Rusby's milkvetch.

The Ponderosa Pine ERU is recognized as being a fire-dependent ecosystem, but suppression objectives that are designed to protect wildland-urban interface, minimize suppression costs, and provide for personnel safety make the reintroduction of fire into the ecosystem challenging, so the ERU and the plants that live in it have a higher risk of being impacted by fire.

Table 109 shows that the management effect Montane/Subalpine Grasslands in alternative A is a 3, which means that the current plan has plan components that maintain or improve protection and management for some habitat occurrences in the plan area. Alternative A does not distinguish between the different grassland types, which differ in terms of precipitation patterns, composition, soil types, elevation, and structure. In the older sections of the current plan, guidance for composition is focused on a balanced composition of cool and warm season grasses. More recently amended sections of the plan, such as in the Flagstaff-Lake Mary Ecosystem Area, have a more ecological approach to composition by promoting diverse healthy populations of native plants and animals with a natural variety of plant species, age classes, and structures, but this guidance is limited to the FLEA analysis area and does not apply forestwide.

The management effect for mixed conifer in alternative A is a 3, which means the current plan has plan components that maintain or improve protection and management for some habitat occurrences in the plan area.

Alternative A does not provide clear distinction between the mixed conifer vegetation types on the forest. Most mixed conifer is included in MA 3 (Ponderosa Pine and Mixed Conifer less than 40 percent slopes) and (MA 4- Ponderosa Pine and Mixed Conifer greater than 40 percent slopes). Direction for management of Mixed Conifer with Frequent Fire or Mixed Conifer with Infrequent Fire ERUs would be included in one or more management areas and would not address the unique structure or composition of these areas.

The management effect for aspen in alternative A is a 3, because the current plan has plan components maintain or improve protection and management for some habitat occurrences in the plan area. Alternative A provides guidance for the management of aspen (1987 Plan, pages 141 to 144), recognizing the need for regeneration and protection from excessive herbivory. Aspen that were protected by the various tools provided in alternative A were expected to regenerate successfully, while those areas not treated would continue to decline and eventually fade from the landscape. Aspen sustainability on the forest was influenced by budget, Forest Service capacity, volunteer effort, and stand vigor. Some aspen stands have been subject to drought, insect defoliators, excessive browsing, and altered fire regimes that have exceeded the capacity of the root reserves to maintain stand vigor. This has resulted in widespread decline of aspen across the forest.

Alternative B (modified)

Table 109 shows that Ponderosa Pine ERU would have the same condition and trend as alternative A. Montane/Subalpine Grasslands would improve to good condition with a trend toward desired condition.

Like alternative A, under the low treatment objectives (2,900 acres mechanical, 8,000 acres prescribed fire) Mixed Conifer with Frequent Fire ERU would remain in fair condition with a trend toward desired conditions in the short term, then move to fair condition with a static trend relative to desired conditions in the long term. Under the high treatment objectives (15,000 acres mechanical, 8,000 acres prescribed fire), Mixed Conifer with Frequent Fire ERU would improve to good condition with a trend toward desired conditions in the short term, then move to good condition with a static trend relative to desired conditions in the long term.

The Mixed Conifer with Infrequent Fire ERU would remain in fair condition, but the trend would improve to static. Like alternative A, Aspen would remain in poor condition with a trend away from desired conditions.

As shown in table 109, the likelihood that Rusby's milkvetch would be limited by habitat quality is low to moderate, depending on the habitat. These likelihoods were derived by combining Rusby's milkvetch F Rank of F3 with the likelihood of habitat limitation variables for each habitat: Montane/Subalpine Grasslands (low), Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective), Mixed Conifer with Frequent Fire (moderate under the low treatment objective, low under the high treatment objective), Mixed Conifer with Infrequent Fire (moderate), and Aspen (high) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all habitats.

In alternative B (modified), increased treatment objectives in the Ponderosa Pine ERU address the need for ecological restoration that addresses both the shift in canopy conditions away from desired conditions. Implementation of these objectives and removal of restrictions on use of wildfires with resource objectives in wildland-urban interface and other areas would also reduce the risk of uncharacteristic fire on the landscape.

Rarity is a risk for these species. Alternative B (modified) has components that address rarity better than alternative A. This is due to more forestwide guidance to address rare habitats and species. This is discussed in the At-risk section under Wildlife and Plant Issues and Topics. In contrast to alternative A, alternative B (modified) has language that better addresses species-specific threats and better provides for habitat for species with restricted ranges and distribution: i.e., rarity. Plan language in alternative B (modified) promotes habitat conditions that would provide microsites and refugia for species with restricted ranges (FW-WFP-DC-5) and would provide the resiliency and redundancy necessary to maintain species diversity and metapopulations (FW-WFP-DC-3). Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur (FW-WFP-G-10).

Alternative B (modified) addresses disturbance to plants and their habitat better than alternative A for these species. Although all alternatives provide mitigations for effects to these species from management actions, the mitigations are stronger in alternative B (modified). Disturbance to Plants and At-risk species are further addressed in the Wildlife and Plant Issues and Topics section above.

Alternative B (modified) distinguishes between different grassland types on the forest and provides updated and improved plan direction that would guide future projects. Alternative B (modified) provides plan components to promote properly functioning and resilient ecosystems, promote characteristic disturbances, reduce the threat of uncharacteristic disturbances, and promote balance between desirable non-native species and subspecies and properly functioning ecosystems, thereby, furthering sustainability and adaptability (FW-Eco-DC-1, 2, 3, 4, FW-TerrERU-All-DC-2). ERU-specific direction would provide for a variety of native species with varying seral stages in natural patterns of abundance and distribution that support natural disturbances (FW-TerrERU-Grass-DC-1 through 5, 7, 8, 9, FW-TerrERU-Grass-G-2). These plan components provide better direction for the grassland habitats and species that use them, including Rusby's milkvetch

Alternative B (modified) describes these forest types and provides guidance for each type. FW-TerrERU-MC-MCFF-DC-1 and 4 and FW-TerrERU-MC-MCIF-DC 4 provide for vegetative ground cover, recognizing its function in controlling erosion and contributions to nutrient cycling while recognizing the various structural stages of vegetation including small forest openings that provide habitat for plants, such as Rusby's milkvetch.

Alternative B (modified) is similar to alternative A in that it provides guidance for the management of aspen (FW-TerrERU-AspMpl-DC 1 to 3 and FW-TerrERU-AspMpl-G-1). The intent of the guidance is that aspen regeneration should be promoted and protected from excessive herbivory from livestock or wildlife. Alternative B (modified) emphasizes that aspen extent and location may shift over time, depending on human and natural disturbances more so than alternative A (FW-TerrERU-AspMpl-DC-2).

Alternative B (modified) does not emphasize or prescribe the tools that could be used, but instead, it describes desired conditions. Individual projects would determine what techniques would be needed in site-specific locations. Unlike alternative A, alternative B (modified) permits the use of wildfire for resource benefits in the wildland-urban interface, which could allow for maintenance and promotion of aspen in those locations.

Alternative B (modified) has a desired condition that describes characteristics of older aspen as including old trees, snags, coarse woody debris, and logs and that the amounts of these characteristics and tree density vary depending on microsite, time since disturbance and age of the stand (FW-TerrERU-AspMpl-DC-3). This desired condition also specifies that aspen snags greater than 12 inches d.b.h. are a well-distributed component. The management effect for alternative B (modified) is a 2, because this alternative includes plan components that maintain or improve protection and management for most habitat occurrences in the plan area.

Soil desired conditions would promote proper functioning soils, soil protection and stabilization, and nutrient cycling (FW-Soil-DC-1 to 4). Forestwide soil guidelines would avoid excessive ground disturbance and limit accelerated erosion (FW-Soil-G-1 to 3). This would help to protect the volcanic soils needed for Rusby's milkvetch.

There are no occurrences of Rusby's milkvetch in recommended wilderness.

Alternative C

Alternative C is the same as alternative B (modified). There are no occurrences of Rusby's milkvetch in recommended wilderness.

Alternative D

Alternative D is the same as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants, and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of the Rusby's milkvetch, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for Rusby's milkvetch, which is a Forest Service sensitive species. All alternatives provide plan components that address the threat of disturbance from human activities by protecting habitats for sensitive and rare and endemic species. Furthermore, all alternatives, particularly alternatives B (modified), C, and D, would also improve ponderosa pine forests for the Rusby's milkvetch.

Southwestern myotis

Affected Environment

The southwestern myotis bat is classified as an Other planning species.

Distribution

Southwestern myotis range spans from extreme southeastern California through central and eastern Arizona into New Mexico, southward through extreme West Texas into Chihuahua and other parts of Mexico. In Arizona, most records of southwestern myotis are from the Mogollon Rim from Alpine northwest to near Flagstaff, including Mingus Mountain, Verde Valley, Sierra Ancha Mountains, and the Pinal Mountains (AZGFD 2003a).

Habitat

Southwestern myotis are found in ponderosa pine forests, typically near water. They are most common at higher elevations between 6,000 and 9,200 feet; however, they have been found at much lower elevations near permanent waterways, including the Verde River (AZGFD 2003a). Southwestern myotis roosts in Gambel oak cavities and caves. There are approximately 303,450 acres of potentially suitable habitat on the forest, not including caves.

Risk Factors

The main risk factors to southwestern myotis are disease and disturbance to active maternity or winter roosts in caves, and there are localized impacts from recreational caving and vegetation treatments that remove medium to large oaks with cavities.

Environmental Consequences

Table 110 summarizes the viability analysis for southwestern myotis. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 110. Analysis summary for southwestern myotis

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	**Likelihood species is limited**	**Habitat condition and trend relative to desired conditions**	**Likelihood species is limited**
Southwestern myotis (Other) F Rank =F3*	Medium to large Gambel oak in PP	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
	Caves (Assuming Moderate)	Fair, static	M	Fair, static	M
Management Effect		All habitats = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F3 = Uncommon on the forest within its habitat.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

All alternatives would protect caves and areas immediately adjacent from unnatural disturbances such as seismic disturbances and drilling. All alternatives would evaluate or utilize a 300-foot buffer around caves to protect cave and karst resources and ecology, and visitor impacts would be managed to maintain the values of significant caves (1987 Plan, page 51-2, FW-BioPhys-Geo-G-2).

Alternative A includes several guidelines that would restrict controlled source seismic surveys requiring explosives or other disruptive techniques from being conducted over or close enough to known caves to create unnatural disturbances. Cave microclimates, hydrology, and entrance vegetation would be maintained to protect long-term cave ecology. (1987 Plan, page 51-2). Significant caves would be monitored to determine visitor impacts and the conditions of key resources. (1987 Plan, page 51-1). Drilling is not allowed over known caves or within a suitable buffer (1987 Plan, page 51-2).

Alternatives B (modified), C, and D include a guideline to protect previously undiscovered caves that are encountered above the zone of saturation for the regional water aquifer during drilling operations, by requiring precautions to be taken to protect the cave, including sealing the casing above and below the cave to prevent airflow and water leakage to maintain sensitive ecosystem conditions (FW-BioPhys-Geo-G-3). Another guideline requires blasting and/or controlled-source seismic surveys requiring explosives or other disruptive techniques to avoid, where possible, or minimize damage to cave features, condition, and function. The purpose is to maintain the chemical, physical, and biological conditions of the cave (FW-BioPhys-Geo-G-4). These alternatives also include a standard that requires that caves that have been designated or nominated as significant caves to be managed to perpetuate those features, characteristics, values, or opportunities for which they were designated (FW-BioPhys-Geo-S-1)

Collectively, these plan components would maintain the microclimate, airflow, chemical, physical, and biological conditions within the cave necessary for bat roosting, overwintering, reproduction and survival under all alternatives.

Ponderosa Pine occurs in five seasonal closure areas: Nordic Ski Center (160 acres), Pine Grove (12,805 acres), Rattlesnake (5,288 acres), Woods (7,603 acres), and Woody Ridge (4,913 acres). These areas are closed seasonally to provide cross country skiing opportunities without motorized vehicles, undisturbed habitat for the protection of rare wildlife and to minimize disturbance to wildlife and big game winter habitat (1987 Plan, pages 59, 167; Off-Road Driving Management Plan associated with 1987 Plan, page 206-114; MA-Peaks-DC-6 and S-2;, MA-VerdeV-DC-7 and S-1; MA-PineBelt- DC-5, 6, 7, 8 and S-1, 2,3,4;, and MA-LkMary-DC-4 and S-1). These closures directly and indirectly create low-disturbance areas for wildlife during the closure time periods which can facilitate reproduction and survival.

Alternative A

Table 110 shows that the Ponderosa Pine ERU (including medium to large Gambel oak) at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn) would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term. The distribution and diversity of understory vegetation are expected to increase where open stands are created, such as in areas treated for restoration. The shift to more open canopy under all alternatives would improve the abundance and vigor of understory vegetation and conditions for Gambel oak.

Generally, caves would remain in fair condition with a static trend related to desired conditions. However, caves that are inaccessible and rarely visited would be in good condition, while caves that are accessible and receive a high level of visitation would be in poor condition.

As shown in table 110, the likelihood that this species would be limited by habitat quality is low-moderate to moderate. These likelihoods were derived by combining this species' F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective) and caves (moderate, assuming fair condition) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect rows show the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for the Ponderosa Pine ERU and caves, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area and thus contribute less to the viability of this species than the other alternatives.

For the Ponderosa Pine ERU, this is primarily because portions of the 1987 Plan manage Gambel oak for firewood and wildlife habitat with detailed silvicultural prescriptions. The emphasis on firewood would not be beneficial for this species because the human population has increased so much since the plan was written, oak is harder to find, and signs of theft are common in certain areas of the forest. Beneficial guidelines include snag retention and rotation age of 240 to 360 years (for large oaks) (1987 Plan, page 131). Gambel oak would be maintained for vegetation diversity and/or mast production in Management Areas 6 and 7 (1987 Plan, pages 147 and 152). Old growth would be managed in 100- to 300-acre stands with specific tree density, snag, and downed log specifications (1987 Plan, pages 70-2, 151, 152, and 157). This would not be beneficial for this species in the short term because 100- to 300-acre stands would not be consistent with the frequent fire low-severity fire regime typical of Ponderosa Pine and this size of stand does not reflect current science (See Vegetation and Fire Report). Consequently, southwestern myotis habitat within these stands would be increasingly vulnerable to habitat loss resulting from uncharacteristic fire.

Plan objectives in Ponderosa Pine would be beneficial for this species because treated areas would move toward more open conditions which would increase the vigor of Gambel oak, and consequently, improve the quality of roost sites.

Plan language that limits the use of wildfires managed for resource objectives in wilderness and in wildland-urban interface would not be beneficial for southwestern myotis because they occur in Ponderosa Pine, which is a fire-adapted ecosystem. This language eliminates one management tool that could maintain openness that favors Gambel oak in southwestern myotis habitat.

As described under Coarse Filter: Habitat, ponderosa pine is also found within geological areas, research natural areas, designated wilderness, and environmental study areas. Direction for geological areas and research natural areas is found in Management Area 17. Standards and guidelines would maintain and protect habitat for this species due to emphasis on ecological condition, requiring allotment management plans to have provisions to protect ecological conditions, prohibiting timber harvest and fuelwood harvest, restricting special use permits that would have a negative impact on the uniqueness of special areas, and preventing motor vehicle intrusions (1987 Plan, pages 195 and 196).

In addition to restrictions on motorized and mechanized use, direction for designated wilderness is found in Management Area 1. In the Munds Mountain, Red Rock-Secret Mountain, and a portion of the Sycamore Wildernesses, plan direction would expand the opportunities for wilderness day hiking by creating more trail loops. This could create disturbance for this species during critical time periods if the trails are adjacent to roosts. Consolidating multiple trails in West Fork (Red Rock-Secret Mountain) into one primary trail could reduce disturbance from high recreation use to some roosts. The prohibition of camping outside of designated camp spots and of recreation fires in West Fork could reduce the potential for uncharacteristic fire in species habitat in this area (1987 Plan, page 108-2).

Direction for Environmental Study Areas (Management Area 18) generally promotes use of these areas for school groups and protection of the resources within them. Use is primarily day-use. Resource protection such as reducing the potential for uncharacteristic fire, and fencing or signing to protect soil, riparian or vegetative resources would generally be beneficial by maintaining or protecting habitat (1987 Plan, pages 198 and 199).

For caves, alternative A includes particularly beneficial plan components for cave-dwelling species, such as conserving wildlife habitat provided by caves; preventing contamination of water draining into, issue from or are contained within caves, and protecting cave resources (1987 Plan, page 22, 51-2). Caves used or recently used by bat populations would be managed to maintain or enhance these populations (1987 Plan, page 51-1). This could include implementing timing restrictions or installing bat gates to reduce disturbance during key portions of their life cycle (maternity, wintering).Alternative A also has standards and guidelines to examine activities near or within cave areas for potential impacts to caves and karst features including adding nutrients or other chemicals (including pesticides which could impact bats or their prey (1987 Plan, page 51-2).

There is no language that explicitly addresses disease. White-nose syndrome (*Pseudogymnoascus destructans)* is a concern, because it is a fungus that has killed millions of bats. It has not yet been detected in Arizona, but has been detected in bat species whose ranges include Arizona.

Alternative B (modified)

Table 110 shows that the Ponderosa Pine ERU and caves would have the same condition and trend as alternative A.

As shown in table 110, the likelihood that this species would be limited by habitat quality is low-moderate to moderate, the same as alternative A. These likelihoods were derived by combining this species' F Rank of F3 with the likelihood of habitat limitation variables for each habitat: PP Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective) and caves (moderate, assuming fair condition) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat.

The management effect is classified as a 2 for all the habitats in this group, which means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area. For the Ponderosa Pine ERU, this rating is due to this alternative containing explicit and updated direction on the composition, structure, and processes of this ERU based on current science. Plan components include direction on management for large Gambel oak trees and snags.

There is improved guidance for Gambel oak in this alternative, compared to alternative A. Desired conditions in Ponderosa Pine ERU emphasize Gambel oak, a roost tree used by this species, as well distributed and provide for sustainability by promoting all sizes and ages of oak trees in natural patterns of abundance and density. Specifically beneficial desired conditions discuss the size and distribution of large oak snags (FW-TerrERU-PP-DC-5 and 7). Moderate to large live oak trees with dead limbs, hollow boles, and cavities would provide shelter and habitat for a variety of wildlife species, including the southwestern myotis. A Ponderosa Pine ERU guideline would manage for Gambel oak trees and snags to be sustained over time (FW-TerrERU-PP-G-4).

For caves, this management effect rating is due to this alternative containing explicit and updated direction related to maintaining the integrity and function of these biophysical features and the specialized habitat they provide. Some particularly beneficial plan components for cave-dwelling species include desired conditions in the section on Geological Features that would provide habitat for species that require specialized niches for roosting and overwintering and disease within natural levels. Other desired conditions promote protection and maintenance of subterranean microclimate and ecology, disease within natural levels, and promotes quantity and quality of water within and entering caves within the natural range of variability. See FW-BioPhys-Geo-DC-2, 3, 4 and G-8. Beneficial guidelines include maintenance and protection of the chemical, physical, and biological conditions of cave resources and protection of endemic cave species (FW-BioPhys-Geo-G-2, 4, and 7). Guidelines also promote management of caves to prevent disturbance, spread of disease, and the use of wildlife-friendly gates that meet Bat Conservation International recommendations (FW-BioPhys-Geo-G- 5 and 6).

Guidelines in the Wildlife, Fish, and Plant section would protect bats and their prey by ensuring that projects include measures to minimize the spread of disease and minimize the negative impact of pesticides and other chemicals to species and their habitat, including chemical-free buffers around bat roosts, riparian, or aquatic habitat (FW-WFP-G-3 and 4). This is more beneficial than the language in alternative A, because it explicitly addresses the fine filter threat for this species and would minimize the negative impacts of pesticides to this species and its habitat.

There are 97 acres of ponderosa pine in recommended wilderness. Desired conditions would be beneficial for this species and its habitat because of the emphasis on undeveloped characteristics, ecological characteristics, native species, and little evidence of human presence or occupation (SA-RWild-DC-1, 2, 3, and 5).

Plan language in alternative B (modified) for geological areas, botanical areas, and research natural areas is similar to alternative A in that there would be an emphasis in research natural areas on ecological condition, natural processes, requiring allotment management plans to have provisions to protect ecological conditions, restricting special use permits that would have a negative impact on the uniqueness of special areas, and preventing motor vehicle intrusions (SA-RNABotGeo-DC-2, G-1, 2, 3, 4, 5). In addition, minimal impact fire suppression tactics are recommended (SA-RNABotGeo G-3). Overnight camping, recreation campfires would be prohibited in established research natural areas and permitted commercial tours would be prohibited, except in support of approved research or education in established research natural areas (SA-RNABotGeo-S-1 and 2).

Alternative C

Alternative C is the same as alternative B (modified), except there are 4,462 acres in recommended wilderness.

Alternative D

Alternative D is the same as alternative B (modified), except there are no recommended wildernesses.

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of southwestern myotis, although individuals may be impacted by site-specific activities or uses. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A, primarily because they contain updated plan language for Gambel oak, which is used for roosting in Ponderosa Pine ERU, and explicit language that addresses disease, which is absent in alternative A. Finally, while alternative A has language that addresses rare and at-risk species, plan language in the remaining alternatives is updated, has wider applicability, and contributes more to the viability of at-risk and rare species than alternative A.

Western red bat

The western red bat is a Southwestern Region sensitive species.

Affected Environment

Distribution

The species occurs from British Columbia into Argentina and Chile. In Arizona, the western red bat is thought to be a summer resident (Hoffmeister 1986). They have been reported from Montezuma Well (Hoffmeister 1986) and Kachina Village area (Gambel oak) (Chambers 2010 pers comm.). Outside the forest, they have also been reported from Bright Angel Creek in the Grand Canyon, and in Santa Cruz and Cochise Counties in southeastern Arizona (Hoffmeister 1986).

Habitat

The western red bat occurs in widely scattered locations statewide, except in deserts, primarily along riparian corridors among oaks, sycamores, walnuts, and cottonwoods at elevations between 2,400 and 7,200 feet. Western red bats typically roost singly in dense clumps of foliage of trees or shrubs in riparian or other wooded areas, but forage in adjacent uplands. They have been located roosting in Gambel oak within the ponderosa pine type as well.

Risk Factors

Intensive use of pesticides in orchards may threaten roosting bats and significantly reduce the amount of insect prey available.

Environmental Consequences

Table 111 summarizes the viability analysis for western red bat. This table was developed using the analysis process described under the Species Viability section above. It includes information on the status, F Rank, habitat, habitat condition and trend, likelihood that this species is limited by its habitat, and the projected management effect, by alternative. Management effect categorizes the relative expected outcome of plan language in each alternative in terms of minimizing species viability risk and are the result of plan decisions, including plan objectives. Management effect category values are 1, 2, 3, and 4. The lower the management effects rating for a species' associated habitat, the more effective the alternative is for that species viability. These topics and the effects of the alternatives are explained in greater detail in the discussions on the alternatives that follow.

Table 111. Analysis summary for western red bat

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
Western red bat (Sensitive) F Rank = F3*	Deciduous trees in CWRF	Fair, slowly toward except portions of Dry Beaver, Spring Creek, Verde River (Childs, private lands) are static	M-H	Good, slowly toward	M
	Deciduous trees in MBDRF	Good, majority is static to slowly toward except: Beaver Creek 5th code HUC is Fair, slowly toward; Oak Creek 5th code HUC is Fair to Good, static; West Clear Creek 5th code HUC is Good, static; and portions of Fossil Creek are Fair, away where there are high recreation impacts	M except M-H in Beaver Creek, Oak Creek, and Fossil Creek 5th code HUCs where recreation impacts are high.	Good, majority is slowly toward except: Beaver Creek 5th code HUC is Good, toward except Fair in recreation impact areas; Oak Creek 5th code HUC is Good, toward; West Clear Creek 5th code HUC is Good, slowly toward; and Fossil Creek 5th code HUC is Good, toward.	M except M-H in Beaver Creek 5th code HUC high recreation areas

Species and status	Habitat	Alternative A		Alternatives B (modified), C, and D	
		Habitat condition and trend relative to desired conditions	Likelihood species is limited	Habitat condition and trend relative to desired conditions	Likelihood species is limited
	MWRF	Good, static to slowly toward except Upper Clear Creek 5th code HUC which is Fair, toward.	M, except Upper Clear Creek 5th code HUC is M-H	Good, slowly toward, except Upper Clear Creek 5th code HUC is Good, toward.	M
	PP	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M	Low objective: Poor, toward at short term then Fair, toward at long term High objective: Fair, toward	Low objective short term: M Low objective long term: L-M High objective: L-M
Management Effect		All habitats = 3: Plan components maintain or improve protection and management for some habitat occurrences in the plan area. Quality of habitat is maintained or improved by providing protection, maintenance, and restoration to some occurrences.		All habitats = 2: Plan components maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.	

*F3 = Uncommon on the forest within its habitat.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Alternative A

Table 111 shows that under alternative A, Cottonwood Willow Riparian Forest would remain in fair condition, and Mixed Broadleaf Deciduous Riparian Forest and Montane Willow Riparian Forest would remain in good condition. All of these riparian forest types would mostly have a static trend, slow trend, or trend toward desired conditions. In Cottonwood Willow, some portions of the Verde River, Dry Beaver Creek, and Spring Creek, would be static due to high recreation or private land. In Mixed Broadleaf Deciduous, static trends are associated with the Oak Creek 5th code and West Clear Creek 5th code HUCs. Trends that are slowly toward desired conditions are associated with the Beaver Creek and the Fossil Creek-Lower Verde River 5th code HUCs, except portions of Fossil Creek have a trend away from desired conditions where recreation use is high. Trends in Montane Willow would be static to slowly toward desired conditions except the Upper Clear Creek 5th code HUC is trending toward desired conditions.

The Ponderosa Pine ERU (including the Gambel oak component) at the low treatment objectives (50,000 acres mechanical, 100,000 acres prescribed burn) would remain in poor condition in the short term, then improve to fair condition and trend toward desired conditions under all alternatives. The improved vegetation structure and composition would reduce the risk of uncharacteristic fire. Under the high treatment objectives (260,500 acres mechanical, 200,000 acres prescribed burn), vegetation quality would improve faster (than the low objective) over existing condition, because more acres would be treated. It would be in fair condition and trending toward desired conditions in both the short and long term. The distribution and diversity of understory vegetation are expected to increase where open stands are created, such as in areas treated for restoration. The shift to more open canopy under all alternatives would improve the abundance and vigor of understory vegetation and conditions for Gambel oak.

As shown in table 111, the likelihood that the western red bat would be limited by its habitats on the forest is low-moderate to moderate-high depending on the habitat. These likelihoods were derived by combining the western red bat's F Rank of F3 with the likelihood of habitat limitation variables for each habitat: Cottonwood Willow Riparian Forest (high), Mixed Broadleaf Deciduous Riparian Forest (moderate), Montane Willow Riparian Forest (moderate), and Ponderosa Pine (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat. There would be localized exceptions such as in high recreation use areas in the Beaver Creek and Upper Clear Creek 5th code HUCs, where the likelihood that this species would be limited would be moderate-high for Mixed Broadleaf Deciduous Riparian Forest and Montane Willow Riparian Forest.

The management effect row in table 111 shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 3 for all habitats, which means that plan components in alternative A maintain or improve protection and management for some habitat occurrences in the plan area, and thus, contribute less to the viability of this species than the other alternatives. Alternative A does not distinguish riparian forest types from other riparian areas, nor does it distinguish between the riparian forest types. It lacks plan components relative to composition, structure, and function. In addition, this alternative has the least potential for improvement to riparian condition compared to the other alternatives.

