Goodding's Onion
(*Allium gooddingii*)
Conservation Assessment and Strategy

USDA Forest Service, Southwestern Region
USDI Fish and Wildlife Service, Southwest Region

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ACKNOWLEDGMENTS

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I. INTRODUCTION

The U.S. Forest Service (FS) is responsible for the management of the National Forests and National Grasslands. It has a national policy (Forest Service Manual 2670) to manage habitats for plant and animal species to prevent the need for their Federal listing under the Endangered Species Act of 1973 (ESA). The U.S. Fish and Wildlife Service (FWS) is responsible for implementing the ESA and coordinating with other Federal and State agencies in a national effort to prevent the extinction of species. The FWS is responsible for the publication of plant and animal candidate lists and has a national candidate conservation program.

In recognition of these mutual interests and responsibilities, the FS, FWS, and several other Federal agencies entered into a national Memorandum of Understanding on January 25, 1994, to cooperate in the conservation of species that are tending toward listing under the ESA. The agencies agreed to work together in the conservation of selected plant and animal species and their habitats to reduce, mitigate, and possibly eliminate the need for their listing under the ESA. This is to be accomplished through the development of conservation assessments and conservation strategies for species, which could lead to the adoption of interagency conservation agreements.

The Southwestern Region of the FS held a meeting May 11-12, 1994, to set priorities for the development of conservation assessments and strategies, and potentially conservation agreements. Goodding's onion (*Allium gooddingii*) was selected as one of the top 20 species in the Region for development of conservation documents. The Gila National Forest was assigned lead for coordinating among the four Southwestern Region Forests with populations of Goodding's onion. The other Forests were the Apache-Sitgreaves, Coronado, and Lincoln.

Biologists from the FWS's Arizona and New Mexico Ecological Services Field Offices met with biologists from the Apache-Sitgreaves, Gila, and Lincoln National Forests in Silver City, New Mexico, on August 18, 1995, to begin developing a consolidated conservation assessment and strategy and a conservation agreement for Goodding's onion. This group has met regularly since then to develop the Goodding's Onion Conservation Assessment and Strategy and the associated Goodding's Onion Conservation Agreement.

The conservation assessment (PART I of this document) summarizes current information about Goodding's onion. Other pertinent information about Goodding's onion is contained in documents referenced in this assessment and in the files of the Forests involved. The conservation strategy (PART II of this document) describes specific actions to be taken by each Forest to ensure that viable populations of Goodding's onion are maintained where they presently exist on National Forests in Arizona and New Mexico.

II. REVIEW OF SPECIAL STATUS DESIGNATIONS AND PROTECTIONS

In 1947, Marion Ownbey named a new species of onion from the Fort Apache Indian Reservation in the White Mountains of east-central Arizona (Ownbey 1947). This new species, *Allium gooddingii*, was represented by a single specimen collected by L.N. Goodding in 1912. Goodding's onion continued to be known from only a few localities well into the 1970s, and it was believed to be vulnerable to extinction from habitat alterations due to logging and livestock grazing.

Recognition of Goodding's onion as a species potentially in need of listing as threatened or endangered under the ESA began with Section 12 of the ESA, which directed the Secretary of the Smithsonian Institution to prepare a report on plant species of the United States considered to be endangered, threatened, or extinct. This report, designated as House Document Number 94-51, was presented to Congress on January 9, 1975. On July 1, 1975, the FWS published a notice in the *Federal Register* (40 FR 27823) accepting the report as a petition under the ESA and announcing its intention to review the status of those plants. Goodding's onion was included in the "threatened" category in the Smithsonian report and the *Federal Register* notice.

On December 15, 1980 (45 FR 82480), September 27, 1985 (50 FR 39526), February 21, 1990 (55 FR 6184), and September 30, 1993 (58 FR 51144), the FWS published updated notices in the *Federal Register* of plants being considered for classification as threatened or endangered. Goodding's onion was included in these notices as a "category 1" species. Category 1 includes the taxa for which the FWS has sufficient information on biological vulnerability and threats to support proposals to list them as endangered or threatened species.

On February 28, 1996, the FWS published in the *Federal Register* (61 FR 7596) a new updated notice of plants and animals being considered for listing as threatened or endangered. The category designations used in previous notices were discontinued in this notice. Species formerly included in category 1 were simply designated as candidates for listing. Goodding's onion is included as a candidate in the February 28, 1996, notice and given a listing priority of 8. Listing priority numbers for candidate species range from 1 to 12 with a listing priority of 8 indicating that the plant is a full species with a moderate to low magnitude of threats, but with an imminent likelihood of the threats occurring. A complete description of the FWS's listing priority system was published in the September 21, 1983, *Federal Register* (48 FR 43098).

Species that are candidates for listing have no protection under the ESA. However, agencies are advised that the development and publication of proposed rules to list candidate species are anticipated and that the agencies should consider this in project planning.

Several status reports have supported the present designation of Goodding's onion as a candidate species. The first report was done in 1978 by Warren Wagner and David Sabo under contract with the FWS (Wagner and Sabo 1978). This report summarized information on the then known historical distribution of the species and threats to its existence based on visits to several of the known sites. A report to the FWS by Richard Spellenberg (1982) expanded on earlier information. It described 9 sites where Goodding's onion was confirmed to be extant and 8 sites known from herbarium specimens that were not visited during the study. Threats to existing populations were discussed. A document called a status report supplement for Goodding's onion was done by Reggie Fletcher of the FS (Fletcher 1984). This report summarized the taxonomy of Goodding's onion, provided a discussion of distinctions between the species and its nearest relatives, and described errors in the original description and in various regional plant manuals that contributed to some specimen misidentifications. The known distribution of Goodding's onion on FS lands in the Santa Catalina, White, Mogollon, and Sacramento mountains was summarized and the implications of current and potential future management activities in the species' habitat were discussed. Subsequent to these reports the FS did several surveys to determine the distribution and abundance of Goodding's onion on the Forests; the results of the surveys are discussed in the Forest management strategies.

Goodding's onion is currently on the FS Southwestern Region Sensitive Species List. It is FS policy to require that sensitive species and their occupied habitats not be adversely impacted without a thorough analysis of the significance of such impacts to prevent any trend toward Federal or State listing. The implementation of protection strategies in this document will not affect the FS's recognition of Goodding's onion as a sensitive plant species.

Goodding's onion is protected under State endangered species laws in Arizona and New Mexico. In Arizona, it is included as a Highly Safeguarded species on the list of plants protected under the Arizona Native Plant Law ARS3–901, administered by the Arizona Department of Agriculture. A Highly Safeguarded species is one "...whose prospects for survival in this State are in jeopardy...." The protections afforded a Highly Safeguarded species include restrictions on collecting and a requirement for salvage permits. In New Mexico, Goodding's onion is listed as endangered under the New Mexico Endangered Plant Species Act (9–10–10 NMSA) and attendant regulation (19 NMAC 21.2). Species so listed are protected from unauthorized collection or take in New Mexico (Sivinski and Lightfoot 1995).

Goodding's onion was recently discovered in the Chuska Mountains on the Navajo Indian Reservation. It has been added to the Navajo Nation Endangered Species List (NESL) for Tribal lands under title 17 section 507(a) of the Navajo Tribal Code and Navajo Nation Council Resources Committee Resolution RCF–014–91. The NESL is maintained by the Navajo Fish and Wildlife Department. Goodding's onion is listed as a Group 3 species, meaning that it is likely to become an endangered species, within the

foreseeable future, throughout all or a significant portion of its range on the Navajo Nation. Under the Navajo Tribal Code, it is unlawful for any person to "...take, possess, transport, export, process, sell or offer for sale, or ship any species or subspecies..." on the NESL.

III. NOMENCLATURE AND MORPHOLOGY

Allium gooddingii Ownbey was described as a new species in "The Genus *Allium* in Arizona" (Ownbey 1947). The description was apparently based on the only known collection at the time, the type specimen #1233 made by L. N. Goodding in the White Mountains on July 23, 1912, on steep rocky slopes of Bonita Creek, Apache County, Arizona.

Based on his studies of the species, Reggie Fletcher, FS, Albuquerque, has corrected two minor errors in the original description pertaining to flower color and spathe bracts. His refined description follows:

> The bulb is elongate, 1 cm (3/8 in) thick, and terminates in a thick iris-like rhizome. The inner bulb coats are whitish or pinkish, the outer coats are brownish and membranous with persistent parallel fibers. Each plant has several leaves, which are flat, entire, and obtuse, 4-8 mm (3/16- 5/16 in) broad, much shorter than the flowering stalk, and green at the time of flowering. The flowering stalk is 35-45 cm (14-17 in) tall, flattened, and narrowly winged toward the apex. The flowering umbel is subtended by one membranous bract, which withers early and often splits. The inflorescence contains 18-23 flowers, usually with fewer flowers in drier, exposed sites. The pedicels are twice as long as the perianth segments and elongate in fruit, becoming stout and curved, but not nodding. The perianth segments are 8-10 mm (3/8 in) long, elliptic, obtuse, and entire. The deep rose to almost purple tepals do not have a thickened mid-rib. The stamens are nearly as long as the perianth. The filaments are broadly dilated below and united into a cup at the base. The anthers are oblong and obtuse. The style is about 4-5 mm (3/16 in) long, capitate, and entire. The fruit is broader than long, the valves are deeply emarginate on top, but not crested. The seeds are short and thick.

Allium gooddingii can be distinguished from other species of onions within its range by its broad, flat, rather blunt leaves, its bulbs on thick iris-like rhizomes, and its thick bulb coat of persistent parallel fibers. These features generally characterize a group of four closely related onions, which with *Allium gooddingii,* include *A. brevistylum, A. validum,* and *A. eurotophilum*. These species are well separated geographically with no overlap in their ranges. *Allium brevistylum* occurs in the Rocky Mountain region from central Montana and northeastern Idaho to eastern Utah and north-central Colorado. *Allium validum* occurs in the mountains from Washington to California, eastward to Nevada and

western Idaho. *Allium eurotophilum* is known only from Sierra San Pedro Mártir in northern Lower California (Ownbey 1947).

IV. DISTRIBUTION

Goodding's onion is known from New Mexico and Arizona with a total range of about 300 miles north to south and 350 miles east to west (Figure 1). Within this range, it occurs in five island-like areas, which include the Chuska, Sacramento, Mogollon, and Tularosa mountains in New Mexico, and the White and Santa Catalina mountains in Arizona. Goodding's onion is most abundant in the White Mountains of Arizona where it

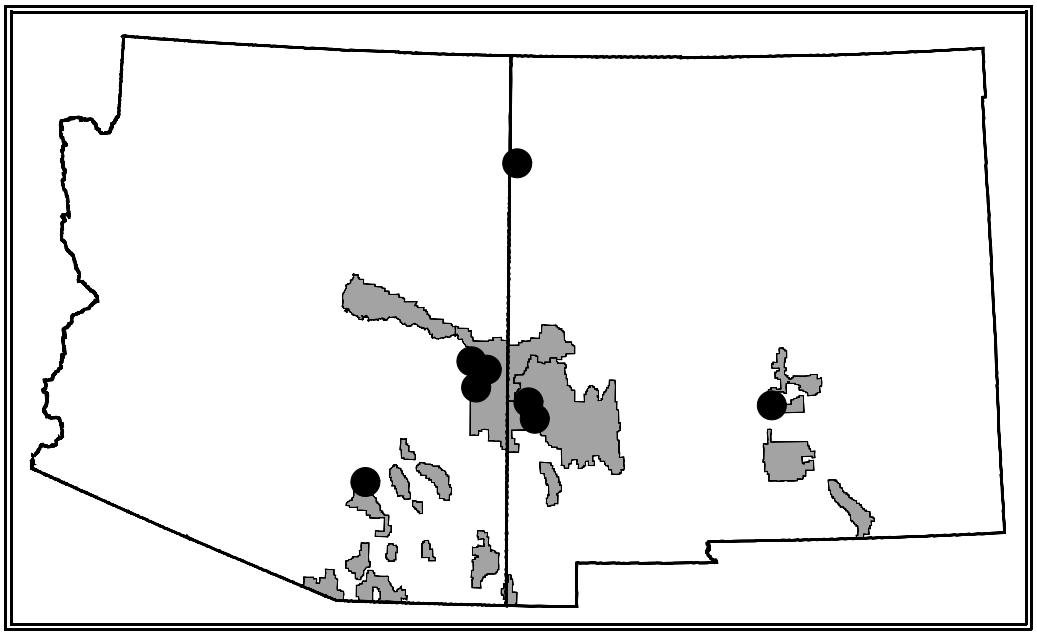


Figure 1. Distribution of currently known Goodding's onion populations.

is confirmed from some 60 sites. It is next most abundant in the Mogollon Mountains of New Mexico where it is confirmed from 18 sites. It occurs in 1 extended area near Sierra Blanca Peak in the Sacramento Mountains, 1 area on Mount Lemmon in the Santa Catalina Mountains, and 1 site in the Chuska Mountains.

The majority of known Goodding's onion sites are on National Forest System lands with a few additional sites on Indian reservations. The type specimen for Goodding's onion was collected from the Fort Apache Indian Reservation adjacent to the Apache-Sitgreaves National Forests. The number of additional populations, if any, on the Reservation is unknown. One specimen of Goodding's onion from Sierra Blanca Peak in the Sacramento Mountains was collected on the Mescalero Apache Indian Reservation adjacent to the Lincoln National Forest. Again, the number of additional populations, if any, on this Reservation is unknown.

A Goodding's onion specimen from Canyon de Chelly National Monument on the Navajo Indian Reservation was confirmed as correct by Dr. Charles Mason, Herbarium, University of Arizona (Spellenberg 1982). Personnel from the Navajo Natural Heritage Program have searched Canyon de Chelly repeatedly without finding any additional plants. The elevation of Canyon de Chelly is about 6,500 feet, which is well below the elevation of any other known sites. The Canyon de Chelly population may now be extirpated. In 1994, Bill Hevron, then of the Navajo Natural Heritage Program, discovered a population of Goodding's onion on the Reservation in the Chuska Mountains in San Juan County, New Mexico. The elevation and general habitat characteristics of this population are typical for Goodding's onion.

Spellenberg (1982) and Fletcher (1984) discussed two Goodding's onion collections that are now believed to be misidentified specimens. One misidentified collection was made in 1960 at Onion Creek in the Chiricahua Mountains. This specimen is likely *Allium plummerae*. Another misidentified collection was made in 1967 at Potato Lake on the Coconino Plateau. This specimen, kept at the Museum of Northern Arizona, was determined by Dr. Arthur Phillips, then of the Museum of Northern Arizona, and Greg Goodwin of the Coconino NF to not be Goodding's onion. Both of these erroneous reports of Goodding's onion have found their way into various databases and literature.

V. HABITAT AND ECOLOGY

Goodding's onion occurs within mixed conifer and spruce-fir zones, generally (but not always) in north-trending drainages at elevations ranging from 7,500 to 11,250 feet. This species is most frequently found in forested drainage bottoms associated with perennial and ephemeral stream courses. Occasionally, Goodding's onion is found on open slopes, however, these sites are moister than those in lower elevation forested habitats. Most sites are shaded to varying degrees, on slopes or in drainages of narrow canyons, and are usually in either primary or secondary stream courses. Soils which support this species are basaltic or rhyolitic with the upper horizon comprised of loamy alluvium with a high organic content.

