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Supplemental Botany Specialist Report

Coconino Forest Plan Revision DEIS

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 /s/
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Preface

The information in this specialist report reflects analysis that was completed prior to and in conjunction with the completion of the Draft Environmental Impact Statement (DEIS) for the revision of the 1987 Coconino National Forest Land Management Plan (the Plan). The primary purpose of specialist reports associated with the DEIS is to provide detailed information to assist in the preparation of the DEIS. As the DEIS was prepared, review-driven edits to the broader DEIS resulted in modifications to some of the information contained in some of the specialist reports. As a result, some reports no longer contain information and analysis that was updated through an interdisciplinary review process and is included in the DEIS in its entirety. This specialist report retains the additional information on the environmental consequences that was not included in the summarized information in the DEIS. However, analysis and information for this resource that is included in its entirety in the DEIS is not duplicated in this report. Efforts have been made to ensure that the retained information in the specialist reports is consistent with the DEIS. If inconsistencies exist between specialist reports and the DEIS, the DEIS should be regarded as the most current, accurate source of analysis.

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Introduction

This specialist report evaluates and discloses the environmental consequences not included in the DEIS on threatened, endangered and sensitive species and forest analysis plant species that may result from the adoption of a revised land management plan. A separate section provides supplemental information on species of noxious or invasive weeds that is not included in the DEIS. Coconino NF

This report provides brief summaries of the ecology and distribution of the TES and analysis plant species. The findings of impacts for the selected alternative will be addressed in the Biological Assessment and Evaluation (BA & E), which will be prepared later.

This report provides a brief summary of the invasive plant species known on the forest and their current distribution and management.

For the analysis of effects and relevant guidance, see the DEIS.

Relevant Laws, Regulations, and Policy

National Forest Management Act (NFMA) regulations, adopted in 1982, require that habitat be managed to support viable populations of native and desirable non-native vertebrates within the planning area (36 CFR 219.9). USDA regulation 9500-004, adopted in 1983, reinforces the NFMA viability regulation by requiring that habitats on national forests be managed to support viable populations of native and desired non-native plants, fish, and wildlife. For planning purposes, a viable population shall be regarded as one that has the estimated numbers and distribution of reproductive individuals to ensure its continued existence is well distributed in the planning area (36 CFR 219.19). Also, the 1982 planning provisions require that “Forest planning shall provide for diversity of plant and animal communities and tree species consistent with the over-all multiple-use objectives of the planning area” (36 CFR 219.26).

Shown below is a partial list of federal and state laws, executive orders, and Forest direction pertaining to project-specific planning and environmental analysis for this Plan.

- Executive Order (EO) 11644 and EO 11989
- Coconino NF Land and Resource Management Plan, 1987 (as amended)
- Endangered Species Act, 1973 (as amended)
- Forest and Rangeland Renewable Resources Planning Act (RPA), 1974 (as amended)
- Forest Service Manual, FSM 2620, 2630, 2670, 2672
- Multiple-Use Sustained-Yield Act of 1960
- National Environmental Policy Act, 1969
- National Forest Management Act, 1976 (as amended); 36 CFR 219.
- Executive Order 13112 of 1999, regarding invasive weed control.
- Federal Noxious Weed Act of 1974, PL 93-629, as amended.

- Forest Service Manuals 2080 and 2150 and Regional Supplements No. 2100-2004-1, No. 2000-2009-1, regarding noxious weed management. New Forest Service Manual 2900 for all invasive species management (Fed.Reg. Vol.76, No. 107, June 03, 2011).
- Southwestern Region's Strategy for the Protection and Restoration of Native Plant Communities (USDA Forest Service, Regional Office 1999a).
- Noxious Weeds Strategic Plan Working Guidelines– Coconino, Kaibab, and Prescott National Forests (1998)
- Arizona State regulations R3-4-244, R3-4-245 require that the landowner must have an active management program to prevent further spread of weeds and reduce numbers of existing populations.
- Final Environmental Impact Statement for the Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab and Prescott National Forests within Coconino, Gila, Mojave and Yavapai Counties, Arizona (USDA Forest Service, 2005).

Methodology and Analysis Process

This report is based on the need for change identified in the Economic and Social Sustainability Assessment (USDA Forest Service 2008), the Ecological Sustainability Report (USDA Forest Service 2009) as well the need to address species viability for rare plant taxa occurring or potentially occurring on National Forest lands within the boundaries of the Coconino NF (CNF).

The species viability analyses is incorporated directly into the Draft Environmental Impact Statement (DEIS). The process resulted in 47 analysis species for consideration in this report. In addition there are one endangered, one threatened and 26 Region 3 sensitive species for consideration. The threatened, endangered and sensitive species were automatically retained due to law, regulation and policy.

Analysis species are other at-risk species and include species with Conservation Agreements with U.S. Fish and Wildlife Service and other at risk species such as endemics.

TES and analysis species their associated potential natural vegetation types PNVT are based on the Ecological Sustainability Report (ESR) (USDA Forest Service 2009) which was used to help develop plan components. This report is incorporated by reference as part of this analysis. The PNVT descriptions with species associations, appropriate coarse filter and fine filter components are incorporated in the DEIS.

Analysis species were selected through a species analysis process which is documented in the Wildlife, Fish, and Plants section and Appendix C of the DEIS.

Assumptions

This analysis is based on the following assumptions:

- The land management plan provides a programmatic framework for future site-specific actions.
- Land management plans do not have direct effects. They do not authorize or mandate any site-specific projects or activities (including ground-disturbing actions).

- Land management plans may have implications, or environmental consequences, of managing the forests under a programmatic framework.
- The plan decisions (desired conditions, objectives, standards, guidelines, management areas, monitoring) would be followed when planning or implementing site-specific projects and activities.
- Laws, regulations, and policies are followed when planning or implementing site-specific projects and activities.
- Monitoring would occur and the land management plan would be amended, as needed.
- Funding for implementation land management activities guided by the selected alternative will similar to past budget levels (past 5-10 years).
- The planning timeframe is 15 years; other timeframes may be analyzed depending on the resource (usually a discussion of anticipated trends into the future).
- The kinds of resource-management activities allowed under the prescriptions are reasonably foreseeable future actions to achieve the goals and objectives. However, the specific location, design, and extent of such activities are generally not known at the time. The decisions are made on a site-specific (project-by-project) basis. Therefore, the discussions should refer to the potential for the effect to occur and are usually only estimates. The effects analyses are to be useful for comparing and evaluating alternatives on a forest-wide basis. It is not intended to be applied directly to specific locations on the Forest.
- The point in time for which the most progress is expected to be made toward achieving desired conditions in fire adapted ecosystems which is still relevant to this analysis is considered to be 50 years. That is, the greatest percentage of the landscape (which is considered temporally relevant to this analysis) would be in the desired state at that time mark. This is also a reasonable scale at which the positive effects to most wildlife populations might be realized. While the life of the forest plan is considered to be 15 years, it should set a trajectory for continued habitat improvement into the feasible future. Additional information on desired conditions in fire adapted ecosystems and detailed information on predicted outcomes for the proposed action and alternatives can be found in the Vegetation and Fire Specialist Report.
- Habitat distribution similar to that which supported associated species during reference conditions will likely contribute to their maintenance in the future, and that the further a habitat departs from that historical distribution, the greater the risk to viability of associated species.
- Risks to some plant species are the same as the risks to the PNVTs in which they occur. We assumed that actions to address the risks or departures in these PNVTs would benefit the species as well. Examples of these risks include uncharacteristic wildfire and missed fire intervals.