For the Ponderosa Pine ERU, this management effect rating is primarily because some portions of alternative A provide outdated direction for Mexican spotted owls and for old growth. Portions of the current forest plan manage Gambel oak for firewood and wildlife habitat with detailed silvicultural prescriptions. The emphasis on oak firewood would not be beneficial for this species because the human population has increased so much since the plan was written, the demand for oak firewood is high, oak is harder to find, and signs of theft are common in certain areas of the forest. Beneficial guidelines include a rotation age of 240 to 360 years (for large oaks) (1987 plan, page 131). Gambel oak would be maintained for vegetation diversity and/or mast production in Management Areas 6 and 7 (1987 Plan, pages 147, 152). Old growth would be managed in 100- to 300-acre stands with specific tree density, snag, and downed log specifications (1987 Plan, pages 70-2, 151, 152, and 157). This would not be beneficial for western red bats in the short term because 100- to 300-acre stands would not be consistent with the frequent fire low-severity fire regime typical of Ponderosa Pine and this size of stand does not reflect current science (see Vegetation and Fire Report). Consequently, western red bat habitat within these stands would be increasingly vulnerable to habitat loss resulting from uncharacteristic fire.

- Plan objectives in Ponderosa Pine would be beneficial for this species because treated areas would move toward more open conditions which would increase the vigor of Gambel oak and consequently improve the quality of roost sites.
- Plan language that limits the use of wildfires managed for resource objectives in wilderness and in wildland-urban interface would not be beneficial for western red bats because they occur in Ponderosa Pine, which is a fire-adapted ecosystem. This language eliminates one management tool that could maintain openness that favors Gambel oak in these portions of western red bat habitat.

Plan language in alternative A promotes the use of pesticides to prevent or suppress damaging pest outbreaks when they are legal, cost-efficient and environmentally acceptable; requires pre-application inspections to ensure that surface or ground water contamination does not occur; and promotes the use of mitigation and protection measures when treating noxious or invasive weeds with chemicals (1987 plan, pages 69, 70, 73, and 121). These are generally protective of this species habitat under conditions that consider western red bat habitat during application.

Alternative B (modified)

Table 111 shows that under alternative B (modified), Cottonwood Willow Riparian Forest would improve to good condition and trend slowly toward desired conditions except portions of the Verde River, Towel Creek, Spring Creek and Dry Beaver Creek would improve faster, i.e., have a trend toward desired conditions.

Mixed Broadleaf Deciduous Riparian Forest would remain in good condition and would slowly move toward desired conditions except portions of Fossil Creek and Wet Beaver Creek would remain static in areas of high recreation use. It would improve faster than alternative A in the Beaver Creek, Oak Creek, West Clear Creek, and Fossil Creek 5th code HUCs.

Montane Willow Riparian Forest would remain in good condition and slowly trend toward desired conditions, except Upper Clear Creek 5th code HUC would improve so it would no longer have a high likelihood of limitation.

The Ponderosa Pine ERU would have the same condition and trend as alternative A, fair with a trend toward desired conditions.

As shown in table 111, the likelihood that western red bat would be limited by its habitat on the forest is low-moderate to moderate-high depending on the habitat. These likelihoods were derived by combining the western red bat’s F Rank of F3 with the likelihood of habitat limitation variables for each ERU: Cottonwood Willow Riparian Forest (moderate), Mixed Broadleaf Deciduous Riparian Forest (moderate), Montane Willow Riparian Forest (moderate), and Ponderosa Pine ERU (moderate in short term and low-moderate in long term for low treatment objective; low-moderate for high treatment objective) (table 9 in volume IIa). Low to moderate ratings are considered to be within the natural range of fluctuations for the habitat to which the species would be adapted. There would be localized exceptions such as in high recreation use areas in the Beaver Creek 5th code HUC where the likelihood that this species would be limited would be moderate-high for Mixed Broadleaf Deciduous Riparian Forest.

The management effect row shows the relative expected outcome of plan language in terms of minimizing species viability risk. The management effect is classified as a 2 for all the habitats associated with western red bat. This means that plan components in alternative B (modified) maintain or improve habitat quality by maintaining or improving protection and management for most habitat and habitat element occurrences in the plan area.

For Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest and Montane Willow Riparian Forest, this rating is primarily because there are updated desired conditions and guidelines that distinguish between the riparian forest types and that support their respective composition, structure, and function (FW-Rip-RipType-DC-1 to 6 FW-Rip-RipType-G-1 to 4). In addition, riparian functional condition would improve faster than alternative A, especially along the Verde River, Towel Creek, Spring Creek, and Dry Beaver Creek, which is habitat for bald eagles, beavers, common black hawks, and western red bats. The desired conditions manage for vegetation diversity and riparian function including in priority watersheds (FW-Rip-RipType-DC-1 and 2; FW-Water-G-2; FW-Rip-RipType-O-1). More site-specific aquatic management zone guidelines protect riparian function and water quality (FW-Rip-All-G-3; Fw-Rip-Strm-G-2) (USDA Forest Service 2016b). Plan components in the Wildlife, Fish and Plant section also contribute to the viability of species associated with riparian areas by promoting properly functioning ecosystems that have the necessary physical and biological components to meet the needs of associated native species (FW-WFP-DC-1 and 3).

For the Ponderosa Pine ERU, this rating is due to this alternative containing explicit and updated direction on the composition, structure, and processes of this ERU based on current science. Plan components include direction on management for large Gambel oak trees and snags. Desired conditions in Ponderosa Pine ERU emphasize Gambel oak, a roost tree used by this species, as well distributed and provides for their sustainability by promoting all sizes and ages of oak trees in natural patterns of abundance and density. Specifically beneficial desired conditions discuss the size and distribution of large oak snags (FW-TerrERU-PP-DC-5 and 7). Moderate to large live oak trees with dead limbs, hollow boles, and cavities will provide shelter and habitat for rare plants and a variety of wildlife species, including the western red bat. A Ponderosa Pine ERU guideline would manage for Gambel oak trees and snags to be sustained over time (FW-TerrERU-PP-G-4).

A guideline in the Wildlife, Fish, and Plant section would protect bats and their prey by ensuring that projects include measures to minimize the negative impact of pesticides and other chemicals to species and their habitat, including chemical-free buffers around bat roosts, riparian, or aquatic habitat (FW-WFP-G-4). This is more beneficial than the language in alternative A, because it explicitly addresses the fine filter threat for western red bats and would minimize the negative impacts of pesticides to this species and its habitat.

Alternative C

Alternative C is the same as alternative B (modified).

Alternative D

Alternative D is the same as alternative B (modified).

Findings

Considering cumulative effects for wildlife, fish, and plants and the analyses under the Coarse Filter: Habitat and Wildlife and Plant Issues and Topics sections, all alternatives would provide for the viability of western red bats, although individuals may be impacted by site-specific activities or uses. Consequently, none of the alternatives would lead to a trend toward Federal listing for western red bat, which is a Forest Service sensitive species. Alternatives B (modified), C, and D better provide for the viability of this species than alternative A, primarily because they contain updated plan language that benefits Gambel oak, which is used for roosting in the Ponderosa Pine ERU, would improve habitat conditions and trends for the riparian forest habitats, would better address the impact of pesticides for this species. In contrast to alternative A, alternatives B (modified), C, and D distinguish riparian forest types from other types of riparian areas, giving managers updated and more specific plan language to rely on. Finally, while alternative A has language that addresses rare and at-risk species, plan language in the remaining alternatives is updated, has wider applicability, and contributes more to the viability of at-risk and rare species than alternative A (see write-up on At-risk Species in the Wildlife and Plant Issues and Topics section for additional information).

Management Indicator Species

National Forest Management Act regulations direct the identification of management indicator species to assess how plan alternatives may affect wildlife populations (1982 Planning Rule section 219.19 (a)(1)) and as a monitoring tool upon plan implementation (219.19(a)(6)). Forest Service Manual 2620.5-2 direction allows identification of ecological indicators such as plant communities that contribute substantially to species viability. Three management indicator species and two ecological indicators are identified and discussed in this section. Chapter 5 of the proposed plan includes monitoring for management indicator species and ecological indicators.

The Forest Supervisor chose pronghorn, Mexican spotted owl, and pygmy nuthatch as management indicator species (table 112). Aquatic macroinvertebrates and aspen were chosen as ecological indicators and are covered in other specialist's reports (USDA Forest Service 2016d species viability and aquatic specialist's report). The reasons for selection of these species was to cover both terrestrial and aquatic ecosystems, to focus on ERUs and riparian forest types where management activities are expected to be emphasized, the availability of, and ease of obtaining monitoring data, and species that are responsive to management activities (table 112).

Table 112. Management indicator species indicator habitat and the primary reasons for their selection. These apply to all alternatives.

Species	Indicator Habitat	Primary Reasons for Selection
Pronghorn	Great Basin Grassland Montane/Subalpine Grassland Semi-desert Grassland	Good indicator for grassland habitat. Also selected by the Kaibab and Prescott National Forests. Good species to evaluate habitat connectivity.
Mexican Spotted Owl	Ponderosa Pine – Gambel Oak Mixed Conifer with Infrequent Fire Mixed Conifer Frequent Fire	Very strongly tied to these three ERUs. Treatments are expected to occur over the life of the plan, particularly in Ponderosa Pine. MSO is a federally-listed species, and population monitoring is a component of its recovery plan.
Pygmy Nuthatch	Ponderosa Pine – Old Growth Ponderosa Pine - Snags	Indicator for mature forest and snags. There are robust density and occupancy estimates from ongoing rocky Mountain Bird Observatory monitoring to help track population trend.

Coconino National Forest Management Indicator Species

Pronghorn

Affected Environment

The pronghorn was selected as an indicator for Semi-desert Grassland, Great Basin Grassland, and Montane/Subalpine Grassland ERUs on the forest. This species was also a management indicator species for the 1987 Plan. Pronghorn prefer areas of grasses and scattered shrubs with rolling hills and mesas (Hoffmeister 1986). Descriptions of these ERUs can be found in the Vegetation and Fire section in Chapter 3 of volume I of the FEIS.

Existing condition habitat trends: Summing the acres within the three grassland ERUs on the forest, the current estimate of indicator habitat for the pronghorn is 206,199 acres (table 113). Current conditions for Montane/Subalpine Grassland and Great Basin Grassland ERUs are that they have low departure from reference conditions, but Semi-desert Grassland is highly departed (table 113). All three ERUs are trending away from reference conditions for vegetation and fire (table 113). All three ERUs are highly departed from their natural soil conditions, although the trend for soil conditions ranges from stable to toward for the three ERUs (table 113). Overall, the current trend for grassland indicator habitat for pronghorn is **declining**.

Table 113. Amount of pronghorn indicator habitat (ERU acreage), and existing departure[1] and trend relative to reference conditions for vegetation, fire, and soils for pronghorn indicator habitat ERUs

Indicator Habitat	Existing Acres	Existing Departure[1] (%) and Trend		
		Vegetation	Fire	Soils
Montane/Subalpine Grassland	23,656	Low (32), Away	High, Away	High (69), Static
Great Basin Grassland[2]	92,842	Low (10), Away	High, Away	High (87), Toward
Semi-desert Grassland[2]	89,701	High (100), Away	High, Away	High (95), Slowly Toward
Total:	**206,199**			

[1]Departure was assessed as Low (0-33 percent), Moderate (34-66 percent), or High (>66 percent).

[2]These ERUs were modeled to predict changes by alternative; other ERUs were qualitatively assessed.

Existing condition population trend: Since the 1987 Plan was signed, pronghorn population indicators have fluctuated since the late 1980s, with fawn:doe ratios showing greater fluctuation than number of pronghorn observed per hour (USDA Forest Service 2013). But within the range of fluctuations, the population trend appears to be relatively stable, with fawn:doe ratios increasing somewhat over approximately the last 10 years (USDA Forest Service 2013).

Summary of Indicator Habitat and Trends for All Alternatives

The following table summarizes the departure and trends for grassland ERUs for existing conditions (table 114). The table also summarizes the predicted departure and trends for grassland ERUs after 15 years of implementation under each alternative. These grassland ERUs serve as indicator habitat for pronghorn. This table will be referred to in the following effects analysis discussions for each alternative.

Table 114. Summary of existing grassland vegetation, fire regime, and soils departure[1] and trend relative to reference conditions

Indicator Habitat (ERU)	Departure (%)[1], Trend								
	Vegetation			Fire			Soils		
	Existing	Alternative A	Alternatives B (modified), C, D	Existing	Alternative A	Alternatives B (modified), C, D	Existing	Alternative A	Alternatives B (modified), C, D
Montane/ Subalpine Grassland	Low (32), Away	Moderate, Away	Low (10-14), Toward	High, Away	High, Away	High, Away	High, Static	High, Static	High, toward
Great Basin Grassland[2]	Low (10), Away	Low (21), Away	Low (11-12), Static	High, Away	High, Away	High, Away	High, Slowly Toward	High, Slowly Toward	High, Toward
Semi-desert Grassland[2]	High (100), Away	High, Static	High (94), Toward	High, Away	High, Away	High, Away	High, Slowly Toward	High, Slowly Toward	High, Toward

[1]Departure was assessed as Low (0-33 percent), Moderate (34-66 percent), or High (>66 percent).

[2]These ERUs were modeled to predict changes by alternative; other ERUs were qualitatively assessed.

Except for vegetation, which changes from Low to Moderate for Montane/Subalpine Grasslands under alternative A, none of the departure values change under the alternatives for any of the ERUs. Additionally, fire trends do not differ among any of the alternatives. Vegetation and soils trends stay the same or improve some under alternative A, but the most improve in trend occurs under alternatives B (modified), C, and D. Overall, alternatives B (modified), C, and D would result in slightly improved condition of grassland indicator habitats as compared to alternative A.

Environmental Consequences

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Alternative A

Pronghorn are identified as a management indicator species for early and late seral grassland habitat. The 1987 Plan gives management emphasis for pronghorn in these habitats within Management Area MA 9 – Mountain Grassland, MA 10 – Grassland and Sparse Pinyon Juniper Above the Rim, and MA 11 – Verde Valley. Almost all of Anderson Mesa, which is important Great Basin Grassland pronghorn habitat, is within MA 10. The management emphasis in these MAs is on livestock grazing, visual quality, and wildlife habitat, specifically, to emphasize management of pronghorn. The corresponding ERUs are Great Basin Grasslands, Montane/Subalpine Grasslands, and Semi-desert Grasslands.

Standards and guidelines that implement the direction to manage for pronghorn in these three MAs call for maintaining and improving mountain meadows and grasslands by removing invading overstory, controlling invasive plant species, prescribed burning, and other methods. Restrictions on off-road driving if resource damage is occurring, and a guideline to avoid construction of new roads in MA 9 are beneficial to maintaining and improving grassland habitat. Range management direction is to improve unsatisfactory range conditions and to maintain seral grasslands where type conversions have occurred in the past. Prescribed fire is used to accomplish resource objectives outside of the wildland-urban interface. In MA 11 Verde Valley, a standard and guideline specific to pronghorn is “Determine the need to control invasion of undesirable plant species in antelope range to improve and protect wildlife habitat values. Where necessary, implement the control measures, such as prescribed burning to improve antelope habitat” (1987 Plan, page 168). Plan direction for these three management areas that call for vegetation treatments, avoidance of new road construction, and restrictions on off-road driving habitat improvement would improve grassland habitats for pronghorn and reduce disturbance from motorized vehicles. (See 1987 Plan, pages 158 to 167 and 168 to170.)

In 1998, the 1987 Plan was amended to include guidance specific to the Red Rock Area on the Red Rock Ranger District (Amendment 12). This included MA 27 – Savannah, which contains most of the Semi-desert Grassland on the forest. In 2002, the 1987 Plan was amended to include guidance specific to the Flagstaff/Lake Mary Ecosystem Analysis Area (FLEA) on the Flagstaff Ranger District (Amendment 17). Amendment 17 provided management emphasis for all management indicator species based on the habitats contained in the new management areas, including grasslands. Additional emphasis was provided to restore and maintain grasslands to benefit pronghorn and other grassland species in MA 32, Deadman Mesa, which contains Great Basin Grassland habitat.

Management Area 27, Savannah, is within the Sedona-Oak Creek planning Area and contains Semi-desert Grassland habitat interspersed with pinyon juniper evergreen shrub. One of the management emphases is that high-quality grassland supports a diversity of wildlife. Guidance is very strong in this management area for pronghorn and its habitat. (1987 Plan, pages 206-50 to 206-53.) Objectives, standards, and guidelines specific to pronghorn are:

- Acquire certain private parcels to reduce habitat fragmentation and otherwise improve antelope and grassland species habitat.
- This MA is characterized by an open vegetation structure. Use prescribed fire and other mechanical treatments to improve forage conditions for wildlife, particularly birds and antelope. Increase the area occupied by grasses and forbs while decreasing the area occupied by shrubs and trees in comparison to recent historic levels.
- Develop conditions that:
    - ♦ provide high-quality habitat for upland game birds and deer;
    - ♦ improve and expand antelope and grassland bird habitat through such means as fence, road, fire and human access management;
    - ♦ provide adequate cover/security for animal shelter and foraging; and
    - ♦ improve forage conditions for wildlife, particularly quail.
- Identify and protect antelope fawning areas.
- Work together with the Arizona Game and Fish Department to develop hunting regulations for antelope below the Rim in Game Management Unit 6B to protect and enhance the antelope population there.
- To minimize restriction of antelope movement, locate fences one-eighth mile from roads if road right-of-way fencing is required. Remove fences that are no longer needed; use smooth-bottom wires and meet the wildlife standards as stated in FSH 2670 and 2240 for all existing or new fences.
- Locate roads to maintain adequate cover for animal shelter and foraging between roads, especially in locations with high road densities.
- Use commercial and personal use firewood sales and Christmas tree cutting areas to reduce encroachment of invasive tree species and maintain open grassland habitat for antelope.
- Acquire large blocks of undeveloped private property to improve antelope habitat and to prevent impacts on National Forest lands from residential and associated infrastructure development. Acquire the Bradshaw Ranch property.
- Road and trail locations must consider antelope protection goals. Recreation goals are subordinate to antelope protection.
- If the demand can be demonstrated, allow commercial tours to provide opportunities for scenic viewing, natural history education, wildlife viewing and other activities that are compatible with antelope protection and Savannah MA goals.

Management Area 32, Deadman Wash, is within the Flagstaff/Lake Mary Ecosystem Area (FLEA). It contains Great Basin Grassland adjacent to Pinyon Juniper with Grass and abuts Wupatki National Monument. Management emphasis is to restore and maintain grasslands and grassland-adapted wildlife species, especially antelope.

In addition to management area standards and guidelines for grasslands, there are numerous other standards and guidelines throughout the 1987 Plan for pronghorn and big game species that provide emphases for management of pronghorn and to minimize impacts from roads and fences. They include guidance for fence specifications to allow wildlife passage, forage habitat improvement, off-road driving restrictions in fawning areas and other sensitive habitats, installation of gates or barriers to limit or restrict motorized access into key winter ranges, cooperation with the Arizona Game and Fish Department to meet their management goals and objectives, and involving interested groups or individuals in achieving objectives. Additionally, a forestwide standard and guideline that specifically mentions pronghorn antelope is included:

- Interior fences in an allotment are generally three wire fences with the bottom wire smooth and conform to the above height restrictions. Install antelope passes, let-down fences, electric fences, or elk jumps wherever necessary to improve wildlife travelways (1987 Plan, page 69).

Implementation of these standards and guidelines for improvement of grasslands habitats will be benefit pronghorn. However, the 1987 Plan identifies quantitative objectives for timber, roads, and recreation developments (see Appendix H), but it does not for grassland improvement. Therefore, the expected amount of treatments to improve grasslands is not known, nor the expected timeframe.

Alternative A Projected Habitat Trend: The amount of indicator habitat is not expected to change, but the quality of habitat could improve with continued implementation of the 1987 Plan, as amended. Plan guidance emphasizes habitat treatments to improve all three ERUs, with particularly strong guidance for MA 27, containing Semi-desert Grassland. Despite this guidance in alternative A, vegetation departure from reference conditions is expected to get worse (from low to moderate) for Montane/Subalpine Grasslands, but the trend for Semi-desert Grassland improves from away to static (table 114). No other changes in departure or trend are expected under this alternative (table 114). Overall, there is essentially no projected change in habitat conditions; therefore, the habitat trend under the continued implementation of alternative A is declining from reference condition but supportive 1987 Plan direction would allow for improvement of grassland habitat if projects are planned to occur.

Alternative A Projected Population Trend: The current population trend for pronghorn on the forest is stable (USDA Forest Service 201a). As noted above, grassland habitat that supports populations is expected to improve slightly for Semi-desert Grassland, but decline for Montane/Subalpine Grassland with continued implementation of alternative A. Direction in alternative A is strong for improvement of habitat and populations, so actions that occur in grassland habitat would be expected to improve conditions for pronghorn. Under implementation of alternative A to date, pronghorn population trend has improved from declining in 2002 (USDA Forest Service 2002c) to stable in 2013 (USDA Forest Service 2013). Therefore, the population trend for pronghorn after 15 years of implementing alternative A is expected to remain **stable.**

Alternative B (modified)

This alternative (and the other action alternatives) have specific plan components for management of pronghorn and their habitat. A number of desired conditions and guidelines are found in forestwide direction as follows:

- A desired condition for constructed waters is that earthen stock ponds and wildlife waters remain accessible during pronghorn fawning season or drought (FW-ConstWat-DC-2).
- Grassland desired conditions include language to provide food and cover for pronghorn (FW-TerrERU-Grass-DC-4 and FW-TerrERU-Grass-DC-8).
- Several guidelines within the forestwide Wildlife, Fish, and Plants section apply specifically to pronghorn and their ability to move freely across their habitat. The design of structural improvements such as fences should allow safe passage for pronghorn (FW-WFP-G-5), and fence construction, maintenance, and removal should consider pronghorn use of their habitat (FW-WFP-G-6). Additionally, new road and trail locations should be designed to maintain fawning habitat for pronghorn (FW-WFP-G-13).
- Another important plan component for pronghorn calls for applying timing restrictions to projects and activities that potentially negatively affect pronghorn, so that impacts to survival and successful reproduction are minimized (FW-WFP-G-8).

Several management areas mention provision of habitat for pronghorn in the general description of the management areas. These are: Painted Desert, Volcanic Woodlands, Anderson Mesa, and House-Mountain Lowlands. Additionally, the Anderson Mesa MA includes pronghorn in its desired conditions as follows:

- The Anderson Mesa pronghorn herd has a sustainable population, is able to move freely across the grasslands and open areas of the forest and woodlands, and can easily access winter range. (MA-AMesa-DC-3).

In addition to the guidance above, other guidance applies to pronghorn through provision for pronghorn grassland indicator habitat. Desired conditions for the three grassland ERUs on the forest generally describe favorable habitat for pronghorn. Canopy cover of trees and shrubs is low, native vegetation dominates, and is distributed in natural patterns across the landscape (FW-TerrERU-Grass-DC-1). Grassland conditions support frequent surface fires (FW-TerrERU-Grass-DC-2), and are unfragmented and connected by soil type (FW-TerrERU-Grass-DC-3).

Desired conditions and guidelines support maintaining vegetation conditions that provide food, water and cover for pronghorn, and would minimize disturbance in key fawning areas that could improve fawn recruitment into the population.

Alternatives B (modified) (and the other action alternatives C, and D) have treatment objectives for grassland ERUs. They are to:

- Restore or improve at least 3,500 acres of Semi-desert Grasslands during each 10-year period over the life of the plan. (FW-TerrERU-Grass-O-1)
- Restore or improve 10,800 to 12,400 acres of Great Basin Grassland during each 10-year period over the life of the plan. (FW-TerrERU-Grass-O-2)
- Restore or improve 7,600 and 11,400 acres of Montane/Subalpine Grassland during each 10-year period over the life of the plan. (FW-TerrERU-Grass-O-3)

A total of approximately 11 to 13 percent of the grassland ERUs are planned to be restored or improved (table 115). Departure trends improve slightly for all three grassland types for vegetation and soils, although not enough to change any of the high departure values (table 114).

Table 115. Acres and percent of ERU restored or improved under alternatives B (modified), C, and D

ERU	ERU Acres	Low Treatment Acres (%)	High Treatment Acres (%)
Montane/Subalpine Grassland	23,656	7,600 (32)	11,400 (48)
Great Basin Grassland	92,842	10,800 (12)	12,400 (13)
Semi-desert Grassland	89,701	3,500 (4)	3,500 (4)
Totals:	**206,199**	**21,900 (11)**	**27,300 (13)**

While these treatments would not be creating new acres of ERU habitat, using the desired conditions and guidelines to develop projects should improve the quality of pronghorn within these ERUs.

Alternative B (modified) recommends designation of three wilderness areas: Abineau, Davey's, and Strawberry. This would have a negligible effect on pronghorn, since very little habitat within these boundaries (table 116).

Table 116. Grassland ERU acreage within recommended wilderness areas in alternative B (modified)

ERU	Wilderness Acres	Total ERU Acres	Percent of Total
Great Basin Grassland	2,327	92,843	2.5
Montane Subalpine Grassland	0	23,656	0
Semi-desert Grassland	638	89,701	0.7

Designation as wilderness would provide pronghorn with minimal extra protections for the 2,327 acres of Great Basin Grasslands, since this ERU has low departure from reference conditions, and the habitat would be managed for the suite of wilderness characteristics, including native species and maintenance of natural processes. Recreation use would be managed to protect wilderness character and motorized traffic would no longer be allowed. Less than one percent of recommended wilderness occurs within Semi-desert Grasslands, so effects would be negligible.

Alternative B (modified) includes a determination that mechanized recreation (e.g., bikes) would be not suitable in botanical and geological areas. This suitability determination includes an exception that would find mechanized recreation suitable on designated trails in these special areas. Allowing bicycles on designated trails in botanical and geological areas would have no appreciable effect on pronghorn. The amount of grassland habitat in botanical and geological areas is extremely small (table 117); therefore, the likelihood of disturbance to pronghorn is negligible.

Table 117. Acres of pronghorn habitat within botanical and geological areas

Area	Great Basin Grassland	Montane/Subalpine Grassland	Semi-desert Grassland
Cottonwood Basin Botanical and Geological Area	0	0	185
Fern Mountain Botanical Area	0	150	0
Mogollon Rim Botanical Area	0	26	0
Verde Valley Botanical Area	0	0	162
Totals Acres:	**0**	**176**	**347**

Overall, guidance contained in alternative B (modified) is not as explicit for management of pronghorn and their habitat as alternative A. Alternative B (modified) does have some similar guidance that would protect and enhance pronghorn and their habitats in the ERU desired conditions and guidelines, such as fawning season restrictions to reduce disturbance, fence standards/guidelines, and maintenance of habitat connectivity. However, alternative B (modified) lacks guidance that alternative A has, such as more comprehensive guidance for grassland habitats where management emphasis is provided for pronghorn, addressing vegetation management, range management, land acquisition, off-road driving, road construction, and other activities in standards and guidelines. Within alternative A's MA 27, objectives, standards, and guidelines are particularly strong for pronghorn in Semi-desert Grassland which is the grassland habitat in poorest condition. Alternative B (modified)'s desired conditions for the Anderson Mesa MA call for stable pronghorn populations, but because populations are currently stable, this does not emphasize improving trends. Objectives for grassland habitats indicate that little active habitat improvement or restoration will be done in those habitats. A small proportion of Great Basin Grassland would be designated as wilderness, providing some extra protections.

Alternative B (modified) Projected Habitat Trend: The amount of indicator habitat is not expected to change. Plan guidance does not emphasize pronghorn habitat and population enhancement as much as alternative A, so projects may not be designed to improve pronghorn habitat to the degree they would under alternative A. However, the quality of a portion of indicator habitat would improve from existing conditions under alternative B (modified) based on implementation of the grassland objectives, which will decrease the percent vegetation departure from reference conditions and improve trends (table 114). Fire departure is expected to move from high to moderate, but the trend is moving away from reference conditions. Fire departure remains highly departed and trending away for the other two ERUs. Because the percent departure from reference conditions is not known for alternative A, and it is unknown how much indicator habitat has been improved under the 1987 Plan, it is difficult to compare the amount of projected habitat improvement under alternative B (modified) to alternative A. Altogether, the trend for grassland habitat is expected to improve from "declining" from reference condition to stable to declining from reference condition due to the improvement expected in habitat in some aspects, but not others.