Overstory vegetation consists of Douglas-fir (*Psuedotsuga menziesii*), Engelmann spruce (*Picea engelmanni*), white fir (*Abies concolor*), and blue spruce (*Picea pungens*), with corkbark fir (*Abies lasiocarpa* var. *arizonica*) in the higher elevation sites and Ponderosa pine (*Pinus ponderosa*) in the lower elevation sites. When present, the shrub community includes mountain alder (*Alnus tenuifolia*) and red-osier dogwood (*Cornus stolonifera*). Herbaceous understory associates vary, however, they can include *Helenium hoopesii*, *Iris missouriensis*, *Swertia* spp., *Pteridium aquilinum*, *Fragaria ovalis*, *Geranium richardsonii*, *Thalictrum fendleri*, *Mertensia franciscanus*, *Achillea lanulosa*, *Poa* spp., *Bromus* spp., *Muhlenbergia* spp., *Rudbeckia laciniata*, *Aconitum columbianum*, *Sidalcea neomexicana*, *Carex* spp., and *Senecio wootonii* (Laurenzi and Warren 1987).

Populations of Goodding's onion in New Mexico on the Lincoln National Forest are found in elevation ranges from 9,300 to 11,250 feet. Some plants are found under canopied stands of corkbark fir and Engelmann spruce where they appear to be reproducing primarily vegetatively. Other plants occur in ski runs, roadside cuts, and roadbanks where they are in the open rather than under a forested canopy. At these open high elevation sites, the soils remain moist and the habitat is such that the plants are vigorous and reproduce sexually. Plants grow in dense patches or as scattered individuals. Fires are infrequent at the Lincoln National Forest sites.

Populations in New Mexico on the Gila National Forest are found at elevations ranging from 7,500 to 10,000 feet. Most of these sites are along drainages under canopied stands of white fir, southwestern white pine (*Pinus strobiformis*), ponderosa pine, corkbark fir, aspen (*Populus tremuloides*), Engelmann spruce, and Douglas-fir. Many of the sites on the Gila National Forest are moving towards full canopy closure and have dense litter or needlecast cover. Densities are variable with most populations having both dense patches of plants and scattered individuals. Aspen at some of the sites may indicate past fire history.

A single population on the Coronado National Forest in Arizona is found on a steep north facing slope in a canyon of basalt outcrops on Mount Lemmon. This population is primarily associated with a seep that keeps the site perennially moist. Associated species at the site include Douglas-fir, white fir, aspen, Gambel oak (*Quercus gambelii*), mountain spray (*Holodiscus dumosus*), New Mexico locust (*Robinia neomexicana*), and snowberry (*Symphoricarpos* spp.). Densities are variable, with the species maintaining an almost 100 percent ground cover near the seep and scattered patches elsewhere along a rock ledge. In 1993 monitoring, the Coronado National Forest estimated the number of plants at 500, with about 60 percent of them flowering.

Populations in Arizona on the Apache-Sitgreaves National Forests are found at elevations from 7,700 to 10,800 feet under forested canopies with varying closure percentages. Most of the sites are associated with drainages and narrow canyon bottoms and adjacent slopes, however, some occur within larger, more open moist slopes. Associated species include Douglas-fir, Engelmann spruce, white fir, and ponderosa pine. Associated herbaceous vegetation varies greatly with grazing pressures. Management of many of the sites on the Apache-Sitgreaves National Forests are under special considerations for other rare species, such as the Mexican spotted owl and the Apache trout.

VI. LAND USE AND MANAGEMENT CONCERNS

Livestock grazing (and its associated operations), timber harvest (and its associated operations), and recreation-related activities can impact the abundance and distribution of Goodding's onions or alter the suitability of its habitat. Despite this, there are no

documented extirpations of Goodding's onion populations due to recent anthropogenic activities.

Livestock grazing and trampling can directly impact Goodding's onions. Based on monitoring data, Warren, Kofira, and Malusa (1996) suggested that repeated heavy livestock grazing may reduce the vigor of Goodding's onions and ultimately reduce plant densities. Livestock traveling to a stock tank on the Gila National Forest have created trails that impact some Goodding's onions. On the Apache-Sitgreaves National Forests, livestock virtually eliminated Goodding's onions in the immediate vicinity of a salt block. Livestock grazing does not occur at sites on the Lincoln and Coronado National Forests.

Timber harvest can in some cases reduce onion vigor and density. The forest canopy often helps maintain mesic conditions that are conducive to Goodding's onion growth. Canopy removal can dry the forest floor severely impacting Goodding's onions (Laurenzi and Warren 1987; Warren, Kofira, and Malusa 1996). On the Apache-Sitgreaves National Forests, onion densities declined drastically at a site where the canopy had been removed through a combination of blowdown and salvage harvesting. Onion densities remained high in the adjacent unimpacted portion of this site (Warren, Kofira, and Malusa 1996). Under some conditions, however, reduction or even total loss of the forest canopy may not adversely impact Goodding's onions. For example, on the Lincoln National Forest, Goodding's onions have persisted and are reproducing on cleared ski slopes. These sites are on north slopes at very high elevations where soil moisture and/or heat may not be limiting. Anecdotal information from the Gila National Forest suggests that under some conditions the partial opening of a closed canopy may increase the vigor of Goodding's onions. Timber harvest is not a potential land use at Goodding's onion sites on the Coronado or Lincoln National Forests.

Activities associated with logging such as road construction, skidding, and slash burning can also impact Goodding's onion through the destruction of plants or the compaction or disruption of soils. However, accounts from the Apache-Sitgreaves National Forests suggest at least one instance where Goodding's onions either colonized or survived in healthy numbers on skid roads prepared and used during a logging operation (Galeano-Popp 1989).

In addition, timber harvesting may interact with livestock grazing to impact Goodding's onions. On the Apache-Sitgreaves National Forests, Laurenzi and Warren (1987) suggested that overstory removal in conjunction with livestock grazing has converted the herbaceous understory of several streamside sites to plant communities (*eg. Poa pratensis/Helenium hoopesii/Iris missouriensis*) that preclude healthy populations of Goodding's onions. On the Gila National Forest, seeding non-native plants after timber operations may cause livestock and elk to concentrate in the vicinity of Goodding's onion sites.

Recreation-related activities can impact Goodding's onions. The Gila National Forest is concerned with the impacts of outfitter-guides and pack animal overuse on a localized site in the Gila Wilderness. On the Lincoln National Forest, the past development of ski runs has fragmented a population of Goodding's onions although apparently without threatening its viability. The single Goodding's onion site on the Coronado National Forest is near a developed ski area, but it is unlikely that dispersed recreation will impact the relatively inaccessible steep-sided drainage in which the plants occur. On the Apache-Sitgreaves National Forests, trails (maintained and those resulting from dispersed hiking), developed campgrounds, and roads associated with recreation areas have impacted Goodding's onion at some sites.

Prescribed fires and prescribed natural fires (PNF) have been identified as potentially impacting Goodding's onions. There is no available information on how Goodding's onions respond to fire. Presumably, very hot fires that destroy the protective tree canopy, sterilize the soils, or result in extensive soil erosion would adversely impact the species. However, low-intensity ground fires as would be anticipated under prescribed/PNF fires would likely have much less adverse impact. The actual impacts of prescribed/PNF fires would probably depend largely on the growth stage of the plants and their immediate proximity to heavier fuels. Low-intensity fires occurring either prior to spring growth or after plants have died-back in the autumn would probably have little adverse impact. Where plants are very close to heavy fuels, adverse impacts may occur because of extended exposure to very hot temperatures. In general, the cool, moist sites typical of Goodding's onion habitat would have difficulty even carrying a low-intensity ground fire during periods when prescribed burns are implemented. In the long-term, prescribed/PNF fires may reduce the likelihood of catastrophic wildfires that could completely destroy the plants and their habitat. It has been suggested that fire suppression has contributed to increased tree densities and the accumulation of heavy fuels, both of which may increase the susceptibility of onion sites to catastrophic fires.

Although Laurenzi and Warren (1987) reported that natural factors did not currently impact Goodding's onions on the Apache-Sitgreaves National Forests, they recognized that large herbivores, such as elk, could potentially impact some plants. Excessive elk grazing is a concern at four of the five known sites on the Gila National Forest, but is not a concern at sites on the Coronado or Lincoln National Forests. In addition, such natural factors as catastrophic wildfire, extended drought, and the loss of tree canopy from blowdown or disease can dry sites directly killing Goodding's onions or destroying their habitat.

On the Lincoln National Forest, the presence of musk thistle (*Carduus nutans*) some 2 miles from Goodding's onion sites has been identified as a potential concern. Musk thistle spreads rapidly and forms extremely dense stands that crowd out other plant species (Whitson *et al*. 1991). Ecological requirements of the musk thistle are poorly understood. There is some indication that the species may favor disturbed sunny sites (Epple 1995) that are not typically associated with Goodding's onions. Musk thistle is

known to inhabit the Apache-Sitgreaves National Forests near at least one Goodding's onion site (Epple 1995), although it has not been reported in direct association with Goodding's onions (Laurenzi and Warren 1987; Warren, Kofira, and Malusa 1996).

Present data on the distribution of Goodding's onion and on the validity of some previously reported sites remains incomplete. Several sites have never been visited subsequent to their discovery. Many of these sites have no documentation that verifies the initial status of the species, or even if the reported species actually was Goodding's onion. Although many areas have been inventoried for Goodding's onion, the recent discovery of several sites indicates the importance of continuing to inventory suitable habitats during the analysis of proposed projects.

VII. COMPATIBILITY WITH MANAGEMENT OF OTHER SENSITIVE SPECIES

On June 5, 1996, the Regional Forester of the Southwestern Region of the FS amended the Forest Plans of all National Forests in Arizona and New Mexico to incorporate recovery plan management recommendations for the Mexican spotted owl (USFWS 1995) and management recommendations for the northern goshawk (Reynolds *et al.* 1992) (Appendix 1). The plan amendment, which does not directly address Goodding's onion, will affect many known onion sites and likely reduce or eliminate several principle threats to the species. Conversely, the conservation of Goodding's onions appears to be compatible with conservation of the Mexican spotted owl and northern goshawk. Most of the Goodding's onion sites on the Apache-Sitgreaves and Gila National Forests are in areas affected by the Mexican spotted owl management recommendations. The Goodding's onion sites on the Coronado and Lincoln National Forests are outside of areas affected by these recommendations.

Mexican spotted owl management direction will restrict or moderate timber harvest, road and trail building, and livestock grazing in mixed-conifer habitats thus promoting the conservation of Goodding's onions. The use of prescribed fire to reduce the risk of catastrophic wildfires while maintaining existing forest structure is also emphasized in the Mexican spotted owl management guidelines. Although the effects of low-intensity fires on Goodding's onions are not known, it is likely that immediate adverse impacts will be minimal while promoting the long-term continued existence of the species.

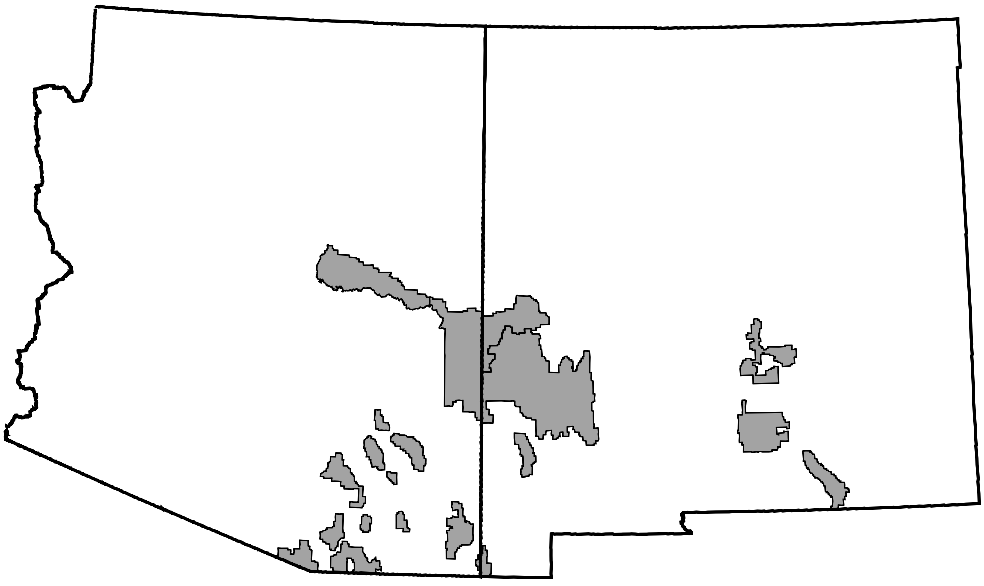
Although the goshawk management direction applies to a variety of forest types, the Mexican spotted owl direction takes precedence except in spruce-fir habitats. Within spruce-fir habitats, northern goshawk management direction may promote the conservation of Goodding's onion through the implementation of timber harvest restriction that will promote the retention of canopy cover and mesic conditions. In addition, goshawk management direction permits low-intensity prescribed fires. As previously mentioned, it is not known how Goodding's onions respond to low-intensity

fires. However, in mesic situations typical of spruce-fir habitats it is unlikely that such fires will destroy onion habitat or threaten the continued existence of Goodding's onion populations. The management direction for goshawks further states that the FS will consult with the FWS to resolve any conflicts that might arise when the implementation of the direction might adversely affect other sensitive species or may conflict with conservation agreements. No such conflicts are anticipated for Goodding's onion.

Other federally listed species associated with Goodding's onions or their habitats include the threatened Apache trout (*Oncorhyncus apache*) on the Apache-Sitgreaves National Forests, and the endangered Gila trout (*Oncorhyncus gilae*) on the Gila National Forest. The decline of both species is attributed to habitat degradation, hybridization with the introduced rainbow and cutthroat trouts, and competition with introduced brown trout (Sublette *et al*. 1990). Habitat threats to these species include overgrazing, streambank damage from ungulates, logging, fires, and road building (Sublette *et al*. 1990, Rinne 1991a, Rinne 1991b). Gila trout have been especially susceptible to adverse impacts from fires, floods, and drought (Rinne 1991a). Conservation measures that reduce the impacts of land-use activities on these fish include reduced upland livestock grazing, reduced or eliminated livestock grazing in riparian areas, the retention of no-cut buffers along streams, the restriction of upland logging to reduce the production of sediments, the elimination of roads impacting streams, and the use of various means to reduce the likelihood of catastrophic wildfires in the watersheds associated with inhabited streams. Implementation of these types of land-use actions to reduce or eliminate threats to the Gila and Apache trouts appear to be very compatible with the conservation of Goodding's onions.

PART II

GOODDING'S ONION CONSERVATION STRATEGY



I. INTRODUCTION

The purpose of this conservation strategy is to identify actions that the National Forests will take to ensure that viable populations of Goodding's onion continue to exist on National Forest System lands, thus precluding the need to list the species as threatened or endangered under the ESA. This document is in compliance with the Forest Service Manual and the individual Forests' Land and Resource Management Plans, which direct the Forests to improve habitat for threatened, endangered, or sensitive species of plants and animals and other species as they become threatened or endangered; to manage threatened, endangered, and sensitive animal, fish, and plant habitats in a manner consistent with the recovery or conservation goals established by the FWS or State conservation agencies; and to manage sensitive species to sustain their viability and prevent the need for their listing as threatened or endangered under the ESA or State endangered species laws.