Data

Sources of information used in analyses for Threatened, Endangered, Region 3 sensitive, and other species included, but were not limited to:

- U.S. Fish and Wildlife Service, Threatened and Endangered Species lists

- NatureServe
- The Southwestern Region Sensitive Species List
- Feedback from a local Species Diversity Workgroup
- Arizona State Heritage Data Management System
- Arizona Rare Plant Task Force
- Taxonomy books, field guides, journals, various publications
- On-line herbaria (accessed through [SEINet](http://swbiodiversity.org/seinet/index.php) <http://swbiodiversity.org/seinet/index.php>)
- Species listed or ranked within various strategies, agreements and lists such as under Arizona's administrative rules and laws:
- Local, regional or national experts for various plant species and taxa
- Various TES plant survey documents and data on file at *Coconino NF* (paper copies)
- GIS Layers
 - TES plant data filed in: NRM TESP/Invasives
 - T: FS\Reference\GIS\r03_coc\Data\Data-baseConnection\EDWEB-SDE.Default\S_USA.TESP\S_USA_TESP_OccurrenceAll

Threatened and Endangered Species

This section focuses specifically on the effects of the alternatives on Threatened and Endangered plants. One endangered plant, Arizona cliffrose (*Purshia subintegra*) and one threatened plant (*Packera franciscana*) occur on the forest.

Arizona cliffrose (*Purshia subintegra*)

Endangered Species Act Status: Endangered, 1984

National Forest Occurrence: Coconino, Tonto

Recovery Plan: Final, 1995

Critical Habitat: None designated

Natural History

Arizona cliffrose is a long-lived shrub. Mature plants are capable of producing many seeds per year. Plants begin blooming in late March and continue through early May. Normally, hundreds of flowers are produced on each mature plant. Flowers are receptive to pollination on any of the first three days after opening. Native bees and introduced honeybees are the main pollinators. The flowers are primarily cross-pollinated, but are partially self-compatible.

Mature plants are capable of producing numerous seeds per year, begin blooming in late March, and continue through early May. Normally, hundreds of flowers are produced on each mature plant. Native bees and introduced honeybees are the main pollinators. The flowers are primarily cross-pollinated, but are partially self-compatible. Cross-pollinated flowers produce significantly more seeds than self-pollinated flowers. Most seeds develop during April and disperse from July through August with seed germination occurring the following spring (Baggs and Maschinski,

2001). Seed production can be highly variable from year-to-year and is at least partly dependent on winter precipitation. Baggs and Maschinski (2001b) collected seeds and determined that about 40% of collected seeds appeared viable. In dry years, plants may not produce any viable seeds (Baggs and Maschinski, 2001b).

Distribution

The Arizona cliffrose is endemic to white Tertiary (Miocene and Pliocene) limestone lakebed deposits that are high in lithium, nitrates, and magnesium (AZGFD Heritage Database, 2001). Elevations are 650-1,100 m (2,100-3,600 ft.) (USDI. U.S. Fish and Wildlife Service 1995).

Arizona cliffrose occurs in four disjunct populations spread across an area of approximately 200 miles in central Arizona. Population areas include Burro Creek in Mohave and Yavapai counties, Cottonwood in Yavapai County, Horseshoe Lake in Maricopa and Yavapai counties and near Bylas in Graham County. The Cottonwood population occurs mostly on the Coconino NF. Jenkins (1991), Lutz (1994, 1995), Hannemann (1995), Baker and Wright (1996) and Goodwin (2012) conducted surveys in the vicinity of Cottonwood in the Verde Valley and elsewhere and confirmed the distribution of the previously known population, but did not extend the known range. The recruitment rates appear to vary among populations. Areas in the Cottonwood population support a relatively large number of established seedlings. In contrast, the other three Arizona cliffrose populations appear to have insufficient recruitment (USDI. U.S. Fish and Wildlife Service 1995).

Distribution of Arizona cliffrose within the boundaries of the Coconino NF is limited to portions of the Desert Communities PNVN where it occurs on a special soil type, the Verde Formation. Refer to the fire and vegetation and soil sections of the DEIS for more information on these elements.

Critical habitat

There is no designated critical habitat for Arizona cliffrose.

Status of the Species (Range-wide)

Multiple agencies have management responsibility for Arizona cliffrose. The Burro Creek population is on Federal lands managed by the BLM, Kingman Resource Area. The Cottonwood population is on Federal, State, and private lands. The Federal lands are part of Coconino NF and the State lands are managed as State Trust lands and as Dead Horse Ranch State Park. The Horseshoe Lake population is on Federal land with management of lake operations under the Bureau of Reclamation and surface management under Tonto NF. The Bylas population is on the San Carlos Apache Indian Reservation (USDI. U.S. Fish and Wildlife Service 1995). Each of these areas is considered a separate Recovery Unit.

Major impacts to Arizona cliffrose include urbanization, recreation, road and utility line construction, minerals exploration and mining, and livestock and wildlife browsing. The Cottonwood population is in a developing urban/suburban area. The most serious impacts from land development, road construction, and recreation are occurring here. The soils supporting Arizona cliffrose populations contain high quality bentonite, a type of clay with numerous commercial uses. Most mining and exploration has been in the Burro Creek and Horseshoe Lake

populations. Livestock and/or wildlife browse all Arizona cliffrose populations. The greatest use occurs when both livestock and wildlife are present and when livestock are grazed yearlong (USDI. U.S. Fish and Wildlife Service 1995).

Reasons for Listing

On May 29, 1984, the Arizona cliffrose was listed as an endangered species, without critical habitat designation (USDI. U.S. Fish and Wildlife Service 1984). The Arizona cliffrose Recovery Plan was completed in 1995. Arizona Native Plant Law (A.R.S Chapter 7, Article 1) also protects the Arizona cliffrose. The provisions of the Arizona Native Plant Law significantly strengthen the protections offered by section 9 of the ESA because a violation of the Arizona Native Plant Law is also a violation of the ESA. Additionally, the Lacey Act, as amended in 1982, provides some protection for the Arizona cliffrose. Under this law, it is prohibited to import, export, sell, receive, acquire, purchase, or engage in the interstate or foreign commerce of this plant.

Major reasons for listing the Arizona cliffrose as endangered include urbanization, recreation, road and utility line construction, mineral exploration, mining, and livestock and wildlife browsing. The Cottonwood population occurs in a developing urban/suburban area, where the most serious impacts stem from land development, road construction, and recreational activities. Soils supporting Arizona cliffrose populations contain high quality bentonite, a type of clay with numerous commercial uses. Mining and mineral exploration has impacted the Burro Creek and Horseshoe Lake populations.

To accomplish the goals of the Recovery Plan, significant progress must be made in all four recovery units to downgrade the status of Arizona cliffrose from endangered to threatened. To date, these goals have not been achieved (USDI. U.S. Fish and Wildlife Service 2012b.)

Effects Analysis

Effects to Arizona cliffrose for all alternatives are described in the Draft EIS.

Cumulative effects

See “*The Biological Assessment for Re-initiation of Consultation on the Continued Implementation of the Land and Resource Management Plans for the Eleven National Forests and National Grasslands of the Southwestern Region*” (USDA Forest Service 2012a) for a discussion of cumulative effects.

In addition these actions related to Arizona cliffrose have occurred

Forest Actions

Coconino NF signed a decision notice implementing the Travel Management Rule in October 2011. As a result, cross-country vehicle travel is no longer allowable on most of the forest including the areas on the forest containing Arizona cliffrose. This eliminates impacts of motorized vehicles.

The Red Rock Ranger District monitors trail use on the Lime Kiln Trail using a series of photo points. They found that the trails had widened and expanded from the existing tread. As a result of this monitoring, the district trail crew and volunteers performed maintenance on the trail, narrowing it back to its established tread, especially in areas containing Arizona cliffrose.

Ongoing monitoring includes the efforts of the Arboretum as well as monitoring by Coconino NF with the assistance of volunteers. The Arboretum monitoring is part of an ongoing long term demography study. Recent data are not available for these transects.

Coconino NF botanists revisited long term monitoring transects in 2008. These were established in 1987 and consisted of six linear transects established in suitable habitat in or near the Verde Valley Botanical area. Results of this monitoring effort were inconclusive due to the inconsistency in data gathering on various visits

Greg D. Goodwin surveyed and documented locations of individuals and groups of Arizona cliffrose plants in the vicinity of the Verde Valley Botanical Area and adjacent public lands during the field seasons 2010-2012 and entered the data into GIS layers, where he then analyzed the validity of previously determined extent of Arizona cliffrose as well as comparing occurrences with soil data. These data refined the current occurrence data for Arizona cliffrose in most of the Cottonwood population but has not extended the known range.