Alternative B (modified) Projected Population Trend: The current population trend for pronghorn is stable. As noted above, some of the grassland habitat that supports populations is expected to improve with implementation of alternative B (modified). Guidance includes guidelines for protection of fawning habitat and fence modifications to improve permeability for pronghorn. Desired conditions for the Anderson Mesa MA call for stable pronghorn populations, but this does not emphasize improving trends. Also, there is a lack of guidance for pronghorn within other programs such as lands and range. Considering the strength of plan direction, combined with projected habitat trends, projected population trend is **stable.**

Alternative C

Alternative C is similar to alternative B (modified), but responds to suggestions from the public for more land to be managed in primitive and natural settings with reduced human-related disturbance for the benefit of recreation, and botanical and wildlife resources. Additional wilderness areas would be recommended on the forest to provide additional protection to botanical and wildlife resources. Alternative C also responds to ecological concerns related to presence or absence of old-growth composition and structure on the landscape. This analysis focuses on the differences from alternative B (modified), which are:

1. Recommends 10 additional wilderness areas (91,757 total wilderness acres compared to 8,733 acres recommended in alternative B (modified)).

2. Determines snowmobile use to be unsuitable in the Walnut Canyon Management Area and areas with a recreation opportunity spectrum objective of semi-primitive non-motorized or primitive.

3. Determines recreational shooting to be unsuitable in botanical areas; geological areas; existing and proposed research natural areas; eight management areas that emphasize reduced-human-related disturbance; and in the Walnut Canyon, Sedona Neighborwoods, and Long Valley Management Areas, and parts of the Flagstaff Neighborwoods Management Area.

4. Restricts livestock grazing in research natural areas unless it supports, or would not affect, the research purpose of that research natural area.

5. Designates seven management areas (Blue Ridge, Hospital Ridge, Jack's Canyon, Knoll Lake, Limestone Pasture, Pine Grove, Second Chance, and modifies alternative B (modified)'s direction and boundaries in Anderson Mesa to further emphasize wildlife habitats) totaling 335,371 acres.

6. Limits motorized dispersed camping in the eight management areas that emphasize reduced human-related disturbance to current levels.

7. Limits public motor vehicle access in eight management areas that emphasize reduced human-related disturbance to current levels.

8. Limits public road density in the Anderson Mesa Management Areas to an average of 1 mile or less of road per square mile.

9. Limits large group recreation events and large commercial tours outside of developed sites in eight management areas that emphasize reduced human-related disturbance.

10. Includes key direction from the 1987 plan for old growth that would be incorporated into the proposed revised plan:

    - Allocation of at least 20 percent of the naturally forested area by forest and woodland ERUs in any landscape by 6th code watershed;
    - Distribution of old growth would be in 100- to 300-acre stands;
    - The Minimum Criteria for the Structural Attributes Used to Determine Old Growth.

Recommended Wilderness Areas

Grassland ERUs acres in the 10 additional recommended wilderness areas is relatively minor, except for Semi-desert Grassland (table 118).

Table 118. Additional grassland ERU acreage within recommended wilderness areas in alternative C

ERU	Alternative B (modified) Acres	Alternative C Acres	Additional Alternative C Acres
Great Basin Grassland	2,327	2,327	**0**
Montane/Subalpine Grassland	0	6	**6**
Semi-desert Grassland	132	12,041	**11,909**

Designation as wilderness would provide pronghorn with some extra protections, since these habitats would be managed for the suite of wilderness characteristics, including native species and maintenance of natural processes. Recreation use would be managed to protect wilderness character and motorized traffic would no longer be allowed. However, Semi-desert Grasslands are highly departed from historical conditions, and management activities may be needed to help restore them. Designation as wilderness would limit management tools primarily to naturally ignited fire. The 11,909 additional acres in wilderness represents approximately 13 percent of the total ERU acreage for Semi-desert Grassland. Since almost 87 percent of Semi-desert Grasslands would be outside of wilderness, this limitation on management tools on a small percentage of the ERU would not have a large negative effect on pronghorn.

Snowmobile Use

The determination that snowmobile use would not be suitable in the Walnut Canyon Management Area and areas with a recreation opportunity spectrum objectives of semi-primitive non-motorized or primitive is not expected to have any effect on pronghorn, as they generally move to lower elevations during the winter months.

Recreational Shooting

Walnut Canyon, Red Rock, Long Valley, Flagstaff Neighborwoods, Anderson Mesa, Blue Ridge, East Clear Creek, Hospital Ridge, Jack's Canyon, and Pine Grove Management Areas contain 74,500 acres of pronghorn habitat (table 119). The determination that recreational shooting would not be suitable in these management areas could benefit pronghorn through less noise disturbance that can cause them to flee from the disturbance.

Table 119. Acres of pronghorn habitat within management areas where recreational shooting would not be suitable

Management Area	Great Basin Grassland	Montane/Subalpine Grassland	Semi-desert Grassland	Total Acres
Anderson Mesa	54,803	1,105	0	**55,908**
Blue Ridge	0	169	0	**169**
East Clear Creek	0	62	0	**62**
Flagstaff Neighborwoods	210	2,919	0	**3,129**
Hospital Ridge	0	13	0	**13**
Jack's Canyon	4,389	0	0	**4,389**
Long Valley	157	3,232	0	**3,389**
Pine Grove	370	346	0	**716**
Red Rock	0	33	6,393	**6,426**
Walnut Canyon	15	284	0	**299**
Total Acres by Grassland ERU	**59,944**	**8,163**	**6,393**	**74,500**
Percent of ERU Acres	**64.6**	**34.5**	**7.1**	

Livestock Grazing in Research Natural Areas

None of the research natural areas contain grasslands, so restricting grazing until grazing supports or would not affect the research purposes of research natural areas would have no impact on pronghorn.

Management Areas

Alternative C includes management areas that emphasize reduced human-related disturbances. There is no Semi-desert Grassland habitat within any of these 8 management areas, but Great Basin and Montane/Subalpine Grassland ERUs can be found in five of the management areas (table 120). Anderson

Mesa and Jack's Canyon MAs contain the majority of grassland habitat (table 120). In general, desired conditions for these management areas envision providing low-disturbance wildlife habitat.

Providing habitat for pronghorn is an emphasis for both Anderson Mesa and Jack's Canyon MAs (MA-AMesa-DC-11 and MA-Jack-DC-9). For both management areas, guidelines minimize human disturbance through limitations on motorized dispersed camping corridors (MA-AMesa-G-1, MA-Jack-G-1), roads (MA-AMesa-G-2, MA-Jack-G-2), and large group recreation events (MA-AMesa-G-4, MA-Jack-G-3). In the Anderson Mesa MA, road densities should not exceed an average of 1 mile per square mile (MA-AMesa-G-3). Collectively, the desired conditions and guidelines would allow pronghorn to access and use available habitat with fewer disturbances within the two management areas that contain the bulk of indicator habitat.

Pronghorn are not an emphasis species in the Blue Ridge, East Clear, Hospital Ridge, and Pine Grove MAs, but desired conditions envision properly functioning wildlife habitat in general (MA-BlueRidge-DC-5, MA-EastClr-DC-5, MA-HospRdg-DC-5, MA-PGrove-DC-5), and guidelines discourage additional motorized dispersed camping corridors, and limit motor vehicle access and large group recreation events (MA-BlueRidge-G-1, 2, 3, MA-EastClr-G-1, 2, 3, MA-HospRdg-G-1, 2, 3, MA-PGrove-G-1, 2, 3). This would result in some less disturbance to pronghorn using the relatively small amounts of indicator habitat in these management areas.

Table 120. Acres of grassland ERUs within alternative C management areas

Management Area	Great Basin Grassland	Montane/Subalpine Grassland	Semi-desert Grassland	Total Acres by MA
Anderson Mesa	54,803	1,105	0	**55,908**
Blue Ridge	0	62	0	**62**
East Clear Creek	0	169	0	**169**
Hospital Ridge	0	13	0	**13**
Jack's Canyon	4,389	0	0	**4,389**
Pine Grove	370	346	0	**716**
Total Acres by Grassland ERU	**59,562**	**1,695**	**0**	**61,257**
Percent of ERU Acres	**64.2**	**7.0**	**0**	

Old Growth

Retaining the old growth standards and guidelines from the 1987 Plan would have no impact on pronghorn and their grassland habitats.

Overall, the positive impacts of designating the management areas that emphasize reduced human-related disturbances and the reduction in disturbance from recreational shooting in several management areas makes alternative C slightly stronger for pronghorn compared to alternative B (modified), despite the small negative impact from designation of wilderness on Semi-desert Grassland habitat.

Alternative C Projected Habitat Trend: The amount of indicator habitat is not expected to change. Vegetation, fire, and soil departure and trends for all three grassland ERUs are the same as alternative B (modified) (table 114), therefore, the habitat trend is expected to be stable to declining from reference condition.

Projected Population Trend: Compared to alternative B (modified), alternative C has positive impacts from inclusion of over 61,000 acres of grassland habitat within management areas that emphasize low-disturbance wildlife habitat. Additionally, over 13,000 acres of grassland habitat would be unsuitable for recreational shooting. Collectively, less disturbance could allow pronghorn to more successfully raise fawns, and disperse throughout their habitats. This makes alternative C slightly stronger for pronghorn populations compared to alternative B (modified), despite the small negative impact from designation of wilderness on Semi-desert Grassland habitat. Overall, the projected population trend is stable to increasing**.**

Alternative D

This alternative would be similar to alternative B (modified), but differs in the following ways:

- No new wilderness areas would be recommended; and
- Expansion and/or increased access for future energy corridor needs would be provided for, and scenic integrity objectives along existing energy corridors for energy infrastructure would be modified.

Not adding any new wilderness areas makes this aspect of alternative D the same as alternative A and would avoid the small negative impact that adding new wilderness areas would have on Semi-desert Grasslands habitats analyzed in alternative C.

Overall, effects from alternative D are not appreciably different than alternative B (modified).

Alternative D Projected Habitat Trend: Since the effects from this alternative are not appreciably different from alternative B (modified), the habitat trend under alternative D is stable to declining from reference condition.

Alternative D Projected Population Trend: Since the effects from this alternative are not appreciable different from alternative B (modified), the projected population trend for alternative D is stable.

Summary of Trends by Alternative for Pronghorn

The amount of indicator habitat is not expected to change under any of the alternatives (table 121), but treatments within indicator ERUs are expected to improve habitat quality by opening up denser stands and/or improving forage quality.

Plan guidance that emphasizes pronghorn habitat and populations is broadest and strongest in alternative A. Although the amount of past habitat improvement treatments under the 1987 Plan is not known, there has been an emphasis on habitat improvement on Anderson Mesa within Great Basin Grasslands due to the declining population trends noted in the early 2000s (USDA Forest Service 2002c). Since that time, forestwide pronghorn populations have increased, and the trend is now stable (USDA Forest Service 2013). Grassland habitat trend on the forest has not improved toward reference conditions from 2002 to the present, likely due to insufficient treatments in habitat. Because alternative A does not specify quantitative objectives for grassland habitat, the amount of projected habitat improvement in unknown (table 121).

Objectives for alternatives B (modified), C, and D call for the same amount of treatment within indicator habitat (table 121). Plan guidance for pronghorn and their habitat varies slightly among alternatives but not enough to change trends.

Table 121. Summary of pronghorn indicator habitat, population and habitat trends, and acres of expected treatment by alternative

Alternative	Acres of Indicator Habitat	Population Trend	Habitat Trend	Acres of Expected Habitat Improvement[1]
A	206,199	Stable	Declining	Unknown
B (modified)	206,199	Stable	Stable to declining	21,900-27,300
C	206,199	Stable to increasing	Stable to declining	21,900-27,300
D	206,199	Stable	Stable to declining	21,900-27,300

[1]Based on objectives; alternative A does not have quantitative objectives.

Pygmy nuthatch

Affected Environment

The pygmy nuthatch was selected as an indicator for mature ponderosa pine that contains large live trees and large snags (18 inches d.b.h. and larger). This species was also an indicator species for the 1987 Plan.

Pygmy nuthatches and other cavity-nesting birds show a preference for large-diameter snags over 75 feet in height (Scott 1978). Snags greater than 15 inches are used significantly more than smaller snags, and snags in the 27- to 30-inch size class have more holes per snag that other size classes (Scott 1978). In Arizona, nest heights range from 7.2 to 62 feet, with a median of 24.6 feet (Corman and Wise-Gervais 2005).

Data on snags are often summarized in size classes of 12 to 18 inches and 18 inches and greater. Although pygmy nuthatches will use snags smaller than 18 inches d.b.h, larger snags are more valuable as habitat. Therefore, for the purposes of identifying and tracking snag indicator habitat, snags 18 inches and greater will be used.

The pygmy nuthatch shows a strong association with long-needled pines and their range is co-extensive (extends over the same space) with ponderosa pine, Jeffrey pine, and similar species (Kingery and Ghalambor 2001). Pygmy nuthatches nest in dead pines and live trees with dead sections and prefer old-growth, mature, and undisturbed forests (Szaro and Balda 1982). The pygmy nuthatch also roosts in cavities, with up to 150 individuals being documented as roosting in one tree (Knorr 1957 and Sydeman and Güntert 1983 *in* Kingery and Ghalambor 2001).

In Arizona, their range closely follows the distribution of ponderosa pine (Corman and Wise-Gervais 2005). The majority of potential breeding records were in either pure pine or pine with Gambel oak. Although nests were found in other vegetation types, they all had a ponderosa pine component (Corman and Wise-Gervais 2005).

Two main factors affecting population density are availability of nest sites and sufficient numbers of large cone-producing trees for food (Kingery and Ghalambor 2001).

In order to compare the amount of mature forest among alternatives, table 122 extricates data for older age classes from table 17 in the specialist’s report for vegetation and fire (USDA Forest Service 2016c). States that include trees 20 inches d.b.h. and greater were used. The estimated amount of mature forest/old growth using these data is 78,123 acres, or 9.8 percent of the Ponderosa Pine ERU (table 122). This is an underestimate of large trees and old growth on the landscape, since other states that include large trees are not included. See the specialist’s report, and Appendix C in particular (USDA Forest Service 2016c) for more detail.

Table 122. Approximated amount of existing ponderosa pine old growth based on acreage in qualitative states that include very large trees

Ponderosa Pine ERU[1] State	Existing % and Acres
E – Very Large Trees, Open, Single Story	1.0% 7,972 acres
I - Very Large Trees, Closed, Single Story	5.2% 41,453 acres
K - Very Large Trees, Open, Multiple Story	1.0% 7,972 acres
M – Very Large Trees, Closed, Multiple Story	2.6% 20,726 acres
Totals:	**9.8%** **78,123 acres**

[1]Total Ponderosa Pine ERU acreage is 797,171 acres

The existing number of snags in Ponderosa Pine that are greater than12 inches d.b.h. per acre is 2.5 (table 123). Snags 18 inches and greater, representing indicator habitat for the pygmy nuthatch, average 1.3 per acre (table 123).

Table 123. Existing ponderosa pine snags per acre

Ponderosa Pine Snag Size	Number per Acre
12 to 18 inches	1.2
18+ inches	1.3
Total snags per acre:	**2.5**

Existing condition habitat trends: Using the comparative number from table 122, the current estimate for ponderosa pine old growth indicator habitat for the pygmy nuthatch is 636,939 acres (table 122). An analysis of ponderosa pine habitat trend found that late seral ponderosa pine is increasing slightly and that the large snag component is stable (USDA Forest Service 2013). Overall, the current trend for ponderosa pine old growth indicator habitat for the pygmy nuthatch is increasing slightly and large snag indicator habitat is stable.

Existing condition population trend: The current forestwide population trend for pygmy nuthatch is **stable to slightly declining** (USDA Forest Service 2013). This is based on current data from the Breeding Bird Survey (BBS), the Christmas Bird Count (CBC), on-forest surveys by the Rocky Mountain Bird Observatory (RMBO), and a long-term research project on the Mogollon Rim Ranger District. State-level BBS data indicate a slight declining trend (USDA Forest Service 2013). Forest-specific CBC data do not indicate any discernible trend, but the RMBO surveys and the research project along the Mogollon Rim indicate declining trends (USDA Forest Service 2013).

Summary of Indicator Habitat for All Alternatives

The following tables summarize the amount of old growth as represented by the amount of very large trees projected to occur on the forest, old growth snags, and overall snags among alternatives (table 124 and table 125). Data are from the vegetation and fire specialist's report (USDA Forest Service 2016c). These tables will be referred to in the following effects analysis discussions for each alternative.

Compared to existing condition, the overall amount of old growth is projected to increase similarly under all alternatives (table 124).

Table 124. Approximated amount of ponderosa pine old growth. Existing and 15-year projection for alternatives.

Ponderosa Pine ERU[1] State	Existing % and Acres	All Alternatives (A, B (modified), C, and D – Low Treatment Objective	All Alternatives (A, B (modified), C, and D – High Treatment Objective
E – Very Large Trees, Open, Single Story	1.0% 7,972 acres	3.8 30,292	3.6 28,698
I - Very Large Trees, Closed, Single Story	5.2% 41,453 acres	5.6 44,642	4.3 34,278
K - Very Large Trees, Open, Multiple Story	1.0% 7,972 acres	4.3 34,278	11.1 88,486
M – Very Large Trees, Closed, Multiple Story	2.6% 20,726 acres	4.2 33,481	3.5 27,901
Totals:	**9.8%** **78,123 acres**	**17.9%** **142,693**	**22.5%** **179,363**

[1]Total Ponderosa Pine ERU acreage is 797,171 acres

Compared to existing condition, the number of snags per acre will increase within 15 years of implementation under all alternatives, but the number only very slightly increases from 1.3 to 1.4 snags per acre for snags greater than 18 inches d.b.h. that represent indicator habitat for the pygmy nuthatch (table 125).

Table 125. Ponderosa pine snags per acre for existing condition and 15-year projection by alternative

Ponderosa Pine Snag Size	Number of Snags per Acre		
	Existing	All Alternatives Low Treatment Objective	All Alternatives High Treatment Objective
12 to 18 inches	1.2	1.8	1.7
18+ inches	1.3	1.4	1.4
Total snags per acre:	**2.5**	**3.2**	**3.1**

Environmental Consequences

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Alternative A

The pygmy nuthatch is identified as a management indicator species for MA 3 – Ponderosa Pine and Mixed Conifer less than 40 percent slope, MA 4 – Ponderosa Pine and Mixed Conifer greater than 40 percent slope, MA 13 – Cinder Hills Off-Highway Vehicle Area, and in ponderosa pine habitats within the FLEA area. The management emphasis in MA 3 is on providing a sustained yield of timber and firewood production, wildlife habitat, livestock grazing, high quality water, and dispersed recreation. MA 4 emphasizes wildlife habitat, watershed condition, and dispersed recreation. MA 13 emphasizes OHV recreation.

Ponderosa Pine Old Growth - Large trees and old growth attributes

Standards and guidelines that apply to old-growth ponderosa pine are found primarily within forestwide direction of the 1987 Plan.

- A guideline for managing Mexican spotted owl restricted habitat includes a guideline to follow implement forest plan old-growth standards and guidelines to maintain and promote development of owl habitat (1987 Plan, page 65-5).
- A standard to be applied in habitats outside of Mexican spotted owl protected and restricted habitat is to “Manage for uneven-age stand conditions for live trees and retain live reserve trees, snags, downed logs, and woody debris levels throughout woodland, ponderosa pine, mixed conifer and spruce-fir forest cover types. Manage for old age trees such that as much old forest structure as possible is sustained over time across the landscape. Sustain a mosaic of vegetation densities (overstory and understory), age classes and species composition across the landscape. Provide foods and cover for goshawk prey.” (1987 Plan, pages 65-7)
- Guidelines to apply outside of goshawk post-fledging areas are to manage for 20 percent in mature (VSS 5) and 20 percent in old (VSS 6) forest conditions. In ponderosa pine, canopy cover should average greater than 40 percent in VSS 5 and 6. Within post-fledging areas, canopy closures are slightly greater (1987 Plan, page 65-9).
- Also in forestwide direction, a standard for old growth states:
  - ♦ Until the forest plan is revised, allocate no less than 20 percent of each forested ecosystem management area to old-growth as depicted in the table below (1987 Plan, page 70-1).
- Several key forestwide guidelines for old growth include:
  - ♦ Strive to create or sustain as much old-growth compositional, structural, and functional flow as possible over time at multiple-area scales. Seek to develop or retain old-growth function on at least 20 percent of the naturally forested area by forest type in any landscape (1987 Plan, page 70-1).
  - ♦ Consider the effects of spatial arrangement on old-growth function, from groups to landscapes, including de facto allocations to old-growth such as goshawk nest sites, Mexican spotted owl protected activity centers, sites protected for species behavior associated with old-growth, wilderness, research natural areas, and other forest structures managed for old-growth function (1987 Plan, page 70-1).
  - ♦ Forested sites should meet or exceed the structural attributes to be considered old growth in the five primary forest cover types in the southwest as depicted in the following table (1987 Plan, page 70-1).

- ♦ Minimum structural aspects of ponderosa pine old-growth, depending on site, include 20 live trees per acre 14 or 18 inches in diameter, 70 to 90 basal area, and 40 to 50 percent canopy cover (1987 Plan, page 70-2).

Forestwide standards and guidelines for fuels treatment include:

- Limit the treatment of natural fuels to areas where fuel buildups are a threat to life, property, adjacent to old-growth areas, or specifically identified high resource values (1987 Plan, page 95).

MA 3 direction for ponderosa pine and mixed conifer less than 40 percent slopes includes:

- Guidance for MA 3 refers to forestwide guidance for old-growth, with the added standard and guideline that old-growth stands are 100 to 300 acres in size (1987 Plan, page 129).

In MA 4, guidance is to follow standards and guidelines in MA 3.

Overall, guidance for maintaining or enhancing old growth conditions is explicit and quantitative. Guidance emphasizes sustaining as much old growth as possible and no less than 20 percent with the ponderosa pine type, with stand sizes ranging from 100 to 300 acres in size. These standards and guidelines that management activities and projects on the forest provide for the mature habitat and large snags needed by pygmy nuthatches (1987 Plan, pages 138 to 140).

Ponderosa Pine Snags

Snag management is emphasized in the 1987 Plan. Standards and guidelines that apply to ponderosa pine snags are found in many sections of the 1987 Plan.

Forestwide guidance for snags includes:

- Mexican spotted owl guidance calls for retaining snags within protected activity centers (PACs) and other protected habitat. In Mexican spotted owl restricted habitat, substantive amounts of snags 18 inches in diameter and larger are to be maintained. In habitats of other forest types that are not protected or restricted, snags are to be retained while applying ecosystem management approaches (1987 Plan, pages 65-2 to 65-5).
- Forestwide guidance for the northern goshawk calls for retaining snags throughout vegetation types, including ponderosa pine. Snags are defined for goshawk management as 18 inches in diameter or larger, and 30 feet tall or taller. In ponderosa pine habitat both within and outside of post-fledging areas, guidance is to leave at least 2 snags per acre. (1987 Plan, pages 65-7 to 65-10).
- Forestwide timber guidance for 10,000-acre (10K) blocks allows for exceeding minimum requirements for snags where it is good multiple-use management to do so (1987 Plan, page 70-3).
- Forestwide direction for old-growth, including snag management, specifies that minimum size criteria for ponderosa pine snags within old-growth are 14 inches in diameter and 15 feet tall on low sites, and 25 feet tall on high sites. Old-growth ponderosa pine should contain at least one ponderosa pine snag per acre. As with 10K blocks, minimum requirements are exceeded where it is good multiple use management to do so. (1987 Plan, pages 70-1 to 70-2.)

- Forestwide direction for fuel treatments is to identify and fire-line snags that are necessary to meet wildlife management objectives. Monitoring during burning is to occur to ensure they are protected (1987 Plan, page 95).

MA 3 direction for ponderosa pine and mixed conifer less than 40 percent slopes includes:

- Guidance for osprey has several standards/guidelines for snags. Potential nest sites in preferred nesting habitat should have at least 2 snags per acre 20 inches or greater in diameter and should be at tall as the forest canopy or taller. Snags should be created if necessary to provide perch and nest sites. (1987 Plan, page 124.)
- In the snag management section, a ponderosa pine snag is defined as a tree greater than 12 inches d.b.h. and 15 feet tall. An oak snag is defined as a tree greater than 10 inches d.b.h. and 10 feet tall. Within 10K blocks at least 50 percent of the forested land, 2 snags per acre will be maintained, and in high priority areas, 2.8 snags per acre will be maintained. Snags are not available for firewood unless designated because of being surplus to wildlife needs. Snags and potential snags will be identified and tallied for each stand. Potential snags will be left where needed to meet snag requirements. Salvage sales must meet snag standards and sales will be delayed if numbers are too low to allow salvage. In order to be considered a road hazard, a snag must lean toward the road and must be tall enough to reach the road if the snag fell and any snag not meeting both requirements will not be removed. (1987 Plan, pages 126 to 127.)
- Silvicultural prescriptions in MA 3 discuss snag management as well (1987 Plan, pages 126 to 127). For ponderosa pine shelterwood prescriptions, dead and poor risk trees in excess of planned snag densities can be harvested, but snags without red needles are retained for wildlife purposes except for wildfire killed trees. Prescriptions for Gambel oak call for retaining two cavity-bearing snags greater than 10 inches in diameter and live trees containing one or more cavities. If snag density objectives are exceeded in 10K blocks, areas containing excessive mortality may be harvested under the following criteria:
    - ♦ Retain at least two snags per acre greater than 15 inches d.b.h. without signs of wildlife use.
    - ♦ Retain trees showing obvious signs of wildlife use or rot.
    - ♦ Retain trees with some live crown and less than 75 percent trunk girdling unless removal is necessary to meet overall objectives.

In MA 4, guidance is to follow standards and guidelines in MA 3.

In FLEA, area-wide direction, protection of large trees and snags occurs when prescribed fires are used to improve and protect bald eagle winter roost areas (1987 Plan, page 206-73).

Overall, guidance in the 1987 Plan for maintaining large snags is explicit and quantitative. Different definitions for ponderosa pine snag size and height definitions are confusing though, ranging from 12 to greater than 20 inches in diameter and 15 to greater than 30 feet tall. Because the standards and guidelines for the Mexican spotted owl and goshawk apply to all forested areas, the more recent guidance for snags in those sections is generally what is applied at the site-specific level. Therefore, at least two snags per acre 18 inches in diameter and 30 feet or greater are managed for in the ponderosa pine type, except in osprey habitat, where snag guidance is for two tall snags per acre 20 inches or greater in diameter. Additionally, standards and guidelines call for retaining two cavity-bearing Gambel oak snags greater than 10 inches in diameter per acre, plus live trees containing one or more cavities. Because pygmy nuthatches favor snags greater than 15 inches in diameter, and more cavities are found in trees greater than 20 inches, standards and guidelines in alternative A for large snags benefits pygmy nuthatches.

Alternative A Projected Habitat Trend: Under this alternative, the amount of old growth habitat increases from 78,123 acres to 142,693 acres (table 124). Qualitatively, plan guidance emphasizes sustaining as much old growth as possible and no less than 20 percent with the ponderosa pine type, with stand sizes ranging from 100 to 300 acres in size. The large snag component of pygmy nuthatch indicator habitat is projected to stay nearly the same, increasing only from 1.3 to 1.4 snags greater than 18 inches across the landscape (table 124). These standards and guidelines ensure that management activities and projects on the forest provide for the mature habitat needed by pygmy nuthatches.