II. EXISTING CONSERVATION DIRECTION

A. FOREST SERVICE MANUAL

The Forest Service Manual (FSM) provides national direction for FS activities. Chapter 2670 deals with threatened, endangered, and sensitive plants and animals. The chapter provides the authority, objectives, policies, and responsibilities for threatened, endangered, and sensitive species management. The parts of this chapter that deal with FS sensitive species are the most relevant to the management of Goodding's onion.

1. FSM Authority

Department of Agriculture Regulation 9500–4 is given in the FSM as the authority to manage threatened, endangered, and sensitive plants and animals. The regulation directs the FS to "...manage habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain at least viable populations of such species, [to] ...conduct activities and programs to assist in the identification and recovery of threatened and endangered plant and animal species, [and to] ...avoid actions which may cause a species to become threatened or endangered" (FSM 2670.12).

2. FSM Objectives for Sensitive Species

The FSM has three objectives for sensitive species. These are to "...develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions, [to] ...maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands, [and to] ...develop

and implement management objectives for populations and/or habitat of sensitive species" (FSM 2670.22).

3. FSM Policies for Sensitive Species

For sensitive species, the FS is to "assist States in achieving their goals for conservation of endemic species [and] ...avoid or minimize impacts to species whose viability has been identified as a concern." The FS will conduct Biological Evaluations to determine the potential effect of programs and activities on sensitive species. If impacts cannot be avoided, the FS will "...analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole." Impacts to sensitive species may be allowed, but the impacts "...must not result in loss of species viability or create significant trends toward Federal listing." The FS will "establish management objectives in cooperation with the States when projects on National Forest System lands may have a significant effect on sensitive species population numbers or distributions" (FSM 2670.32).

4. FSM Responsibilities for Sensitive Species Management

All levels of FS management from the Regional Forester to District Rangers have responsibilities for sensitive species, but most of the operational responsibilities fall at the Forest Supervisor and District Ranger levels. It is the responsibility of Forest Supervisors to "...ensure compliance with procedural and biological requirements for sensitive species, ...develop quantifiable objectives for managing populations and/or habitat for sensitive species, ...determine distributions, status, and trend of ...sensitive species and their habitats on Forest lands, [and] ...coordinate Forest programs with other Federal agencies, States, and other groups and individuals concerned with the conservation of ...sensitive species." It is the responsibility of District Rangers to "...ensure compliance with procedural and biological requirements for sensitive species, ...identify, protect, and manage habitat necessary to meet sensitive species objectives, ...coordinate District activities with interested State and Federal agencies, groups, and individuals concerned with the conservation of ...sensitive species, ...conduct necessary biological evaluations, [and] ...prohibit the collection or taking of sensitive plants except as authorized by Regional policy."

B. FOREST LAND MANAGEMENT PLAN GOALS

Forest Land Management Plans (FLMP) contain goals, which are concise statements of the state or condition that a land and resource management plan is designed to achieve on a Forest. Goals are generally not quantifiable and may not have a specific date for completion. Objectives are the annual activities implemented to accomplish the goals. Standards and guidelines set parameters for the achievement of annual activities. Goals in FLMPs that will contribute to the conservation of Goodding's onion are described here; specific FLMP standards and guidelines that will contribute to the conservation of

Goodding's onion are described in the introductory part of the conservation strategy for each Forest.

Some goals given in FLMPs will, if achieved, contribute significantly to the maintenance of viable populations of Goodding's onion on the Forests. The goals most pertinent to Goodding's onion conservation are the ones concerning management of threatened, endangered, and sensitive species; habitat/species diversity; watersheds; and riparian areas. These goals are similar for the various Forests, but differ enough that a single summary will not suffice. The areas of management emphasis and goals for each forest are given in the following tables.

Table 1. Some Apache-Sitgreaves National Forests goals that will contribute to the conservation of Goodding's onion.

Area of Management Emphasis	Goal
Threatened, endangered and sensitive species	– "Improve habitat for listed threatened, endangered, or sensitive species of plants and animals and other species as they become threatened or endangered. Work toward recovery and declassification of species."
	– "Identify and protect areas that contain threatened, endangered, and sensitive species of plants and animals."
Habitat/species diversity	– "Maintain habitat to maintain viable populations of wildlife and fish species and improve habitat for selected species. This is accomplished "directly" through habitat management and "indirectly" through coordination of habitat management in conjunction with other resource activities."
Watersheds	– "Maintain, or where needed, enhance soil productivity and watershed condition. Put all areas in a satisfactory watershed condition by 2020. Maintain a high quality sustained water yield for Forest users and others. Identify and protect wetlands and floodplains."
Riparian areas	– "Improve vegetative condition in riparian areas. This is an emphasis area for the plan. Improvements will be accomplished by reducing or, in some cases eliminating adverse impacts from grazing, vehicles, and over-use by man."

Table 2. Some Coronado National Forest goals that will contribute to the conservation of Goodding's onion.

Area of Management Emphasis	Goal
Threatened, endangered, and sensitive species	– "Improve the habitat of and the protection for local populations of Threatened and Endangered species to meet the goals of the Endangered Species Act of 1973."
Habitat/species diversity	– "Provide for a diversity of wildlife, fish, and plant species through improved habitat management."
Watersheds	– "Provide a favorable water flow in quantity and quality for off-Forest users by improving and maintaining all watersheds to a satisfactory or higher level."

Table 3. Some Gila National Forest goals that will contribute to the conservation of Goodding's onion.

Area of Management Emphasis	Goal
Threatened, endangered, and sensitive species	– "Maintain and/or improve habitat for threatened or endangered species and work toward the eventual recovery and delisting of species through recovery plans."
	– As a goal for the Range Program, "Identify and manage areas that contain threatened or endangered species of plants."
Habitat/species diversity	– "Manage for diverse, well distributed pattern of habitats for viable wildlife populations and fish species in cooperation with states and other agencies."
	– "Integrate wildlife habitat management activities into all resource practices through intensive coordination."
Watersheds	– "Restore land in unsatisfactory watershed condition."

Riparian areas	– "Improve all riparian areas to satisfactory condition."

Table 4. Some Lincoln National Forest goals that will contribute to the conservation of Goodding's onion.

Area of Management Emphasis	Goal
Threatened, endangered, and sensitive species	– "Provide for the improvement of habitat for threatened and endangered species to meet the goals and intent of the Endangered Species Act of 1973."
	– "Provide for management of sensitive species in accordance with Regional requirements."
Habitat/species diversity	– "Provide for diversity of plant and animal species through improved habitat management."
Watersheds	– "Manage for a favorable flow of water for users by improving or maintaining all watersheds to a satisfactory or higher condition."
Riparian areas	– Manage riparian areas to provide optimum vegetation and ecological diversity."

Goodding's onion is currently on the FS Southwestern Region Sensitive Species List. The goals for the Coronado and Gila National Forests do not include sensitive species. The standards and guidelines for the Gila National Forest include provisions for protection of sensitive species, but sensitive species are not mentioned in the FLMP for the Coronado National Forest. Protection for sensitive species on the Coronado National Forest comes through application of guidance in the Forest Service Manual rather than through FLMP direction.

III. REGIONWIDE STANDARDS, GUIDELINES, AND STRATEGIES FOR THE CONSERVATION OF GOODDING'S ONION

In assessing the conservation needs of Goodding's onion on the four National Forests, it was discovered that some conservation actions are needed regionwide. Many of these actions are part of the standards and guidelines for threatened, endangered, and sensitive (TES) species contained in Forest Plans and, therefore, are already being routinely

implemented at the Forest Ranger Districts. Other actions are specific to Goodding's onion, but are similar to the conservation actions that might be taken for any TES species on a Forest. These regionwide actions are outlined here rather than repeating them in the conservation strategies for each Forest.

A. IDENTIFY DISTRIBUTION AND ABUNDANCE

1. Where lacking, document and verify the species' occurrence at historical sites.

2. Continue to survey suitable habitat within proposed activity areas (timber sale areas, grazing allotments, recreation sites, *etc.*) to document the presence or absence of Goodding's onion.

3. Use Global Positioning System technology to accurately map sites currently occupied by Goodding's onion.

4. Collect descriptive and quantitative habitat and population data at each known site.

5. Provide collected data to the appropriate state and federal agencies, and to The Nature Conservancy/Natural Heritage Program databases.

6. Survey suitable habitat not yet searched for the purpose of documenting new occurrences.

B. AVOID ADVERSE IMPACTS TO KNOWN POPULATIONS AND SUITABLE HABITAT

1. Continue to include Goodding's onion in Biological Assessments and Evaluations for all proposed, permitted, or funded activities.

2. Use habitat and survey information to design proposed, permitted, or funded activities in such a way that adverse impacts to Goodding's onion sites will be minimized or eliminated.

3. Design timber management activities to leave some canopy cover and avoid ground disturbance or erosion in and near occupied sites.

4. Manage prescribed fires in occupied habitat for low-intensity burns.

5. Evaluate the construction of new roads and trails, and redesign or prohibit the activity if it would adversely affect the onion.

6. Amend the annual operating plans for grazing allotments in Goodding's onion areas to:

   – Prohibit new livestock structures that would attract grazing ungulates to occupied sites.

   – Prohibit the placement of salt where it would attract ungulates to occupied sites.

   – Avoid actively trailing livestock through occupied sites. Avoid issuing livestock crossing permits through occupied sites.

   Include these specifications in allotment management plans when the plans come up for renewal.

7. Include provision(s) in outfitter/guide operating plans to prohibit picketing stock and camping in occupied areas that are being adversely affected by these activities.

C. MONITOR STATUS TRENDS

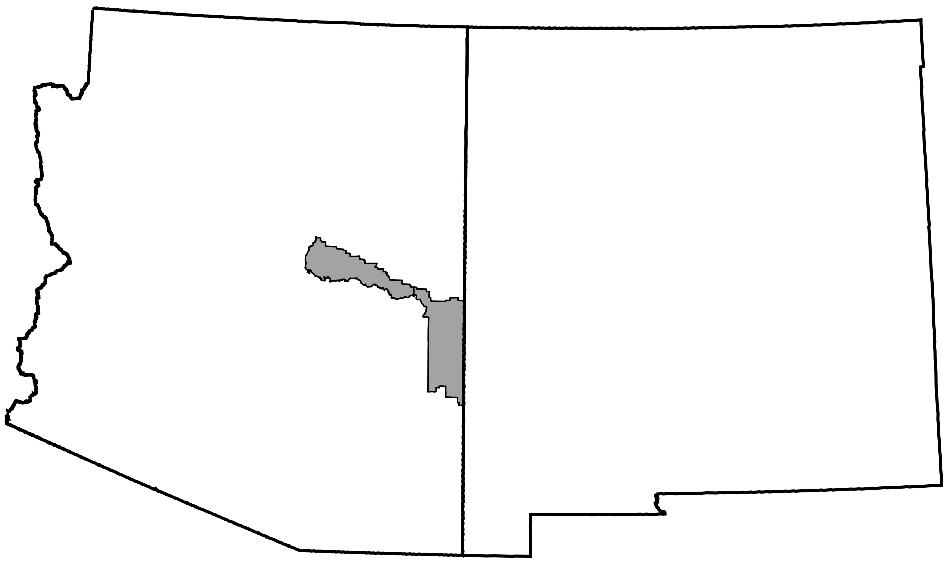
1. Monitor past and new projects to ensure that protection measures are implemented and that the measures adequately protect Goodding's onion populations.

2. Monitor Goodding's onion sites at the levels and frequencies indicated in each Forest's Goodding's onion conservation strategy.

D. SUPPORT LIFE HISTORY AND ECOLOGY STUDIES

1. Coordinate with interested parties in the implementation of scientific investigations (responses to fire, varying degrees of shading, grazing, and moisture requirements).

IV.
GOODDING'S ONION CONSERVATION STRATEGY FOR THE APACHE-SITGREAVES NATIONAL FORESTS



A. INTRODUCTION

In 1982, Spellenberg summarized information for 3 reported Goodding's onion sites on the Apache-Sitgreaves National Forests (ASNF). In 1984, Fletcher reported an additional 8 or 9 locations on the ASNF, most of which had been found during the inventory of timber sale areas. In 1987, the ASNF and The Nature Conservancy Arizona Chapter entered into a cooperative agreement to identify the status of Goodding's onion on the ASNF. As a result of this effort, the number of sites on the ASNF increased to 49 (Laurenzi and Warren 1987). Several sites were reported during the inventory of "old growth" on the ASNF in 1991. Presently, over 60 sites are known on the ASNF. Files are maintained at the ASNF Supervisor's Office, Springerville, and in the Arizona Game and Fish Department, Heritage Data Management System (HDMS), Phoenix.

Goodding's onion plants occur on the ASNF from about 7,700 to 10,800 feet elevation on the Alpine, Springerville, and Clifton Ranger Districts. Although some Goodding's onion sites are composed of fewer than 100 plants, other sites appear to contain in excess of several million plants (Laurenzi and Warren 1987). About two-thirds of the known sites are associated with mixed-conifer forests; the remaining one-third of the sites are associated with spruce-fir forests. Plants are known from the watersheds of the Little Colorado, Black, and Blue rivers, and Eagle Creek where they typically inhabit forested drainage bottoms. Occasionally onions are found on forested slopes well away from any defined drainage. Goodding's onions occur in the Escudilla and Bear Wallow wilderness areas.

In 1984, Fletcher (1984) reported that several Goodding's onion populations on the ASNF had been extirpated because of livestock grazing and logging. However, following a detailed inventory and monitoring effort on the ASNF, Laurenzi and Warren (1987) concluded that "little direct evidence exists to suggest that [livestock grazing and logging] have led to extirpation of a population [of Goodding's onion]."

The distribution of Goodding's onion on the ASNF shows considerable overlap with other species for which special management direction exists. For example, except for those sites within wilderness areas, all of the documented Goodding's onion sites occur within areas that the FWS designated as critical habitat for the Mexican spotted owl.[1] At least 30 Goodding's onion sites are within mixed-conifer habitats and, therefore, are included within "protected" or "restricted" areas described in the Mexican Spotted Owl Recovery Plan (USFWS 1995). About 35 sites are directly associated with spotted owl

[1] The United States District Court for the District of New Mexico issued a judgement on April 1, 1997, setting aside the critical habitat designation for the Mexican spotted owl until the FWS complies with the National Environmental Policy Act. *Coalition of Arizona/New Mexico Counties for Stable Economic Growth. et al. v. U.S.F.W.S.,* No. 95-1285 M Civil (D.N.M. 1997).

management areas (*i.e.* "protected activity centers" as defined in the Mexican Spotted Owl Recovery Plan).

In addition, recent management direction for the Northern goshawk will include areas occupied by Goodding's onion. This management direction, described in the "Record of decision for amendment of Forest Plans: Arizona and New Mexico" (USFS 1996), affects all habitats occupied or potentially occupied by Goodding's onion on the ASNF. However, because spotted owl management takes precedence in mixed-conifer habitats, the goshawk management direction will primarily involve those Goodding's onion sites in spruce-fir habitats that are not otherwise within spotted owl management areas. At least 15 Goodding's onion sites are in spruce-fir habitats.