Research

The Arboretum at Flagstaff has studied several aspects of Arizona cliffrose ecology including genetics, cultivation requirements, and perceived threats. The research has resulted in several scientific articles. Baggs and Maschinski (2001b) discussed ex-situ requirements for cultivation of Arizona cliffrose, which may be necessary in the future if the species is to survive. The ex-situ study was initiated as part of mitigation for the Hwy. 89A expansion project. They found that Arizona cliffrose more readily regenerated from seed as compared to cuttings. Baggs and Maschinski (2001c) discuss the increasing threat of habitat fragmentation and hybridization with the more common relative *Purshia stansburiana*. Introgressions (hybrid forms) were typically found in drainages in the past and were created when the two species came in close contact. Road construction and associated disturbance may create corridors, bringing the introgressed forms spatially closer to “pure” forms of Arizona cliffrose, resulting in disruption of population dynamics for Arizona cliffrose (Baggs and Maschinski, 2001c).

Maschinski, et al. (2004) explored human - assisted expansion of the geographic range for Arizona cliffrose. They found that seedling survival was significantly influenced by habitat and survival was greatest in currently occupied habitats, declining in “novel” soil types nearby. Arizona cliffrose has high site fidelity to Verde Formation limestone soil, which is generally found mid-slope. The “novel” soil types included in the study were alluvial soil in drainage bottoms and sites on ridge tops above the Verde Formation. Soil moisture and the proportion of fine and very fine sands appeared to be contributing factors in survival. Survival was lower in alluvial soils in drainage bottoms and on ridge tops as compared to seedlings planted or naturally occurring in the Verde Formation soil. Maschinski, et al (2004) determined that introduction into these “novel” habitats would not be good sites for re-introduction. Therefore, the preservation of the Verde Formation habitat is critical to the survival of Arizona cliffrose.

Climate Change

Past climate change and geologic activity formed a chain of narrow basins containing exposed late Tertiary lacustrine deposits forming sharp contrasts with the surrounding soil leading to the development and fragmented, isolated habitat of cliffrose. The fragmented habitat allowed endemics such as Arizona cliffrose to escape competition from other more common species such as creosote bush (*Larrea tridentata*) (Anderson, 1996) and was therefore beneficial to the species.

The effects of modern climate change on Arizona cliffrose are unknown. There are no expectations of measurable changes in climate within the time lines of this analysis and decision to be made. Maschinski et al. (2006) state that global warming conditions are likely to reduce the carrying capacity of many rare species' habitats; their models also suggest that the Arizona cliffrose population in the Verde Valley is slowly declining and will be at greater risk of extinction with global warming. With decreasing population size, the risks of genetic erosion and extinction increase, and these risks become even higher when habitat is fragmented. Despite the current limits of climate change effects analysis, the 2011 BA also states that the USFS Southwestern Region has developed guidance for addressing climate change in Forest Plan revisions, which are broad and general in scope and which rely on adaptive management as climate change science evolves.

Maschinski, et al. (2006) prepared a publication based on data from the demography study. Through creation of a mathematical model, they determined that Arizona cliffrose faces increasing risks of extinction from increasingly arid climates and may eventually go extinct without human intervention. These risks would be even higher if the fragmentation of existing habitat increases from additional roads, trails and other forms of human disturbance. The threat of global climate change has been a growing concern. Natural ecosystems are regulated by climate and changes in climate may lead to shifts in structure, function and composition of ecosystems (USDA Forest Service, 2010). Plants growing in specialized niches such as Arizona cliffrose may be of special concern. The population of Arizona cliffrose in the Verde Valley is slowly declining and may be of greater risk of extinction as a result of climate change. Seedlings may be especially vulnerable. Genetic erosion and extinction may occur with climate change.

San Francisco Peaks Ragwort (*Packera franciscana*)

Endangered Species Act Status: Threatened, 1983

National Forest Occurrence: Coconino

Recovery Plan: Final, 1987

Critical Habitat: Yes, 1983

Natural History

The San Francisco Peaks ragwort is a dwarf herbaceous perennial alpine plant. Plants develop as small clones. Frost action and soil gravitational movement break up the clones producing independent plants (USDI Fish and Wildlife Service 1987). Plants flower in July and August and set fruit in August and September.

Distribution

The San Francisco Peaks ragwort is endemic to the alpine tundra of San Francisco Peaks. The entire known population occurs within the Coconino NF.

Critical habitat

Designated Critical Habitat for San Francisco Peaks ragwort is 720 acres, which includes the summits of Agassiz and Humphrey's peaks and the surrounding slopes and alpine areas. The location is Arizona: Coconino County, Coconino NF, Agassiz Peak and Humphreys Peak, T22 N, R7E, N½ of NW¼ Sec. 5; T23N, R7E, W½ Sec. 32, and W½ Sec. 29. "Primary constituent elements" as identified by the U.S. Fish and Wildlife Service are the loose cinder talus slopes of the alpine tundra system of the San Francisco Peaks and absence of disturbance and damage from hikers (USDI Fish and Wildlife Service 1983).

Status of the Species (Range-wide and in the Action Area)

San Francisco Peaks ragwort is limited to the Coconino NF. Range-wide distribution and the action area are the same. The population appears to be healthy and reproducing; the number of plants is estimated to exceed 100,000. The population occurs entirely within the Kachina Peaks Wilderness with part of the population within the San Francisco Peaks Research Natural Area. Hiker damage from uncontrolled use of the alpine tundra was the main threat to San Francisco Peaks ragwort when it was listed as threatened. Use was expected to increase with the proposed expansion of the Arizona Snow Bowl ski area; a ski lift and hiker trails provide access to the alpine tundra (U.S. Fish and Wildlife Service 1983).

Reasons for Listing

Impacts from recreation within the habitat of San Francisco Peaks ragwort were cited as reasons for listing.

Effects Analysis

Effects to San Francisco Peaks ragwort for all alternatives are described in the Draft EIS.

Region 3 Sensitive Species

Affected Environment

There are 26 Region 3 sensitive plant species on the Coconino NF. The Draft EIS shows the primary habitat, current estimated habitat, and fine filter threats for each of these species. Coarse filter threats for each species are addressed in the primary PNVV.

Alcove bog orchid (*Platanthera zothecina*)

Alcove bog orchid is a regional endemic of the Colorado and Green rivers and their tributaries in eastern Utah, northwest Colorado and northern Arizona (AZGFD Heritage Database Abstract, 2004a). Habitats include stream banks, seeps, and hanging (Welsh et al, 1987). Known occurrences of alcove bog orchid are in the West Fork of Oak Creek.

Arizona bugbane (*Actaea arizonica*)

Arizona bugbane occurs only in northern and central Arizona. It 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. Arizona bugbane requires deep shade from forest or riparian overstory at elevations from 4800 to 8600 feet. It occurs in the Mixed Broadleaf Deciduous Forest, Montane Willow Riparian and Gallery Coniferous Forest PNVTs in canyons.

Arizona sneezeweed (*Helenium arizonicum*)

Arizona sneezeweed is a perennial herb that grows up to 4 feet tall with several stems. Flower heads consist of yellow to orange 3-lobed ray flowers and purplish-brown globular disk flowers and bloom July through September. Arizona sneezeweed grows at elevations from 7000 to 9000 feet. Hundreds of individuals may exist in a single population. This endemic species ranges from the Mormon Lake area southeastward to the White Mountains area where it grows in drainages, near springs, ponds and other wet areas.

Arizona sunflower (*Helianthus arizonensis*)

Arizona sunflower was added to the Region 3 sensitive species list for the Coconino NF in 2007. It is an herbaceous perennial with long creeping roots that function like rhizomes. The known distribution of Arizona sunflower includes New Mexico (Catron County, west of Quemado) and Arizona in Coconino and Navajo counties. The distribution and habitat requirements of this species are poorly understood, but documented occurrences are in dry, sandy soil at elevations of 4,000 to 7000 ft. (New Mexico Rare Plant Technical Council, 1999). It has been reported from the Soldier Lake area on Anderson Mesa.