Overall, the trend for ponderosa pine old growth habitat for the pygmy nuthatch is increasing toward reference condition and large snag indicator habitat is stable with reference condition.

Alternative A Projected Population Trend: The current forestwide population trend for pygmy nuthatch is stable to slightly declining. Given the projected habitat trends that would increase the amount of old growth in the largest size classes and keep large snags stable, implementation of alternative A should result in a halt to the declining population trend and improve the population trend for the pygmy nuthatch to stable**.**

Alternative B (modified)

Alternative B (modified) does not have specific guidance for the pygmy nuthatch, but does have a monitoring element (#21a) that inquires about the status and trends of this species. The Ponderosa Pine ERU provides indicator habitat for this species.

Ponderosa Pine Old Growth – Large trees and old growth attributes
Ponderosa pine old growth direction is contained primarily in forestwide desired conditions for the Ponderosa Pine ERU. Desired conditions envision that pine stringers that consist of large, old trees and that extend into lower elevations will persist. (FW-TerrERU-All-DC-4). Other desired conditions are described at three levels as follows.

At the landscape level (1,000 to 10,000+ acres), desired conditions envision a functioning ecosystem that contains old trees (FW-TerrERU-PP-DC-2 and 4). And specifically, desired conditionFW-TerrERU-PP-DC-6 describes old growth as follows:

> "Old-growth structure occurs throughout the landscape consistent with vegetative characteristics of a frequent, low-severity fire regime. Old growth is a component of uneven-aged forests, generally composed of groups of similarly aged trees and single trees interspersed with open grass–forb–shrub interspaces, but occasionally, it occurs in larger even-aged patches where local microsites facilitate less frequent fire regimes. Within-group variability may be low, but variation among groups is typically high, and proportions of patches with different developmental stages may vary, depending on site-specific conditions. Old-growth components include old trees, dead trees (snags), and dead and downed wood (coarse woody debris including large size classes). Snags and large dead and downed fuels are irregularly distributed across the landscape and may not exist in some patches. The location of old-growth components shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality)."

At the mid-scale (10 to 999 acres), tree groups are a mosaic of tree groups that generally comprises an uneven-aged forest with all age classes present, including old growth (FW-TerrERU-PP-DC-9). And specific to northern goshawks, post-fledging family areas will contain 10 to 20 percent higher basal area in mid-aged to old tree groups. (FW-TerrERU-PP-DC-12).

At the fine scale (less than 10 acres), old-growth groups have interlocking (or nearly interlocking) canopies, contain trees of similar age characteristics and conditions, and consist of 2 to 40 trees per group (FW-TerrERU-PP-DC-13)

In addition to desired conditions for Ponderosa Pine old-growth, there are three guidelines to apply to projects and activities:

- Protect existing old-growth from uncharacteristic natural disturbances (FW-TerrERU-PP-G-1)
- Develop old-growth where it is lacking (FW-TerrERU-PP-G-2)
- In promoting uneven-aged conditions, retain presettlement trees, which are often the oldest and tallest trees (FW-TerrERU-PP-G-3)

One other section of the plan addresses old-growth relative to pygmy nuthatch ponderosa pine indicator habitat. The Wildlife, Fish, and Plants section articulates that old trees and other attributes of mature stands provide habitat for associated species (FW-WFP-DC-7).

Collectively, qualitative descriptions of desired conditions, and the guidelines for old-growth in the Ponderosa Pine ERU describe conditions that should provide good habitat for the pygmy nuthatch. Compared to alternative A, direction in alternative B (modified) is not as explicit with respect to the amount of old-growth ponderosa pine habitat to manage for.

Ponderosa Pine Snags

Specific to the Ponderosa Pine ERU, forestwide desired conditions for snags are described at the landscape and fine scale. At the landscape level (1,000 to 10,000+ acres), desired conditions envision a functioning ecosystem that contains snags (FW-TerrERU-PP-DC-2 and 4), including snags as a component of old growth (FW-TerrERU-PP-DC-6). Ponderosa pine snags are typically 18 inches or greater d.b.h., and average 1 to 2 snags per acre (FW-TerrERU-PP-DC-5). At the fine scale (less than 10 acres), desired conditions include dead trees and spike tops as components of old-growth groups (FW-TerrERU-PP-DC-13).

In addition to the desired conditions described above, a guideline for projects and activities calls for emphasizing the largest and tallest snags in a stand to provide habitat for cavity-nesting birds and other wildlife (FW-TerrERU-PP-G-5). This would be beneficial to identification and maintenance of the large snags that pygmy nuthatches require.

Alternative B (modified) allows for management of snags at the lower end of the range within the wildland-urban interface (WUI) (FW-WUI-DC-5, FW-WUI-G-1). Although not as desirable for the pygmy nuthatch, large snags would still occur in the wildland-urban interface, just at a lower density than within the remaining ponderosa pine matrix.

Snags guidance that would apply to the pygmy nuthatch can also be found in forestwide desired conditions for Wildlife, Fish, and Plants, where snags are identified as an important attribute of old growth in all forest and woodland ERUs (FW-WFP-DC-7).

Alternative B (modified) includes a determination that mechanized recreation (e.g., bikes) would be not suitable in botanical and geological areas. This suitability determination includes an exception that would find mechanized recreation suitable on designated trails in these special areas. Allowing bicycles on designated trails in botanical and geological areas will have no measurable effects on pygmy nuthatches. The only Ponderosa Pine habitat within botanical or geological areas is 49 acres in the Red Mountain Geological Area.

Overall, compared to alternative A, the guidance in alternative B (modified) is not as explicit or quantitative for protection and maintenance of ponderosa pine snags that pygmy nuthatches need for nesting and roosting. Snags are often mentioned as a desired part of the landscape, but specifics of guidance for maintenance and development of snags is lacking. Desired conditions do define snags as 18 inches or greater in diameter but generally envision levels of 1 to 2 snags per acre, which is less than alternative A. No minimum heights are mentioned. Unlike alternative A, this alternative does not describe protections for snags when doing management activities such as timber harvest, thinning, or fuels treatment. And the desired conditions and guidelines that allow for lower levels of snags in the wildland-urban interface will provide less habitat for pygmy nuthatches in all areas identified as the wildland-urban interface.

Alternative B (modified) Projected Habitat Trend: Although the plan language for managing old growth is not as explicit with respect to the amount of old growth ponderosa pine to manage on the landscape as alternative A, the same increase in old growth occurs in alternative B (modified) (table 124). Qualitatively, plan desired conditions envision old growth throughout the landscape, and guidelines provide for protecting existing old growth, developing old growth where it is lacking, and protecting presettlement trees. As with alternative A, the large snag component of pygmy nuthatch indicator habitat is projected to stay nearly the same, increasing only from 1.3 to 1.4 snags greater than 18 inches across the landscape (table 124). These plan components provide for the mature habitat needed by pygmy nuthatches.

Overall, the trend for ponderosa pine old growth habitat for the pygmy nuthatch is increasing and toward reference condition large snag indicator habitat is stable with reference condition.

Alternative B (modified) Projected Population Trend: The current forestwide population trend for pygmy nuthatch is stable to slightly declining. Given the projected habitat trends that would increase the amount of old growth in the largest size classes and keep large snags stable, implementation of alternative B (modified) should result in a halt to the declining population trend and improve the population trend for the pygmy nuthatch to stable**.**

Alternative C

Alternative C is similar to alternative B (modified), but responds to suggestions from the public for more land to be managed in primitive and natural settings with reduced human-related disturbance for the benefit of recreation, and botanical and wildlife resources. Additional wilderness areas would be recommended on the forest to provide additional protection to botanical and wildlife resources. The primary difference related to pygmy nuthatch indicator habitat is that alternative C also responds to ecological concerns related to presence or absence of old-growth composition and structure on the landscape. This analysis focuses on the differences from alternative B (modified), which are:

1. Recommends 10 additional wilderness areas (91,757 total wilderness acres compared to 8,733 acres recommended in alternative B (modified)).

2. Determines snowmobile use to be unsuitable in the Walnut Canyon Management Area and areas with a recreation opportunity spectrum objectives of semi-primitive non-motorized or primitive.

3. Determines recreational shooting to be unsuitable in botanical areas; geological areas; existing and recommended research natural areas; eight management areas that emphasize reduced human-related disturbance; and in the Walnut Canyon, Sedona Neighborwoods, and Long Valley Management Areas, and parts of the Flagstaff Neighborwoods Management Area.
4. Restricts livestock grazing in research natural areas unless it supports, or would not affect, the research purpose of that research natural area.
5. Designates seven management areas (Blue Ridge, Hospital Ridge, Jack's Canyon, Knoll Lake, Limestone Pasture, Pine Grove, and Second Chance) and modifies alternative B (modified)'s Anderson Mesa Management Area direction and boundaries to emphasize reduced human-related disturbance totaling 335,371 acres.
6. Limits motorized dispersed camping in the eight management areas that emphasize reduced human-related disturbance to current levels.
7. Limits public motor vehicle access in the eight management areas that emphasize reduced human-related disturbance.
8. Limits public road density in the Anderson Mesa Management Area to an average of 1 mile or less of road per square mile.
9. Limits large group recreation events and large commercial tours outside of developed sites in the eight management areas that emphasize reduced human-related disturbance.
10. Includes key direction from the 1987 plan for old growth that would be incorporated into the proposed revised plan:
    - Allocation of at least 20 percent of the naturally forested area by forest and woodland ERUs in any landscape by 6th code watershed;
    - Distribution of old growth would be in 100- to 300-acre stands;
    - The Minimum Criteria for the Structural Attributes Used to Determine Old Growth.

Recommended Wilderness Areas

The acreage of Ponderosa Pine ERU within the 13 recommended wildernesses is only 0.6 percent (4,462 acres) of the total ERU acres (797,171 acres). Designation of these additional recommended wilderness areas would have a negligible effect on pygmy nuthatches and their habitat.

Snowmobile Use

The determination that snowmobile use would not be suitable in the Walnut Canyon Management Area and areas with a recreation opportunity spectrum objectives of semi-primitive non-motorized or primitive would have a very minor positive impact by reducing the potential for disturbance since pygmy nuthatches do not migrate in the winter.

Recreational Shooting

There are 18,131 acres of the Ponderosa Pine ERU in the Walnut Canyon MA, 16,098 acres in the Red Rock MA, 156,800 acres in the Long Valley MA, 40,933 acres in the Flagstaff Neighborwoods MA, 48,284 acres in the Anderson Mesa MA, 21,011 acres in the Blue Ridge MA, 26, 480 acres in the East Clear Creek MA, 862 acres in the Hospital Ridge MA, 8,241 acres in the Jack's Canyon MA, 2,158 acres in the Limestone Pasture MA, 12,722 acres in the Pine Grove MA, and 1,444 acres in the Second Chance MA. The determination that these management areas are not suitable for recreational (non-hunting) shooting will minimally impact pygmy nuthatches by reducing the amount of disturbance from shooting. There are 18,131 acres of the Ponderosa Pine ERU in the Walnut Canyon MA, 16,098 acres in the Red Rock MA, 156,800 acres in the Long Valley MA, and 40,933 acres in the Flagstaff Neighborwoods MA. Designating these management areas as not suitable for recreational (non-hunting) shooting would positively impact pygmy nuthatches by reducing the amount of disturbance from shooting.

Livestock Grazing in Research Natural Areas

Only 925 acres of Ponderosa Pine are in research natural areas. Restricting grazing would have no measurable impact on pygmy nuthatches or their habitats. Livestock grazing is low to nonexistent in these areas, because they have low forage production or are inaccessible for livestock due to naturally occurring topographical features.

Management Areas

Alternative C includes eight management areas that emphasize reduced human-related disturbances. Pygmy nuthatches are not identified as an emphasis species in these management areas, but in general, desired conditions for these management areas envision providing low-disturbance wildlife habitat. While changes in habitat are not expected compared to alternative B (modified), there is likely to be some reduction in disturbance to breeding and wintering pygmy nuthatches overall.

Old Growth

Including key direction for old growth from the 1987 Plan is not expected to change the amount of ponderosa pine old growth over time for alternative C (see table 124). As described for the analysis of alternative A, plan language for maintaining or enhancing old growth conditions is more explicit and quantitative. Guidance emphasizes sustaining as much old growth as possible and no less than 20 percent with the ponderosa pine type, with stand sizes ranging from 100 to 300 acres in size. These standards and guidelines provide for the mature habitat and large snags needed by pygmy nuthatches.

Overall, since alternative C is very similar to alternative B (modified), the effects are very similar as well. The amount of ponderosa pine old growth and large snags is not different from alternatives A and B (modified). Alternative C would provide slightly less disturbance potential to breeding or wintering pygmy nuthatches through limitations of disturbance from snowmobiles and recreational shooting in some areas, and through management of additional management areas to provide low-disturbance wildlife habitat.

Alternative C Projected Habitat Trend: The amount of old-growth ponderosa pine habitat and the number of large snags per acre are not expected to differ from the other alternatives. Therefore, although old-growth language is retained from the 1987 Plan, the effects do not differ from alternative B (modified).

Overall, the trend for ponderosa pine old growth habitat for the pygmy nuthatch is increasing toward reference condition and large snag indicator habitat is stable with reference condition.

Alternative C Projected Population Trend: The current forestwide population trend for pygmy nuthatch is stable to slightly declining. The projected habitat trend is that the amount of old growth compared to existing conditions will increase, and large snags will remain stable on the landscape. Alternative C provides plan emphasis and direction that is expected to reduce disturbance impacts to pygmy nuthatches slightly, but not enough to change the population trend as described for alternative B (modified).

Therefore, implementation of alternative C is expected to improve the population trend for the pygmy nuthatch to stable**.**

Alternative D

This alternative would be similar to alternative B (modified), but differs in the following ways:

- No new wilderness areas would be recommended; and
- Expansion and/or increased access for future energy corridor needs would be provided for, and scenic integrity objectives along existing energy corridors for energy infrastructure would be modified.

Not adding any new wilderness areas makes this aspect of alternative D the same as alternative A. However, as analyzed above for both alternatives B (modified) and C, the addition of wilderness has a negligible impact on pygmy nuthatches compared to alternative A.

This alternative reduces the scenic integrity object from moderate or high, to low, for approximately 32 miles along two utility corridors to accommodate future energy corridor expansion. Since the corridors already exist and disturbance to habitat has already occurred, it is unlikely that there would be additional impacts to pygmy nuthatch populations or habitat.

Overall, effects from alternative D are not appreciably different than alternative B (modified).

Alternative D Projected Habitat Trend: The projected trends are the same as for alternative B (modified): increasing toward reference condition for ponderosa pine old growth, and stable with reference condition for large snags.

Alternative D Projected Population Trend: Like alternative B (modified), the population trend for the pygmy nuthatch is stable**.**

Summary of Trends by Alternative for Pygmy Nuthatch

Despite more explicit and quantitative guidance for old growth and snags in alternatives A and C, the amount of ponderosa pine old growth and large snag habitat does not differ among any of the alternatives (table 124 and table 125). Alternative C would result in slightly less disturbance to pygmy nuthatches, but is not different enough from the other alternatives to result in changes to the forestwide trends. Therefore, the trends compared to existing conditions are the same for all alternatives (table 126). All trend estimates are after 15 years of implementation.

Table 126. Summary of amount of pygmy nuthatch indicator habitat (old-growth ponderosa pine), and forestwide trends for habitat and populations by alternative

Alternative	Acres of Old Growth Indicator Habitat	Large Snags[1] per Acre in ERU	Population Trend	Habitat Trend Old Growth	Habitat Trend Snags
A	142,693 – 179,363	1.4	Stable	Increasing	Stable
B (modified)	142,693 – 179,363	1.4	Stable	Increasing	Stable
C	142,693 – 179,363	1.4	Stable	Increasing	Stable
D	142,693 – 179,363	1.4	Stable	Increasing	Stable

[1]Large snags are defined as greater than 18 inches d.b.h.

Mexican spotted owl

Affected Environment

The Mexican spotted owl was selected as an indicator for Mixed Conifer with Infrequent Fire, Mixed Conifer with Frequent Fire, and Ponderosa Pine (Gambel oak subtype) ERUs on the forest. This species was also an indicator species for the 1987 Plan where indicator habitat was identified as late seral mixed conifer and spruce-fir. Since then, the Mexican spotted owl had been found to use ponderosa pine-Gambel oak, and has not been found using spruce-fir habitat. The Mexican spotted owl prefers areas of well-structured forests with high canopy cover, large trees, and other late seral characteristics for nesting and roosting habitat (USDI Fish and Wildlife Service 2012b). Although the nesting and roosting habit used by owls is well-structured, late seral habitat, all of the mixed conifer and pine-oak habitats are important to the owl and will be considered as indicator habitat. Descriptions of the Mixed Conifer with Infrequent Fire, Mixed Conifer with Frequent Fire, and Ponderosa Pine ERUs can be found in the Vegetation and Fire section in chapter 3 of volume 1 of this document. The forest does not have the Ponderosa Pine ERU broken out by pure pine and pine/oak, but it is estimated to be approximately 40 percent (USDA Forest Service 2009a), or approximately 318,868 acres.

Existing condition habitat trend: Summing the acres within the three indicator ERUs on the forest, the current estimate of indicator habitat for the Mexican spotted owl is 405,606 acres (table 127). Current information shows that mixed conifer and pine-oak habitats on the forest are moderately to highly departed from reference (historical) conditions and vegetation is moving away from reference conditions (table 127). Overall, the current trend for Mexican spotted owl indicator habitat is declining.

Table 127. Amount of Mexican spotted owl indicator habitat (ERU acreage), and existing vegetative departure[1] and trend relative to reference conditions

Indicator Habitat	Existing Acres	Vegetation Existing Departure[1] (%) and Trend
Mixed Conifer with Frequent Fire	49,595	Moderate (64), Away
Mixed Conifer with Infrequent Fire	37,143	Moderate (62), Away
Ponderosa Pine-Gambel Oak[2]	318,868	High (79), Away
Total:	**405,606**	

[1]Departure was assessed as Low (0-33 percent), Moderate (34-66 percent), or High (>66 percent).
[2]Departure and trends are from the ERU as a whole.

Existing condition population trend: Overall, the forestwide population trend for the Mexican spotted owl is not known for certain, but may be stable to declining (USDA Forest Service 2013). A few new PACs are still being found on the forest, and occupancy rates are up and down. The only demography study done on the forest found that the owls within the study area were declining at a rate of greater than 10 percent per year from 1991 to 1997 (Seamans et al. 1999). Implementation of the population monitoring plan called for in the 2012 recovery plan (USDI Fish and Wildlife Service 2012b) should help determine more accurate rangewide and Forest trends.

Summary of Indicator Habitat and Trends for All Alternatives

The following table summarizes the departure and trends for Mexican spotted owl indicator habitat ERUs for existing conditions and all alternatives (table 128). The table also summarizes the predicted departure and trends for the Mexican spotted owl indicator habitat ERUs under each alternative. This table will be referred to in the following effects analysis discussions for each alternative.

Table 128. Summary of existing vegetation departure[1] and trend relative to reference conditions.

Indicator Habitat (ERU)	Vegetation Departure (%), Trend		
	Existing	Alternative A	Alternatives B (modified), C, D
Mixed Conifer with Frequent Fire[2]	Moderate (64), Away	Moderate (42), Toward	Low Treatment: Moderate (42), Toward High Treatment: Low (33), Toward
Mixed Conifer with Infrequent Fire	Moderate (62), Away	Moderate, Away	Moderate, Static
Ponderosa Pine – Gambel Oak[2,3]	High (79), Away	Low Treatment: High Treatment:	Moderate (68), Toward Moderate (56), Toward

[1]Departure was assessed as Low (0-33 percent), Moderate (34-66 percent), or High (>66 percent).
[2]These ERUs were modeled to predict changes by alternative; other ERUs were qualitatively assessed.
[3]Departure and Trend values are assumed to be the same as for the ERU as a whole.

Except for alternative A for Mixed Conifer with Infrequent Fire, all alternatives improve departure and/or trend for indicator habitats for the Mexican spotted owl. The greatest improvement for all three ERUs occurs under alternatives B (modified), C, and D.

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Alternative A

The Mexican spotted owl is identified as a management indicator for MA 3 (ponderosa pine and mixed conifer on slopes less than 40 percent) and MA 4 (ponderosa pine and mixed conifer greater than 40 percent slopes) and for these habitat types within the FLEA area. The management emphasis for MA 3 is on a sustained-yield of timber and firewood, wildlife habitat, livestock grazing, high quality water, and dispersed recreation. The management emphasis for MA 4 is on wildlife habitat and dispersed recreation.

The 1987 Plan has a standard to follow approved recovery plans. Specific standards and guidelines for the Mexican spotted owl (1987 Plan, pages 65 and 65-1 to 65-6) tier to the 1995 Mexican spotted owl Recovery Plan. Guidance is provided for protected, restricted, and other forest and woodland types. A guideline for managing restricted habitat includes a guideline to follow implement forest plan old-growth standards and guidelines to maintain and promote development of owl habitat (1987 Plan, page 65-5). Similarly, a guideline for other forest and woodland types calls for retention of existing old growth in accordance with forest plan old-growth standards and guidelines (1987 Plan, page 65-5).

While not specific to the Mexican spotted owl, additional old growth direction for ponderosa pine and mixed conifer in the 1987 Plan is contained in several places. In forestwide direction, a standard to be applied in habitats outside of Mexican spotted owl protected and restricted habitat is to:

- Manage for uneven-age stand conditions for live trees and retain live reserve trees, snags, downed logs, and woody debris levels throughout woodland, ponderosa pine, mixed conifer and spruce-fir forest cover types. Manage for old age trees such that as much old forest structure as possible is sustained over time across the landscape. Sustain a mosaic of vegetation densities (overstory and understory), age classes and species composition across the landscape. Provide food and cover for goshawk prey (1987 Plan, page 65-7). Guidelines to apply outside of goshawk post-fledging areas are to manage for 20 percent in mature (VSS 5) and 20 percent in old (VSS 6) forest conditions. In mixed conifer, canopy cover should average greater than 50 percent in VSS 5 and greater than 60 percent in VSS 6. In ponderosa pine, canopy cover should average greater than 40 percent in VSS 5 and 6. Within post-fledging areas, canopy closures are slightly greater (1987 Plan, page 65-10).

Also in forestwide direction, a standard for old growth states:

- Until the forest plan is revised, allocate no less than 20 percent of each forested ecosystem management area to old growth, as depicted in the table below (1987 Plan, page 70-10).

Several key forestwide guidelines for old growth include:

- Strive to create or sustain as much old-growth compositional, structural, and functional flow as possible over time at multiple-area scales. Seek to develop or retain old-growth function on at least 20 percent of the naturally forested area by forest type in any landscape (1987 Plan, page 70-1).
- Consider the effects of spatial arrangement on old-growth function, from groups to landscapes, including de facto allocations to old-growth such as goshawk nest sites, Mexican spotted owl protected activity centers, sites protected for species behavior associated with old-growth, wilderness, research natural areas, and other forest structures managed for old-growth function (1987 Plan, page 70-1).
- Forested sites should meet or exceed the structural attributes to be considered old growth in the five primary forest cover types in the Southwest as depicted in the following table (1987 Plan, page 70-1).

A forestwide fuels treatment standard and guideline is:

- Limit the treatment of natural fuels to areas where fuel buildups are a threat to life, property, adjacent to old-growth areas, or specifically identified high resource values (1987 Plan, page 95).

Guidance for MA 3 refers to forestwide guidance for old growth, with the added standard and guideline that old-growth stands are 100 to 300 acres in size.

In MA 4, guidance is to follow standards and guidelines in MA3.

Overall, guidance for maintaining or enhancing old growth conditions in the 1987 Plan is explicit and quantitative. Guidance emphasizes sustaining as much old growth as possible and no less than 20 percent in each ERU, with stands ranging from 100 to 300 acres in size. This is positive for the Mexican spotted owl in ensuring a high proportion of forested landscapes are maintained in old-growth conditions.

Projected Habitat Trend: The amount of ponderosa pine and mixed conifer habitat is not expected to change with continued implementation of the 1987 Plan. Old-growth will be managed to comprise at least 20 percent of the landscape, primarily in blocks of 100 to 300 acres. Departure from reference conditions and/or vegetative trend is expected to stay the same or improve. While modest, these improvements are expected to change the existing trend from declining, to stable to slightly increasing with continued implementation of alternative A.

Projected Population Trend: The current forestwide population trend for the Mexican spotted owl is stable to declining. Alternative A has strong guidance to manage for the Mexican spotted owl and there is a standard to follow approved recovery plans. Combined with the slightly increasing habitat trend noted above, the projected population trend for the Mexican spotted owl under alternative A is expected to be stable to slightly increasing.

Alternatives B (modified) and D

Alternative D does not differ from alternative B (modified) with respect to the Mexican spotted owl and its habitat, so the findings are the same. As summarized in the analysis for the Mexican spotted owl as a listed species, most of the guidance for old-growth ponderosa pine and mixed conifer habitat is in the form of desired conditions and generally describes conditions that would encompass habitat needs for Mexican spotted owl (FW-TerrERU-PP-DC-6, 7, and 8; FW-TerrERU-MC-All-DC-3 and 4; FW-TerrERU-MC-MCFF-DC-2 and 7; and FW-TerrERU-MC-MCIF-DC-2 and 6). Like alternative A, these two alternatives point to guidance in recovery plans and emphasize recovery of the Mexican spotted owl (FW-WFP-G-1) that address habitat improvement and protection from disturbance. Alternatives B (modified) and D also have an objective to implement at least 20 activities that contribute to recovery of listed species (FW-WFP-O-1), highlighting the revised plan's intention to recover species. However, alternative A has more explicit and quantitative guidance for the minimum amount of old growth to manage for and maintain on the landscape, and provides for larger groups (stand size) in old-growth conditions, which would better ensure that Mexican spotted owl mature and old forests are managed for.

Projected Habitat Trend: The amount of pine-oak mixed and conifer habitat is not expected to change under alternatives B (modified) or D. Vegetation trends improve for all three ERUs compared to existing conditions, particularly for Mixed Conifer with Frequent Fire and Ponderosa Pine, and more so toward the upper end of treatment objectives (table 128). The current trend for Mexican spotted owl indicator habitat is declining, so the expected improvement in departure and trend for Mexican spotted owl (table 128) is expected to change the trend to stable to increasing toward reference condition.

Projected Population Trend: The existing population trend for the Mexican spotted owl on the forest is stable to declining. Given the expected improvement in habitat trend through implementation of alternative B (modified), combined with implementing actions and projects to benefit and contribute to recovery, the projected population trend for the Mexican spotted owl under alternative A is expected to be stable to slightly increasing**.**

Alternative C

Alternative C is similar to alternative B (modified), but responds to suggestions from the public for more land to be managed in primitive and natural settings with reduced human-related disturbance for the benefit of recreation, and botanical and wildlife resources. Additional wilderness areas would be recommended on the forest to provide additional protection to botanical and wildlife resources. The primary difference related to Mexican spotted owl indicator habitat is that alternative C retains key elements of old growth from the 1987 Plan. This analysis focuses on the differences from alternative B (modified), which are:

1. Recommends 10 additional wilderness areas (91,757 total wilderness acres compared to 8,733 acres recommended in alternative B).
2. Determines snowmobile use to be unsuitable in the Walnut Canyon Management Area and areas with a recreation opportunity spectrum objectives of semi-primitive non-motorized or primitive.