Finally, Apache trout inhabit, or are scheduled for reintroduction into several streams along which Goodding's onion sites are known. At least 7 Goodding's onion sites are along streams identified by the Apache Trout Recovery Team as necessary for the recovery of the fish. Additionally, at least 16 Goodding's onion sites are within watersheds of Apache trout recovery streams.

B. EXISTING FOREST CONSERVATION DIRECTION

1. Forest Land Management Plan Standards and Guidelines

The Forest Land Management Plan (FLMP) includes no specific standards and guidelines (S&Gs) for Goodding's onion. Several S&Gs will likely contribute to the conservation of the species, but may not by themselves insure its protection. These S&Gs include:

- "The Forest Wildlife Biologist will be consulted on all proposed activities, modifications, and other commitments of lands within known habitats of ...threatened, endangered or sensitive plants" (p. 71).

- "Allow area closures to protect habitat of listed, sensitive, or proposed T&E species" (p. 71).

- "Salt is not placed within ¼ mile of any riparian area or water" (p. 76).

- "Riparian areas will be mapped as separate areas when they are at least 10 acres; otherwise, they will be considered as areas which require special consideration even though they are part of a larger stand" (p. 80).

- "Designate stream courses to receive protection during projects. Those streams shown on 7.5 minute quads as a streamcourse should be considered for designated streamcourses" (p. 81).

- "Roads will be located away from stream bottoms to minimize sediment delivery to the stream courses whenever possible" (p. 81).

- "Maintain riparian and meadow communities by providing waters for wildlife and livestock away from sensitive riparian areas" (p. 159).

- "In areas of unsatisfactory riparian condition where grazing has been determined to be a significant causative factor revised allotment management plans will: a) Implement intensive management systems which limit grazing and provide adequate rest for riparian areas, b) Reduce stocking to a level that will allow degraded areas to recover, or c) Use site specific exclusion fencing" (p. 160).

- "Salting in or within ¼ mile of riparian areas for the purpose of livestock management is prohibited" (p. 160).

- "Limit moving of livestock from pasture to pasture or between allotments along the length of riparian areas except on approved routes as specified in annual permittee instructions. Approval will be granted only where it is determined that there is no alternative route and that riparian areas will not be damaged" (p. 161).

2. Apache/Sitgreaves National Forests Monitoring Action Plan

- Monitoring threatened, endangered and sensitive species is a "Priority One" activity, and includes monitoring that is necessary to "...meet law or regulation; key Forest commitments; or where the monitoring effort would determine excellent and key resource condition status. Since these are critical monitoring needs, there will probably be little Ranger/Forest Staff discretion as to whether these items are/or not included in the annual monitoring effort" (p. 3).

- "It is expected that all environmental assessments for future and currently active projects will have a monitoring section which will specify what monitoring will be conducted during and/or following project implementation. When decision documents are signed[,] the line officer approving the project is committed, within reason, to completing the monitoring activities specified in that assessment[']s monitoring section. Funds and personnel will be programed to accomplish the monitoring" (p. 3).

- "Any monitoring [related to threatened, endangered and sensitive species] will be specifically identified in the biological evaluation" (p. 18).

- The individual directly responsible for initiating monitoring efforts for threatened, endangered, and sensitive species is the District Ranger (p. 18), although many other Forest specialists will be assigned the responsibility of conducting the actual monitoring actions (p. 3).

C. APACHE-SITGREAVES NATIONAL FORESTS GOODDING'S ONION MONITORING

1. Monitoring Schedule

A detailed inventory and monitoring effort for Goodding's onion on the ASNF began with the work of Laurenzi and Warren (1987) to locate and monitor all Goodding's onion populations on the Forest. The program to monitor Goodding's onion on the ASNF is continuing. The monitoring schedule for 1997-1999 is given in the following table. Site numbers are assigned by the Arizona Heritage Date Management System. Missing numbers represent sites that are not on the ASNF.

Table 5. Schedule of Goodding's onion monitoring, by year, on the Apache-Sitgreaves National Forests.

1997		1998		1999	
Site	Objective	Site	Objective	Site	Objective
ASNF-04		ASNF-04		ASNF-02	
09	Evaluate site condition	04	Evaluate permanent transects	53	Evaluate site condition
15	Evaluate site condition	10	Evaluate permanent transects	60	Evaluate site condition
16	Evaluate site condition	19	Population trend follow-up	66	Evaluate site condition
17	Evaluate site condition	21	Population trend follow-up		
18	Evaluate site condition	23	Evaluate permanent transects	ASNF-03	
22	Evaluate site condition	26	Population trend follow-up	06	Evaluate site condition
24	Evaluate site condition	30	Evaluate permanent transects	13	Evaluate site condition
25	Evaluate site condition	33	Evaluate permanent transects	43	Evaluate site condition
27	Evaluate site condition	34	Population trend follow-up	54	Verify species
28	Evaluate site condition	36	Population trend follow-up	55	Verify species
29	Evaluate site condition			62	Evaluate site condition
37	Evaluate site condition	ASNF-01		63	Verify species
38	Verify species	45	Evaluate site condition		
39	Verify species	46	Evaluate site condition		
42	Verify species	47	Evaluate site condition		
52	Verify species	48	Population trend follow-up		
57	Verify species	49	Population trend follow-up		
58	Verify species	50	Evaluate site condition		
59	Verify species	51	Evaluate site condition		
61	Verify species				
64	Verify species	ASNF-03			
65	Evaluate site condition	02	Population trend follow-up		
		07	Population trend follow-up		
ASNF-05					
40	Evaluate site condition				
41	Evaluate site condition				
ASNF-06					
67	Evaluate site condition				

2. Description of Monitoring

Verifying the species and evaluating the site condition roughly correspond to Level 1 monitoring described in Appendix 2. Evaluating permanent transects and population trend follow-up roughly correspond to Level 2 monitoring described in Appendix 2.

- Verify species: Determine presence or absence of species. If present, then proceed to evaluate site condition.

- Evaluate site condition: Estimate numbers of individuals in population by making an overall approximation. Utilize Global Positioning System (GPS) to map extent of population. Identify factors potentially or actually impacting site. Describe habitat (slope, aspect, other vegetation present, canopy cover, general location) of plants.

- Evaluate permanent transects: Repeat of work done previously by Laurenzi and Warren (1987) and Warren, Kofira, and Malusa (1995) following their methodology. This monitoring estimates relative plant density, percent of plants in flower, and percent of plants grazed. Utilize GPS to map extent of population and location of transects.

- Population trend follow-up: Repeat work done previously by Laurenzi and Warren (1987) and Warren, Kofira, and Malusa (1995) following their methodology. Utilize GPS to map extent of population.

3. Estimated Monitoring Costs

The following table gives estimates for implementing the Goodding's onion conservation strategy on the ASNF from 1997 through 2006. The estimates include GPS data collection and processing, GIS data processing, field time, and report preparation.

Table 6. Estimated Goodding's onion monitoring costs on the Apache-Sitgreaves National Forests.

Year	Mgt. Unit	Work Days	Rate	Cost
1997	ASNF-04	8	$200/day	$1,600
	ASNF-05	2	$200/day	$ 400
	ASNF-06	2	$200/day	$ 400
1998	ASNF-01	6	$200/day	$1,200
	ASNF-03	2	$200/day	$ 400
	ASNF-04	10	$200/day	$2,000

(continued)

Table 6. (concluded)

Year	Mgt. Unit	Work Days	Rate	Cost
1999	ASNF-02	3	$200/day	$ 600
	ASNF-03	5	$200/day	$1,000
2000-2002		5/year	$225/day	$3,375
2003		11[A]	$225/day	$2,475
2004-2006		5/year	$225/day	$3,375
			TOTAL	$16,825

[A]The effort of 11 days for this year includes 6 days for transect and population trend monitoring, but this may be reduced to a total of 5 days with a total cost of $1125 if previous monitoring indicates transect and population trend monitoring are no longer needed.

Various projects such as range improvements, recreation developments, and timber management may occur in or near populations of Goodding's onion. The cost of monitoring the impacts of these projects on Goodding's onions is unknown. However, because monitoring the impacts of projects is a required part of Forest Service actions under existing regulations, the potential cost of such monitoring is not attributed to the implementation of this conservation strategy.

D. APACHE-SITGREAVES NATIONAL FORESTS GOODDING'S ONION MANAGEMENT UNITS

1. Goodding's Onion Management Unit: ASNF 01 - Little Colorado River Watershed

Location: This management unit includes Goodding's onions found in the Little Colorado River watershed, except those within the Escudilla Wilderness (see Goodding's Onion Management Unit 02, below).

Land Ownership: ASNF, Alpine and Springerville Ranger Districts

Forest Plan Management Areas/Emphasis: 01 Forest Land; 02 Woodland; 03 Riparian; 04 Mountain Grass; 05 Developed Recreation; 07 Mount Baldy Wilderness; 09 Escudilla; 10 Phelps Research Natural Area (and Botanical Area); 11 Water (wetlands); 17 Special Management Area - East and West Forks Little Colorado River.

Number of HDMS Records: 10 (Nos. 3, 14, 45-51, and 56)

Mapping: USGS quadrangles A334109, A434109, H533109, H333109, and H433109. Plotted locations are on file at the ASNF Supervisor's Office, Springerville, and at the Arizona Game and Fish Department, HDMS, Phoenix.

Description and Existing Conditions: Goodding's onions have been documented along Benton Creek (45), Rudd Creek (49, 50), Water Canyon (47, 48), and the South Fork of the Little Colorado River (46, 51). The Arizona Game and Fish Department HDMS also reports the species from the East and West Forks of the Little Colorado River (03, 14, 56). However, there is no evidence that Goodding's onion ever naturally occurred at sites 03 and 56. Plants were introduced at sites 03 and 56 in 1987 and 1989, respectively, but have not been relocated and apparently did not survive. In 1982, Goodding's onions were reported within the Mt. Baldy Wilderness at site 14. Unfortunately, directions to the site are unclear and no documentation (eg. photographs, specimens, *etc.*) exists to verify the species' occurrence. A subsequent visit to site 14 in 1987 failed to locate any Goodding's onions.

Grazing Allotments: Voigt (for record no. 3), Greer (for record no. 14), Pool Corral (for record nos. 46, 51, and 56), Rudd Creek (for record nos. 45, 49, and 50), Water Canyon (for record nos. 47 and 48), and Rudd Knoll (for record nos. 47, 48, and 49?).

Apache Trout Recovery Streams: None

Site-specific Concerns: There is no indication present management activities are causing adverse impacts that might threaten the viability of the 7 documented sites.

1) Grazing: Livestock management seems to be compatible with Goodding's onion sites in this management unit. Recent monitoring of three sites (46, 48, and 49) in 1993 and 1995 found them to be at least stable since 1987, even though grazing (livestock and/or elk) was apparent in some areas. The other four documented sites (45, 47, 50, and 51) were last visited in the late 1980s at which time no adverse impacts were identified that threatened their viability. Although livestock use was evident in 1987 at site 47, onions were described as dense and continuous.

2) Recreation: Some plants in sites 46 and 51 may be impacted by dispersed hiking along the South Fork Trail.

3) Roads: Onion numbers adjacent to a road crossing at site 48 were reported "diminished" in 1993.

4) Clarification of Status: The extirpation of site 03 had been suggested in previous reports on Goodding's onion (Fletcher 1984). The best information available indicate Goodding's onions have never naturally occurred at site 03 (AGFD 1994, Buckner 1967), but were collected several miles from the site and erroneously reported in Kearney and Peebles (1960). In addition, the initial report of Goodding's onions at site 14 is poorly documented (AGFD 1994). Repeated attempts to relocate Goodding's onions at this site have been unsuccessful. Because no apparent actions or events have taken place that would likely cause the extirpation of Goodding's onions at this site, it is unlikely that the species naturally occurred here.

Past Conservation Actions: Potential habitat in this management unit was systematically inventoried in 1987 through a cooperative agreement between the ASNF and The Nature Conservancy (Laurenzi and Warren 1987). A "no-cut" buffer was designated around site 46 during planning for the Mexican Hay Lake Timber Sale in the mid-1980s.

Past Monitoring:

Site	Year Found	1987	1993	1995	1996	Site	Year Found	1987	1993	1995	1996
03 (intro 1987)				–	–	48	1987	*	*		
14	1982	–				49	1987	X	X		
45	1987	X				50	1987	X			
46	1984	X			X	51	1987	X			
47	1987	*				56 (intro 1989)			–		

X - no adverse impacts noted
* - light livestock grazing
** - moderate to heavy livestock grazing

– - no Goodding's onions found

Proposed Conservation Actions: Goodding's onion populations in this management unit have remained stable under past management practices and management direction for the unit is not anticipated to change. No specific conservation actions are proposed, but continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the ASNF Standards and Guidelines in the unit. Future transplantations of the species are not recommended. Continue to document new sites as they are encountered.

All seven of the documented naturally occurring sites are within Mexican spotted owl habitat. Implementation of activities intended to recover this species and its habitat are also likely to promote the conservation of Goodding's onions (*eg*. maintenance of tree canopies, moderate livestock grazing, *etc.*). None of the three questionable sites are within Mexican spotted owl habitat.

Proposed Monitoring:

1) In 1998, visit and evaluate the condition of sites 45, 46, 47, 50, and 51. GPS each site visited and enter data in the ASNF GIS. The ASNF Supervisor's Office will coordinate this monitoring.

2) In 1998, visit sites 48 and 49 to repeat population trend monitoring done by Warren, Kofira, and Malusa (1996) in 1993. GPS each site visited and enter data in the ASNF GIS. The ASNF Supervisor's Office will coordinate this monitoring.

3) Ranger Districts will develop and implement specific monitoring plans for any proposed projects that may impact Goodding's onion sites in this management unit. District Biologists will review the monitoring plans for adequacy prior to implementation.

2. Goodding's Onion Management Unit: ASNF 02 - Escudilla Wilderness

Location: This management unit includes Goodding's onions that inhabit the slopes of Escudilla Mountain within the boundaries of the Escudilla Wilderness.

Land Ownership: ASNF, Alpine Ranger District

Forest Plan Management Areas/Emphasis: 10 Escudilla Research Natural Area; 13 Escudilla Wilderness.

Number of HDMS Records: 3 (Nos. 53, 60, and 66)

Mapping: USGS quadrangles H133109 and H233109. Plotted locations are on file at the ASNF Supervisor's Office, Springerville, and at the Arizona Game and Fish Department, HDMS, Phoenix.

Description and Existing Conditions: Presently, three sites are recognized by the Arizona Game and Fish Department HDMS. A newly discovered site consisting of two patches along the western slope of the upper ridge of the mountain has not yet been recorded in the HDMS. This new observation seems to include site 53, which had not been reported since 1982. It appears that Goodding's onions on Escudilla Mountain form a single large, discontinuous population extending across the western slope of the mountain, between 9,600 and 10,800 feet.

Grazing Allotment: South Escudilla

Apache Trout Recovery Streams: None

Site-specific Concerns: There is no indication present management activities are causing adverse impacts that might threaten the viability of the 3 sites.

1) Timber Harvest: No harvest occurs in the Escudilla Wilderness.

2) Recreation: Some individual onions in site 60 have been impacted by the long-established trail to Escudilla Lookout. Potentially, some plants in the immediate vicinity of the lookout tower may be impacted by dispersed hikers.

3) Grazing: Livestock grazing has not been documented among any of the onions observed in this management unit. The lack of water, steep slopes, and dense forest limit livestock use in this upper portion of Escudilla Mountain.