Bebb's willow (*Salix bebbiana*)

Bebb's willow is a large native shrub or a small bushy tree fifteen to twenty-five feet that ranges from Alaska south to British Columbia to east Newfoundland and in northeast United States and upper mid-western United States. Bebb's willow plants are dioecious and some populations on the forest contain plants of only one sex. Bebb's willow was added to the Region 3 Sensitive Species list for the Coconino NF in 2007. The largest population is in Hart Prairie on the Flagstaff Ranger District, where it forms a unique high elevation riparian community. Scattered individuals and small groups occur elsewhere on the forest.

Blumer's dock (*Rumex orthoneurus*)

Blumer's dock is a large, long-lived herbaceous perennial plant endemic to New Mexico and Arizona. Habitat for the species is mid- to high-elevation wetlands with moist, organic soil

adjacent to perennial springs or streams in canyons or meadows (AZGFD Heritage Database Abstract, 2002a). There are isolated populations of this species in the Fern Mountain area and Mogollon Rim on the Coconino NF.

Cliff fleabane (*Erigeron saxatilis*)

Cliff fleabane occurs only in northern and central Arizona where it inhabits sheer canyon walls, moist north-facing slopes, steep solid rock and bedrock outcrops from 5,000 to 8,350 ft. Known locations include Barbershop Canyon, East Clear Creek, Mt. Elden, Oak Creek Canyon, Tule Canyon, Walnut Canyon, West Fork of Oak Creek Canyon and Sycamore Canyon (AZGFD Heritage Database Abstract, 2003).

Cochise sedge (*Carex ultra*)

This large sedge looks similar to bulrush but is actually a large sedge with round, stout, erect, culms 3.3-6.6 ft. tall (AZGFD Heritage Database Abstract, 2000). The documented range of this species is southeastern Arizona and southwestern New Mexico. It has been reported from Fossil Creek and the East Clear Creek areas on the Coconino NF. The habitat of this species is moist soil near perennially wet springs and streams in rocky-gravelly terrain (AZGFD Heritage Database Abstract, 2000).

Crenulate moonwort (*Botrychium crenulatum*)

Crenulate moonwort is a small fern that grows from an underground caudex, forming a single fan-shaped leaf. The leaf contains a cluster of reproductive structures known as sporangia. The known distribution of crenulate moonwort includes central and southern California to central Arizona and Montana. On the Coconino NF crenulate moonwort occurs above timberline on the San Francisco Peaks.

Disturbed rabbitbrush (*Chrysothamnus molestus*)

The range of disturbed rabbitbrush is north central Arizona in Coconino County, and northeastern Arizona in Apache and Navajo counties (AZGFD Heritage Database Abstract, 2005b). This perennial sub-shrub is associated with the pinyon-juniper woodlands and grasslands. It occurs on slopes and flats, infrequently on steep slopes and grows exclusively on calcareous soils including soil whose parent material was alluvium derived from Kaibab limestone and soil whose parent material was predominantly basalt.

Flagstaff beardtongue (*Penstemon nudiflorus*)

Flagstaff beardtongue grows in dry pine, pine/oak, pine/oak/ juniper and pinyon juniper forests. It occurs on dry slopes, in openings and along edges of openings and in forested areas. Forest-wide, documented locations for Flagstaff beardtongue included Anderson Mesa, near Lake Mary, Luke Mountain, Mormon Lake, Stoneman Lake, along the Schnebly Hill Road, along Oak Creek.

Flagstaff pennyroyal (*Hedeoma diffusum*)

Flagstaff pennyroyal is a small perennial, mat-like herb that grows on dolomitic limestone outcrops or soils in ponderosa pine forests. It has square, wiry stems and small oval opposite

leaves. The flowers are blue and occur in clusters of one to three at the nodes. There are two major population areas for this species on the Coconino NF; the first extends roughly from Flagstaff, east to Marshall Lake and Fisher point, then south to the vicinity of Mountainaire, then to Lower Lake Mary. A second population area is near the rim of Oak Creek Canyon and its tributaries (Boucher, 1984; Phillips, 1984). Flagstaff pennyroyal occurs in three distinctive habitats in the ponderosa pine forest; rock pavement, cliffs and limestone. Forest canopy cover ranges from zero to 86%, averaging 26.5%.

Grand Canyon Agave (*Agave phillipsiana*)

Grand Canyon Agave was previously thought to occur only in the Grand Canyon (Hodgson, 2001). However, Hodgson found populations of this species in the Verde Valley area on the Coconino NF in 2005. Like the Tonto Basin Agave, it grows in association with archaeological sites. Existing populations are remnants of domesticated crops that have persisted without human care.

Hairy clematis (*Clematis hirsutissima* var. *hirsutissima*)

Hairy clematis is a perennial herb with pinnately compound leaves with finely divided, pubescent leaflets. The leaves have petioles and join the stems at right angles. The flowers are solitary, purple and bell shaped. Habitat includes rocky hillsides with slopes. This plant generally grows on limestone soil in ponderosa pine forests but at least one population has been detected on basalt soils on the forest.

Heathleaf Wild Buckwheat (*Eriogonum ericifolium* var. *ericifolium*)

Heathleaf wild buckwheat is endemic to northern and central Arizona. The plant is restricted to a limestone substrate described as white or chalky gray and powdery formed from old lakebed deposits. Heath-leaf wild buckwheat grows on low arid hillsides associated with the Verde formation on the forest.

Lyngholm's cliffbrake (*Pellaea lyngholmii*)

Lyngholm's brakefern occurs only in a few isolated canyons near Sedona. Lyngholm's cliffbrake is a rare fern of hybrid origin and is found on sandstone substrates.

Metcalf's tick trefoil (*Desmodium metcalfei*)

Metcalf's tick trefoil is a perennial herb that occurs in New Mexico (Grant and Sierra counties) in Arizona in Cochise, Gila, Pinal, and Santa Cruz counties; and probably adjacent Mexico. The habitat is rocky slopes, canyons, and ditches in grasslands and oak/pinyon-juniper woodlands; at 4,000-6,500 ft. (New Mexico Rare Plant Technical Council, 1999). Documented locations of Metcalf's tick trefoil on the Coconino NF include the Huckaby Trail area (Licher, 2001) and Fossil Creek (Rink, 2005).

Mogollon thistle (*Cirsium parryi* ssp. *mogollonicum*)

Mogollon thistle occurs only in its type location at Dane Spring and a few nearby springs on the Coconino NF. Characteristics that distinguish it from related species include white corollas,

nearly entire leaf margins in the mature leaves and poorly developed spines. Mogollon thistle grows in moist soils with riparian understory plants associated with springs in mixed conifer and ponderosa pine forest. The limited distribution of this species makes it particularly susceptible to loss or extirpation.

Mt. Dellenbaugh sandwort (*Arenaria aberrans*)

Mt. Dellenbaugh sandwort is endemic to northern and north-central Arizona. The type specimen is from Mount Dellenbaugh north of Grand Canyon. It is a perennial plant with a somewhat woody caudex from 2 to 5 inches tall. The leaves are mostly basal and linear in form but there may be one or more pairs of leaves on the stem. The inflorescence is a cyme, with most flowers occurring near the top of the stem.

Ripley wild buckwheat (*Eriogonum ripleyi*)

Ripley wild buckwheat is endemic to northern and central Arizona. Ripley wild buckwheat grows on low arid hillsides associated with the Verde formation.

Rusby's milkvetch (*Astragalus rusbyi*)

Rusby's milkvetch is known only from northern and central Arizona on the Coconino and Kaibab NFs. It is a perennial herb with upright form and pinnately compound leaves with rounded leaflets. No tendrils are present on the stem. A distinguishing character is trigonous pods (triangular in cross section) which also have small black hairs, seen best with hand lens or under scope. The flowers are white to cream color. Rusby's milkvetch occurs at elevations from 6,500 to 9000 ft. Habitats where this plant is likely to be found include aspen groves; mixed conifer, ponderosa pine/Arizona fescue and ponderosa pine/Gambel oak sites in dry or temporarily moist basaltic soils.