3. Determines recreational shooting to be unsuitable in botanical areas; geological areas; existing and proposed research natural areas; eight management areas that emphasize reduced human-related disturbance; and in the Walnut Canyon, Sedona Neighborwoods, and Long Valley Management Areas, and parts of the Flagstaff Neighborwoods Management Area.
4. Restricts livestock grazing in research natural areas unless it supports, or would not affect, the research purpose of that research natural area.
5. Designates seven management areas (Blue Ridge, Hospital Ridge, Jack's Canyon, Knoll Lake, Limestone Pasture, Pine Grove, and Second Chance) and modifies alternative B (modified)'s Anderson Mesa Management Area direction and boundaries to emphasize reduced human-related disturbance, totaling 335,371 acres.
6. Limits motorized dispersed camping in the eight management areas that emphasize reduced human-related disturbance to current levels.
7. Limits public motor vehicle access in the eight management areas that emphasize reduced human-related disturbance.
8. Limits public road density in the Anderson Mesa Management Area to an average of 1 mile or less of road per square mile.
9. Limits large group recreation events and large commercial tours outside of developed sites in the eight management areas that emphasize reduced human-related disturbance.
10. Includes key direction from the 1987 Plan for old growth that would be incorporated into the proposed revised plan:
    - Allocation of at least 20 percent of the naturally forested area by forest and woodland ERUs in any landscape by 6th code watershed;
    - Distribution of old growth would be in 100- to 300-acre stands;
    - The Minimum Criteria for the Structural Attributes Used to Determine Old Growth.

Recommended Wilderness Areas

The acreage of Ponderosa Pine ERU within the 13 recommended wildernesses is only 0.6 percent (4,462 acres) of the total ERU acres (797,171 acres). The acreage of Mixed Conifer with Infrequent Fire is 347 acres (0.9 percent) and 283 acres (0.6 percent) for Mixed Conifer with Frequent Fire. Designation of these additional recommended wilderness areas would have a negligible effect on the Mexican spotted owl and its indicator habitat.

Snowmobile Use

There are approximately 1,830 acres of PACs within the Walnut Canyon Management Area. The determination that snowmobile use would not be suitable in that management area and other areas with a recreation opportunity spectrum objectives of semi-primitive non-motorized or primitive would have a positive impact by reducing the potential for disturbance to Mexican spotted owl s.

Recreational Shooting

Recreational (non-hunting) shooting has the potential to disturb nesting or roosting owls. Placing restrictions on recreational shooting in botanical areas, geological areas, existing and recommended research natural areas, and management areas will benefit nesting and roosting owls by reducing the amount of disturbance from shooting.

Livestock Grazing in Research Natural Areas
PAC and/or critical habitat occurs in several research natural areas (see Biological Assessment, Overby et al. 2017). Restricting grazing could reduce impacts on grasses, forbs, and shrubs used by prey species for food and cover. However, livestock grazing is low to nonexistent in these areas because they have low forage production or are inaccessible for livestock due to naturally occurring topographical features.

Management Areas
Alternative C includes management areas that emphasize reduced human-related disturbances. In general, desired conditions for these management areas envision providing low-disturbance wildlife habitat. The Mexican spotted owl is an emphasis species for Anderson Mesa, Pine Grove, Jack's Canyon, East Clear, Blue Ridge, Hospital Ridge, and Knoll Lake MAs. Designation of these MAs would, therefore, be expected to reduce disturbance to owls, improving the quality of their habitat.

Old Growth
Including key direction for old growth from the 1987 Plan is not expected to change the amount of ponderosa pine old growth over time for alternative C (see table 124). As described for the analysis of alternative A, plan language for maintaining or enhancing old growth conditions is explicit and quantitative. Guidance emphasizes sustaining as much old growth as possible and no less than 20 percent with the ponderosa pine type, with stand sizes ranging from 100 to 300 acres in size. These standards and guidelines provide for the mature habitat and large snags needed by the Mexican spotted owl.

Overall, since alternative C is very similar to alternatives B (modified) and D, the effects are very similar as well. The primary emphasis of alternative C is to reduce human disturbance, which would benefit the Mexican spotted owl through suitability determinations on snowmobile use and recreational shooting, and an emphasis on less human disturbance in eight management areas.

Projected Habitat Trend: Like alternatives B (modified) and D, the amount of pine-oak and mixed conifer habitat is not expected to change under alternative C. Vegetation trends improve for all three ERUs compared to existing conditions, particularly for Mixed Conifer with Frequent Fire and Ponderosa Pine, and more so toward the upper end of treatment objectives (table 128). The current trend for Mexican spotted owl indicator habitat is declining, so the somewhat modest expected improvement in departure and trend for MSO is expected to change the trend to stable to increasing toward reference condition**.**

Projected Population Trend: The existing population trend for the Mexican spotted owl on the forest is stable to declining. Given the expected improvement in habitat trend through implementation of this alternative, combined with the additional direction that will reduce disturbance, the projected population trend for the Mexican spotted owl under alternative C is expected to be stable to increasing**.**

Summary of Trends by Alternative for the Mexican Spotted Owl

Forestwide habitat trend is projected to improve under all alternatives (table 129), but slightly less so for alternative A, since less improvement is expected in trend toward reference conditions for the mixed conifer ERUs (table 128). Forestwide population trend is also expected to improve under all alternatives (table 129). Primarily because of the emphasis on less human disturbance, the population trend under alternative C is projected to be greater than the other alternatives (table 129).

Table 129. Summary of amount of Mexican spotted owl indicator habitat, and population and habitat trends by alternative

Alternative	Acres of Indicator Habitat	Habitat Trend	Population Trend
A	405,606	Stable to Slightly Increasing	Stable to Slightly Increasing
B (modified)	405,606	Stable to Increasing	Stable to Slightly Increasing
C	405,606	Stable to Increasing	Stable to Increasing
D	405,606	Stable to Increasing	Stable to Slightly Increasing

Migratory Birds

Affected Environment

The primary direction for management of migratory birds is contained within the Migratory Bird Treaty Act, Executive Order (EO) 13186, and the 2008 Memorandum of Understanding (MOU) titled: *Memorandum of Understanding between the U.S. Department of Agriculture Forest Service and the U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds.* The MOU was signed in 2008, and was extended to be in effect through December 31, 2017. The MOU identifies strategies and outlines responsibilities that promote conservation of migratory birds and avoid or minimize adverse impacts. Region 3 guidance to implement the intent of the EO and MOU is to evaluate effects to priority species, designated important bird areas, and over-wintering areas.

Three sources were used to identify priority species: (1) Partners in Flight Landbird Conservation Plan (Rosenberg et al. 2016), (2) Birds of Conservation Concern 2008 (USDI Fish and Wildlife Service 2008), and (3) Arizona’s State Wildlife Action Plan: 2012-2022 (AZGFD 2012). Using these sources, a list of migratory birds that occur on the forest was developed. In the Partners in Flight plan (PIF Plan), birds listed for the Intermountain West and Sonoran Joint Ventures were evaluated. Birds listed in Bird Conservation Regions 16 and 34 were evaluated from the Birds of Conservation Concern (BCC 2008) plan, as were Tier 1a and 1b Species of Greatest Conservation Need from the Arizona State Wildlife Action Plan.

From those lists, 31 priority bird species were identified. Of those, 25 breed on the forest and the other 6 species (Cassin’s finch, chestnut-collared longspur, grasshopper sparrow, savannah sparrow, Ferruginous hawk, and lark bunting) are present in the winter. Federally-listed and Forest Service Sensitive species were not included, as projects evaluate effects under the ESA and as Sensitive species. Eagles are addressed in the section above on Eagles.

Table 130. Coconino NF priority migratory birds

Common Name	Occurrence Type	Nest Type	Primary ERUs
Band-tailed Pigeon	breeding	tree	Mixed Conifer, Ponderosa Pine (Gambel oak subtype)
Bell's Vireo	breeding	shrub, tree	Cottonwood Willow Riparian Forest
Bendire's Thrasher	breeding	shrub, tree	Semi-desert Grassland
Black-chinned Sparrow	breeding	shrub	Interior Chaparral
Black-throated Gray Warbler	breeding	tree	Pinyon Juniper Woodland, Pinyon Juniper Evergreen Shrub

Common Name	Occurrence Type	Nest Type	Primary ERUs
Brewer's Blackbird	breeding, wintering	ground, shrub, trees	Wetlands, Montane/Subalpine Grasslands, Montane Willow Riparian Forest
Cassin's Finch	wintering	n/a	Ponderosa Pine
Chestnut-collared Longspur	wintering	n/a	Semi-desert Grassland
Common Black-Hawk	breeding	tree	Montane Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, Cottonwood Willow Riparian Forest
Common Nighthawk	breeding	ground	Ponderosa Pine (including P-O) Pinyon Juniper Woodland, Great Basin Grassland
Elf Owl	breeding possible, migration	tree	Cottonwood Willow Riparian Forest
Evening Grosbeak	breeding; wintering	tree	Mixed Conifer, Aspen and Maple
Ferruginous Hawk	wintering, migration	n/a	Grasslands
Flammulated Owl	breeding	tree	Ponderosa Pine
Grace's Warbler	breeding	tree	Ponderosa Pine
Grasshopper Sparrow	wintering	n/a	Semi-desert Grassland
Gray Vireo	breeding	tree	Pinyon Juniper Woodland, Pinyon Juniper Evergreen Shrub
Lark Bunting	wintering, migration	n/a	Semi-desert Grassland, Desert Communities
Lewis's Woodpecker	breeding	tree	Ponderosa Pine
Lincoln's Sparrow	breeding, wintering	ground	Montane Willow Riparian Forest (breeding)
Lucy's Warbler	breeding	tree	Cottonwood Willow Riparian Forest
MacGillivray's Warbler	breeding	ground	Montane Willow Riparian Forest, Aspen and Maple, Mixed Conifer
Mexican Whip-poor-will	breeding	ground	Ponderosa Pine-Gambel Oak, Mixed Conifer
Olive Warbler	breeding	tree	Ponderosa Pine (including P-O), Mixed Conifer
Olive-sided Flycatcher	breeding	tree	Mixed conifer (open), Ponderosa Pine (including P-O)
Phainopepla	breeding	tree	Desert Communities
Red-faced Warbler	breeding	ground	Mixed conifer (open), Ponderosa Pine (including P-O), Montane Willow Riparian
Savannah Sparrow	wintering	n/a	open habitats forestwide
Virginia's Warbler	breeding	ground, shrub	Many; shrub component important
Wood Duck	breeding, wintering	tree	Cottonwood Willow Riparian Forest
Yellow Warbler (*sonorana* ssp.)	breeding	tree	Cottonwood Willow Riparian Forest; Mixed Deciduous Riparian Forest

Table 131. Ecological response unit (ERU) acreage within portions of important bird areas (IBA) on the forest

ERU	Anderson Mesa	Lower Oak Creek	Mogollon Rim Snowmelt Draws	Salt and Verde Riparian Ecosystem	Tuzigoot
Desert Communities		339			30
Grassland, Great Basin	47,122				
Grassland, Montane/Subalpine	2,397		390		
Grassland, Semi-desert		885			
Interior Chaparral		39			
Mixed Conifer with Aspen	258				
Mixed Conifer with Frequent Fire			33,827		
Pinyon Juniper Evergreen Shrub		1,952		37	
Pinyon Juniper with Grass	50,968				
Pinyon Juniper Woodland	15,853				
Ponderosa Pine	39,808		7,226		
Riparian, Cottonwood Willow				90	4
Riparian, Mixed Broadleaf		471		3	
Riparian, Montane Willow	60		630		
Water	1,744		45		
Wetland Cienega	9,229		261		
Total Coconino IBA Acres:	**167,439**	**3,686**	**42,379**	**130**	**34**

Environmental Consequences

Common to All Alternatives

Plan components in all alternatives contribute to species viability by managing for sustainable populations of native species and improving and protecting habitat for threatened, endangered, and sensitive species (1987 Plan, pages 22-1, 23, 64, 64-1, 66, 95, 108-2, 180, 187, 206-9, 206-11, 206-12, 206-13, 206-23, 206-30, 206-32, 206-66, 206-67, 206-71, 206-72, 206-79, 206-87, 206-89, 206-98, 206-103, 206-105, 206-108, 206-109, 206-114; FW-WFP-DC-1, 2, 3, 4, 5, 6, 8, and FW-Eco-DC-1). See At-risk Species in the Wildlife and Plant Issues and Topics section above for more information.

Most Forest Service management activities would not meet the definition of take under the Migratory Bird Treaty Act, which is "… to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR 10.12). Vegetation removal or destruction is not considered a taking; however, activities done during breeding seasons, such as hazard tree or snag removal, timber harvest, fuels reduction, prescribed fire could result in unintentional take if active nests with eggs or young are present in trees, shrubs or on the ground. These activities would occur under all alternatives considered in this analysis. The EO and MOU would be reviewed and elements incorporated into all projects and activities as applicable to promote conservation of migratory birds and avoid or minimize adverse impacts.

Under all alternatives, mechanical vegetation treatment and prescribed/managed fire are most frequently planned in the Ponderosa Pine and Mixed Conifer with Frequent Fire ERUs. The amount of habitat expected to be treated over the next 10 to 15 years does not differ among alternatives, except that the high range of potential acreage to be treated mechanically is 2,900 acres in alternative A, and 15,000 acres in alternatives B (modified), C, and D (Kipervaser et al. 2016).

Alternative A – 1987 Plan

There are no specific goals, objectives, standards, or guidelines for migratory birds in the 1987 Plan. Alternative A was implemented before EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds was signed in January 10, 2001, to promote the conservation of migratory birds. As a result, many of the topics that must be considered pursuant to this order were not incorporated into plan direction. Alternative A does contain an overall goal to "Manage habitat to maintain viable populations of wildlife and fish species and improve habitat for selected species" (1987 Plan, page 22-1) that is inclusive of migratory birds.

Forestwide Direction

The following standards and guidelines area are applicable to migratory birds and their habitat, but are very general in nature:

- Inventory and evaluate wildlife and fish habitat. Use the best available resource data and technical expertise to identify habitat objectives and prepare implementation schedules for key habitats (1987 Plan, page 64).
- Improve vegetation conditions through seeding a mixture of species of grass, forbs, forage, and browse species desirable to wildlife (1987 Plan, page 66).

The following guidance would be applicable only to ferruginous hawks, as they are the only priority raptor species on the forest's list:

- Construct raptor perch, roost, and nest structures where applicable to improve habitat (1987 Plan, page 66).
- Powerlines and towers are built (construction or reconstruction) to specifications compatible with raptor use (1987 Plan, page 80).

In general, the guidance in the 1987 Plan provides limited specific direction for migratory birds. Effects on migratory birds are further evaluated in the following sections by considering the types of management actions that occur within the ERUs that support migratory birds.

Mixed Conifer and Ponderosa Pine

Priority breeding birds that use mixed conifer and/or ponderosa pine as primary habitats are band-tailed pigeon, common nighthawk, evening grosbeak, flammulated owl, Grace's warbler, Lewis's woodpecker, MacGillivray's warbler, Mexican whip-poor-will, olive warbler, olive-sided flycatcher, and red-faced warbler. The evening grosbeak uses these ERUs when aspen/maple are present. Additionally, the Cassin's finch is a winter visitor, primarily in ponderosa pine.

Management for mixed conifer habitats is contained primarily in direction for MA 3 and MA 4. Management emphases are on a combination of multiple uses, including wildlife habitat (1987 Plan, pages 117 and 139). Standards and guidelines provide for maintenance of stand diversity through integrated stand management. Snag and old-growth management is emphasized. Snags are defined as a tree greater than 12 inches d.b.h. and 15 feet tall. Snag standards and guidelines call for a minimum of 200 snags per 100 acres on 50 percent of forested lands within 10K blocks (1987 Plan, page 126, 127, and 143).

Stand diversity requirements and snag management guidance in MA 3 and 4 would contribute positively to priority bird habitat preferences for the presence of tall trees and snags, and openings and edges within mixed conifer forests. Additionally, guidance for a diversity of age classes and canopy closures, and management for snags and openings will also contribute positively to priority bird habitat needs.

Most of the mechanical tree harvest activities that occur on the forest occur in these habitat types. Under this alternative, approximately 2,900 acres of Mixed Conifer with Frequent Fire, and between 50,000 to 260,500 acres of Ponderosa Pine acres are projected to be mechanically treated over a 10-year period (Kipervaser et al. 2016). Eight of 11 priority species are tree-nesters. If tree removal occurs during the breeding season, some nests or young could be lost. However, treatment acres are relatively small proportions of the overall ERU acreage—approximately 6 percent of Mixed Conifer with Frequent Fire acreage, and approximately 6 to 33 percent of Ponderosa Pine acreage.

Prescribed fire is another management tool used to manage for desired conditions in these ERUs. Under alternative A, prescribed fire is projected to be applied to approximately 8,000 acres of Mixed Conifer with Frequent Fire, and between 150,000 to 200,000 acres over a 10-year period (Kipervaser et al. 2016). Prescribed fire has potential to affect ground or shrub-nesters (common nighthawk, MacGillivray's warbler, Mexican whip-poor-will, and red-faced warbler) if prescribed fire is applied in active nesting areas during the breeding season. As with mechanical tree harvest acres, prescribed burn acreages are relatively small proportions of the overall ERU acreages – approximately 16 percent of Mixed Conifer with Frequent Fire, and 19 to 25 percent of Ponderosa Pine acreage.

Pinyon Juniper

Priority breeding birds that use pinyon juniper types are the black-throated gray warbler, common nighthawk, and gray vireo. Management for pinyon juniper is contained primarily in direction for MAs 7 and 8. In the 1987 Plan, management of wildlife habitat is identified as a key emphasis in MAs 7 and 8 (1987 Plan, pages 148 and 156). Old growth is provided on slopes greater than 15 percent, with stand sizes ranging from 100 to 300 acres (1987 Plan, pages 148 and 151). Stand diversity is established and maintained through integrated stand management to provide suitable habitat for wildlife (1987 Plan, page 148).

Priority species need mature or old-growth stands, generally open, with good ground cover and a shrub component. Collectively, the guidance in the 1987 Plan for pinyon juniper generally contributes positively to migratory bird habitat by emphasizing maintenance of diverse conditions with old growth and snags, providing key habitats for migratory birds.

Activities within pinyon juniper habitats with the potential to affect priority bird species include fuelwood cutting and prescribed fire. Removal of trees during the breeding season could remove nests of the black-throated gray warbler, and gray vireo. Prescribed fire is most likely to impact the ground-nesting common nighthawk.

High-elevation Grasslands (Montane/Subalpine Grassland and Great Basin Grassland)

Priority breeding birds that use high- elevation grasslands are Brewer's blackbird, common nighthawk, ferruginous hawk. Direction for management of grasslands in contained primarily in MA 9 (Mountain Grassland), MA 10 (Grassland and Sparse Pinyon Juniper above the Rim), and MA 11 (Verde Valley). Wildlife habitat is a management emphasis for all three management areas (1987 Plan, pages 158, 162, and 166). Guidance calls for improvement of meadow and grassland habitats using a variety of methods, including conifer removal, gully stabilization, reseeding, fencing, and prescribed burning (1987 Plan, pages 159, 164, and 168). Conifer removal typically involves removal of small encroaching trees, so is not very likely to affect the ground-nesting common nighthawk, or remove perch trees for wintering or migrating ferruginous hawks. Brewer's blackbirds usually nest in loose colonies, and nest in shrubs and trees and on the ground, so there is some potential to affect this species through conifer removal. Prescribed burning is an activity that has the potential for removal of nests and disturbance to the ground-nesting common nighthawk, and the ground- and shrub/tree-nesting Brewer's blackbird.

Chaparral

There is no specific guidance for management of chaparral in the 1987 Plan. It is mentioned as a habitat component in some wildernesses and in MA 11, Verde Valley (1987 Plan, page 166). Little active management occurs in chaparral, and if a person-caused or natural ignition starts a fire, it tends to be stand-replacing.

Although there is no specific guidance, the lack of management activities in chaparral results in little impacts, plus or minus, to black-chinned sparrows and their habitat.

Desert Communities and Semi-Desert Grasslands

Priority species that use these ERUs for breeding are Bendire's thrasher and phainopepla. Additionally, the chestnut-collared longspur, Ferruginous hawk, grasshopper sparrow, and lark bunting use these habitats for overwintering. Management guidance for these habitats is contained primarily in MA 11, Verde Valley. Management emphases are watershed condition, range management, wildlife habitat for upland game birds, and dispersed recreation.

Guidance for range forage improvement allow for vegetative treatments where overstories include mesquite, catclaw, Canotia, manzanita, and turbinella oak with the objective to convert to a lower successional and more productive state (1987 Plan, page 168.)

Essentially, there is no mention of providing for the brushy grassland states that Bendire's thrasher and sage sparrows use. Guidance is lacking in the 1987 Plan to protect and enhance habitats for these migratory species. Without sideboards, management activities like prescribed fire could directly impact breeding bird nests, and lack of habitat improvement could impact the use of these habitats by wintering priority birds.

Riparian – High-elevation (Montane Willow and Mixed Broadleaf) and Low-elevation (Cottonwood Willow)

Priority breeding birds that use riparian forest habitats are Bell's vireo, Brewer's blackbird, common black hawk, elf owl, Lincoln's sparrow, Lucy's warbler, MacGillivray's warbler, red-faced warbler, wood duck, and yellow warbler. Management guidance for riparian habitat is primarily contained with MA 12. Management of wildlife habitat is a key emphasis (1987 Plan, page 172). The goal in the 1987 Plan is to recover 80 percent of riparian habitats by year 2030, with the remaining 20 percent significantly improved (1987 Plan, page, 172). There are multiple standards for maintaining overstory, three age classes of woody vegetation, stream shading, etc. (1987 Plan, page 174). In high-elevation habitats, at least 80 percent of the potential shrub cover is to be maintained (1987 Plan, page 174). Standards and guidelines call for protection of riparian from grazing (1987 Plan, page 174).

Although all of MA 12 is for riparian management, riparian habitat guidance is scattered throughout the 1987 Plan. In forestwide wildlife, direction ensures that riparian standards apply to all areas, even if they are too small to manage (1987 Plan, page 64). Standards and guidelines for Mexican spotted owl and goshawk also emphasize riparian management (1987 Plan, pages 65-5 and 65-8). Riparian habitat is identified as restricted habitat for Mexican spotted owl (1987 Plan, page 65), and management is to maintain and restore healthy ecosystems and to improve degraded conditions as soon as possible (1987 Plan, page 65-5). Utilization standards and guidelines for livestock grazing are to be implemented to maintain and restore riparian habitats (1987 Plan, page 65-5). Similarly, goshawk guidelines also call for maintenance and restoration of healthy riparian ecosystems (1987 Plan 65-8).

Forestwide range direction identifies riparian condition as a potentially significant issue that needs to be addressed during the environmental analysis for revising Allotment Management Plans every 10 years (1987 Plan, page 67). Permanent salt is not to be placed within one-quarter mile of riparian habitats to avoid concentration of livestock (1987 Plan, page 68). Range forage improvement calls for establishing woody riparian vegetation and to protect from livestock grazing through management and/or fencing to allow for establishment and eliminate overuse (1987 Plan, page 69).

In addition to the recovery objectives, other objectives for protection and improvement of riparian habitats include construction of 10 miles of fence per decade and installation of stream habitat improvement projects in the first decade (1987 Plan, page 175). These objectives have been met, and riparian habitat improvement projects continue to be implemented.

Collectively, the guidance in the 1987 Plan for riparian habitats contributes positively to migratory birds by emphasizing recovery of habitat, and providing standards, guidelines, and objectives to guide improvement.

Area-specific Direction
Management Area 2 (Verde Wild and Scenic River (VWSR)) emphasizes management of migratory birds and recognizes the high importance of riparian habitat to the diversity of migratory birds (1987 Plan, page 115-3). And, the desired conditions for wild and scenic sections include: “Wildlife management within the VWSR focuses on a variety of riparian dependent species including migratory birds (1987 Plan, page 115-3) …,” which would include Lucy’s and yellow warblers.

Protection of riparian and open water habitat during the breeding season would reduce disturbance to the Brewer’s blackbird and wood duck, and could incidentally protect other priority riparian nesting bird species. The standard and guideline states:

- The following applies to riparian areas, whether they are large enough to be mapped out or not. Wetlands and open water containing emergent vegetation which provide nesting habitat are protected from disturbing uses that will harass nesting birds, such as activities that are noisy or would damage nests or nesting habitat from May 1 to July 15 (1987 Plan, page 173).

A number of priority bird species that only occur on the forest in the winter can be found in open habitats in the Verde Valley (e.g., chestnut-collared longspur, grasshopper sparrow, savannah sparrow, and lark bunting). Guidance for MA 27 (Savannah) has an objective to improve grassland bird habitat (1987 Plan, page 206-50).

In the 1987 Plan, the monitoring plan includes the following for migratory birds:

> “Monitor high-use recreation areas for impacts on threatened, endangered, and sensitive species and their habitat, especially neotropical migratory birds. Take appropriate actions to minimize

impacts, such as seasonal closures, area closures, signs, and interpretation" (1987 Plan, page 242-30).

This will ensure that the effects of intense recreational use are minimized when migratory birds are being impacted.

Important Bird Areas

There is no specific guidance for the management of important bird areas in the 1987 Plan. Environmental consequences are described above by habitat. Refer to table 131 for ERU acres within important bird areas.

Determination of Effects

The 1987 Plan considers migratory birds and their habitats, and provides direction from improvement of habitats. Unintentional take could occur from management activities that destroy nests or kill individual birds, primarily from tree removal and prescribed fire during the breeding season. The scope and scale of these losses will be distributed through the 10+ years of plan implementation and in the long term, management activities strive toward habitat improvement, sustaining priority bird habitat into the future.

Considering environmental and cumulative consequences common to all alternatives and the effects disclosed above, alternative A is likely to result in some unintentional take of migratory birds, but is not likely to be occurring to such an extent to have a measurable negative effect on migratory bird populations.

Alternative B (modified)

There are no specific goals, objectives, standards, or guidelines for migratory birds in this alternative. However, there is general wildlife guidance that would apply to migratory birds.

Forestwide Direction

Desired conditions describe thriving native wildlife populations supported by diverse habitats (FW-WFP-DC-1, 3, and 8). Habitats and specific microclimate needs support viable populations (FW-WFP-DC-5).

The objective to restore/enhance at least 60,000 acres of terrestrial wildlife habitat during each 10-year period (FW-WFP-O-3) can be applied to migratory bird habitat.

The standard to apply timing restrictions for threatened, endangered, proposed, and candidate sensitive species (FW-WFP-S-2) and the guideline to apply timing restrictions for Southwestern Region sensitive species and pronghorn (FW-WFP-G-8) will also protect migratory birds within those habitats during the breeding season.

In general, the guidance in alternative B (modified) provides limited specific direction for migratory birds. Habitat management is indirectly addressed through guidance for the different habitat types as addressed in the following sections.

Mixed Conifer (Mixed Conifer with Infrequent Fire and Mixed Conifer with Frequent Fire)

Priority breeding birds that use mixed conifer as primary habitats are band-tailed pigeon, evening grosbeak, MacGillivray's warbler, Mexican whip-poor-will, olive warbler, olive-sided flycatcher, and red-faced warbler. Additionally, the Cassin's finch is a winter visitor, primarily in ponderosa pine.

Desired conditions for mixed conifer describe a mosaic of forest conditions, with old growth well-distributed throughout (FW-TerrERU-MC-All-DC-1, FW-TerrERU-MCFF-DC-1, and FW-TerrERU-

MCIF-DC-1. Snags and downed logs are numerous. Composition, structure and function are resilient to disturbances and climate variability. Mixed Conifer with Frequent Fire is more open than Mixed Conifer with Infrequent Fire.

Objectives for Mixed Conifer with Frequent Fire include cutting to treat 2,900 to 15,000 acres (6 to 30 percent of ERU acres) and using prescribed fire on at least 8,000 acres (16 percent of ERU acres) within 10 years of plan approval (FW-TerrERU-MC-MCFF-O-1 and 2). Tree removal can adversely affect tree-nesting priority birds (band-tailed pigeon, evening grosbeak, olive warbler, and olive-sided flycatcher). Prescribed fire is generally low severity, yet has potential to directly impact nests of ground-nesting priority birds (MacGillivray's warbler, Mexican whip-poor-will, and red-faced warbler).