Past Conservation Actions: Observations of the species in 1995 and 1996 have documented a much more extensive distribution on Escudilla Mountain than previously known.

Past Monitoring: None

Proposed Conservation Actions: Little management activity occurs in the wilderness and no adverse impacts to Goodding's onions have been observed in this management unit. No specific conservation actions are proposed, but continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the ASNF Standards and Guidelines in the unit.

Proposed monitoring: In 1999, visit and evaluate the condition of sites in this management unit. GPS each site visited and enter data in the ASNF GIS. The ASNF Supervisor's Office will coordinate this monitoring. The Ranger Districts will develop and implement specific monitoring plans for any proposed projects that may impact Goodding's onion sites in this management unit. District Biologists will review the monitoring plans for adequacy prior to implementation.

3. Goodding's Onion Management Unit: ASNF 03 - Black River North Watershed

Location: This management unit includes Goodding's onions found in the watersheds of the West and East Forks of the Black River.

Land Ownership: ASNF, Springerville and Alpine Ranger Districts

Forest Plan Management Areas/Emphasis: 01 Forest Land; 03 Riparian; 04 Mountain Grass; 05 Developed Recreation; 10 Hayground Research Natural Area (proposed); 11 Water (wetlands); 15 Special Management Area - East and West Forks Black River.

Number of HDMS Records: 9 (Nos. 2, 6, 7, 13, 43, 54, 55, 62, and 63)

Mapping: USGS quadrangles H433109 and G433109. Plotted locations are on file at the ASNF Supervisor's Office, Springerville, and at the Arizona Game and Fish Department, HDMS, Phoenix.

Description of Existing Conditions: Goodding's onions have primarily been found along drainage bottoms (*eg*. Home Creek, Hayground Creek, West Fork of the Black River), but are also found in forested, upland sites not associated with drainages (07, 13). Five of the 9 sites in this management unit have recently been monitored (2, 7, 13, 43, 62). All five sites were found to be stable or increasing.

Grazing Allotments: Hayground (for record nos. 2, 6, 43, 55, and 63), Burro Creek (for record nos. 7, 13, 54, and 62), Big Lake (for record no. 54), and P.S. (for record no. 54).

Apache Trout Recovery Stream: Record nos. 2, 54, and 63.

Site-specific Concerns:

1) Recreation: Site 13 lies within a developed campground area at Big Lake. Although at some time in the past a gravel road has been built through a portion of this site, and although campers have been observed walking through patches of onions, this site presently does not appear to be adversely impacted by ongoing activities.

2) Incomplete Documentation: Of the four sites not recently monitored, documentation for sites 54 and 55 is incomplete. Insufficient information is available to evaluate the status of either site. However, adverse impacts are unlikely because both sites are within Mexican spotted owl habitat, and site 54 lies along an Apache trout recovery stream. Sites 06 and 63, likewise, have not been visited in 9 and 5 years, respectively. However, information for these 2 sites does not indicate any particular susceptibility to adverse impacts.

3) Clarification of Status: The extirpation of a "Stinky Canyon" population as a result of livestock grazing has been reported (Fletcher 1984). However, the reported legal description of this population places it somewhere on the Fort Apache Indian Reservation. As reported by Galeano-Popp (1989), this site may actually have been site 07, which continues to maintain large numbers of the species.

Past Conservation Actions: Potential habitat in this management unit was systematically inventoried in 1987 through a cooperative agreement between the ASNF and The Nature Conservancy (Laurenzi and Warren 1987). Goodding's onion sites were considered during the recent allotment management plan revision of the Burro Creek, Hayground, and Reservation allotments. In compliance with this allotment management plan, the Springerville Ranger District has monitored Goodding's onion sites within the allotments (Ordonez 1994).

Past Monitoring:

Site	Year Found	1987	1993	1995	1996	Site	Year Found	1987	1993	1995	1996
02	1986	X	X			54	1989/91				
06	1959	X				55	1989				
07	1949	X	X	X		62	1991			X	
13	1982/94	X		X	X	63	1991				
43	1987	X		X		New	1996				

X - no adverse impacts noted
* - light livestock grazing
** - moderate to heavy livestock grazing
– - no Goodding's onion found

Proposed Conservation Actions: Defer timber harvest at occupied sites. Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the ASNF Standards and Guidelines in the unit. Continue to document new sites. Submit record of a newly found site (along the West Fork of the Black River, near the West Fork Campground) to the Arizona Game and Fish Department HDMS.

Most of the sites in this management unit are within Mexican spotted owl habitat, and three sites (02, 63, and 54) are along Apache trout recovery streams. As a result, timber harvest, livestock grazing, and other ground disturbing activities such as prescribed fires, trail construction, *etc.*, in the vicinity of Goodding's onion occupied sites are likely to be implemented in a manner that will minimize adverse impacts to onions.

Proposed Monitoring:

1) In 1998, visit sites 02 and 07 to monitor population trends as described by Laurenzi and Warren (1987) and Warren, Kofira, and Malusa (1996). GPS each site visited and enter data in the ASNF GIS. The ASNF Supervisor's Office will coordinate this monitoring.

2) In 1999, visit sites 54, 55, and 63 to verify the species of onion present at these sites. GPS each site visited and enter data in the ASNF GIS. The ASNF Supervisor's Office will coordinate this monitoring.

3) In 1999, visit sites 06, 13, 43, and 62 to evaluate the condition of each site. GPS each site visited and enter data in the ASNF GIS. The ASNF Supervisor's Office will coordinate this monitoring.

4) Ranger Districts will develop and implement specific monitoring plans for any proposed projects that may impact Goodding's onion sites in this management unit. District Biologists will review the monitoring plans for adequacy prior to implementation.

4. Goodding's Onion Management Unit: ASNF 04 - Black River South Watershed

Location: This management unit includes Goodding's onions found in the watershed of the Black River downstream from the confluence of the East and West Forks.

Land Ownership: ASNF, Alpine Ranger District

Forest Plan Management Areas/Emphasis: 01 Forest Land; 03 Riparian; 04 Mountain Grass; 10 Thomas Creek Research Natural Area (proposed); 12 Bear Wallow Wilderness; 14 Special Management Area - Black River.

Number of HDMS Records: 37 (Nos. 4, 8-10, 15-39, 42, 52, 57-59, 61, 64, and 65)

Mapping: USGS quadrangles E333109, E433109, and F233109. Plotted locations are on file at the ASNF Supervisor's Office, Springerville, and at the Arizona Game and Fish Department, HDMS, Phoenix.

Description of Existing Conditions: The onions are typically associated with drainage bottoms, although some sites extend up slopes along drainages.

Grazing Allotments: Sprucedale-Reno (for record nos. 9, 10, 15-18, 21, 23, 25-35, 37-39, 42, 59, 61, and 64), Fish Creek (for record nos. 4, 8, 18, 24, 36, and 52), KP (for record no. 65), and Foote Creek (for record nos. 19, 20, 22, 57, and 58)

Apache Trout Recovery Stream: Record nos. 25, 36, 37, and 65 are along recovery streams. Record nos. 24, 26-35, 38, 39, 42, and 58 are in recovery stream watersheds.

Site-specific Concerns:

1) Incomplete Documentation: Verification of onion species is needed at several sites that were initially reported during "old growth"surveys and/or for which no documentation was collected (eg. photographs, specimens, *etc.*). Some of these sites, in fact, may not have been Goodding's onions. For example, in 1995 two of these sites (52 and 58) were visited and, although other onion species were present, no Goodding's onions were observed. No timber harvest or other factors were apparent that are likely to have caused the extirpation of Goodding's onions at these sites. It is likely that the initial reports of these sites incorrectly identified Goodding's onions.

2) Grazing: Livestock grazing has been identified as impacting some sites in this management unit. Specifically, heavy livestock grazing has been identified as a probable cause for a decline observed at site 04 between 1987 and 1993. During 1996, this site was inspected and a salt block removed from the drainage bottom. In the immediate vicinity of the salt block, livestock activity appeared to have reduced the

incidence of Goodding's onions to just a few scattered plants. Elsewhere along the drainage, onions at site 04 appeared healthy except where the forest overstory had been harvested in the past. Site 24 has not been visited since 1987 when heavy livestock grazing was observed. However, in 1987 heavy livestock grazing was also observed at sites 08 and 19, yet during follow-up monitoring (1993 and 1996, respectively), onions at the sites were ungrazed and appeared healthy despite signs of recent livestock presence. In addition, although monitoring in 1987 and 1993 showed site 30 to be stable, in 1995 livestock intensively grazed patches of Goodding's onions at the site.

3) Loss of Forest Canopy: "Windthrow" blowdown of forest overstory (in conjunction with subsequent salvage logging) has been identified as a likely cause of population declines at some sites. These observations indicate the importance of maintaining canopy cover, especially at drier sites.

4) Clarification of Status: Although reported as extirpated from logging (Fletcher 1984), site 10 remains extant with high or medium densities of plants (Laurenzi and Warren 1987; Warren *et. al* 1995).

Past Conservation Actions: Potential habitat in this management unit was systematically inventoried in 1987 through a cooperative agreement between the ASNF and The Nature Conservancy (Laurenzi and Warren 1987). Beginning in the mid-1980s, the Alpine Ranger District has inventoried proposed timber sales for Goodding's onion. As a result, "no-cut" buffers have been established around at least 11 sites (*eg*. 04, 08, 15, 16, 17, 21, 23, 25, 27, 28, and 29). In 1996, a salt block was removed at site 08.

Past Monitoring:

Site	Year Found	1987	1993	1995	1996	Site	Year Found	1987	1993	1995	1996
04	1987	**	**	X	X	30	1987	X	X	*	
08	1987	**		X	X	31	1987	X		*	
09	1987	X				32	1987	X		*	
10	1974	*	X			33	1987	X	X/B	*	
15	1987	X				34	1987	X	X	*	
16	1987	*				35	1987	X		*	
17	1987	X				36	1987	X	X		
18	1987	X				37	1987	*			
19	1987	**	X			38	1987	*			
20	1986	–	–			39	1987				
21	1984	*	X			42	1987				
22	1987	**				52	1987			–	
23	1984	X	X			57	1991				

24	1987	**				58	1991	–			
	Year						Year				
Site	Found	1987	1993	1995	1996	Site	Found	1987	1993	1995	1996
25	1984	*				59	1991				
26	1987	X	B			61	1991				
27	1987	**				64	1991	(extension of site 17)			
28	1986	*				65	1991			B	
29	1987	*									

X - no adverse impacts noted
* - light livestock grazing
** - moderate to heavy livestock grazing
B - blowdown may impact site
– - no Goodding's onions found

Six transects monitored at 5 sites (04, 10, 23, and 33) in 1993 indicated that onions along 4 of the 6 transects in this management unit remained stable from 1987 to 1993. A decline in the density of onions along one transect at site 04 appeared correlated with heavy livestock grazing facilitated by the placement of a salt block in the drainage. A decline in onion densities at site 33 appeared to result from the combined effects of overstory reduction from a blowdown event followed by salvage logging that completely removed the tree canopy over the onions. Six additional sites (19, 20, 21, 26, 34, and 36) were visited in 1993 to qualitatively assess their status. Three of these sites showed little change between 1987 and 1993 (19, 21, and 36). Site 20 could not be relocated because of poor initial directions. Site 34 showed an apparent increase. Site 26 showed an apparent decrease. Neither the increase nor the decrease could be explained.

Proposed Conservation Actions: Defer timber harvest at occupied sites. Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the ASNF Standards and Guidelines in the unit.

Most of the sites in this management unit are within Mexican spotted owl habitat, and over half of the sites are associated with Apache trout recovery streams. As a result, timber harvest, livestock grazing, and other ground disturbing activities such as prescribed fires, trail construction, *etc.*, in the vicinity of Goodding's onion occupied sites are likely to be implemented in a manner that will minimize adverse impacts to onions.

Proposed monitoring:

1) In 1998, visit sites 04, 10, 23, 30, and 33 to evaluate permanent transects established by Laurenzi and Warren (1987) and last evaluated in 1993 by Warren, Kofina, and Malusa (1996). The ASNF Supervisor's Office will coordinate this monitoring.

2) In 1998, visit sites 19, 21, 26, 34, and 36 to monitor population trends at described by Laurenzi and Warren (1987) and Warren, Kofira, and Malusa (1996). The ASNF Supervisor's Office will coordinate this monitoring.

3) The Ranger Districts will develop and implement specific monitoring plans for any proposed projects that may impact Goodding's onion sites in this management unit. District Biologists will review the monitoring plans for adequacy prior to implementation.

5. Goodding's Onion Management Unit: ASNF 05 - Blue River Watershed

Location: This management unit consists of Goodding's onion sites and habitat located in the watershed of the Blue River.

Land Ownership: ASNF, Alpine Ranger District

Forest Plan Management Areas/Emphasis: 01 Forest Land; 02 Woodlands; 03 Riparian; 04 Mountain Grass; 08 Blue Range Primitive Area; 18 Special Management Area - Sandrock.

Number of HDMS Records: 2 (Nos. 40 and 41)

Mapping: USGS quadrangle E333109. Plotted locations are on file at the ASNF Supervisor's Office, Springerville, and at the Arizona Game and Fish Department, HDMS, Phoenix.

Description of Existing Conditions: Both sites were found by The Nature Conservancy in 1987 along the headwater drainage of KP Creek.

Grazing Allotment: KP

Apache Trout Recovery Stream: Record no. 40 is along streamside. Record no. 41 is in watershed.

Site-specific Concerns: When first found in 1987, both sites were identified as small populations subjected to livestock grazing. Neither site has been visited since 1987. These are the only known sites in the Blue River watershed.

Past Conservation Actions: Potential habitat in this management unit was systematically inventoried in 1987 through a cooperative agreement between the ASNF and The Nature Conservancy (Laurenzi and Warren 1987). The two known sites were found as a result of that effort. In 1996, extensive reductions were proposed for livestock numbers permitted to graze on the KP allotment. Livestock reductions are scheduled for implementation from 1998 to 2000.

Past Monitoring: None

Proposed Conservation Actions: Defer timber harvest at occupied sites. Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the ASNF Standards and Guidelines in the unit. Because only two sites are known in this management unit, additional surveys of suitable habitat in the Blue River watershed are especially important.

All of the sites in this management unit are within Mexican spotted owl habitat and are associated with Apache trout recovery streams. Implementation of the recovery plans and conservation of these two listed species is likely to promote the protection and conservation of Goodding's onions.

Proposed Monitoring:

1) The Ranger Districts will develop and implement specific monitoring plans for any proposed projects that may impact Goodding's onion sites in this management unit. District Biologists will review the monitoring plans for adequacy prior to implementation.

6. Goodding's Onion Management Unit: ASNF 06 - Eagle Creek Watershed

Location: This management unit includes Goodding's onions and habitats found in the East Eagle watershed.

Land Ownership: ASNF, Clifton Ranger District

Forest Plan Management Areas/Emphasis: 01 Forest Land; 02 Woodlands; 03 Riparian.

Number of HDMS Records: 1 (No. 67)

Mapping: USGS quadrangle E433109. Plotted locations are on file at the ASNF Supervisor's Office, Springerville, and at the Arizona Game and Fish Department, HDMS, Phoenix.