Rusby (Hualapai) milkwort (*Polygala rusbyi*)

Rusby milkwort is a perennial sub-shrub, endemic to northern and central Arizona at elevations of 3500 to 5000 feet. The total range of the species is from the Peach Springs area, southeastward to the Verde Valley area. In some areas of its range this plant occurs on the same formation as Verde Valley sage, heathleaf wild buckwheat, Ripley wild buckwheat and Arizona cliffrose.

Senator mine Alum root (*Heuchera eastwoodiae*)

Eastwood alum root is endemic to central Arizona where it occurs on the Mogollon Rim, in Oak Creek Canyon, and West Fork of Oak Creek Canyon (AZGFD Heritage Database Abstract, 2005c). Habitat for Senator Mine alum root includes moist slopes in ponderosa pine forests and canyons where it typically grows on slopes or cliffs.

Sunset Crater beardtongue (*Penstemon clutei*)

Sunset Crater beardtongue is a perennial herb 12 to 30 inches tall with bright pink flowers. The leaves are sharply toothed with lower leaves joining to surround the stem, forming a disk around the stem (amplexicaul). The range of this species is limited to the Sunset Crater volcanic field near Flagstaff, including the Coconino NF and Sunset Crater National Monument. The soil 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.

Tonto Basin Agave (*Agave delamateri*)

Tonto Basin Agave frequently occurs in association with archaeological sites in several areas of the state and represents remnants of domesticated crops that have persisted without human care for hundreds of years. 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.

Verde Valley sage (*Salvia dorrii* ssp. *mearnsii*)

Verde Valley sage is a shrub that grows 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. The elevational range is approximately 3000 to 5000 ft. (AZGFD Heritage Database Abstract, 2002b). Associated species include heathleaf wild buckwheat, Ripley wild buckwheat, Arizona cliffrose, and Rusby milkwort as well as more common species such as crucifixion thorn, juniper, barberry and snakeweed. Habitat types include creosote bush shrub, Sonoran desert scrub and pinyon-juniper woodlands

Effects Analysis Region 3 Sensitive Plants

Effects to Region 3 sensitive plants for all alternatives are described in the Draft EIS. Additionally, they are protected by law, regulation and policy.

Analysis Species

For the purposes of this report, analysis species are those species which are neither threatened, endangered or Region 3 sensitive but were identified as species at risk in the species viability process on the Coconino NF. Many of these species are endemics that face additional threats simply because of their relatively limited range-wide distribution so they might be easily affected by localized and/or stochastic events regardless of whether or not they have habitat level threats. Due to their limited distribution and potential susceptibility to perturbation, these species may require additional management considerations.

Affected Environment

There are 47 analysis plant species on the Coconino NF. The Draft EIS shows the primary habitat, current estimated habitat, and fine filter threats for each of these species. Coarse filter threats for each species are addressed in the primary PNVF.

Apache beardtongue (*Penstemon oliganthus*)

Apache beardtongue is a perennial species that occurs in montane meadows and rocky slopes. Its range includes portions of Colorado, New Mexico and Arizona (Martin and Hutchins, 1986). On the Coconino NF, it has been observed in several of the “parks” on Coconino NF including Broliar Park, Pratt Park and Antelope Park.

Arizona Phlox (*Phlox amabilis*)

Arizona phlox is endemic to central and northern Arizona where it grows on limestone and basalt soils associated with prickly pear, yucca, bear grass, hackberry, and pinyon pine. Knowledge of the range of this species has expanded over the past few years. Not long ago, distribution was thought to be limited to the Verde Valley area but it has since been collected in other areas such as the northern fringes of the Coconino NF and on the Kaibab NF. Arizona phlox occurs in pinyon/juniper woodlands, ponderosa pine forests, desert communities and semi-desert grasslands communities.

Arizona Whitefeather (*Ivesia arizonica* var. *arizonica*)

Arizona whitefeather is uncommon throughout its range. It is found in ponderosa pine forests where it tends to grow in rock crevices, hanging gardens and rock outcrops, usually in limestone soil (Springer et al, 2009).

Basin Bladderpod (*Lesquerella cinerea*)

Basin bladderpod is a small perennial plant with a woody caudex. It is endemic to northern and central, Arizona. Plants tend to grow on rocky slopes on calcareous soils, sandstone cobble, and gypsum soils.

Bearded Cinquefoil (*Potentilla crinita* var. *lemmonii*)

The habitat for the species is relatively dry meadows and open pinyon-juniper, ponderosa pine, gambel oak and aspen communities (Cronquist et al, 1997). The type locality is in Oak Creek Canyon, where it was described as occurring on vertical rocks.

Bearded gentian (*Gentianopsis barbellata*)

Bearded gentian was formerly a Region 3 Sensitive species for the Coconino NF. Bearded gentian is perennial and spreads by rhizomes. It is generally found above timberline on the Coconino NF. Several locations of it have been recorded by surveyors on the San Francisco Peaks.

Bigelow's onion (*Allium bigelovii*)

Bigelow's onion is a very distinct species without obvious affinity to other North American species in the genus *Allium*. Individual plants arise from a bulb shortly after snowmelt and persist until frost. 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 Heritage Database Abstract 2005d).

Black Dropseed (*Sporobolus interruptus*)

Black dropseed is endemic to central Arizona where it grows on rocky slopes and in dry meadows of open ponderosa pine and oak-pine forests and pinyon-juniper woodlands. This species tends to be abundant in its narrow range.

Blackroot sedge (*Carex elynoides*)

Blackroot sedge is dwarf and densely tufted, without creeping rhizomes. It occurs on open dry slopes at high elevations on mountain ranges throughout the intermountain west (Hurd, et al, 1998). Habitat requirements include meadows and dry areas with subsurface moisture (Ball and Reznicek, 2002.) Blackroot sedge has been collected on the San Francisco Peaks above timberline in the alpine tundra PNV

Black spleenwort (*Asplenium adiantum-nigrum*)

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. Its preferred habitat is cliffs (Wagner et al, 1993). There are only a few occurrences of this species on the Coconino NF where it grows on dacite flows of Mount Elden.

Bollander's quillwort (*Isoetes bollanderi*)

Bollander's quillwort is a small aquatic plant found in ponds, lake margins, and sometimes on mud (Welsh et al, 1987.). Its leaves are simple grass-like tufts. Species of quillworts are often overlooked in the field, because of their superficial similarity to some aquatic species of grasses, sedges, and rushes. Bollander's' quillwort is quite rare in Arizona with no recent recordings of the species at some historic locations. This is due in part to lowering water tables in some areas. However, plants may reappear later because reproductive spores are long-lived (Yatskievych and Windham, 2009).

Bristlecone pine (*Pinus aristata*)

Bristlecone pine is native to the high mountains of Colorado, New Mexico and Arizona. Closely related species are found elsewhere in the intermountain west. Individual bristlecone pines can live to be very old and recruitment of young plants is generally very slow. Distribution on the Coconino NF is on the San Francisco Peaks in the Spruce fir forest.

Colorado blue columbine (*Aquilegia caerulea* var. *pinetorum*)

Colorado blue columbine) has been collected on the San Francisco Peaks and Schultz Pass areas on the Coconino NF and on the North Kaibab Ranger District of the Kaibab NF. The species is quite variable and four weakly distinguishable varieties are recognized, including var. *pinetorum*. Geographic, floral color and size variation are thought to be partly in response to different pollinators in various parts of its range. Colorado blue columbine occurs throughout the Rocky Mountains, from the foothills to the alpine, where it is often common in aspen groves, open forests, meadows, and talus slopes (Whittemore, 1997).

Common moonwort (*Botrychium lunaria*)

Common moonwort is one of the most widely distributed and abundant of the moonworts. It is often the most common moonwort in its habitat. It ranges from parts of Canada, throughout parts of the U.S. and is found in high mountain habitats of all southwestern states. Common moonwort occurs on the San Francisco Peaks where it grows in the spruce fir forest, subalpine grasslands and alpine tundra.