Collectively, desired conditions, objectives, and guidelines provide for the habitat needed by priority bird species. Tall trees and snags will be provided through protection and promotion of old growth, and openings and edge habitats through implementation of desired conditions and burning objectives. Alternative B (modified) provides fairly similar guidance and protections for mixed conifer migratory birds as alternative A, but is expected to mechanically harvest more acres.

Ponderosa Pine

Priority breeding birds that use ponderosa pine as a primary habitat are band-tailed pigeon, common nighthawk, flammulated owl, Grace's warbler, Lewis's woodpecker, Mexican whip-poor-will, olive warbler, olive-sided flycatcher, and red-faced warbler. Additionally, the Cassin's finch is a winter visitor, primarily in ponderosa pine.

Desired conditions for ponderosa pine describe a landscape that has a variety of age and structural classes, that is generally uneven-aged and open, and have well-distributed old growth. Forest arrangement is in individual trees, small clumps, and groups of trees interspersed with openings that range from 10 to 70 percent of the landscape (FW-TerrERU-PP-DC-4). Size of tree groups averages less than 1 acre and may be larger in areas managed for bald eagles and Mexican spotted owl (FW-TerrERU-PP-DC-13). Tree density ranges from 22 to 89 square foot basal area per acre, but denser tree conditions occur in some locations such as north-facing slopes and canyon bottoms (FW-TerrERU-PP-DC-8). Ponderosa pine snags are typically 18 inches or greater at diameter at breast height and average 1 to 2 snags per acre. Downed logs average 3 logs per acre within the forested area of the landscape (FW-TerrERU-PP-DC-5). The composition, structure, and function of vegetative conditions are resilient to disturbances and climate variability (FW-TerrERU-All-DC-2, FW-TerrERU-PP-DC-2). The Gambel oak subtype is maintained with large oak trees scattered across the landscape, providing cooler, moister microsites for wildlife (FW-TerrERU-PP-DC-7).

Objectives are as follows:

- Use prescribed cutting to treat 50,000 to 260,050 acres of ponderosa pine during each 10-year period over the life of the plan (FW-TerrERU-PP-O-1).
- Use prescribed fire to underburn 150,000 to 200,000 acres of ponderosa pine within the natural fire regime during each 10-year period over the life of the plan (FW-TerrERU-PP-O-2).

Four of the guidelines emphasize the protection of existing old growth; to promote development of future old growth; and to protect old trees, including Gambel oak. Another guideline emphasizes snags and downed logs along edges of openings and within groups and clumps of trees. Slash is managed to minimize impacts from Ips beetles, and to provide habitat for small mammals and turkey nesting habitat.

Collectively, the desired conditions, objectives, and guidelines provide fairly well for the habitats needed by ponderosa pine priority migratory birds. Moving toward more open stand conditions using thinning and fire will benefit species such as Grace's warbler, Lewis's woodpecker, and olive warbler. Provisions for maintaining a portion of the landscape in denser habitats will provide the more closed canopy and denser conditions used by species such as Mexican whip-poor-will. Maintaining a large snag component will benefit the woodpeckers. Desired conditions and guidelines for old growth should provide for habitat needed by flammulated owls, but compared to alternative A, management for old growth is less explicit in the amount to manage for. The 1987 Plan calls for managing at least 20 percent, or as much of the landscape as possible as old growth. Alternative B (modified) does not identify the amount of old growth to maintain or develop although desired conditions describe "…having sufficient groups of old growth to be representative of the vegetation type prior to 1850." Also, old growth in alternative A is in stands from 100 to 300 acres in size, while alternative B (modified) group size averages 0.5 acre in size, with 2 to 40 trees per group. For most priority bird species, alternatives A and B (modified) provide similar guidance and will have similar effects. For the flammulated owl, which used mature forests and old growth, alternative A has clearer guidance for the minimum amount of old growth to maintain, and provides for larger groups (stand size) in old-growth conditions. However, the amount of mechanical harvest and prescribed fire does not differ from alternative A, so the risk of loss of nests and individual birds would be similar under alternative B (modified).

High-elevation Grassland

Priority breeding birds that use high-elevation grasslands are Brewer's blackbird, common nighthawk, and ferruginous hawk. The desired condition for Great Basin and Montane/Subalpine grassland ERUs describes a landscape that provides good habitat for migratory birds. The goal is to have native vegetation in a mix of age classes with the height, density, and cover of plants that supports historic fire return intervals. Canopy cover of trees and shrubs is less than 10 percent. Soil erosion is minimal, and long-term soil productivity is maintained. The desired condition describes connectivity among grasslands. Surface drainages and subsurface flow patterns of water are maintained to return water flow into connected water bodies and streams. The desired condition includes a description of a mosaic of vegetation, ranging from densely vegetation, to bare areas that result from natural activities, such as prairie dog burrowing.

Desired conditions for Pinyon Juniper with Grass also describe a landscape that provided good habitat for migratory birds. Canopy cover is 10 to 30 percent, providing a native herbaceous understory that provides food and cover for wildlife and can support frequent surface fires.

One of the guidelines for Great Basin and Montane/Subalpine grassland ERUs would contribute to retaining 90 percent of potential ground cover. Guidelines for Pinyon Juniper with Grass describe the intent to maintain seral grasslands as grasslands, rather than enhancing successional states and call for improvement in soil and watershed conditions and herbaceous vegetation growth.

Objectives are identified that would help move grassland habitats toward desired conditions as follows:

- Restore, or improve at least 10,800 to 12,400 acres of Great Basin Grasslands during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-2).
- Restore, or improve at least 7,600 to 11,400 acres of Montane/Subalpine Grasslands during each 10-year period over the life of the plan (FW-TerrERU-Grass-O-3).

With respect to total ERU acreage, this represents approximately 12 to 13 percent of Great Basin Grasslands, and approximately 32 to 48 percent of Montane/Subalpine Grasslands.

While not tied specifically to grassland ERUs, other objectives that call for soil improvements (FW-Soil-O-1), naturalizing and decommissioning roads (FW-RdsFac-O-1), implementation of actions to benefit federally listed species (FW-WFP-O-1), and restoration of terrestrial wildlife habitat (FW-WFP-O-3) could contribute to meeting desired conditions for migratory bird habitat.

Some of the key activities used to restore high-elevation grasslands include removal of encroaching trees and shrubs, and application of prescribed fire. Conifer removal typically involves removal of small encroaching trees, so is not very likely to affect the ground-nesting common nighthawk, or remove perch trees for wintering or migrating ferruginous hawks. Brewer's blackbirds usually nest in loose colonies, and nest in shrubs and trees and on the ground, so there is some potential to affect this species through conifer removal. Prescribed burning is an activity that has the potential for removal of nests and disturbance to the ground-nesting common nighthawk, and the ground- and shrub/tree-nesting Brewer's blackbird. Given the relatively high proportion of Montane/Subalpine Grassland likely to be treated over the next 10 years, there is some likelihood that individual nests could be removed. However, the overall desired conditions to improve and restore grassland habitat should benefit migratory birds in the long term.

Pinyon Juniper

Desired conditions for pinyon juniper types describe a landscape with a shifting mosaic of trees, interspersed with openings that provide enough connectivity for pronghorn movement (FW-TerrERU-PJ-DC-1 and 6). Large snags and old trees with dead limbs and tops are scattered across the landscape (FW-TerrERU-PJ-DC-2, 7, and 12). Vegetative conditions are resilient to disturbances and climate variability (FW-TerrERU-All-DC-2). Enough ground cover is present to resist erosion (FW-TerrERU-PJ-DC-15). Old growth occurs in pinyon juniper woodlands as individual trees and patches of old trees (FW-TerrERU-PJ-DC-11).

Objectives call for mechanical treatment of 1,000 to 10,000 acres, and 7,500 acres using naturally ignited fires within 10 years of plan approval (FW-TerrERU-PJ-O-1, 2, and 3). This represents 1 to 3 percent of pinyon juniper habitats (600,660 acres).

Guidelines call for managing grassland soil types (Mollisols) for grassland desired conditions (FW-TerrERU-PJ-G-1) and using slash treatments to improve herbaceous vegetation growth (FW-TerrERU-PJ-G-2).

Priority species (black-throated gray warbler, gray flycatcher, gray vireo, pinyon jay, and sage sparrow) need mature or old-growth stands that are generally open, with good ground cover and a shrub component. Mature pinyon trees provide the seeds necessary for pinyon jays. The Modified Proposed Plan only manages for old growth in the woodland component, which represents only 13 percent of the pinyon juniper types. Alternative B (modified) does not emphasize maintenance or development of old-growth conditions as much as alternative A.

Chaparral

Desired conditions describe chaparral as shifting on the landscape over time due to succession and disturbance, reflecting a mix of early, middle, and late seral stages (FW-TerrERU-IC-DC-1). Young stages have more of a grass and forb component and older stages are very dense (FW-TerrERU-IC-DC-2). Fire hazard is reduced in the wildland-urban interface (FW-TerrERU-WUI-DC-4). Ground cover protects soils from compaction and erosion, and biological soil crusts improve nutrient cycling (FW-TerrERU-IC-DC-4).

The guideline for chaparral is to provide a diversity of burn intensities within burn units, and burn units are rotated across the landscape (FW-TerrERU-IC-DC-1). There are no objectives or standards.

Although desired conditions provide for habitat diversity, there are no objectives to treat chaparral vegetation, so there is not likely to be much management in this habitat during the life of the plan. Therefore, there will be few impacts, plus or minus, to Virginia's warbler and black-chinned and sage sparrows and their habitat.

High-elevation (Montane Willow and Mixed Broadleaf) and Low-elevation (Cottonwood Willow) Riparian

Priority bird species that use high-elevation ERUs are Brewer's blackbird, common black hawk, Lincoln's sparrow, MacGillivray's warbler, red-faced warbler, and yellow-warbler. Species that use low-elevation riparian are Bell's vireo, Brewer's blackbird, common black hawk, elf owl, Lucy's warbler, wood duck, and yellow warbler.

Desired conditions for all riparian forest types describe conditions that would provide good habitat for migratory birds. Goals are to have diverse native vegetation in multiple age classes, uncompacted soils, and ecosystems that are functioning within their natural potential (FW-Rip-RipType-DC-1, 2, 3, and 4).

The objective for riparian forest types is to restore at least 200 to 500 acres of non-functioning and functioning-at-risk riparian areas within 10 years following plan approval (FW-Rip-RipType-O-1). There are approximately 11,018 acres of riparian forest types on the forest (USDA Forest Service 2016b), so this represents 2 to 5 percent of riparian forests that are expected to be improved.

Guidelines provide project sideboards to manage for riparian habitats. Water diversions and ground water pumping should not lower water tables (FW-Rip-RipType-G-1), which could impact riparian vegetation. Connectivity among Cottonwood Willow, Mixed Broadleaf Deciduous Riparian Forest, and mesquite bosques should be maintained and enhanced to benefit Bell's vireo and other species (FW-RipType-G-2), which would include Lucy's warbler, which also prefer mesquite bosques. Recreation activities can have direct effects to riparian breeding birds if nests are knocked out of trees and shrubs, or disturbance is high enough to result in nest abandonment. Another guideline calls for management of recreational activities, permitted uses, and other management activities to occur at levels that maintain or allow improvement of riparian vegetation, which would help protect breeding riparian species (FW-Rip-RipType-G-3). Because Bells' vireo and Lucy's warbler favor riparian habitat combined with mesquite bosques, firewood cutting in bosques would be managed to avoid impacts to the understory, tree density, and tree growth will protect habitat for these priority species (FW-Rip-RipType-G-4).

Collectively, the guidance in alternative B (modified) would contribute positively to migratory bird riparian habitat as projects are implemented under the Modified Proposed Plan. Benefits are not as strong as alternative A, since that alternative calls for all riparian habitats to be in or trending toward satisfactory conditions by 2030. Extrapolating out to 2030, implementation of riparian habitat improvement objectives in alternative B (modified) would improve a relatively small proportion of riparian forest acres, but the remaining will stay in at-risk or non-functioning conditions.

Desert Communities and Semi-Desert Grasslands

Priority species that use these ERUs for breeding are Bendire's thrasher and phainopepla. Additionally, the chestnut-collared longspur, ferruginous hawk, grasshopper sparrow, and lark bunting use these habitats for overwintering.

Desired conditions for Desert Communities call for stabilization of arroyos and gullies (FW-TerrERU-DC-DC-1), and for the ERU to be dominated by various age classes of native shrubs, forbs, and grasses with little soil compaction or erosion (FW-TerrERU-DC-DC-2 and 4). Uncharacteristic fires are infrequent and localized (FW-TerrERU-DC-DC-3). Applicable desired conditions for Semi-desert Grasslands include goals to stabilize and recover arroyos and gullies (FW-TerrERU-Grass-DC-5) and to have a mosaic of vegetation densities that includes densely vegetated area that provide cover for ground-nesting birds (FW-TerrERU-Grass-DC-8). Although neither of the priority breeding birds are ground nesters, they do sometimes place nests low in shrubs and trees.

The objective for Semi-desert Grassland is to restore/enhance 3,500 acres (4 percent) every 10-year period. This would have some benefit to priority bird species, but the amount is very small. There are no objectives for Desert Communities.

This alternative provides stronger habitat improvement goals and protections than alternative A for these migratory species. But management activities, particularly prescribed fire applied during the breeding season, could still result in removal of nests placed low in shrubs and trees by priority breeding birds.

Area-Specific Direction
There is no specific guidance for migratory birds in these sections of the plan. Environmental consequences are described above by habitat.

Important Bird Areas
There is no specific guidance for the management of important bird areas in the proposed plan, alternative B (modified). Environmental consequences are described above by habitat. Refer to table 131 for ERU acres within important bird areas.

Determination of Effects
Guidance in alternative B (modified) provides for migratory bird habitat through desired conditions, objectives, standards, and guidelines for the vegetation types (ERUs). Additional general direction to improve habitats and maintain viable populations in forestwide wildlife direction also applies to migratory birds.

Unintentional take could occur from management activities that destroy nests or kill individual birds, primarily from tree removal and prescribed fire that occurs during the breeding season. The scope and scale of these losses would be distributed throughout the 10+ years of plan implementation and in the long term, management activities strive toward habitat improvement, sustaining priority bird habitat into the future.

Considering environmental and cumulative consequences common to all alternatives and the effects disclosed above, alternative B (modified) is likely to result in some unintentional take of migratory birds, but is not likely to be occurring to such an extent as to have a measurable negative effect on migratory bird populations.

Alternative C

Alternative C is similar to alternative B (modified), but responds to suggestions from the public for more land to be managed in primitive and natural settings with reduced human-related disturbance for the benefit of recreation, and botanical and wildlife resources. Additional wilderness areas would be recommended on the forest, as well as other special areas, to provide additional protection to botanical and wildlife resources. Alternative C also responds to ecological concerns related to presence or absence of old-growth composition and structure on the landscape. Specific differences from alternative B are:

1. Recommends 10 additional wilderness areas (91,757 total wilderness acres compared to 8,733 acres recommended in alternative B).
2. Places restrictions on snowmobile use in the Walnut Canyon Management Area and areas with a recreation opportunity spectrum objective of semi-primitive non-motorized.
3. Places restrictions on recreational shooting in botanical areas; geological areas; existing and recommended research natural areas; management areas that emphasize reduced human-related disturbance; and in the Walnut Canyon, Sedona Neighborwoods, and long Valley Management Areas, and parts of the Flagstaff Neighborwoods Management Area by identifying these areas as unsuitable for that activity.
4. Restriction on livestock grazing in research natural areas unless it supports, or would not affect, the research purpose of that research natural area.
5. Designation of seven management areas (Blue Ridge Management Area, Hospital Ridge, Jack's Canyon, Knoll Lake, Limestone Pasture, Pine Grove, Second Chance, and modification of Alternative B (modified)'s Anderson Mesa Management Area direction and boundaries to further emphasize wildlife habitats) totaling 335,371 acres.
6. Limitation on motorized dispersed camping in management areas to current levels.
7. Limitation on public motor vehicle access in management areas.
8. Limitation on public road density in the Anderson Mesa Management Areas to an average of 1 mile or less of road per square mile.
9. Limitation on large group recreation events and large commercial tours in management areas outside of developed sites.
10. Includes key direction from the 1987 Plan for old growth that would be incorporated into the proposed revised plan:
    - Allocation of at least 20 percent of the naturally forested area by forest and woodland ERUs in any landscape by 6th code watershed;
    - Distribution of old growth would be in 100- to 300-acre stands;
    - The Minimum Criteria for the Structural Attributes Used to Determine Old Growth.

Wilderness Areas (#1)

Alternative C proposes approximately 82,121 additional wilderness acres than alternative B (modified) (table 132). The majority of the proposed area falls within the Pinyon Juniper Evergreen Shrub, Pinyon Juniper Woodland, and Semi-desert Grassland ERUs. The proposed areas represent anywhere between less than 0.1 percent to 19 percent of the ERUs (Kipervaser et al. 2016) (table 132).

Table 132. Additional ERU acreage within alternative C proposed wilderness

ERU	Alternative B (modified) Acres	Alternative C Acres	Additional Alternative C Acres
Alpine Tundra	0	0	0
Cottonwood Willow	0	233	233
Desert Communities	0	949	949
Great Basin Grassland	2,327	2,327	0
Interior Chaparral	0	1,720	1,720
Mixed Broadleaf Riparian	21	662	641
Mixed Conifer with Aspen	347	347	0
Mixed Conifer with Frequent Fire	0	283	283
Montane Subalpine Grassland	0	6	6
Montane Willow Riparian	0	438	438
Pinyon Juniper Evergreen Shrub	723	50,164	49,441
Pinyon Juniper with Grass	3,618	3,618	0
Pinyon Juniper Woodland	1,467	13,600	12,133
Ponderosa Pine	97	4,462	4,365
Semi-desert Grassland	132	12,041	11,909
Spruce Fir	0	0	0
Urban or Agricultural	0	0	0
Water	0	0	0
Wetland Cienega	0	3	3
Total Wilderness Acres:	**8,732**	**90,853[1]**	**82,121**

[1]This acreage does not include 905 acres of Hackberry Wilderness that occurs on the Prescott NF.

Designation as wilderness would provide extra protections for riparian migratory birds, since these habitats would be managed for the suite of wilderness characteristics, including native species and maintenance of natural processes. Recreation use would be managed to protect wilderness character. Access would be limited and motorized vehicle traffic would be eliminated, which would result in less disturbance for migratory birds than other alternatives. Only 1 percent of the proposed acreage would restrict timber production, so direct removal of tree nests is not expected to be much different than alternative B (modified).

Like alternative B (modified), this alternative allows fire to play its natural role as a disturbance agent within wilderness areas (SA-Wild-DC-4). But logistical constraints and reduction in available fire management tools (e.g., chainsaws, ATVs, etc.) in proposed wilderness areas would result in fewer prescribed fires and wildfires managed for resource objectives in this alternative compared to alternative B (modified) (Kipervaser et al. 2016). While fewer fires can reduce the number of nests (both tree and ground) impacted in the short term, the long-term impacts to habitat could be adverse.

Snowmobile Use and Recreational Shooting (#2 and 3)

Restrictions on snowmobile use in the Walnut Canyon Management Area and areas with a recreation opportunity spectrum objective of semi-primitive non-motorized is not expected to have any significant benefit to migratory birds. The Cassin’s finch overwinters in ponderosa pine habitats and grasshopper sparrows and ferruginous hawks will use open areas forestwide, but the ability to move away from temporary disturbance in the winter makes an increase in potential for take unlikely.

Restrictions on recreational shooting are unlikely to have any significant effects, since shooting migratory birds is an illegal activity not authorized by the plan.

Livestock Grazing in Research Natural Areas (#4)

Restrictions on livestock grazing in research natural areas is not expected to have an appreciable impact on reducing the potential for take of migratory birds. Properly managed livestock grazing should not reduce vegetation enough to result in trampling of ground nests or nests places low in trees or shrubs.

Management Areas (#5-9)

The emphasis on providing lower-disturbance areas is expected to reduce disturbance to migratory birds that occur within these management areas, lessening the potential for take.

The Anderson Mesa Important Bird Area overlaps the Anderson Mesa, Jack's Canyon, and Pine Grove Management Areas. This alternative would reduce disturbance to wildlife from public motorized access in about 6 percent of the important bird area that is within the Jack's Canyon and Pine Grove MAs. Alternative C contains a guideline to reduce the public road density for the Anderson Mesa Management Area to an average of 1 mile of road per square mile. Currently, the area has 1.01 miles of public roads per square mile; over the life of the proposed revised plan, roads would be decommissioned and closed to lower the average to 1.0 mile per square mile. Road closures would result in a minimal reduction of roads within Anderson Mesa MA. This guideline would also retain a road density, which minimizes the likelihood of increasing road density over time. In locations where road closures occur in the Anderson Mesa Important Bird Area, there would be a slight reduction in disturbance to migratory birds and their habitat.

Old Growth (#10)

Although the language is different in this alternative compared to alternative B (modified), the amount of old growth does not change among alternatives, but the spatial arrangement does (Kipervaser et al. 2016). This could influence the distribution of migratory birds that use older age classes, but is not expected to increase the risk of incidental take.

Determination of Effects

Similar to alternative B (modified), alternative C provides for migratory bird habitat through desired conditions, objectives, standards and guidelines for the vegetation types. Additional general direction to improve habitats and maintain viable populations in forestwide wildlife direction also applies to migratory birds.

Unintentional take could occur from management activities that destroy nests or kill individual birds, primarily from tree removal and prescribed fire that occurs during the breeding season. The scope and scale of these losses will be distributed throughout the 10+ years of plan implementation and in the long-term, management activities strive toward habitat improvement, sustaining priority bird habitat into the future.

Considering environmental and cumulative consequences common to all alternatives and the effects disclosed above, alternative B (modified) is likely to result in some unintentional take of migratory birds, but is not likely to be occurring to such an extent to have a measurable negative effect on migratory bird populations.

Additional wilderness areas, management areas that emphasize reduce human-related disturbance, and retaining the old-growth standards and guidelines result in stronger guidance and protections for migratory birds than either alternative A or B (modified).

Unintentional take could occur from management activities that destroy nests or kill individual birds.

Considering environmental and cumulative consequences common to all alternatives and the effects disclosed above, alternative C is likely to result in some unintentional take of migratory birds, but is not likely to be occurring to such an extent to have a measurable negative effect on migratory bird populations. This alternative has greater positive impacts on migratory birds and their habitats than alternative A or B (modified).

Alternative D

This alternative would be similar to alternative B (modified), but differs in the following ways:

- No new wilderness areas would be recommended;
- Mechanized recreation (e.g., bikes) would be suitable on designated trails in botanical and geological areas; and,
- Expansion and/or increased access for future energy corridor needs would be provided for, and scenic integrity objectives along existing energy corridors for energy infrastructure would be modified.

Not recommending additional wilderness areas would make this aspect of alternative D the same as alternative A. Any reductions in disturbance to migratory birds from additions to wilderness acres (as occurs in alternative B (modified) and C) would not occur.

Allowing bicycles on designated trails in botanical and geological areas would have no appreciable effects on migratory birds.

This alternative reduces the scenic integrity object from moderate or high, to low, for approximately 32 miles along two utility corridors to accommodate future energy corridor expansion. Since the corridors already exist and disturbance to habitat has already occurred, it is unlikely that there would be additional take of migratory birds along these utility corridors.

Determination of Effect

Considering environmental and cumulative consequences common to all alternatives and the effects disclosed above, alternative D would likely result in some unintentional take of migratory birds, but it would not likely occur to such an extent that would have a measurable negative effect on migratory bird populations.

Cumulative Effects for Wildlife, Fish, and Plants

Cumulative effects from implementation of the alternatives include both the potential effects of forest management on the wildlife resource and the potential effects of land management on adjacent lands of other ownership (i.e., private, State, tribal, other Federal agencies, county, etc.) on the wildlife resource. In general, cumulative effects include impacts from past activities and potential future activities, such as agricultural use, forestry, fire, human development, and recreation.

Cumulative effects of alternatives A, B (modified), C, and D were evaluated by considering the management actions of other entities of a similar planning scope within a relevant spatial and temporal context. The analysis area for wildlife includes the Coconino NF and relevant portions of Arizona Game and Fish Department's Region II and Bird Conservation Regions 16 (Southern Rockies/Colorado Plateau) and 34 (Sierra Madre Occidental). The analysis area encompasses the three counties immediately adjacent to and/or surrounding the Coconino NF: Coconino, Navajo, and Yavapai. The analysis area is of a spatial extent that accounts for effects on wide-ranging species such as big game and migratory birds that travel across numerous land jurisdictions. The area encompasses similar habitat types as identified in the proposed action area and reflects similar ecological settings that wildlife species referenced in this FEIS could or would use. These effects were evaluated for the life of the forest plan or approximately 10 to 15 years.

Several categories of factors can contribute to cumulative effects: plans, such as land and resource management plans and wildfire protection plans (for these see the section on fire management); recovery plans, including safe harbor agreements, conservation agreements, and similar action plans; recovery actions, such as salvage, reintroduction, and translocations; ground-disturbing activities, such as mines, urban development, and fire suppression. The cumulative effects of these plans range from negative to the point of removing all useable habitats to beneficial for biological resources.

American Indian Tribes

The Hopi Tribe's Hopi Woodland Management Plan includes objectives to protect wildlife habitat, watersheds, and threatened, endangered, and culturally sensitive species. The plan also includes objectives that protect and restore riparian areas and to prevent the invasion of noxious weeds. The Hualapai Reservation's Hualapai Fire Management Plan includes goals to sustainably manage timber resources, maintain water quality, and reduce the likelihood of catastrophic fire. The Hualapai Reservation also has watershed management plans designed to improve water quality in the Colorado River. The Tribe is also actively managing endangered native fish. Together, the management of biological resources is enhanced by the cumulative management of the Tribes and the Coconino NF. These combined management efforts should positively contribute to species that use forest and woodland, riparian, and aquatic habitats and support species viability on the Coconino NF.

Department of Interior – National Park Service

The Coconino NF is adjacent to or near six national monuments: Walnut Canyon, Sunset Crater Volcano, Wupatki, Montezuma Castle, Montezuma Well, and Tuzigoot. Each of these national monuments has a general management plan that includes goals to provide healthy habitat for wildlife and sustainable, resilient ecosystems over the greater landscape. The management of biological resources is enhanced by the cumulative management of these national monuments and the Coconino NF. These combined management efforts to provide healthy wildlife habitat and ecosystem should positively contribute to species that have habitats in the national monuments and support species viability on the Coconino NF.

National Guard Bureau/Arizona Army National Guard – Camp Navajo

The National Guard Bureau and Arizona Army National Guard are in the process of reviewing Camp Navajo's Draft Integrated Resource Management Plan. The draft plan has many goals related to natural resource management, including: restoration of forest resiliency and function by moving toward re-establishment of historic forest, structure, pattern, and composition, restoration of fire to its natural role in the ecosystem, protection of vegetation communities, and management of wildlife habitat. Cumulatively, these actions are expected to improve habitat, while decreasing the overall long-term viability risk to wildlife species that evolved with fire-adapted ecosystems. The combined management efforts to re-establish historic forest, structure, pattern, and composition, restore fire to its natural role in the ecosystem, and manage wildlife habitat should positively contribute to species that have habitats in Camp Navajo and support species viability on the Coconino NF.

Fish and Wildlife Service

The Fish and Wildlife Service administers the Endangered Species Act. The Fish and Wildlife Service issues national polices to promote the conservation and recovery of listed species, including species recovery plans. In 2012, the Fish and Wildlife Service approved a revised recovery plan for the Mexican spotted owl (USDI Fish and Wildlife Service 2012b). The guidance contained in the revised recovery plan applies to projects on all Federal lands. This increases consistency across all Federal activities and contributes positively to the Mexican spotted owl and their habitat and supports species viability on the Coconino NF.