Description of Existing Conditions: The single site record in this management unit was discovered during a field inspection during the analysis of a project to improve a recreational trail. The site is located in the bottom of Squirrel Canyon. In 1995, the population appeared vigorous and extensive (5,000-10,000 plants along 1.5 to 2 miles of the drainage). The downstream terminus of this site was not determined. Other similar habitats occur in the management unit and it is likely that additional sites will be discovered.

Grazing Allotment: East Eagle

Apache Trout Recovery Stream: No

Site-specific Concerns: In 1995, unauthorized livestock use was observed at the upper end of Squirrel Canyon although the impact to Goodding's onions appeared minimal. Evidence of an old fire was also apparent in the upper end of Squirrel Canyon, outside the present distribution of the onion. Some individual plants were likely impacted by activities associated with the trail prior to its rerouting, but this impact did not appear to threaten the existence of the onions. No timber harvest occurs or is planned in this area.

Past Conservation Actions: In 1995, as part of the planning process for a proposed trail reconstruction project, the Clifton Ranger District surveyed the proposed project area for rare species. The single known Goodding's onion site in this management unit was discovered as a result of this effort. In addition, the trail was subsequently rerouted around the known site to reduce any impact on the onion.

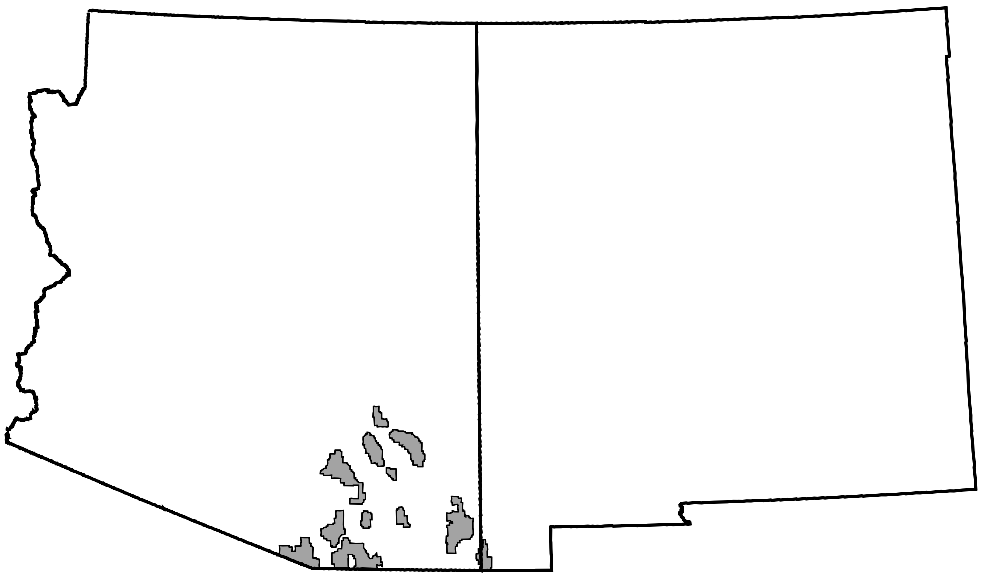
Past Monitoring: None

Proposed Conservation Actions: Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the ASNF Standards and Guidelines in the unit. Because only one site is known in this management unit, additional surveys of suitable habitat are especially important in the Eagle Creek watershed.

Proposed Monitoring:

1) The Ranger Districts will develop and implement specific monitoring plans for any proposed projects that may impact Goodding's onion sites in this management unit. District Biologists will review the monitoring plans for adequacy prior to implementation.

V.
GOODDING'S ONION CONSERVATION STRATEGY FOR THE CORONADO NATIONAL FOREST



A. INTRODUCTION

The Coronado National Forest has only one location for Goodding's onion. That location is on Mount Lemmon in the Santa Catalina Ranger District. This population is disjunct from the other major populations in Arizona and New Mexico. Suitable habitat on other mountain ranges in the Forest have been surveyed, but no other populations have been found. The Mount Lemmon population was discovered in mid-1970. It has maintained a very stable population density over time. Due to its relative isolation from other populations, the Mount Lemmon population may represent a unique genetic entity from the other Goodding's onions populations. Seed has been collected and is stored in the Center for Plant Conservation's collection.

B. EXISTING CONSERVATION DIRECTION

1. Forest-wide Land Management Plan Standards and Guidelines

Several of the Standards and Guidelines in the Land and Resource Management Plan will likely contribute to the conservation of Goodding's onion. These Standards and Guidelines include:

- "Maintain or improve occupied habitat of commonly hunted species, listed threatened and endangered species, and management indicator species through mitigation of Forest activities with cooperation of New Mexico Department of Game and Fish, Arizona Game and Fish Department, and U.S. Fish and Wildlife Service. Where applicable consult with other wildlife and plant oriented groups and affected agencies" (p. 31).

- "Maintain or improve current vegetative diversity (numbers of plant associations and species occurrence) by mitigation of Forest activities" (p. 31).

- "With cooperation of federal, Arizona and New Mexico wildlife agencies, develop overall direction for listed threatened and endangered species. Delist federally and state listed threatened and endangered species in accordance with species recovery plans. Reoccupy historical habitat Forest-wide with other identified species" (p. 31).

- "Consult with the New Mexico Department of Game and Fish, New Mexico Department of Natural Resources, Arizona Game and Fish Department, and U.S. Fish and Wildlife Service during the environmental analysis process on projects significantly affecting wildlife and threatened and endangered plant habitats. Specific agency responsibilities are described in FSM 2610 (Wildlife and Fish Cooperative Relations) and 2670 (Threatened and Endangered Plants and Animals)

and in the Endangered Species Act. Where applicable consult with other wildlife and plant oriented groups (such as State Heritage Programs) and affected federal agencies" (p. 32).

- "Determine presence of federally and state listed threatened and endangered plant and animal species in project areas through on-site inventory and consultation with existing data bases as part of environmental analysis completion. Recommendations for habitat needs will be made on a project by project basis" (p. 32).

- In cooperation with the U.S. Fish and Wildlife Service, Arizona Game and Fish Department, and New Mexico Department of Game and Fish develop a general activity plan for state and federally listed threatened and endangered species. This direction plan would guide habitat management on the Coronado National Forest by: (1) determining critical habitat for threatened and endangered species and prescribing measures to prevent the destruction or adverse modification of such habitat; (2) recommending appropriate conservation measures including the designation of special areas to meet the protection and management needs of such species; (3) prioritizing completion of recovery plans on memorandums of understanding by species; and (4) establishing a time frame for (3) above. Habitat requirements, research needs, and transplant goals with completion dates would be outlined for each species within its recovery plan" (p. 32).

C. CORONADO NATIONAL FOREST GOODDING'S ONION MONITORING

Implementing the Goodding's onion monitoring strategy on the Coronado National Forest from 1997 through 2006 will require visits to the known site every three years beginning in 1997. The estimated cost of monitoring is $400 per visit for 2 people for 1 day. If additional sites are discovered on the Forest, monitoring costs will increase at a rate of $133 per site per year.

Various projects could occur in the vicinity of the Goodding's onion population. The cost of monitoring the impacts of these projects on Goodding's onions is unknown. However, because monitoring the impacts of projects is a required part of Forest Service actions under existing regulations, the potential cost of such monitoring is not attributed to the implementation of this conservation strategy.

D. CORONADO NATIONAL FOREST GOODDING'S ONION MANAGEMENT UNIT

1. Goodding's Onion Management Unit: CNF 1 - Mount Lemmon Population

Location: EO Code PMLIL02120.005. T. 11 S., R. 15 E., Sec. 26. Mount Lemmon.

Land Ownership: Coronado National Forest, Santa Catalina Ranger District

Forest Plan Management Area/Emphasis:

Area of Occupied Habitat: 2-5 acres (estimated)

Mapping: Plant occurrences have been mapped manually on the Mount Lemmon, AZ, 7 1/2 minute Quad USGS. Scale = 1:24,000.

Description of Plant Management Unit and Existing Conditions: This population occurs on a steep north-facing slope in a canyon of basalt outcrops. The population is associated with a seep in the area that keeps the site continually moist; there is no visible stream channel or above ground water present. In the near vicinity of the seep, the Goodding's onion population is quite dense (100 percent ground cover in some places). Moving away from the seep there are fewer patches associated with a rock ledge. The population extends about 200 feet above and 300 feet below the seep. The overstory is comprised of conifer dominated by Douglas-fir and white fir. Common associated understory species are quaking aspen, Gambel oak, mountain spray, New Mexico locust, and snowberry. In 1993, seed was collected from 100 individuals and sent to The Arboretum at Flagstaff. Goodding's onion is in the national collection of the Center for Plant Conservation and as part of the conservation effort seeds are collected and maintained in storage at the arboretum. In 1993, the population was estimated to be 500 plants, with about 60 percent flowering. Seed set was high.

Grazing Allotment: None

Site-specific Concerns: This site is quite remote and off the beaten path. Dispersed recreation is a minor concern. It is located near a parking lot for the Mount Lemmon ski area, but it is unlikely that there would be heavy foot traffic to this site. The population is in a steep drainage and there is no direct trail to the site. The site is mesic, north facing, and protected from the threat of wildfire because of microsite conditions. It would have to be a wildfire of catastrophic proportions to eliminate this population.

Past Conservation Actions: The seed collection and site visit in 1993 ensures the genetic integrity of this disjunct population.

NEPA documentation (1989) for the potential effects from a proposed parking lot on Mount Lemmon ensured that no damage was done to the existing population.

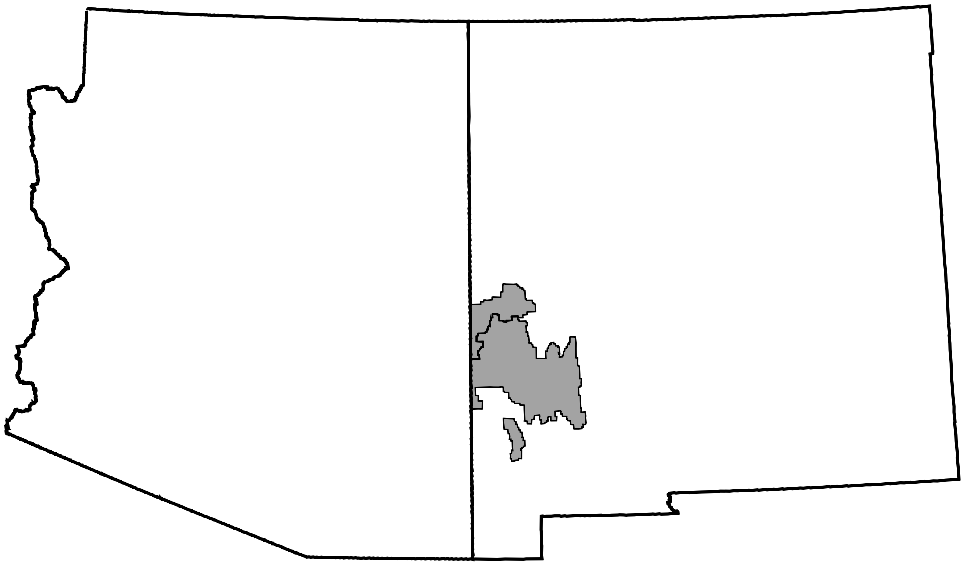
Past Monitoring: The unit was last visited in September, 1993**.**

Proposed Conservation Actions: Forest Plan Standards and Guidelines call for the immediate suppression and containment of wildfires to 10 acres or less.

Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document). Because the site is remote and there are no management activities that threaten the population, there are no additional recommendations for conservation actions.

Proposed Monitoring: The population will be visited every 3 years and monitored at Level 3 as described in Appendix 2. The next site visit will be in 1997. Estimates will be made of population size and reproductive status. Habitat will be evaluated for changes. If threats are identified, corrective measures will be taken to ensure population viability.

VI.
GOODDING'S ONION CONSERVATION STRATEGY FOR THE GILA NATIONAL FOREST



A. INTRODUCTION

Goodding's onion was first discovered on the Gila National Forest in 1972. At that time, this species was thought to exist only in the Indian Creek area of the Glenwood Ranger District. Surveys conducted in 1981, 1984, 1988, and 1991 located additional occupied sites in the Bearwallow Mountain and Eagle Peak areas.

B. EXISTING CONSERVATION DIRECTION

1. Forest Land Management Plan Standards and Guidelines

The overall general section of the FLMP includes no specific standards and guidelines (S&Gs) for Goodding's onion. Several S&Gs will likely contribute to the conservation of the species, but will not by themselves insure its protection. These S&Gs include:

- "Monitor management practices within occupied and potential habitat of plants listed as threatened, endangered or on the Regional Forester's Sensitive Plant List. Manage sensitive species to sustain viability and prevent the need for listing as threatened or endangered" (p. 29).

- "On an opportunity basis or if funds become available, inventory plants on the New Mexico endangered species list known to occur on the forest" (p. 29).

- "Recovery activities will be pursued where pertinent" (p. 29).

- "If proposed for listing, monitor actions to determine affect of management practices on habitat and the need for conference with U.S. Fish and Wildlife Service" (p. 29).

- "Monitor status of federal listings. If elevated to threatened or endangered status, complete consultations with U.S. Fish and Wildlife Service as required" (p. 29).

Management Areas 6B and 6C within the FLMP specifically mention threatened and endangered species in the S&Gs as follows:

- "Accomplish/implement threatened and endangered species habitat improvements as identified through approved recovery plans. T&E and sensitive species within this area include: Plants: *Allium gooddingii*" (p. 181)

- "Threatened and endangered species habitat developments are projected as follow for the first decade:

Protection Fencing 2 miles (6B) / 1 mile (6C)
Waters/Wetlands 1 structure (6B) / 1 structure (6C)" (p.181-182).

The above mentioned structures for TES species were included specifically for upgrading/protecting loach minnow habitat. No fences have been constructed around Goodding's onion sites to date. Spot checks have indicated that no special protection is presently needed.

C. GILA NATIONAL FOREST GOODDING'S ONION MONITORING

Implementing the Goodding's onion monitoring strategy on the Gila National Forest from 1998 through 2007 will require visits to the known site every three years. Monitoring levels and costs are described in the following table.

Table 7. Estimated Goodding's onion monitoring costs on the Gila National Forest.

Year	Management Unit	Monitoring Level	Work Days	Rate	Cost
1998	GNF-1	2	1	$200/day	$200
	GNF-2	2	1	$200/day	$200
	GNF-3	2	1	$200/day	$200
	GNF-4	2	2	$200/day	$400
	GNF-5	2	2	$200/day	$400
	GNF-6	2	1	$200/day	$200
2001	GNF-1	1	1	$200/day	$200
	GNF-2	1	1	$200/day	$200
	GNF-3	1	1	$200/day	$200
	GNF-4	1	2	$200/day	$400
	GNF-5	1	2	$200/day	$400
	GNF-6	1	1	$200/day	$200
2004	GNF-1	2	1	$200/day	$200
	GNF-2	2	1	$200/day	$200
	GNF-3	2	1	$200/day	$200
	GNF-4	2	2	$200/day	$400
	GNF-5	2	2	$200/day	$400
	GNF-6	2	1	$200/day	$200
2007	GNF-1	1	1	$200/day	$200
	GNF-2	1	1	$200/day	$200
	GNF-3	1	1	$200/day	$200
	GNF-4	1	2	$200/day	$400

(continued)

Table 7. (concluded)

Year	Management Unit	Monitoring Level	Work Days	Rate	Cost
	GNF-5	1	2	$200/day	$400
	GNF-6	1	1	$200/day	$200
				TOTAL	$6,400

Various projects could occur in the vicinity of Goodding's onion populations. The cost of monitoring the impacts of these projects on Goodding's onions is unknown. However, because monitoring the impacts of projects is a required part of Forest Service actions under existing regulations, the potential cost of such monitoring is not attributed to the implementation of this conservation strategy.