Corkbark (subalpine) fir (*Abies lasiocarpa* var. *arizonica*)

Two varieties of subalpine fir are recognized: the typical variety (*Abies lasiocarpa* var. *lasiocarpa*) and corkbark fir (*Abies lasiocarpa* var. *arizonica*). Cork bark fir is distinguished by its, whitish, corky bark, is restricted to the Rocky Mountains of southern Colorado and the southwest (Alexander et al, 1990). It occurs at higher elevations on the Coconino NF where it is restricted to the spruce-fir forests.

Creeping Milk-vetch (*Astragalus troglodytes*)

Creeping milkvetch is a low herbaceous perennial which grows in ponderosa pine forests, pinyon/juniper chaparral mixture, and grasslands. Associated species include: blue grama, Wright's wild buck-wheat, Alligator juniper, cliff-rose, and shrub live oak. Individuals occur in local populations that are often widespread from one another. Creeping milkvetch is endemic to Coconino and Yavapai Counties, Arizona (AZGFD Heritage Database Abstract, 2004a).

Dane's dwarf gentian (*Gentianella tenella*)

Dane's dwarf gentian is an annual plant that grows at high elevations among boulders (Mason, 1998). Occurrences of Dane's dwarf gentian are above timberline in the alpine tundra.

Diamond Valley Suncup (*Camissonia gouldii*)

Diamond Valley suncup has been collected in the Sunset Crater Area and on several nearby cinder hills. Habitat for this species includes volcanic ash cones in pinyon-juniper and big sagebrush communities (Utah Native Plant Society, 2009) and volcanic scree or cinder flats (AZGFD Heritage Database Abstract, 2005e).

Different-nerve sedge (*Carex heteroneura*)

Different nerve sedge is common in meadows and dry slopes at mid to high elevations throughout North America (Hurd et al, 1998) Different-nerve sedge has been collected on the San Francisco Peaks in the alpine tundra PNVT.

Ebony spleenwort (*Asplenium platyneuron*)

Ebony spleenwort is an ecological generalist with a disjunct distribution, occurring in southern Africa as well as in the United States. Habitats include forest floors, rocks, masonry and disturbed soils (Wagner et al, 1993). There are only a few occurrences of this species on the Coconino NF where it grows on dacite flows of Mount Elden. Ebony spleenwort occurs on rocky outcrops and cliffs.

Fossil Creek bedstraw (*Galium collomiae*)

Fossil Creek is an endemic species native to central Arizona where it grows at the bases of steep cliffs and in rocky crevices (Dempster, 1995). It is found in the Fossil Creek area on the Coconino NF and adjacent Tonto National Forest. Fossil Creek bedstraw grows on specific biophysical features such as basalt palisades.

Graceful buttercup (*Ranunculus inamoenus* var. *subaffinis*)

Graceful buttercup is endemic to San Francisco Peaks where it grows near timberline in moist ground (Whittemore, 1997). Graceful buttercup occurs in the spruce-fir and alpine tundra.

Grassy slope sedge (*Carex oreocharis*)

Grassy slope sedge is a tufted perennial that occurs in ponderosa pine and mixed conifer forests. It grows on granitic and gravelly soils (Springer et al, 2009). Grassy slope sedge occurs in the montane subalpine, montane-willow riparian forest and alpine tundra PNVTs. The plan components that address the risks to the PNVTs are sufficient to protect grassy slope sedge.

Hall's milkweed (*Asclepias hallii*)

Hall's milkweed is a perennial herb arising from a spreading rootstalk. It occurs in a variety of communities throughout its range (Cronquist et al, 1984a). On the Coconino NF, Hall's milkweed occurs in the mixed conifer with aspen.

James' rubberweed (*Hymenoxys jamesii*)

James' rubber weed is a monocarpic species (biennial or perennial), sometimes with sparingly branched, woody caudices. It is endemic to northern Arizona and was first collected and identified by M.W. Bierner in 1993 near Winslow. Its habitat includes roadsides, open areas and forest edges (Bierner, 2006).

Jones spider flower (*Cleome lutea* var. *jonesii*)

The habitat for Jones spider flower includes dry sandy flats, desert scrub. Most occurrences of Jones' spider flower on the Coconino NF are in the Sedona and Verde Valley areas. Most occurrences on the neighboring Prescott NF were in grassland areas.

Jones' Wild Buckwheat (*Eriogonum jonesii*)

Jones' wild buckwheat is a perennial shrub or sub-shrub, endemic to northern Arizona. Its habitat is rocky limestone, sandstone or pumice washes, flats, and outcrops, saltbush, blackbrush, and sagebrush communities, pinyon-juniper woodlands. It is an endemic species, occurring mostly in Coconino County, with scattered populations just entering Mohave and Navajo counties. (Reveal, 2005).

Macdougals' aletes (*Aletes macdougali*)

Macdougals' aletes is a perennial tap rooted perennial with basal, pinnately compound leaves. According to Springer et al (2009), it grows in rock crevices, sandy ground and rocky soil from pinyon/juniper to bristlecone pine communities. Macdougals' aletes is West Fork of Oak Creek and Schnebly Hill Area where it grows in rocky ledges and crevices (Theobald et al., 1963).

Macoun's false bindweed (*Calystegia macounii*)

Macoun's false bindweed grows in disturbed habitats of various types. It is typically associated with moist sandy soils near waterways in open grasslands or in openings in woodlands. It

originated in the Great Plains area but was spread westward by railroads (Austin 1997). It is found on historic railroad beds on Coconino NF.

Mearns lotus (*Lotus mearnsii* var. *mearnsii*)

Mearns lotus is a gray-green, low growing perennial herb with silvery pubescence. Shoots arise from underground rhizomes and generally occur in small clones. The species occurs in streambeds and of various aspects if dry, rocky slopes and ridgelines. Soils include limestone, clay, calcareous sand gravel, and deep sand. Vegetation types include pinyon-juniper woodland, desert communities and grasslands. Mearns lotus has an affinity for limestone soils.

New Mexico Alum-root (*Heuchera novomexicana*)

New Mexico Alum-root occurs in the mountains of Arizona and New Mexico where it grows in shaded rocky ledges and outcrops (Wells and Elvander 2009). It is known from the Sycamore Canyon area.

Oak Creek Tritelleia (*Tritelleia lemmoniae*)

This species is endemic to Arizona, limited mostly to Oak Creek, Flagstaff and the Mogollon escarpment. The type locality is in Oak Creek Canyon. Habitats include ponderosa pine forests, along streams or wet areas and in open areas (AZGFD Heritage Database Abstract, 2004c).

Pond lily (*Nuphar lutea*)

Pond lily is an aquatic perennial. Rhizomes anchor the plant to the bottom of the water body and give rise to long stems. Leaves and flowers form on the water surface, and die back in autumn (Wennerberg, 2006). It occurs in the upper reaches of Sycamore Canyon on the Coconino NF.

Quaking aspen (*Populus tremuloides*)

Quaking aspen is the most widespread tree species in North America, growing on many soil types. It is an early seral species with the ability to pioneer disturbances, but is replaced later by slower growing tree species. Recently aspen has suffered serious declines throughout the intermountain west and on the Coconino NF. Locally, weather conditions, herbivores, disease, fire and succession (replacement by conifers) have reduced the spatial coverage and numbers of plants on the forest. This has led to serious concern for this species on the forest. It provides habitat for wildlife as well as scenic beauty for humans and is a vital part of several plant communities such as the mixed conifer with aspen PNVT.

Reflected moonwort (*Botrychium echo*)

Reflected moonwort is one of several moonworts that occur in northern Arizona. It occurs in the spruce fir forest PNVT on the San Francisco Peaks.

Rothrock's Hedge-nettle (*Stachys rothrockii*)

Rothrock's hedge-nettle is a perennial herb that grows in colonies from deep. Populations tend to occur on rocky, north, west, and east facing slopes and hill tops with substrates including basalt, gravel, clay loam and sand.

Rough Whitlow-grass (*Draba asprella* var. *asprella*)

Rough whitlow grass is endemic to northern Arizona where occurs in ponderosa pine forests in shady habitats with rich soil. There are three varieties of rough whitlow grass on the forest including var. *asprella* (Springer et al, 2009).