In addition to the Coconino NF, the Arizona cliffrose occurs on soils derived from white Tertiary limestone lakebed deposits on the Tonto and Prescott NFs. Recreation, road construction and maintenance, utility corridors, land exchanges, mining, and grazing are the activities most likely to affect these populations. The forest plans for the Coconino and Tonto NFs direct that projects will be assessed to determine impacts to Arizona cliffrose and that appropriate consultations will be requested, but neither plan contains specific prohibitions that would preclude the need for consultation requests for all of these uses. The forest plan for the Prescott NF includes direction to locate mineral materials and motorized trails outside of areas identified as medium or high potential rare plant habitat within the Verde formation. This addresses some of the possible impacts from recreation and mining, but does not address the effects of non-motorized trails and uses and so impacts from these recreation types would still be possible under their revised plan. The Tonto NF plan does not have direction for Arizona cliffrose or the Verde formation that removes the risk of these activities from impacting this species.

The Fish and Wildlife Service issued National Bald Eagle Management Guidelines that advise landowners, land managers, and others when and under what circumstances the Bald and Golden Eagle Protection Act may apply to their activities (USDI Fish and Wildlife Service 2007c). The goal is to minimize impacts to bald eagles through implementation of the recommendations in the plan. The forest and neighboring landowners and land managers refer to and apply the guidance in the plan at the site-specific level to minimize impacts and avoid take. The coordinated management increases the effectiveness of the Coconino NF efforts to maintain the viability of this species.

The Fish and Wildlife Service issued interim guidance for golden eagles that identified inventory and monitoring protocols, and other information and recommendations to support management and take permit issuance. This increases consistency across all Federal activities including highway construction, which is reasonably foreseeable given the environmental assessment for upgrading Interstate 17. The interim guidance contributes positively to golden eagles and their habitat and supports species viability on the Coconino NF.

Forest Service

Similar forest planning efforts have been completed on three neighboring national forests: the Kaibab, Prescott, and Apache-Sitgreaves NFs. All of these forests have revised their land management plans based upon the same regional vegetative desired conditions for ecological response units found in the Southwest Region. The Tonto NF is in the process of revising its forest plan; it will also incorporate the regional vegetative desired conditions. The cumulative restoration activities from alternatives B (modified), C, and D and from the revised plans of these four neighboring national forests could have a pronounced effect on modifying stand structure to be less susceptible to stand-replacing fire in these vegetation types, while promoting resiliency with regard to climate change. Collectively, the net result of implementation of the forest plans for these five forests should be positive and beneficial for wildlife and botanical species by ensuring the persistence of these habitats into the future and by providing continuity of suitable habitats. This should decrease the overall risk to species viability on the Coconino NF.

Because other extant populations of Chiricahua leopard frog occur on the Apache-Sitgreaves NFs and Tonto NF, management activities and recovery actions on those forests can also have impacts. Under the Apache-Sitgreaves NFs' forest plan, road densities have been reduced within some Chiricahua leopard frog habitat, and livestock exclusion has been maintained or increased from sites, reducing potential negative impacts to the Chiricahua leopard frog (USDA Forest Service 2011f). Under the Tonto NF's forest plan, Chiricahua leopard frog habitat has been improved and restored in Gentry Creek and Crouch Creek and frogs have been released into these sites (USDA Forest Service 2011f). Implementation of some of the standards and guidelines in the Tonto NF's forest plan could negatively impact Chiricahua leopard frog, and the overall finding for Chiricahua leopard frog and proposed critical habitat is "may affect, likely to adversely affect." However, the Tonto NF is currently in the forest plan revision process. The guidance in the revised Tonto NF forest plan will have effects that are cumulative to the Coconino NF's forest plan, but what the precise guidance will be is unknown at this time. Cumulatively, the management plans and active restoration efforts on the Apache-Sitgreaves NFs and Tonto NF have contributed positively to Chiricahua leopard frog and their habitat and support species viability on the Coconino NF.

The Coconino, Prescott, and Tonto NFs manage 113.2 miles of the Verde River that is designated for occupation by the nonessential, experimental population of Colorado pikeminnow. The majority of these fish are being stocked in the Verde River at Beasley Flat and Childs river access points. These reintroductions are considered experimental, nonessential populations, and low survival with no successful reproduction has been documented as a result of these releases (USDI Fish and Wildlife Service 2002c). Cumulatively, the management plans and active restoration efforts on the Prescott NF and Tonto NF have contributed positively to Colorado pikeminnow and their habitat and support species viability on the Coconino NF.

Several of the bald eagle breeding areas on the Verde River are shared with the Prescott NF. The revised Prescott NF's forest plan includes direction for projects to incorporate design features and mitigation measures into projects to ensure compliance with the Bald and Golden Eagle Protection Act. This direction contributes positively to bald eagles and their habitat and supports the viability of this species on the Coconino NF.

The Four-Forest Restoration Initiative is a large-scale planning effort involving three of the neighboring forests. It would focus on improving resiliency in fire-adapted ecosystems. If implemented, the Four-Forest Restoration Initiative could treat up to 50,000 acres annually across the Coconino, Kaibab, Apache-Sitgreaves, and Tonto NFs. The cumulative effect of this process could have widespread beneficial outcomes in restoration across the forest including decreased susceptibility to large disturbances (e.g., uncharacteristic wildfire and insect outbreaks) and increased water yields from winter snowfall through the creation of interspaces. The scale of this project is such that these changes could have a meaningful impact on wildlife habitat by improving adaptability of ponderosa pine types to a changing climate and providing for it well into the future. These changes in wildlife habitat condition would decrease the overall risk to species viability on the Coconino NF.

The Fossil Creek Wild and Scenic River Comprehensive River Management Plan (CRMP) is being developed concurrently with this forest plan revision effort. The CRMP will provide detailed direction, implementation actions, and monitoring to protect or enhance outstandingly remarkable values of the wild and scenic river. The proposed action is designed to include the most flexibility to increase capacity and recreation infrastructure—maximizing recreation opportunities in the future—while providing protection for sensitive river and Tribal values at the same time through both a management plan and site-specific actions. Project actions would address recreation capacity, corridor access, recreation facilities, services, and public health and safety. Even if an alternative to the proposed action is selected, it is likely to include managing recreation to prevent resource damage in the river corridor. Management actions under the CRMP would contribute positively to species associated with Fossil Creek (including Fossil Creek bedstraw, Metcalfe's tick trefoil, Cochise sedge, Fossil springsnail, western yellow-billed cuckoo, northern Mexican garter snake, narrow-headed gartersnake, bats, common black hawk, lowland leopard frog, Arizona toad) and their habitat and support species viability on the Coconino NF.

Arizona Department of Agriculture and Arizona Department of Environmental Quality

The State of Arizona has promulgated regulations for agriculture and environmental quality. Title 3 of the Arizona Revised Statutes contains the provisions related to agricultural topics such as dangerous plant pests and diseases. Title 49 outlines specifics such as water quality standards and total maximum daily loads. These regulations create management outcome expectations that are similar to those envisioned on the forest. By ensuring safe and effective plant pest and disease control and clean water on other lands used by species that have habitat on the Coconino NF, these state regulations should decrease the overall risk to species viability on the forest.

Arizona Department of Water Resources

The Arizona Department of Water Resources administers and enforces the State's groundwater code and surface water rights laws. (Arizona Department of Water Resources 2016). The mission of the Arizona Department of Water Resources is to secure long-term dependable water supplies for Arizona. Title 45 of the Arizona Revised Statutes contains the provisions related to water and groundwater resources. Groundwater pumping and diversion of surface water can impact the condition of riparian areas (streams, wetlands, springs, and riparian forest types). For example, groundwater pumping off the forest can lower water tables and affect the connectivity of habitats for fisheries and aquatic biota. Continued or increased pumping may negatively affect the base flow of streams that are directly connected to major aquifers and associated streams, especially the Verde River, Beaver Creek, West Clear Creek and Oak Creek, because domestic use is high adjacent to these streams. Groundwater pumping within the Little Colorado River Plateau may negatively affect adjacent forest wells used for stock watering and domestic use. Groundwater pumping adjacent to springs and seeps may reduce flow, but little quantitative information is available to accurately project the extent (USDA Forest Service 2016j). The downward trend in groundwater levels is projected to continue with increasing use adjacent to the Verde Valley cities and Flagstaff; however, trends in the remainder of the area are unknown. The Arizona Department of Water Resources' regulation of the use of water, especially in the face of growing populations in the area should decrease the overall risk to species viability on the forest.

Arizona Game and Fish Department

The Arizona Game and Fish Department manages wildlife populations in the State. The Arizona Game and Fish Department pursues its management under the guidance of a variety of plans. The "Wildlife 20/20 Strategic Plan" provides management direction for the department's program of work. The plan is built around two strategic themes: wildlife conservation and recreation (AZGFD 2016). "The Arizona State Wildlife Action Plan: 2012-2022" (previously titled "Arizona's Comprehensive Wildlife Conservation Strategy"), was approved in 2012, and provides the vision for managing Arizona's fish, wildlife, and wildlife habitats. The plan contains several key elements that may provide information for, or have an impact on, Coconino NF management:

- distribution and abundance of wildlife;
- locations and condition of key habitats and community types;
- problems that may adversely affect species in their habitats; and
- proposed conservation actions for habitats and species and implementation priorities.

The "Coconino County Wildlife Connectivity Assessment: Detailed Linkages, San Francisco Peaks to Mogollon Rim Linkage Design" identifies three linkage strands that could provide desirable wildlife connectivity between blocks of wildlands around the San Francisco Peaks and the Mogollon Rim (AZGFD 2013). The San Francisco Peaks to Mogollon Rim movement area has been identified as a priority by workshop attendees and is supported by County planners with knowledge of future growth patterns and potential conservation opportunities. The Garland Prairie Strand includes ponderosa pine forest, pinyon juniper woodland, high-elevation grassland, and ephemeral wetland and provides live-in and pass-through habitat for species utilizing these habitat types. The Volunteer Mountain Strand follows the wooded highlands on the western edge of the U.S. Army's Camp Navajo installation and is dominated by ponderosa pine forest, with small areas of pinyon juniper and grassland at its southern and western edges. The Woody Ridge Strand is predominantly ponderosa pine forest and encompasses most of north-south trending Woody Ridge east of Camp Navajo. Understanding wildlife connectivity patterns across the region will help guide development in the future. This information contributes positively to wildlife and their habitat and supports the viability of wildlife on the Coconino NF.

AZGFD has developed a conservation assessment and strategy for bald eagles in Arizona (Driscoll et al. 2006). The Southwestern Region signed a memorandum of understanding (MOU), along with other partners, agreeing to conserve the bald eagle and implement the conservation assessment and strategy. This results in additional assurance that bald eagles will be protected at the project level and that the potential for take is minimized in a consistent way across all national forests in the Southwest. This protection contributes positively to bald eagles and their habitat and supports the viability of wildlife on the Coconino NF.

Private land development in grasslands on private land adjacent to the forest have reduced the overall abundance of habitat for Gunnison's prairie dog outside the forest boundary. NFS lands only comprise about 6 percent of predicted range, and so can only support a small population compared to non-NFS lands (Underwood 2007). AZGFD manages Gunnison's prairie dog as a "nongame mammal," which may be taken during an open hunting season. AZGFD has instituted seasonal shooting closures from April 1 to June 15 to protect pregnant and lactating prairie dogs and their young (Underwood 2007). The developments on private land and authorized hunting are negatively contributing to Gunnison's prairie dog and their habitat and do not support species viability on the Coconino NF.

Arizona State Parks

Deadhorse State Park includes portions of the Desert Communities ERU, which is Arizona cliffrose habitat, and portions of the Verde Formation soil type, with is habitat for Bigelow's onion, Heath-leaf wild buckwheat, Rusby's milkwort, Verde Valley sage, and Ripley's Wild Buckwheat. Dead Horse State Park limits disturbance to this soil type from recreation by limiting hiking and bicycling to trails to support the viability of this plant. The private land development in the Verde Valley has reduced the overall abundance of these habitats for these species. The limited disturbance to these habitats under Deadhorse State Park's management contributes positively to these species and their habitat and supports species viability on the Coconino NF.

Local Government

The landscape in the analysis areas has become more fragmented and altered as a result of human activities that include urban development, roads, infrastructure development, ranching, and fire suppression. Fragmentation and habitat alteration has been especially problematic in the Montane/Subalpine Grassland ERU and the cinder soils found in the Doney Park, Timberline, and similar neighborhoods in Coconino County and in the Semi-desert Grassland and Desert Communities ERUs in Yavapai County. Many local governments have addressed this growing fragmentation in their planning efforts. The "Coconino County Comprehensive Plan (2015)" serves as a long-range guide for the future, with goals that provide general direction, and policies that specify the location, form, purpose, and acceptable impacts of development. The environmental pillar of this plan includes ecosystem services, air quality, water quantity and quality, open space, and climate change. The "Flagstaff Regional Plan (2014)" adopted by the Coconino County Board of Supervisors and Flagstaff City Council includes an element that addresses open space. The "Yavapai County Comprehensive Plan (2012)" covers eight topic areas: land use, transportation, water and open space, energy, environment, cost of development, and growth areas. The "Sedona Community Plan (Imagine Sedona 2020 and Beyond)" guides the city in, among other things, making decisions about new development and re-zonings (City of Sedona 2014). The "Verde Valley Regional Land Use Plan" includes open space preservation as a key component for a balanced land-use pattern (Yavapai County 2006). By ensuring that development decision consider the value of open space, these local plans should decrease habitat fragmentation and correspondingly result in lowering the overall risk to species viability on the forest.

There are four community wildfire protection plans in the analysis area. These plans cover the Blue Ridge and Mogollon Rim Communities, Flagstaff and Surrounding Communities, Greater Williams Area Community, and Tusayan Community. These community wildfire protection plans generate a broad operating framework for landowners and resource managers within the areas, and identify community protection priorities. These plans use a combination of fuel management, FireWise standards, and appropriate wildfire suppression response to reduce threats to life and property, protect values-at-risk, and create a safe context for the use of fire in subsequent forest ecosystem restoration efforts. These plans outline actions needed to prepare and equip the community to live and thrive within our fire-adapted ponderosa pine forests. These plans help reduce the risk of uncharacteristic fire in areas adjacent or near the Coconino NF. Reducing the overall risk of uncharacteristic fire will contribute positively to a wide variety of species and their habitat and support species viability on the Coconino NF.

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and other organization and individuals during the development of this environmental impact statement:

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Federal, State, and Local Agencies

Numerous Federal, State, county, and local agencies and organizations have been consulted in the development of the proposed revised plan and this environmental impact statement. Complete mailing lists for the scoping periods are available in the planning record. Some of the agencies consulted include the following.

Federal

U.S. Department of Agriculture
- Apache-Sitgreaves National Forests
- Kaibab National Forest
- Natural Resources Conservation Service
- Prescott National Forest
- Rocky Mountain Research Station
- Southwestern Regional Office
- Tonto National Forest

U.S. Department of Defense

Army Corps of Engineers

U.S. Department of Energy

U.S. Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- Fish and Wildlife Service
- National Park Service

U.S. Department of Transportation
    Federal Highway Administration
U.S. Environmental Protection Agency
U.S. Federal Energy Regulatory Commission
U.S. Senators
U.S. Representatives

State

Arizona Department of Environmental Quality
Arizona Department of Mines and Minerals
Arizona Department of State Lands
Arizona Department of Transportation
Arizona Department of Water Resources
Arizona Game and Fish Department
Arizona Geological Survey
Arizona State Forestry Division
Arizona State Representatives
Arizona State Parks
Arizona State University
Arizona State Senators
Northern Arizona Council of Governments
Northern Arizona University
Office of the Governor
University of Arizona
Coconino County Cooperative Extension
Yavapai County Cooperative Extension

County

Coconino County
Gila County
Yavapai County

Local Municipalities

City of Flagstaff
City of Sedona
City of Winslow
City of Phoenix
Town of Camp Verde
Town of Clarkdale
Town of Cottonwood
Town of Payson
Village of Oak Creek

Unincorporated Communities

Beaver Creek Communities (Lake Montezuma, McGuireville, and Rimrock)
Camp Navajo
Cornville
Happy Jack/Long Valley/Clint's Well
Munds Park
Page Springs
Pine
Strawberry
Winona

Tribes

Fort McDowell Yavapai Nation
Navajo Nation
Pueblo of Zuni
San Carlos Apache Tribe
San Juan Southern Paiute Tribe
The Havasupai Tribe
The Hopi Tribe
The Hualapai Tribe
The Pueblo of Acoma
The Yavapai-Apache Nation
The Yavapai-Prescott Indian Tribe
White Mountain Apache Tribe

Others

Numerous groups and individuals participated in the process through written comments and/or attending public meetings. Groups that participated include:

360 Adventures
A-1 Ranch
Absolute Bikes
Access Fund
All-American Road Committee
Arizona Public Service
Arizona Cattle Growers' Association
Arizona Elk Society
Arizona Forest Plan Revision Coalition
Arizona Greenworks
Arizona Riparian Council
Arizona Safari Jeep Tours
Arizona Snowbowl
Arizona Wilderness Coalition
Arizona Wildlife Federation
Back Country Horsemen of Arizona
Bar T Bar, Inc.
Barlow Jeep Rentals
Big Park Council
Blue Ribbon Coalition
Bristlecone Pines Property Owners Association
Camp Colton
Center for Biological Diversity
CenterFocus Reservations
Coconino County Trail Riders
Coconino Horsemen's Alliance
Coconino Rural Environment Corps
Cocopai Trails
Crooked H Ranch
Democrats of the Red Rocks
Diablo Trust
Earth Wisdom Tours
East Flagstaff Community Library
Ecological Restoration Institute
Environmental Planning Group
Equinature USA
ERA Young Reality
Flagstaff Activist Network
Flagstaff Biking Organization
Flagstaff Convention and Visitors Bureau
Flying M Ranch
Forest Guardians
Free Soul Mind/Body Education
Friends of the forest
Friends of the Well
Friends of Verde River Greenway
Friends of Walnut Canyon
Gon' Fishen
Grand Canyon Wildlands Council
Great Western Trail
Greater Flagstaff Economic Council
Habitat Harmony
Hart Livestock
High Desert Investment Co.
Highlands Fire Department
Hitchin' Post Stables, Inc.
Horse Trails Coalition
Independent Resources
James Guide Service
KAZM Radio
Keep Sedona Beautiful
Kendrick Mountain Allotment
Kentucky Wolf Information Center
Little Horse Ranch, LLLP O.X. Ranch
Logan Simpson Design, Inc.
Manterola Sheep Company
M-Diamond Ranch
Merriam-Powell Center for Environmental Research
Mormon Lake Lodge
Morrison Brothers Windmill Ranch, LLC
Museum of Northern Arizona
Northern Arizona ATV

Northern Arizona Building Association
Northern Light Balloon Expeditions
Orme Ranch
Phoenix Zoo
Pink Jeep Tours
Recreation resident special use permittees
Red Rock Balloons
Red Rock Western Jeep Tours
Red Rock-Dry Creek Community Plan
Rocky Mountain Elk Foundation
Salt River Project
Sedona Fire District
Sedona Metaphysical Spiritual Association
Sedona Metaphysical Spiritual Association
Sedona Mountain Bike Adventures
Sedona Private Guides
Sedona Publishing Company
Sedona Sports
Sedona Verde Valley Association of REALTORS
Sedona Wedding Professionals Association
Sedona Westerners
Sedona.Biz
Segway of Sedona
Shadow Estates Homeowners Association
Shadow Estates Homeowners Board
Sheep Limited
Sierra Club, Grand Canyon Chapter
Sky Island Alliance
Southwest Area Transmission Planning GroupSouthwest Forest Products, Inc.
Southwestern Environmental Consultants, Inc.
Sultana Cycles
The i/mx Companies HMA, Inc.
The Institute of Ecotourism
The Nature Conservancy
The Trust for Public LandTonto Rim Sports Club
Touch of Southwest Tours
Trek AmericaTucson Electric Power
V Bar V Ranch
Verde Valley 4 Wheelers
Verde Valley Cyclists
Verde Valley Horsemen's Council
Verde Valley Land Preservation Institute
Vertical Relief Climbing Center
W.C. Long Outfitters
Weddings in Sedona
Western Area Power Administration
Western Environmental Law Center
Western Watershed Coalition
William Grant Still Music
Windmill Ranch
Yavapai Cattle Growers Association

Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document and those who submitted substantive comments on the draft environmental impact statement. In addition, copies have been sent to the following Federal agencies, federally recognized tribes, State and local governments, and organizations representing a wide range of views.

Glossary

Accessibility – Term referring to the degree to which recreation opportunities, facilities, or programs meet current legal, social, and design requirements for use by persons of varying physical and mental abilities.

Age class – Refers to trees that originated within a relatively distinct range of years. Typically the range of years is considered to fall within 20 percent of the average natural maturity (e.g., if 100 years is required to reach maturity, then there would be five 20-year age classes).

Air quality related values – Values associated with wilderness character, such as visibility and pollutant concentrations consistent with natural conditions.

Airshed – Subset of air basin, the term denotes a geographical area that shares the same air because of topography, meteorology, and climate. (Source: [http://www.ecologydictionary.org/EPA-Terms-of-Environment-Dictionary/Airshed, Ecology Dictionary](http://www.ecologydictionary.org/EPA-Terms-of-Environment-Dictionary/Airshed))

Animal unit months (AUMs) – One AUM is the amount of forage required by an animal unit (AU) for 1 month, or the tenure of one AU for a 1-month period. An animal unit is defined as a mature (800- to 1,000-pound) cow with or without a calf, based on an average consumption rate of 26 pounds of forage dry matter per day. (Ruyle and Ogden 1993)

Arterials – Roadways that form a network linking cities and larger towns (and other traffic generators, such as major resort areas, which are capable of attracting travel over similarly long distances) and provide interstate and intercounty travel corridors.

Authorized use – The use specified on the annual bill(s) for collection and verified by permittee's payment of fees.

Basal area – The cross-sectional area at breast height (4.5 feet above the ground) of trees measured in square feet. Basal area is a way to measure how much of a site is occupied by trees. The cross-sectional area is determined by calculating the tree's radius from its diameter (diameter/2 = radius) and using the formula for the area of a circle (π x radius2 = cross-sectional area). Basal area per acre is the summation of the cross-sectional area of all trees in an acre or in a smaller plot used to estimate basal area per acre. Diameter at root collar (defined below) is used to calculate the cross-sectional area of multi-stemmed trees such as juniper and oak.

Best management practices – Methods, measures, or practices an agency selects to meet its nonpoint source control needs. Best management practices include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. Best management practices can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (40 CFR 130.2(m)).

Biological soil crusts – Crusts of soil particles formed by living organisms (e.g., algae, mosses, lichens) in arid areas. The crusts hold soil in place, help retain moisture, and improve soil nutrients by fixing atmospheric nitrogen.

Candidate species – Plant and animal species that, in the opinion of the U.S. Fish and Wildlife Service, may become endangered or threatened (FSM 2670 09/23/2005). These are documented in the Fish and Wildlife Service's program advice to its regional directors for preparation of listing packages or documented in a current Federal Register Notice of Review (categories 1 and 2) for threatened or endangered listing. The Fish and Wildlife Service recognizes three categories of candidate species for listing as endangered or threatened:

- **Category 1.** Taxa for which the Fish and Wildlife Service has substantial information on hand to support the biological appropriateness of proposing to list the species as endangered or threatened. Currently, data are being gathered concerning essential habitat needs and for some taxa, the precise boundaries for critical habitat designations. Development and publication of proposed listing of these species is anticipated.
- **Category 2.** Taxa for which information now in possession of the Fish and Wildlife Service indicates that proposing to list the species as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat(s) are not currently available to support proposed listing.
- **Category 3.** Taxa that are no longer being considered for listing as endangered or threatened and are not regarded as candidate species. There are three subcategories:

  (1) Taxa for which the Department of the Interior, Fish and Wildlife Service has persuasive evidence of extinction.

  (2) Taxa that while represented in published revisions and monographs do not meet the Endangered Species Act of 1973, as amended definition of species on the basis of current taxonomic understanding.

  (3) Taxa that have proven to be more abundant or widespread than was previously believed and/or those that are not subject or any identifiable threat.

Carbon monoxide (CO) – Colorless, odorless gas that forms when carbon in fuel does not burn completely. Carbon monoxide is a component of exhaust from motor vehicles and engines. Carbon monoxide emissions increase when conditions are poor for combustion; thus, the highest carbon monoxide levels tend to occur when the weather is very cold or at high elevations where there is less oxygen in the air to burn the fuel. (Source: http://www.epa.gov/oms/invntory/overview/definitions.htm, EPA Glossary for Mobile Source Emissions)

Class I area – Geographic area designated by the Clean Air Act where only a small amount or increment of air quality deterioration is permissible. (Source: http://www.forecast.weather.gov/glossary.php, NOAA National Weather Service Glossary)

Clump – A tight cluster of two to five trees of similar age and size originating from a common rooting zone that typically lean away from each other when mature. A clump is relatively isolated from other clumps or trees within a group of trees, but a standalone clump of trees can function as a tree group.

Critical habitat – Areas designated as critical by the Secretary of the Departments of the Interior or Commerce for the survival and recovery of listed species (50 CFR Parts 17 and 226). Because use of the term has legal implications, the Forest Service limits its use to only those habitats officially determined as critical by the Secretary.

Coarse woody debris – Woody material on the ground greater than 3 inches in diameter, including logs.

Collector road – Road providing both land access service and traffic circulation within residential neighborhoods, commercial, and industrial areas. These streets channel traffic volumes into the arterial system. The collector system may include the street grid, which forms a logical entity for traffic circulation.

Declining – Refers to the senescent (aging) period in the lifespan of plants that includes the presence of dead and/or dying limbs, snag tops, and other characteristics that indicate the later life stages of vegetation.

Desired landscape character – Described in the Scenery Management System Handbook as "The most complete, attractive and sustainable expression of the valued landscape character which is compatible with that landscape's fully integrated set of desired conditions" (page 5-5 expanded). Desired landscape character represents the most "ideal" and attractive scenic identity that is possible, given the limitations of the ecosystem and achievement of other resource objectives as defined in the desired conditions.

Developed site – A discrete place containing a concentration of facilities and services used to provide recreation opportunities to the public and evidencing a significant investment in facilities and management under the direction of an administrative unit in the National Forest System.

Diameter at breast height (d.b.h.) – Diameter of a tree typically measured at 4.5 feet above ground level.

Diameter at root collar (d.r.c) – Diameter of a tree typically measured at the root collar or at the natural ground line, whichever is higher, outside the bark. For a multistemmed tree, diameter at root collar is calculated from the diameter measurements of all qualifying stems (1.5 inches diameter or greater and at least 1 foot in length).

Ecological Response Units (ERUs) – ERUs represent an ecosystem stratification based on vegetation characteristics that would occur when natural disturbance regimes and biological processes prevail (TNC 2006), and combine potential vegetation and historic fire regimes to form ecosystem classes useful for landscape assessment. Technical ERU descriptions were developed to assist in the analysis of ecological sustainability for plan revision (Wahlberg et al. 2014). The vegetation types used in describing desired conditions were based on these technical ERU descriptions, but were written in more general terms for ease of understanding.

Ecosystems – Spatially explicit, relatively homogeneous units of the Earth that include all interacting organisms and elements of the abiotic environment within its boundaries. An ecosystem is commonly described in terms of its:

- **Composition** – biological elements within the different levels of biological organizations, from genes and species to communities and ecosystems.
- **Structure** – organization and physical arrangement of biological elements such as snags and down woody debris, vertical and horizontal distribution of vegetation, stream habitat complexity, landscape pattern, and connectivity.
- **Function** – ecological processes, such as energy flow; nutrient cycling and retention; soil development and retention; predation and herbivory; and natural disturbances such as wind, fire, and floods that sustain composition and structure.