D. VERIFICATION OF NEW AND EXISTING SITES

Two possible sites were reported on the Quemado Ranger District in Frieborn Canyon, 1993-1994, and in Lily Patch Canyon, 1995. These sites were visited in July, 1997. Goodding's onions were present in Frieborn Canyon, but none were found in Lily Patch Canyon. These canyons need further survey. Two sites, 001 and 014, in the Indian Creek Management Unit, Glenwood Ranger District, also need to be verified. Specimens were collected in 1972 at site 001 and in 1984 at site 014. Surveys in 1991 failed to relocate these recorded sites.

E. GILA NATIONAL FOREST GOODDING'S ONION MANAGEMENT UNITS

1. Goodding's Onion Management Unit: GNF 1 - Eagle Peak

Location: NMNHP EO[2] #009 - T. 07 S., R. 17 W., Sec. 10. Long Canyon.

Land Ownership: Gila National Forest, Reserve Ranger District

Forest Plan Management Area/Emphasis: 6C/timber harvest, cattle grazing, and wildlife.

Area of Occupied Habitat: 10 acres (estimated)

Mapping: Plant occurrences have been mapped manually on the Eagle Peak, NM, 7 1/2 minute Quad #314 NE. Scale = 1:24,000. Original topographic maps are on file at the Reserve Ranger District, Reserve, New Mexico. Photocopies are on file at the Supervisor's Office in Silver City, New Mexico.

Description of Plant Management Unit and Existing Conditions: Goodding's onion occurs in Long Canyon, which is located on the north side of Eagle Peak at an elevation of 8,000 feet. Plants are found in small patches under canopied stands of white fir, southwestern white pine, ponderosa pine and Douglas-fir. In 1991, range conditions were poor over half the allotment. Cattle numbers were reduced from 199 cattle year long (CYL) to 120 CYL in 1994, then raised to 125 CYL in 1996. Numerous roads have been constructed in order to maintain/access grazing developments, for timber sales, and for fire prevention measures.

Grazing Allotment: Eagle Peak

Gila Trout Inhabited Streams: None

Site-specific Concerns:

1) Grazing: This unit is located between two stock tanks. Because of the tanks locations, grazing ungulates will concentrate in and around the area causing soil compaction and trampling of the plants. Cattle were being grazed in the Long Canyon drainage during the 1989 survey. During the 1991 survey, there were no cattle or evidence the area

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[2] NMNHP EO = New Mexico Natural Heritage Program Element Occurrence. The Heritage Program uses Element Occurrence records to map and track species in its rare and sensitive species data base.

had been grazed and it appeared that the numbers and vigor of Goodding's onions had increased slightly. Trailing by livestock may impact several groups of onions.

2) Roads: The location of a road within this unit is increasing erosion and possibly causing gully development.

Past Conservation Actions: The Eagle Peak Timber Sale was completed in 1992. The occupied canyon was designated a no-cut unit with the exception of the west side of the canyon, 1/2 mile above the lower tank. The following restrictions were implemented and monitored:

- No logging in the bottom of Long Canyon.
- No reconstruction of the road within the drainage occupied by Goodding's onion.
- No disturbance (location of landings, skidding, turn-around areas, debris or soil dumping, *etc*.) on the east side on the existing road in the canyon.
- Erosion control (waterbars) was restricted to flagged areas. District Ecologist and Timber Sale Administrator delineated areas.
- Directionally fall trees that may impact populations away from drainage.

This management unit is within Mexican spotted owl habitat. Ground disturbing activities (*ie*. timber harvesting, grazing, *etc.*) are unlikely to be implemented in such a manner as to cause adverse impacts to the onion.

Past Monitoring:

NMNHP #	Year Found	1989	1991
009	1984	*	M*

* - low vigor and density
M - monitoring transect established

Proposed Conservation Actions:

1) If monitoring indicates grazing is degrading the occupied area, implement the following:
   - Schedule cattle to be in Wilson pasture (affected pasture) at the end of Goodding's onion flowering season (August - September), or

- Fence out occupied area, or
- Develop drinker away from Long Canyon tank, or
- Phase out Long Canyon tank and develop new waters elsewhere.

2) Prohibit salting within the occupied drainage 1/2 mile below and above tanks, and the bottom 1/3 of the slope within the 1/2 mile restriction.

3) Maintain current grade control in drainage.

4) Obliterate road above Long Canyon tank.

5) Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the GNF Standards and Guidelines in the unit.

Proposed Monitoring: Utilize GPS to map occupied areas and photograph site. Choose appropriate schedule listed below to apply monitoring levels described in Appendix 2.

1) There is an absence of direct perturbations to site:
   - Level 1 monitoring every 6 years starting in 2001.
   - Level 2 monitoring every 6 years starting in 1998 (this would entail reading established monitoring transect).

2) There is a proposal for management activities resulting in direct perturbations:
   - Level 2 monitoring before and after management activities.

2. Goodding's Onion Management Unit: GNF 2 - Indian Creek

Locations: NMNHP EO #001 - T. 10 S., R. 17 W., Sec. 27
NMNHP EO #002 - T. 10 S., R. 17 W., Sec. 32
NMNHP EO #003 - T. 10 S., R. 17 W., Sec. 31
NMNHP EO #014 - T. 10 S., R. 17 W., Sec. 33
NMNHP EO #016 - T. 10 S., R. 17 W., Sec. 32
NMNHP EO # not yet issued - T.10 S., R.17 W., Sec. 33

Land Ownership: Gila National Forest, Glenwood Ranger District

Forest Plan Management Area/Emphasis: 6A/timber harvest, cattle grazing, and wildlife.

Area of Occupied Habitat: 100 acres (estimated)

Mapping: Plant occurrences have been mapped manually on the Negrito Mountain, NM, 7 1/2 minute Quad # 338 NE. Scale = 1:24,000. Original topographic maps are on file at the Glenwood Ranger District, Glenwood, New Mexico. Photocopies are on file at the Supervisor's Office in Silver City, New Mexico.

Description of Plant Management Unit and Existing Conditions: Goodding's onion occurs in the headwaters of north facing canyons that drain into Indian Creek. The elevation ranges from 8,000 to 8,500 feet. The plants are found under canopied stands of white fir, ponderosa pine, Douglas-fir, southwestern white pine, and Engelmann spruce where they appear to be clonal and reproducing vegetatively. Sexual reproduction does occur at this site with the right environmental conditions. This has been noted during past monitoring trips with flowers and seed being produced.

Grazing Allotment: Copper Creek

Gila Trout Inhabited Streams: None

Site-specific Concerns: Ungulate grazing may affect the plants as most of the available forage is located in the canyon bottoms of this steep terrain. Ungulates also use some of the more shaded occupied areas as bedding grounds; however, no long term negative effects of the activity have been documented.

Past Conservation Actions: The heads of the occupied drainages were logged as part of the Indian Creek Timber Sale in 1978. Occupied drainages were considered inoperable as cable logging was not utilized. Disturbance above these drainages increased channel erosion and runoff. Plant numbers were less in 1981 than in 1978. A large rain and subsequent flooding in late 1978 created a great amount of disturbance in these drainages

with timber activities possibly magnifying erosive forces. The drainages appear to have stabilized since 1981. The Adam Timber Sale of 1981 was designed as a cable logging operation in and around the same area as the Indian Creek Timber Sale. The occupied drainages were removed from the timber sale due to the presence of the onion and soil considerations.

This management unit is within Mexican spotted owl habitat. Ground disturbing activities (*ie*. timber harvesting, grazing, *etc*.) are not likely to be implemented in such a manner as to cause adverse impacts to the onion.

Past Monitoring:

NMNHP #	Year Found	1972	1978	1980	1981	1984	1991
001	1972	C					--
002	1972	C		N		N	N
014	1984					C	--
016	1978		C	F	N	N	
???	1991						M*

* - low vigor and density
M - monitoring transect established
-- - no Goodding's onions found
C - specimen collected
N - no comments on vigor or density
F - flowering
??? - NMNHP # not yet issued

Proposed Conservation Actions: Monitor utilization by grazing ungulates. If damage to the plants is observed, and grazing management does not alter use, fence off occupied areas, install deflector fences, or drop trees below the affected area to discourage use. Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the GNF Standards and Guidelines in the unit.

Proposed Monitoring: Utilize GPS to map occupied areas and photograph site. Choose appropriate schedule listed below to apply monitoring levels described in Appendix 2.

1) There is an absence of direct perturbations to site:
   - Level 1 monitoring every 6 years starting in 2001.
   - Level 2 monitoring every 6 years starting in 1998 (this would entail reading established monitoring transect).

2) There is a proposal for management activities resulting in direct perturbations:

- Level 2 monitoring before and after management activities.

3. Goodding's Onion Management Unit: GNF 3 - Rainy Mesa Divide

Locations: NMNHP EO #010 - T. 09 S., R. 17 W., Sec. 17. Water Canyon.
NMNHP EO #011 - T. 09 S., R. 17 W., Sec. 18. Rainy Mesa Canyon.
NMNHP EO # not yet issued - T. 09 S., R.17 W., Sec. 17. Hail Canyon.

Land Ownership: Gila National Forest, Reserve Ranger District

Forest Plan Management Area/Emphasis: 6B/timber harvest, cattle grazing, and wildlife.

Area of Occupied Habitat: 100 acres (estimated)

Mapping: Plant occurrences have been mapped manually on the Telephone Canyon, NM, 7 1/2 minute Quad #314 SE. Scale = 1:24,000. Original topographic maps are on file at the Reserve Ranger District, Reserve, New Mexico. Photocopies are on file at the Supervisor's Office in Silver City, New Mexico.

Description of Plant Management Unit and Existing Conditions: Goodding's onion occurs in drainages originating off both sides of Rainy Mesa Divide. Elevation ranges from 7,500 to 8,000 feet. Overstory species include Engelmann spruce, ponderosa pine, southwestern white pine, aspen, Douglas-fir and white fir. The Corner Mountain Allotment permit was waived back to the Reserve Ranger District in 1991. Cattle numbers have not been re-permitted. An adjacent permittee grazes the allotment occasionally in the spring. Water Canyon was logged heavily, primarily in the bottom, in the 1950s. A logging road was constructed in Water Canyon, but has since been obliterated. This obliteration restored the natural hydrologic function of the drainage.

Grazing Allotments: Negrito/Yeguas and Corner Mountain

Gila Trout Inhabited Streams: None

Site-specific Concerns: Overuse of the forage within canyon bottoms by livestock and elk could present a problem. The placement of salt or mineral supplement in certain key areas could result in population damage.

Past Conservation Actions: Occupied drainages (Water and Hail) were within the 1992 Water Timber Sale. Water Canyon is within Mexican spotted owl protected activity centers and habitat, therefore no logging occurred in this drainage. The following restrictions were implemented and monitored in Hail Canyon:

- Occupied area (15' x 20') was marked with steel posts.

- Approximately 75 yards of the drainage were designated as a protected stream course and skidding was prohibited in this same area.

- Approximately 1/2 acre was deleted from harvest to provide shade.

This management unit is within Mexican spotted owl habitat. Ground disturbing activities (*ie*. timber harvesting, grazing, *etc.*) are not likely to be implemented in such a manner as to cause adverse impacts to the onion.

Past Monitoring:

NMNHP #	Year Found	1984	1991
010	1984	N	*
011	1984	N	
???	1991		*

* - low vigor and density
N - no comments on vigor or density
??? - NMNHP # not yet issued

Proposed Conservation Actions: Any future livestock use of this allotment should be designed to protect and enhance the existing occupied onion sites. Monitor utilization by grazing ungulates. If damage to the plants is observed, and grazing management does not alter use, fence off Water Canyon tank and occupied areas, and develop a drinker out of the canyon. Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the GNF Standards and Guidelines in the unit.

Proposed Monitoring: Utilize GPS to map occupied areas and photograph site. Choose appropriate schedule listed below to apply monitoring levels described in Appendix 2.

1) There is an absence of direct perturbations to site:
   - Level 1 monitoring every 6 years starting in 2001.
   - Level 2 monitoring every 6 years starting in 1998.

2) There is a proposal for management activities resulting in direct perturbations:
   - Level 2 monitoring before and after management activities.

4. Goodding's Onion Management Unit: GNF 4 - Bearwallow

Locations: NMNHP EO #006 - T. 10 S., R. 18 W., Sec. 36. North Fork Mineral Creek.
NMNHP EO #007 - T. 10 S., R. 18 W., Sec. 36. North Fork Mineral Creek.
NMNHP EO #012 - T. 10 S., R. 18 W., Sec. 34. BS Canyon.
NMNHP EO #013 - T. 10 S., R. 18 W., Sec. 27. Bearwallow Creek.
NMNHP EO #017 - T. 10 S., R. 18 W., Sec. 10. BS Canyon.
NMNHP EO #018 - T. 10 S., R. 18 W., Sec. 15. Goosberry Canyon.

Land Ownership: Gila National Forest, Glenwood Ranger District

Forest Plan Management Area/Emphasis: 4A/timber harvest, cattle grazing, and wildlife.

Area of Occupied Habitat: 200 acres (estimated)

Mapping: Plant occurrences have been mapped manually on the Bearwallow, NM, 7 1/2 minute Quad #338 NE. Scale = 1:24,000. Original topographic maps are on file at the Glenwood Ranger District, Glenwood, New Mexico. Photocopies are on file at the Supervisor's Office in Silver City, New Mexico.

Description of Plant Management Unit and Existing Conditions: Goodding's onion occurs in drainages and forested upland sites not associated with drainages in the Bearwallow Mountain area. Elevations range from 8,000 to 9,500 feet. The overstory in the occupied areas is comprised of Engelmann spruce, Douglas-fir, white fir, aspen, southwestern white pine, and scattered ponderosa pine. Logging has occurred in lower portions of Stub Canyon and the canyons and ridges to the northeast of Stub Canyon. It is not known if Goodding's onion occurred in the logged areas prior to the harvest and the onion has not been found in these areas. Canyon bottoms were used for skidding and log landings and seeded with introduced forage species. Areas occupied with Goodding's onion in the canyons southwest of Stub Canyon are healthy and appear to be reproducing (vegetatively as well as from seed) as additional Goodding's onion plants have been found below documented occupied areas.

Grazing Allotment: Deep and Copper Creek

Gila Trout Inhabited Streams: None

Site-specific Concerns: Excessive livestock and elk grazing of the occupied sites may be a problem as most of the available forage is located in the canyon bottoms of this steep terrain.

Past Conservation Actions: Forest Development Road 153 was planned to be extended up to Bearwallow Mountain in 1992. Due to the presence of Goodding's onion and roadless issues, the project was abandoned.

This management unit is within Mexican spotted owl habitat. Ground disturbing activities (*i.e*. timber harvesting, grazing, *etc.*) are not likely to be implemented in such a manner as to cause adverse impacts to the onion.