Serrate Phacelia (*Phacelia serrata*)

Serrate Phacelia is an annual species with an unusually disjunct distribution; near Flagstaff and in New Mexico in the Zuni-Bandera Volcanic Field (AZGFD Heritage Database abstract, 2004b). It was formerly a Region 3 sensitive species but was removed after it was determined that it is generally abundant in its habitat, which is deep cindery soil in the Sunset Crater volcanic field but is limited to that habitat.

Silver Milkvetch (*Astragalus subcinereus*)

Silver milkvetch occurs in pine forests, pinyon/ juniper woodlands and in chaparral forests where it occurs on dry hillsides and in openings (Springer et al, 2009).

Skunk-top Scurfpea (*Pediomelum mephiticum*)

Skunk-top scurfpea is a low perennial plant with a tuberous taproot. The species range includes Arizona, Nevada and Utah. Welsh and Licher (2010) have reclassified some material from the Verde Valley area into a new species; *Pediomelum verdiense* which also occurs on the forest.

Spider saxifrage (*Saxifraga flagellaris*)

Spider saxifrage grows in alpine meadows and rocky slopes (Springer et al, 2009). On the Coconino NF, it is confined to the Alpine Tundra.

Thurber's (Scarlet) cinquefoil (*Potentilla thurberi* var. *sanguinea*)

Scarlet cinquefoil is a rare taxon found in the Flagstaff area. A revision has been proposed, raising the variety *sanguinea* to species level (AZGFD Heritage Database abstract, 2008). Scarlet cinquefoil is differentiated from the more common *P. thurberi* by having different leaf structure and red-orange petals distally with darker centers. (AZGFD Heritage Database abstract, 2008).

Timberland Blue-eye-grass (*Sisyrinchium longipes*)

Timberland blue grass grows in spruce or pine forests, often found near seeps and springs (Springer et al, 2009), Wet or moist meadows, stream banks, springs, or ephemeral pools in coniferous woods (Cholewa and Henderson, 1994).

Utah bladder fern (*Cystopteris utahensis*)

This rare fern was described by Haufler and Windham in 1991. It originated as a hybrid, formed from the parent taxa; *C. bulbifera* and *C. reevesiana*. Utah bladder fern grows in cracks and ledges on cliffs on calcareous substrates. Habitats include calcareous cliffs 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.

Western Mouse-tail (*Myosurus nitidus*)

Western mouse-tail is a small annual forb. Most species in this genus are found in vernal pools. However, western mouse-tail generally occurs in drier communities such as sagebrush (Springer et al, 2009).

Western porterella (*Porterella carnosula*)

Western porterella is an annual succulent plant that occurs in muddy ponds, marshes and other wet areas (Cronquist et al, 1984b). It is locally rare, collected only a few times in the Ft. Valley area where it grows on the edges of ephemeral ponds.

Yavapai Wild Buckwheat [*Eriogonum pulchrum* (*Eriogonum ericifolium* var. *pulchrum*)]

Yavapai wild buckwheat is closely related to *Eriogonum ericifolium* and until recently was considered a variety of it. Its range is mostly along the Mogollon Rim across northern Arizona and in northern Yavapai County. The habitat of Yavapai wild buckwheat is described as gravelly to rocky volcanic soil and outcrops, blackbrush and sagebrush communities, juniper or pinyon-juniper woodlands (Reveal, 2005).

Effects Analysis

Effects to analysis plant species for all alternatives are described in the Draft EIS.

Threats and plan components for these species are found in the Wildlife, Fish, and Plants section of the DEIS. The environmental consequences of each of the alternatives will vary by species, the location and size of plant populations, as well as the locations and sizes of management actions include in various projects as directed by revised plan. Mitigation and monitoring will still be directed by the plan as well as applicable laws, rules and regulations.

Noxious or invasive weeds

Noxious or invasive weeds were addressed in the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds* (USDA Forest Service 2005). Guidance from that document has been carried forward in all alternatives of the current analysis. Noxious or invasive weeds are addressed in each PNVT in the Draft EIS.

Affected Environment

There are currently more than 50 species of weeds on the Coconino NF compared to 22 known in 2000. They are distributed in 6000 populations totaling nearly 40,000 acres. The Coconino is actively controlling 33 priority invasive weeds on more than 2000 acres per year of priority populations based on species and site characteristics.

Leafy spurge (*Euphorbia esula*)

Leafy spurge is a destructive perennial weed, reproducing from adventitious root buds and seeds. Roots of this species form extensive underground systems that can extend 30 feet into the soil, and laterally as well. The plant forcefully expels seeds which are able to travel up to 15 feet from the original plant. Humans may vector the species by dispersing seeds or plant fragments by various activities including by vehicle travel through infested areas, contaminated feed products and domestic animals. Birds and animals may disperse leafy spurge seeds in fecal matter or in their fur. These factors make the species very difficult to control making this species a priority species for control. The main infestation of leafy spurge on the Coconino NF occurs in Brolliar Park. Several satellite populations exist in areas surrounding the main infestation. For more than 10 years, the forest has expended copious resources on control and eradication of this species. The density, acreage and distribution of leafy spurge have been substantially reduced but additional work is needed before the species is eradicated from the forest.

Yellow starthistle (*Centaurea solstitialis*)

Yellow starthistle is an annual plant, 2 to 3 feet tall that reproduces solely from seed. In certain areas of the country yellow starthistle decreases the value of recreational experiences such as hiking by creating a thorny, impenetrable barrier that discourages use by human and/or animals. There are several populations of yellow starthistle in the Verde Valley area.

Malta starthistle (*Centaurea melitensis*)

Malta starthistle is a close relative of yellow starthistle. It is similar to yellow starthistle in appearance and growth habit. Impacts to recreational experiences would be similar. Malta starthistle generally tends to grow at lower elevations than yellow starthistle. Scattered populations have been detected in various areas in the Verde Valley.

Camelthorn (*Alhagi pseudoalhari*)

Camelthorn is a perennial spiny shrub that reproduces from seeds and by underground rhizomes. It grows in disturbed soil where it can form monocultures if not controlled. There are scattered

populations of camelthorn along Leupp Highway, Sunset Crater Road and along State Highway 87. .

Russian knapweed (*Acroptilon repens*)

Russian knapweed is a deep-rooted perennial that reproduces from seed and vegetation root buds. These buds develop into adventitious roots enabling the species to colonize large areas quickly. Russian knapweed produces compounds that suppress growth in native plants, which allows it to form dense monoculture over time. There are several locations of Russian knapweed on the forest including along State Highway 87.

Whitetop (*Cardaria draba*)

Whitetop is a deep rooted perennial that reproduces from seed and root fragments. One reported location on Forest Highway 3 was apparently controlled by the reporting party and has not been relocated. A small population of whitetop was detected on forest land in 2009, adjacent to a road right-of way along U.S. Highway 89.

Mediterranean sage (*Salvia aethiopsis*)

Mediterranean sage is biennial plant that reproduces solely from seed. During the first season of growth it produces a rosette of large, grayish hairy leaves. The rosettes over-winter, bolt and produce seed forming stalks in the second year. There are numerous scattered populations of Mediterranean sage along Lake Mary Road (Forest Highway 3).

Musk thistle (*Carduus nutans*)

Musk thistle is a biennial that can reach heights of 6 feet. Like most thistles, it grows in disturbed soils growing on roadsides, pastures, and forestlands. It can quickly form a monoculture if not promptly controlled. It has been reported from various locations in and around Flagstaff including populations along Fort Valley Road and near Kachina Peaks Wilderness.

Diffuse knapweed (*Centaurea diffusa*)

Diffuse knapweed is an annual to short-lived perennial, growing one to two feet tall. Diffuse knapweed invades disturbed areas and can become an aggressive competitor, eliminating desirable vegetation. There are numerous populations of this species in and around the Flagstaff area including many on Forest lands. Past and current control efforts for this species on the Forest include manual, herbicide and biological control agents.