Ecotone – Transition zone between two distinct ecological communities.

Emissions – Releases of pollutants into the air from a source, such as a motor vehicle or a factory. (Source: http://www.epa.gov/oms/invntory/overview/definitions.htm, EPA Glossary for Mobile Source Emissions)

Emission reduction standards – Rules and regulations that set limits on how much pollution can be emitted from a given source. Vehicle and equipment manufacturers have responded to many mobile source emission standards by redesigning vehicles and engines to reduce pollution. (Source: http://www.epa.gov/oms/invntory/overview/definitions.htm, EPA Glossary for Mobile Source Emissions)

Environmental justice – According to USDA DR5600-002 (USDA 1997), environmental justice and minority, minority population, low-income, and human health and environmental effects, are defined as follows:

- **Environmental justice** means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by, government programs and activities affecting human health or the environment.
- **Minority** means a person who is a member of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.
- **Minority population** means any readily identifiable group of minority persons who live in geographic proximity to and, if circumstances warrant, migrant farm workers and other geographically dispersed/transient persons who would be similarly affected by USDA programs or activities.
- **Low-income population** means any readily identifiable group of low-income persons who live in geographic proximity to and, if circumstances warrant, migrant farm workers and other geographically dispersed or transient persons who would be similarly affected by USDA programs or activities. Low-income populations may be identified using data collected, maintained and analyzed by an agency or from analytical tools such as the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty.
- **Human health and/or environmental effects** as used in this departmental regulation includes interrelated social and economic effects.

Even-aged stands – Tree stands composed of one distinct age class of trees.

Experimental population – A population (including its offspring) of a listed species designated by rule published in the Federal Register that is wholly separate geographically from other populations of the same species. An experimental population may be subject to less stringent prohibitions than are applied to the remainder of the species to which it belongs.

Fire exclusion – Fire exclusion interrupts natural fire return intervals. It ultimately affects the density and structure of live and dead vegetation, overstory and understory abundance, diversity and resiliency, and soil productivity in many of the PNVTs. As density of live and dead vegetation increases, vulnerability to uncharacteristic fire increases.

Fire return interval – The number of years between two successive fires in a designated area (i.e., the interval between two successive fires); the size of the area must be clearly specified (McPherson and others 1990).

Fire regime – Patterns of fire that occur over a long period of time across an appropriately scaled area and its immediate effects on the ecosystem in which it occurs. An ecosystem's natural fire regime is the one that existed prior to human-facilitated interruption of fire frequency, extent, or severity. The five fire regimes are classified based on frequency (i.e., average number of years between fires) and severity (i.e., amount of replacement on the dominant overstory vegetation) of the fire. The five regimes are:

- **Fire regime I.** 0- to 35-year frequency and low (surface fires most common, isolated torching can occur) to mixed severity (less than 75 percent of dominant overstory vegetation replaced);
- **Fire regime II.** 0- to 35-year frequency and high severity (greater than 75percent of dominant overstory vegetation replaced);
- **Fire regime III.** 35- to 100+-year frequency and mixed severity;
- **Fire regime IV.** 35- to 100+-year frequency and high severity;
- **Fire regime V.** 200+-year frequency and high severity

Forest analysis species – Plant, animal, and aquatic species considered for analysis during the forest plan revision process.

Forest highway – A forest road under the jurisdiction of, and maintained by, a public authority and open to public travel (23 USC 101). The Forest Highway Program falls under 23 USC 202, 203, and 204.

Forest transportation atlas – A display of the system of roads, trails, and airfields of an administrative unit (36 CFR 212.1).

Fugitive dust – Particles lifted into the ambient air caused by human-made and natural activities such as the movement of soil, vehicles, equipment, blasting, and wind. This excludes particulate matter emitted directly from the exhaust of motor vehicles and other internal combustion engines, from portable brazing, soldering, or welding equipment, and from pile drivers. (Source: http://www.epa.gov/region9/air/phoenixpm/define.html, EPA Federal Implementation Plan Definitions)

General forest area – General forest areas are all lands available for recreational use and outside of wilderness, developed sites, trails, and administrative sites. The general forest areas are composed of concentrated use areas. Concentrated use areas can include front- and/or back-country campsites, parking areas, pullouts and landings, river and road corridors, lake surfaces, and day-use areas such as off-highway vehicle areas, climbing areas, target shooting areas, etc. Amenities or constructed features inside general forest areas are primarily for resource protection.

Groups – A cluster of two or more trees with interlocking or nearly interlocking crowns at maturity surrounded by an opening. Size of tree groups is typically variable depending on forest type and site conditions and can range from fractions of an acre (a two-tree group) (i.e., ponderosa pine, dry mixed conifer) to many acres (i.e., wet mixed conifer, spruce-fir). Trees within groups are typically nonuniformly spaced, some of which may be tightly clumped.

Haze – Atmospheric particulate matter and gases that diminish visibility. Visibility is reduced when light encounters tiny pollution particles, such as soot and dust, and some gases (such as nitrogen dioxide) in the air. Some light is absorbed by the particles and gases and other light is scattered away before it reaches your eye. More pollutants mean more absorption and scattering of light, resulting in more haze. Some haze-causing pollutants are directly emitted to the atmosphere from vehicle emissions; others are formed indirectly when pollutants from mobile sources react with other elements and materials in the atmosphere (Source: http://www.epa.gov/oms/invntory/overview/definitions.htm, EPA Glossary for Mobile Source Emissions).

Head months (HMs) – is one month's use and occupancy of the range by one animal. For grazing fee purposes, it is a month's use and occupancy of range by one weaned or adult cow with or without calf, bull, steer, heifer, horse, burro, or mule, or five sheep or goats.

Heritage sites or assets – Remnants of past cultures that remind us of the centuries-old relationship between people and the land (from National Heritage Strategy); property, plant, or equipment that are unique for one or more of the following reasons: (1) historical or natural significance; (2) cultural, educational or artistic/aesthetic significance; or (3) significant architectural characteristics.

INFRA – An integrated Forest Service infrastructure database for collection, storage, and use of feature, land unit, facility, utility, work item, cost, accessibility, and real property data. For recreation management, INFRA provides the opportunity to enter information to derive operations and maintenance costs, recreation funding shortfalls, recreation use data, accessibility information, and constructed feature inventory conditions. INFRA brings together tabular and spatial technology. INFRA provides information critical to using the Meaningful Measures for Quality Recreation Management System.

Invasive exotic plants – Plants that are non-native, highly competitive, and have few, if any, threats. Once established, they can replace native species and disrupt soil stability, fire return intervals, and hydrologic regimes.

Leasable minerals – Oil, gas, coal, phosphate, potassium, sodium, sulphur, gilsonite, oil shale, geothermal resources, and hardrock minerals. Geothermal energy is natural heat from within the Earth captured for producing electric power, space heating, or industrial steam. A geothermal area is any that may contain underground reservoirs of hot water or steam created by heat from the Earth or that have subsurface areas of dry hot rock. A lease grants the exclusive right to explore for, develop, and produce the mineral commodity identified in the lease. Lease stipulations are used to limit or constrain those rights. Lease notices are used to make the lessee aware of constraints based on existing law or regulation. Lease regulations for the Forest Service are found in 36 CFR 228 Subpart E. Leasing is a discretionary decision and activity and the Forest Service can decide against leasing oil and gas and geothermal, but doing so must be fully justified and documented in our environmental analysis of the leasing decision per 36 CFR 228.102 (c). The Forest Service cannot deny lease operations of an application for a permit to drill or a mine plan except where it would violate the Endangered Species Act or some other statute, but can mitigate impacts within the terms of the lease and to the extent negotiated with the lessee/operator.

Locatable minerals – Minerals that may be located and removed from Federal lands under the General Mining Law of 1872 as amended and which were not excepted in later legislation. They include hard rock, placer, and industrial minerals and uncommon varieties of rocks found on public domain lands. This category includes gold, silver, manganese, copper, and other valuable deposits specifically named in the law. Later regulatory acts removed certain mineral and energy resource from the locatable classification. The role of the Forest Service in this process is to minimize environmental impacts on NFS surface resources. It does not manage the mineral resource per se; the responsibility for managing the mineral resource is in the Department of the Interior. The Forest Service manages the surface resources and the surface management regulations are found at 36 Code of Federal Regulations (CFR) 228, Subpart A, Locatable Minerals. More information on the requirements of the locatable minerals surface management regulation are found in 36 CFR 228 Subpart A.

Maintenance level – Defines the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria (FSH 7709.59, 62.32).

- **Maintenance level 1**. Roads that have been placed in storage between intermittent uses. The period or storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to resources to an acceptable level and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are “prohibit” and “eliminate” all traffic. Roads receiving level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular/motorized traffic but may be available and suitable for non-motorized uses
- **Maintenance level 2.** Assigned to roads open for use by high-clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as “Warning No Traffic” signs may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to (a) discourage or prohibit passenger cars or (b) accept or discourage high-clearance vehicles.
- **Maintenance level 3.** Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. The Manual on Uniform Traffic Control Devices is applicable. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations. Roads in this maintenance level are typically low speed, with single lanes and turnouts. Appropriate traffic management strategies are either “encourage” or “accept.” “Discourage” or “prohibit” strategies may be employed for certain classes of vehicles or users.
- **Maintenance level 4.** Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. Manual on Uniform Traffic Control Devices is applicable. The most appropriate traffic management strategy is “encourage,” however, the “prohibit” strategy may apply to specific classes of vehicles or users at certain times.
- **Maintenance level 5.** Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. Manual on Uniform Traffic Control Devices is applicable. The appropriate traffic management strategy is “encourage.”

Mineral materials or saleable minerals – Include petrified wood, common varieties of sand, gravel, stone, pumice, pumicite, cinders, clay, and other similar materials. Such mineral materials include deposits which although they have economic values, are used for agriculture, animal husbandry, building, abrasion, construction, landscaping, and similar uses. Peat is also a mineral material. Mineral materials regulations are found in 36CFR 228 Subpart C. The Forest Service is responsible for managing the surface occupancy and use of NFS lands and the disposal of certain mineral materials. The Mineral Materials Act of 1947 provides for the disposal of mineral materials (common varieties). It specifically requires competitive bidding for mineral materials on public domain lands unless it is impracticable to obtain competition.

Mosaic – Pattern of patches, corridors and matrix (forest or non-forest) that form a landscape in its entirety.

National Forest System road (NFS road) – A road wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources (23 USC 101, 36 CFR 212.1, 36 CFR 251.51, 36 CFR 261.2, FSM 7705).

National Visitor Use Monitoring (NVUM) – Systematic process to estimate annual recreation and other uses of NFS lands through user surveys. The National Visitor Use Monitoring process includes a survey to develop statistically accurate estimates of national forest visitor use; the survey began in 2000 and will continue indefinitely, during which 20 percent of all national forests will participate in a given year. Use information is gathered in five categories: day use developed sites, overnight use developed sites, general forest areas, wilderness, and viewing corridors.

Natural events – Natural disturbances such as seismic activity, windstorms, and wildfires, which may be excused from exceedances of National Ambient Air Quality Standards "if they occur over natural undisturbed areas or areas that have been disturbed by human activities with appropriate controls in place." (Source: http://www.nmenv.state.nm.us/aqb/NEAP/InfoOnDust.pdf, New Mexico Environment Department 2000)

Natural fire regime – The fire regime that existed before human-facilitated interruption of frequency, extent, or severity.

Niche – Specific focus area within which the unit is most suited to add value to the agency and society and from which features in recreation sites facilitate the unique opportunities and benefits. Niche is the best "fit" in which to operate sites given the context in which they exist. It is simply another term to reflect how the broader agency role or mission is narrowed to provide a more precise interpretation of how the broader mission will be delivered by the recreation sites and opportunities on a specific unit within its unique context. The forest's niche has been referred to as the overlap between "assets" and customer demand, both existing and potential, including new market segments. Assets may include geology, topography, climate, vegetation, and history that make the forest attractive for specific activities and experiences. Assets are also "special places" that make the forest unique and highly valued by communities. Frequently, these places have been nationally recognized by designations such as wilderness areas, scenic byways, historic sites, wild and scenic rivers, or national recreation areas.

Nitrogen oxides (NO_2) – Group of highly reactive gases that contain nitrogen and oxygen in varying amounts. Many of the nitrogen oxides are colorless and odorless. The common pollutant nitrogen dioxide (NO_2) can often be seen combined with particles in the air as a reddish-brown layer over many urban areas. Nitrogen oxides are formed when the oxygen and nitrogen in the air react with each other during combustion. The formation of nitrogen oxides is favored by high temperatures and excess oxygen (more than is needed to burn the fuel). The primary sources of nitrogen oxides are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. (Source: http://www.epa.gov/oms/invntory/overview/definitions.htm, EPA Glossary for Mobile Source Emissions)

Nonattainment region – Geographic area in which the level of a criteria air pollutant is higher than the level allowed by the NAAQS (Source: http://www.nps.gov/dscw/definitionsdc_n.htm, National Park Service Denver Service Center Workflows Definitions 2011).

Northern goshawk nest areas – Nest areas are approximately 30 acres in size and include active nests followed by the most recently used historic nest areas. Approximately 180 acres of nest areas are designated within each post-fledging area and minimally include 3 nest areas and 3 replacement nest areas.

Northern goshawk post-fledging areas – Areas that include the nest sites and habitat most likely to be used by the fledglings during their early development. Post-fledging family areas are approximately 600 acres in size.

Noxious weed – A legal term applied to plants regulated by Federal and State laws, such as plants designated as noxious weeds by the Secretary of Agriculture or by the responsible State official. Noxious weeds generally possess one of the more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insect or disease, and being not native or new or not common to the United States or parts thereof.

Old growth – Old growth in southwestern forested ecosystems is different than the traditional definition based on northwestern infrequent fire forests. Due to large differences among southwestern forest types and natural disturbances, old-growth forests vary extensively in tree size, age classes, presence, and abundance of structural elements, stability, and presence of understory. Old growth refers to specific habitat components that occur in forests and woodlands—old trees, dead trees (snags), downed wood (coarse woody debris), and structure diversity. These important habitat features may occur in small areas, with only a few components, or over larger areas as stands or forests where old growth is concentrated. In the Southwest, old growth is considered "transitional," given that the location of old-growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). Some species, notably certain plants, require "old forest" communities that may or may not have old-growth components, but have escaped significant disturbance for lengths of time necessary to provide the suitable stability and environment.

Openings – Spatial breaks between groups or patches of trees, as large as or larger than groups, that contain grass, forb, shrub, and/or tree seedlings but are largely devoid of big trees, with a total tree cover of less than 10 percent in openings.

Ozone – Gaseous molecule that contains three oxygen atoms (O_3). Ozone can exist either high in the atmosphere, where it shields the Earth against harmful ultraviolet rays from the sun, or close to the ground, where it is the main component of smog. Ground-level ozone is a product of reactions involving hydrocarbons and nitrogen oxides in the presence of sunlight. Ozone is a potent irritant that causes lung damage and a variety of respiratory problems. (Source: http://www.epa.gov/oms/invntory/overview/definitions.htm, EPA Glossary for Mobile Source Emissions)

PAOT – Acronym for persons-at-one-time; a measure of facility or site designed recreation carrying capacity, particularly for developed sites. National conventions include 5 persons per family picnic or camp unit, 3.5 persons per parking lot stall at a trailhead or visitor center, 1.5 persons per motorcycle parking stall, and 40 persons per tour bus parking stall.

Patches – Areas larger than tree groups in which the vegetation composition and structure are relatively homogeneous. Patches comprise the mid-scale, thus they range in size from 100 to 1,000 acres.

Particulate matter (PM) – Tiny particles or liquid droplets suspended in the air that can contain a variety of chemical components. Larger particles are visible as smoke or dust and settle out relatively rapidly. The tiniest particles can be suspended in the air for long periods of time and are the most harmful to human health because they can penetrate deep into the lungs. Some particles are directly emitted into the air. They come from a variety of sources such as cars, trucks, buses, factories, construction sites, tilled fields, unpaved roads, stone crushing, and wood burning. Other particles are formed in the atmosphere by chemical reactions. (Source: http://www.epa.gov/oms/invntory/overview/definitions.htm, EPA Glossary for Mobile Source Emissions)

Permitted use – is the number of animals, period of use, and location of use specified in part 1 of the grazing permit (see also definition for authorized use).

Pollutants (pollution) – Unwanted chemicals or other materials found in the environment. Pollutants can harm human health, the environment, and property. Air pollutants occur as gases, liquid droplets, and solids. Once released into the environment, many pollutants can persist, travel long distances, and move from one environmental medium (e.g., air, water, land) to another (Source: http://www.epa.gov/oms/invntory/overview/definitions.htm, EPA Glossary for Mobile Source Emissions).

Primary constituent elements – Physical and biological features within a species' critical habitat that are essential to its conservation and that may require special management considerations or protection. Examples of features include: space for individual and population growth and normal behavior; food, water, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, or rearing of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

Primary standards – Set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. (Source: http://www.epa.gov/air/criteria.html, EPA National Ambient Air Quality Standards 2011)

Properly functioning condition – Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to: dissipate stream energy associated with high flows (thereby reducing erosion and improving water quality); filter sediment; capture bedload and aid in flood plain development; improve floodwater retention and groundwater recharge; develop root masses that stabilize streambanks; develop diverse ponding and channel characteristics to provide habitat for fish, waterfowl, and other uses; and support greater biodiversity. Two other categories for evaluating riparian-wetland condition are:

- **Functional-at-risk.** Riparian-wetland areas that are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation.
- **Nonfunctional.** Riparian-wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and, consequently, are not reducing erosion and improving water quality.

Proposed critical habitat – Habitat proposed to be designated for the benefit of any listed or proposed species. Notice of proposed critical habitat appears in the Federal Register.

Proposed species – Any species of fish, wildlife, or plant that is proposed by the Department of the Interior, Fish and Wildlife Service or the Department of Commerce, National Oceanic and Atmospheric Administration Fisheries Service to be listed as threatened or endangered.

Protected and target threshold habitat – Mexican spotted owl protected habitat includes protected activity centers; all areas in mixed-conifer and pine-oak types (as defined in the 1995 Mexican spotted owl recovery plan) with slopes greater than 40 percent, where timber harvest has not occurred in the past 20 years; and all legally and administratively reserved lands. Mexican spotted owl target/threshold habitat is located outside of Mexican spotted owl protected habitat in mixed conifer and pine-oak. Some of the language from the 1995 recovery plan has been incorporated into the 1987 plan. The 1995 recovery plan has been replaced by the 2012 recovery plan.

Recreation capacity – A measure of the number of people a site can reasonably accommodate at one time, sometimes measured as persons-at-one-time (PAOT).

Reference conditions – Conditions thought to be present historically before European settlement.

Resiliency – The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.

Restoration – The process of assisting in the recovery of an ecosystem that has been degraded, damaged, or destroyed (Society for Ecological Restoration International, 2004). Ecological restoration focuses on establishing or re-establishing the composition, structure, pattern, and ecological processes necessary to facilitate terrestrial and aquatic ecosystem sustainability, resilience, and health under current and future conditions. Accordingly, any project or activity that assists in the recovery of a degraded, damaged, or destroyed ecosystem can be considered restoration. Restoration can be active or passive. Treatments that move ecosystem components toward desired conditions are considered restoration as are removal of impacts. Allowing natural processes to move ecosystem components toward desired conditions can also assist in the recovery of an ecosystem.

Riparian function – The interaction of various hydrologic, geomorphic, and biotic processes across a range of spatial and temporal scales within the riparian environment.

Road decommissioning – Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1). For administrative purposes, these roads are not considered as existing and are not available for motorized use.

Road maintenance – Upkeep of the entire transportation facility including surface and shoulders, parking and side areas, structures, and such traffic control devices as are necessary for its safe and efficient utilization (36 CFR 212.1). This work includes brushing of roadside vegetation, falling danger trees, road blading, cleaning ditches, cleaning culvert inlets and outlets, etc.

Scale – Aerial extent of certain plan decisions are described at various scales:

- **Fine scale. A**n area of about 10 acres or less at which the distribution of species is described.
- **Mid-scale**. An area of 100 to 1,000 acres composed of assemblages of grouped and individual species which have similar biophysical conditions. An area at this scale is composed of 10 or more fine-scale units.
- **Landscape scale.** A unit of forest land approximately 10,000 acres or greater, typically composed of variable elevations, slopes, aspects, soils, plant associations, and natural ecological processes. An area at this scale is composed of 10 or more mid-scale units.

Scenic integrity levels – Measure of the degree to which a landscape is visually perceived to be "complete," and are determined by three factors: dominance, degree of deviation, and intactness of the desired landscape character, and are established based on the existing condition. Scenic Integrity disturbances most typically result from human activities, but can also result from natural events which exceed the landscape's historic range of variability in terms of magnitude, duration, or intensity. An exception to this is direct human alterations that have become accepted over time as positive landscape character attributes; e.g., historic cabins, farms, and ranches. Scenic integrity is the state of naturalness or, conversely, the state of disturbance created by human activities or alterations. Scenic integrity is stated in degrees of deviation from the existing landscape character in a national forest (USDA Forest Service 1995). The following definitions refer to both existing scenic integrity and scenic integrity objectives.

- **Very High Integrity** – The valued landscape character appears natural and unaltered with only minute if any deviations. These areas generally provide for ecological change only. The existing landscape character and sense of place is expressed at the highest possible level.
- **High Integrity** – The valued landscape character "appears natural or appears unaltered." Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.
- **Moderate Integrity** – The valued landscape character "appears slightly altered." Noticeable disturbances are minor and must remain visually subordinate to the valued scenery being viewed.
- **Low Integrity** – The valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed.
- **Very Low Integrity** – The valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character and may not borrow from valued attributes such size, shape edge effect, and pattern of natural openings. However, deviations must be shaped and blended with the natural terrain (landforms) so that elements such as unnatural edges, roads, landings, and structures do not dominate the composition. (USDA Forest Service 1995a, pp. 2-4).

Secondary standards – Set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (Source: http://www.epa.gov/air/criteria.html, EPA National Ambient Air Quality Standards 2011).

Sensitive species – Those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by:

- Significant current or predicted downward trends in population numbers or density.
- Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Site type – The type of recreation site. Recreation sites are divided into several categories (i.e., family campground, fishing site, trailhead, interpretive site minor, horse camp, etc.).

Smoke management unit (SMU) – Any of the geographic areas defined by the Arizona Department of Environmental Quality whose area is based on primary watershed boundaries and whose outline is determined by diurnal windflow patterns that allow smoke to follow predictable drainage patterns (map available at http://www.azdeq.gov/environ/air/smoke/images/mgmt.jpg). (Source: ARS 18-2-1501)

Soil function – An ecological service, role, or task that soil performs.

Soils condition classes – There are four types of soil condition classes: satisfactory, impaired, unsatisfactory, and inherently unstable.

- **Satisfactory** – Indicators signify that soil function is being sustained and soil is functioning properly and normally. The ability of the soil to maintain resource values and sustain outputs is high.
- **Impaired** – Indicators signify a reduction in soil function. The ability of the soil to function properly and normally has been reduced and/or there exists an increased vulnerability to degradation. An impaired category indicates there is a need to investigate the ecosystem to determine the cause and degree of decline in soil functions. Changes in land management practices or other preventative measures may be appropriate.
- **Unsatisfactory** – Indicators signify that a loss of soil function has occurred. Degradation of vital soil functions result in the inability of the soil to maintain resource values, sustain outputs or recover from impacts. Unsatisfactory soils are candidates for improved management practices or restoration designed to recover soil functions.
- **Inherently unstable –** These soils have natural erosion exceeding tolerable limits. Based on the Universal Soil Loss Equation, these soils are eroding faster than they are renewing but are functioning properly and normally.

Special use authorization – A permit, term permit, temporary permit, lease, or easement, or other written instrument that grants rights or privileges of occupancy and use subject to specified terms and conditions on NFS land.

Streamside management zone – Area of vegetation or forest litter located adjacent to stream courses and/or riparian areas for the purpose of filtering sediment, providing bank stability, and providing shade for fisheries habitat in tree/shrub ecosystems.

Structure (vegetation) – The presence, size, and physical arrangement of vegetation in a stand. Vertical structure refers to the variety of plant heights, from the canopy to the forest floor. Horizontal structure refers to the types, sizes, and distribution of trees and other plants across the land surface. Forestlands with substantial structural diversity provide a variety of niches for different wildlife species.

Sustainability – A goal for economic development and natural resource management. Ecosystem sustainability is the capacity of an ecosystem for long-term maintenance of ecological processes and functions, biological diversity, and productivity. It is also called ecological sustainability, which generally refers to land management practices that provide goods and services from an ecosystem without degradation of the site quality and without a decline in the yield of goods and services over time.

Temporary road – A road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a National Forest System road and that is not included in the transportation atlas (36 CFR 212.1).

Term grazing permit – The document used to authorize individuals, partnerships, or corporations to graze livestock if only NFS grazing capacity is involved. Term permits are issued to livestock operators for a period up to l0 years, to graze a specified number, kind, and class of livestock for a specific season and area of use. (FSM 2231.11)

Terrestrial ecosystem survey (also called terrestrial ecological unit inventory or TEUI) – A classification of ecological types and mapped terrestrial ecological units at a consistent standard throughout NFS lands. Ecological units are designed to identify land and water areas at different levels of resolution based upon similar capabilities and potentials for response to management and natural disturbances. Capabilities and potentials derive from multiple elements: climate, geomorphology, geology, soils, water, and potential vegetation.

Total maximum daily load (TMDL) – Written analysis that determines the maximum amount of a pollutant that a surface water can assimilate (the "load") and still attain water quality standards during all conditions. The TMDL allocates the loading capacity of the surface water to point sources and nonpoint sources identified in the watershed, accounting for natural background levels and seasonal variation, with an allocation set aside as a margin of safety.

Unauthorized road – Road that is not a National Forest System road or a temporary road and that is not included in a forest transportation atlas (36 CFR 212.1, FSM 2353.05, FSM 7705).

Uncharacteristic fire – Fire burning at a severity, frequency, or scale outside the historic range of variability.

Uneven-aged forests – Forests that are composed of three or more distinct age classes of trees, either intimately mixed or in small groups.

Viable populations – A population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range (or range required to meet recovery for listed species) within the planning area.

Visibility – Visual impact of haze on the ability of the eye to perceive scenery.

Visual quality objectives (VQOs) – A management tool used in the Visual Management System to measure the scenic quality of the landscape of NFS lands and the public's level of concern for that scenic quality. The following is a description of each of the five VQOs:

- **Preservation**. Allow ecological changes only; management activities are prohibited, with exception of very low-visual impact recreation facilities.
- **Retention.** Management activities not visually evident.
- **Partial retention.** Management activities remain visually subordinate.
- **Modification.** May visually dominate characteristic landscape, but must follow naturally established line, form, color, etc.
- **Maximum modification.** Management activities may dominate the landscape, but mostly appear to borrow from characteristic form, color, line, etc.

Wild and scenic river – A river selected for nomination and/or designation through the Wild and Scenic Rivers Act of 1968 for possessing outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values.

Wilderness – A congressionally designated area that is part of the National Wilderness Preservation System established through the Wilderness Act of 1964; generally larger than 5,000 acres and retaining its primeval character, where nature and its forces work undisturbed by human activity.

Wildland-urban Interface – Includes those areas of resident populations at imminent risk from wildfire and human developments having special significance. These areas may include critical communications sites, critical sites for water supply, high voltage transmission lines, observatories, church camps, scout camps, research facilities, and other structures that if destroyed by fire, would result in hardship to communities. These areas encompass not only the sites themselves, but also the continuous slopes and fuels that lead directly to the sites, regardless of the distance involved.

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