Spotted knapweed (*Centaurea maculosa*)

Spotted knapweed is a biennial or short-lived perennial from Eurasia, growing 1-3 feet tall. If allowed to spread, it forms a monoculture and reduces desirable plant populations. This species is allelopathic and has a taproot. Known infestations in northern Arizona include areas along Highway 89A and Highway 179 in Sedona, Northern Arizona University Campus, on A-1 Mountain, and along the Forest Highway 3 at Diversion Park.

Scotch thistle (*Onopordum acanthium*)

Scotch thistle is a large biennial thistle, native to Europe and eastern Asia. Characteristics of this species include broad, spiny stems with vertical ribs, large, spiny leaves with dense hairs and violet to reddish flower heads. Scotch thistle grows in disturbed habitats, along roadsides and in waste areas and occurs in many locations on the Coconino NF. The seeds of this thistle are long-lived, persisting in the soil for many years. There are numerous infestations of Scotch thistle scattered throughout the forest.

Russian olive (*Elaeagnus angustifolia*)

Russian olive is a fast-growing tree that reaches heights from 10 to 25 feet. The tree produces copious numbers of fruits with papery outer coverings, which are relished by wildlife and birds. Russian olive has been widely planted as an ornamental, windbreak and in some cases as sources of food and protection for wildlife. However, Russian olive can become a serious weed in wildland areas, especially in wetland and riparian areas. There are scattered occurrences of Russian olive on the Forest.

Tamarisk (*Tamarix* spp.)

Tamarisk is a woody species that forms large woody shrubs to small trees. This highly invasive species was introduced for windbreaks and soil stabilization but has since become a serious threat to riparian systems throughout the western U.S. where it often replaces native woody species such as willows and cottonwoods and affects hydrological function especially along river corridors. There are scattered infestations of this species on the Coconino NF, especially in the Verde River System.

Himalayan blackberry (*Rubus procerus*)

Himalayan blackberry is a non-native species that was planted in several locations on the Coconino NF, mainly around old homesteads. It is faster growing and more aggressive than its native relatives are and is well suited to a variety of habitats. The Himalayan blackberry can spread by seeds and by underground runners. Animals and humans relish the fruits and this may contribute to dispersal of populations into new areas. There are scattered populations of Himalayan blackberry in several locations on the Coconino NF including populations in the West Fork of Oak Creek and Fossil Springs area.

Houndstongue (*Cynoglossum officinale*)

Houndstongue is a biennial herb introduced from Europe. The common name of this plant alludes to the large “hound tongue” shaped leaves. The plant reproduces only by seeds that form in clustered of four nutlets. The nutlets break apart at maturity and have spiny attachments that are transported on clothing, animal fur or vehicles. Houndstongue produces compounds that can cause liver failure in cattle and horses when eaten. There are documented locations of houndstongue near the Arizona Snowbowl parking lot and near Kachina Peaks trailhead.

Giant reed (*Arundo donax*)

Giant reed is an invasive graminoid that grows in wet areas and riparian areas. In riparian areas, it can compete with native plants and carry fire through its volatility into riparian ecosystems not adapted to fire. There are scattered occurrences of giant reed in various areas of the Coconino NF, especially in the Fossil Creek and Verde River. Aggressive control efforts in the Fossil Creek area have been going on for the past several years.

Sulfur cinquefoil (*Potentilla recta*)

Sulfur cinquefoil is an invasive perennial herbaceous weed. This non-native plant is related to several desirable locally occurring native plants. Sulfur cinquefoil is unpalatable to animals and can form large colonies in certain areas. It has been reported locally in areas in the Rio de Flag drainage and along Lake Mary Road (Forest Highway 3).

Dalmatian toadflax (*Linaria dalmatica*)

Dalmatian toadflax is an introduced perennial weed that can grow up to 3 feet tall and reproduces from both seed and underground rootstalks. The species is native to the Mediterranean region and was introduced to the United States as an ornamental. It forms dense stands eliminating native species by out-competing them for water. Often stands of Dalmatian toadflax will disappear for several years, only to re-establish through the seed bank or possibly vegetative root buds. Dalmatian toadflax is widely dispersed throughout the ponderosa pine type on the forest, especially in and around Flagstaff and is spreading along roadsides into pinyon-juniper and lower elevation ecosystems.

Tree of Heaven (*Ailanthus altissima*)

The tree of heaven is a deciduous tree. It has a broad, spreading crown, pinnately compound leaflets, and gray bark. The leaflets resemble sumac leaves that have from one to four glands on the undersides of each leaflet, and have 11 to 25 leaflets per leaf. The leaves are large, from one to four feet in length. Regeneration can occur from seeds or root sprouts. The tree of heaven was planted as an ornamental in certain parts of Northern Arizona including the Sedona area and West Fork of Oak Creek. In certain wildland areas such as West Fork, the sites of former human occupation are now abandoned and the cultivated plants including the tree of heaven remain on the sites. The trees have formed numerous root sprouts and now cover several acres that originated from a few mature trees.

Bull thistle (*Cirsium vulgare*)

Bull thistle is a stout biennial or short lived perennial thistle that regenerates solely from seeds. During the first year of life, bull thistle forms seedlings and then rosettes with taproots. Under ideal conditions, rosettes over-winter, resume growth during spring of the next year, then bolt, flower, and die. Bull thistle grows in numerous areas of the Coconino NF, mostly in the ponderosa pine forests, where it invades disturbed sites such as slash piles, old log decks, and roadsides. Additionally, several recent wildfires on the forest are infested with bull thistle.

Siberian elm (*Ulmus pumila*)

Siberian elm is a large tree native to Asia which has been widely planted in certain parts of northern Arizona as an ornamental and for windbreaks. It has escaped into wildland areas near habitation in some areas. There are scattered Siberian elm trees along some of the major roadways and near some communities.

Cheatgrass (*Bromus tectorum*)

Cheatgrass is an erect winter and spring annual grass from Europe that can grow to a height of two feet. The plant is a prolific seed producer and the density of this species has more to do with available sites (bare soil) for germination than the number of seeds produced. Cheatgrass can emerge early in the spring and can sometimes form several generations of plants in one season. Cheatgrass increases the risk and frequency of fire in some ecosystems by providing fine fuel and by forming a flammable link between disturbed areas and surrounding forested vegetation. Cheatgrass is especially prevalent in disturbed areas.

Wild oats (*Avena fatua*)

Wild oats is an annual grass that can occur on roadsides, pastures and disturbed areas. It is related to but taxonomically distinct from cultivated oats, which is sometimes used in mulching material in various projects. Wild oats reproduces from seed which are long-lived and can remain in the soil for several years after introduction.

Common teasel (*Dipsacus fullonum*)

Common teasel is a biennial herbaceous species that reproduces solely from seed. Teasel is commonly used in dried flower arrangements. In some areas of the country, common teasel has formed dense monocultures that can exclude all other vegetation. There are scattered infestations of teasel in Flagstaff and adjacent forest lands. Teasel has been detected in a few locations on the Coconino NF.

Oxeye daisy (*Chrysanthemum leucanthemum*)

Oxeye daisy is an erect rhizomatous perennial species. This ornamental and has escaped cultivation in some areas where it can be found in meadows, roadsides and in disturbed areas.

Effects Analysis

The effects of noxious or invasive weeds are interwoven and addressed in the DEIS. The DEIS incorporates the guidance of the Final Environmental Impact Statement (FEIS) for Integrated Treatment of Noxious or Invasive Weeds (USDA Forest Service 2005) as well as providing guidance through forest-wide desired conditions, guidelines and management approaches. Additionally there is guidance within resource areas and within the PNVTs. The DEIS incorporates the guidance and Best Management Practices from the FEIS in all alternatives. All alternatives will provide for noxious or invasive weed control but techniques, restrictions and costs may be site specific.

Unavoidable Adverse Impacts

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Before any ground-disturbing actions take place, they must be authorized in a subsequent environmental analysis. Therefore, none of the alternatives cause unavoidable adverse impacts. Mechanisms are in place to monitor and use adaptive management principles in order to help alleviate any unanticipated impacts that need to be addressed singularly or cumulatively.

Irreversible and Irretrievable Commitment of Resources

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

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