Past Monitoring:

NMNHP #	Year Found	1981	1982	1984	1988
006	1982		N	N	
007	1981	N	N		
012	1981	C	N	N	N
013	1984			N	
017	1988				N
018	1988				N

C - specimen collected
N - no comments on vigor or density

Proposed Conservation Actions: Monitor utilization by grazing ungulates. If damage to the plants is observed, and grazing management does not alter use, fence off occupied areas, install deflector fences, or drop trees below the affected area to discourage use. Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the GNF Standards and Guidelines in the unit.

Proposed Monitoring: Utilize GPS to map occupied areas and photograph site. Choose appropriate schedule listed below to apply monitoring levels described in Appendix 2.

1) There is an absence of direct perturbations to site:
   - Level 1 monitoring every 6 years starting in 2001.
   - Level 2 monitoring every 6 years starting in 1998.

2) There is a proposal for management activities resulting in direct perturbations:
   - Level 2 monitoring before and after management activities.

5. Goodding's Onion Management Unit: GNF 5 - Gila Wildemess

Locations: NMNHP EO #005 - T. 11 S., R. 17 W., Sec. 16. Upper Iron Creek.
NMNHP EO #015 - T. 11 S., R. 17 W., Secs. 5 and 6. Upper Willow Creek.
NMNHP EO # not yet issued - T. 11 W, R. 17 E., Sec. 4. Little Turkey Creek.
NMNHP EO # not yet issued - T. 11 S., R. 16 W., Sec. 18. Turkey Feather Pass.
NMNHP EO # not yet issued - T. 11 S., R. 18 W., Sec. 12. Middle Fork Willow Creek

Land Ownership: Gila National Forest, Wilderness and Glenwood Ranger Districts.

Forest Plan Management Area/Emphasis: 6B, 8B/wildlife and wilderness management.

Area of Occupied Habitat: 70 acres (estimated)

Mapping: Plant occurrences have been mapped manually on the Negrito Peak, NM, 7 1/2 minute Quad #338 NE; Grouse Mountain, NM, 7 1/2 minute Quad #338 SW; and Mogollon Baldy Mountain, NM, 7 1/2 minute Quad #338 SE. NM. Scale = 1:24,000. Original topographic maps are on file at the Glenwood Ranger District, Glenwood, New Mexico. Photocopies are on file at the Supervisor's Office in Silver City, New Mexico.

Description of Plant Management Unit and Existing Conditions: Goodding's onion occurs in the headwaters of small tributary streams that flow north-northeast from the Mogollon Divide and near Turkey Feather Spring. The plants occur at elevations ranging from 8,000 to 10,000 feet. Overstory species include Engelmann spruce, ponderosa pine, white fir, southwestern white pine, corkbark fir, Douglas-fir, and scattered aspen. Hikers and outfitter/guides frequently use the Turkey Feather Spring area for recreation. This unit is located in the Gila Wilderness and has been managed as a wilderness area since 1924. The Upper Willow Creek population (EO #015) has 2 colonies with 10 plants, Little Turkey Creek (EO #000) has a large uncounted population 1/2 mile in length, Upper Iron Creek (EO #005) has 4 small populations of 50 plants, and Turkey Feather Pass (EO # not issued) has 3 large populations with hundreds of plants in each population.

Grazing Allotment: Closed since 1952

Gila Trout Inhabited Streams: NMNHP EO #005 and #015

Site-specific Concerns: Overuse of the forage base and site destruction by outfitter/guide stock are the main concerns for the Turkey Feather Pass site.

Past Conservation Actions: A prescribed natural fire plan for the wilderness is currently being implemented.

Past Monitoring:

NMNHP #	Year Found	1982	1991
005	1982	N	**
015	1982	N	N
???	1991		M*
???	1991		**
???	1994?		*

* - low vigor and density
M - monitoring transect established
** - high vigor and density
N - no comments on vigor or density
??? - NMNHP # not yet assigned

Proposed Conservation Actions: Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the GNF Standards and Guidelines in the unit.

Proposed Monitoring: Utilize GPS to map occupied areas and photograph site. Choose appropriate schedule listed below to apply monitoring levels described in Appendix 2.

1) There is an absence of direct perturbations to site:
   - Level 1 monitoring every 6 years starting in 2001.
   - Level 2 monitoring every 6 years starting in 1998 (this would entail reading established monitoring transect).

2) There is a proposal for management activities resulting in direct perturbations:
   - Level 2 monitoring before and after management activities.

6. Goodding's Onion Management Unit: GNF 6 - Blue Unit

Locations: NMNHP EO - None - T. 7 S., R. 21 W., Sec. 12. Freiborn Canyon.

Land Ownership: Gila National Forest, Quemado Ranger District.

Forest Plan Management Area/Emphasis: 3B/timber harvest, cattle, grazing, and wildlife.

Area of Occupied Habitat: 1 acre (estimated)

Mapping: Plant occurrences have been mapped manually on the Bull Basin, NM, 7 1/2 minute Quad #313 NW

Description of Plant Management Unit and Existing Conditions: Goodding's onion occurs in the headwaters of Frieborn Canyon. The plants occur at elevations ranging from 8,200 to 8,400 feet. Overstory species include ponderosa pine, white fir, southwestern white pine, and Douglas-fir.

Grazing Allotment: Luna

Site-specific Concerns: None.

Past Conservation Actions: This management unit is within Mexican spotted owl habitat. Ground disturbing activities (*ie.* timber harvesting, grazing, *etc.*) are not likely to be implemented in such a manner as to cause adverse impacts to the onion.

Past Monitoring: Level 1 monitoring was done in July of 1997.

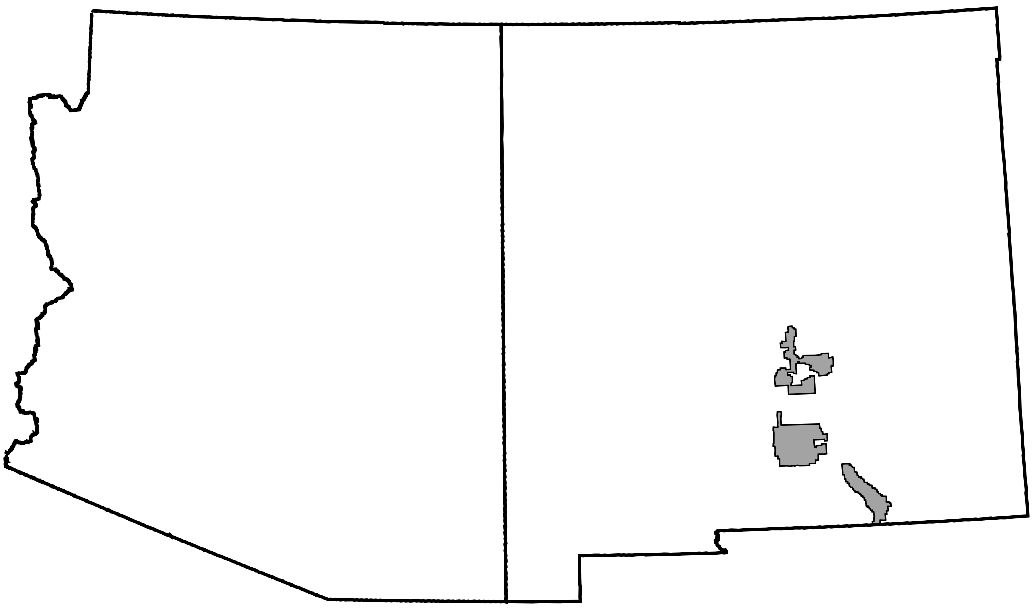
Proposed Conservation Actions: Continue to implement the regionwide Goodding's onion guidelines (pages 18-20 of this document) and the GNF Standards and Guidelines in the unit. This site was incorporated in the Biological Assessment for the Annual Operating Plan. No restrictions were identified at this time.

Proposed Monitoring: Utilize GPS to map occupied area and photograph site. Choose appropriate schedule listed below to apply monitoring levels described in Appendix 2.

1) There is an absence of direct perturbations to site:
   - Level 1 monitoring every 6 years starting in 2001.
   - Level 2 monitoring every 6 years starting in 1998

2) There is a proposal for management activities resulting in direct perturbations:
   - Level 2 monitoring before and after management activities.

VII.
GOODDING'S ONION CONSERVATION STRATEGY FOR THE LINCOLN NATIONAL FOREST



A. INTRODUCTION

On the Lincoln National Forest, Goodding's onion is found only on the Smokey Bear Ranger District in the vicinity of Sierra Blanca. Specimens collected here in 1977 and 1980 were initially identified as *Allium brevistylum*. It was not until 1984 that they were recognized and annotated as *Allium gooddingii* by Reggie Fletcher.

The plants are found at elevations between 9,300 feet and 11,250 feet in the montane coniferous forest and in cleared openings in and adjacent to the White Mountain Wilderness and the Ski Apache ski area. Surveys conducted by Lincoln National Forest botanists in 1989 and 1990 mapped some 53 occurrences and also surveyed 2-3 miles further out into potential habitat beyond the currently documented occurrences. No attempt has been made to count the total number of plants, but an estimate would have to include tens of thousands of plants.

The occupied habitat has been divided into three management units or sub-populations based on the Forest Plan direction for management of each area. These three areas are the Ski Apache sub-population, the White Mountain Wilderness sub-population, and the Rio Bonito sub-population.

B. EXISTING FOREST CONSERVATION DIRECTION

Management direction and standards and guidelines in the Lincoln National Forest Land and Resource Management Plan (1986) call for the protection, management, and enhancement of existing and potential habitat of sensitive species through ensuring that legal and biological requirements of designated species are met and are in compliance with Forest Service Regional requirements. Per direction in the Forest Plan, the occupied Goodding's onion areas are not open to domestic livestock grazing, nor are they designated for timber production. The occupied areas do not support the Mexican spotted owl or its habitat, but other sensitive species known to be present or to use the area include the northern goshawk, Sierra Blanca cinquefoil, and possibly the Penasco chipmunk.

1. Forest-wide Land Management Plan Standards and Guidelines

Several of the Standards and Guidelines in the Land and Resource Management Plan will likely contribute to the conservation of Goodding's onion. These Standards and Guidelines include:

- Protect and manage essential and critical habitats of threatened, endangered, and sensitive species through ensuring that legal and biological requirements of designated plants and animals are met.

– Identify, protect, and enhance existing and potential habitat of all threatened, endangered, and sensitive species.

2. Lincoln National Forest Monitoring Action Plan

– Monitoring will determine if management prescriptions are being applied as directed, if standards are being followed, and if objectives of the Forest Plan are being achieved.

– Monitoring will determine population and habitat trends of State and federally listed plants and animals and of sensitive species through direct counts and monitoring of habitat trends.

C. LINCOLN NATIONAL FOREST GOODDING'S ONION MONITORING

Implementing the Goodding's onion monitoring strategy on the Lincoln National Forest from 1998 through 2007 will require Level 1 monitoriing every third year and Level 2 monitoring every sixth year. Seven monitoring plots established in and adjacent to newly cleared ski runs in 1995 in Management Unit 1a will be read every third year beginning in 1997. Monitoring levels and costs are described in the following table.

Table 8. Estimated Goodding's onion monitoring costs on the Lincoln National Forest.

Year	Management Unit	Monitoring Level	Work Days	Rate	Cost
1998	LNF-1a	1	1	GS5 $88/day GS9 $165/day	$ 253
	LNF-1b	1	1	GS5 GS9	$ 253
	LNF-1c	1	1	GS5 GS9	$ 253
1999	LNF-1a	2 w/GPS set-up	4	GS5 GS11 $200/day	$1,152
	LNF-1b	2 w/GPS set-up	2	GS5 GS11	$ 576
	LNF-1c	2 w/GPS set-up	2	GS5 GS11	$ 576
2000	LNF-1a	Monitor 7 plots	1	2 GS3 $70/day 2 GS4 $80/day 1 GS5 1 GS9	$ 553

(continued)

Table 8. (concluded)

Year	Management Unit	Monitoring Level	Work Days	Rate	Cost
2001	LNF-1a	1	1	GS5 GS9	$ 253
	LNF-1b	1	1	GS5 GS9	$ 253
	LNF-1c	1	1	GS5 GS9	$ 253
2003	LNF-1a	Monitor 7 plots	1	2 GS3 2 GS4 1 GS5 1 GS9	$ 553
2004	LNF-1a	1	1	GS5 GS9	$ 253
	LNF-1b	1	1	GS5 GS9	$ 253
	LNF-1c	1	1	GS5 GS9	$ 253
2005	LNF-1a	2	2	GS5 GS11	$ 576
	LNF-1b	2	1	GS5 GS11	$ 288
	LNF-1c	2	1	GS5 GS9	$ 288
2006	LNF-1a	Monitor 7 plots	1	2 GS3 2 GS4 1 GS5 1 GS9	$ 553
2007	LNF-1a	1	1	GS5 GS9	$ 253
	LNF-1b	1	1	GS5 GS9	$ 253
	LNF-1c	1	1	GS5 GS9	$ 253
1998-2001	All units	GPS and document each occurrence on LNF Population Site Report	2/year	GS5 GS11	$2,304
				TOTAL	$10,455

D. LINCOLN NATIONAL FOREST GOODDING'S ONION MANAGEMENT UNITS

1. Goodding's Onion Management Unit: LNF 1a - Ski Apache Sub-population

Location: T. 10 S., R. 11 E., Secs. 33 and 34 (portions) NMPM. Sub-population boundaries coincide with the Ski Apache Area boundaries on National Forest System lands.

Land Ownership: Lincoln National Forest, Smokey Bear Ranger District

Forest Plan Management Area/Emphasis: 1I - Upper Ruidoso/Developed Recreation

Number of Known Plant Occurrences: 26

Area of Occupied Habitat: 100 acres (estimated)

Mapping: Plant occurrences have been mapped manually on the Nogal Peak, NM, 7 1/2 minute Quad #349 NE. Scale = 1:24,000. The maps are located in the botany files in the Supervisor's Office and at the Smokey Bear Ranger District Office.

Description of Plant Management Unit and Existing Conditions: This sub-population occurs in the headwaters of the North Fork of Rio Ruidoso. The plants occur within an elevation range of 9,360 to 11,100 feet. Goodding's onion plants are found under canopied stands of corkbark fir and Engelmann spruce where they appear to be clonal and to reproduce vegetatively. They also occur in disturbed openings such as ski runs and roadside cuts and banks where they appear to be more vigorous than plants under the forest canopy, to bloom in greater numbers, and to set seed. Plants are found in fairly dense patches and also as scattered individuals in both shaded and exposed sites.

This area was managed as a Primitive Area from 1933 until 1957 when it was removed from the Primitive Area in anticipation of development of the ski area.

Grazing Allotment: Closed since 1965

Livestock Management Unit: N/A

Site-specific Concerns: Development, operation, and maintenance of the ski area within this management unit since 1961 has splintered plant occurrences to the extent that the integrity of the original sub-population may have been lost. Goodding's onion plants continue to persist and thrive, however, in this unit. Ongoing maintenance and operation of the facilities are not felt to pose a threat to the population in this area, however,

construction of new facilities could possibly threaten substantial numbers of plants if not carefully designed. It is believed that the new ski runs and lift facility approved through the NEPA process in 1989 constitute the majority of new development that will take place at the ski area.

Uncontrolled wildfires could render habitat unsuitable for Goodding's onion if, for example, forest stringers and stands are lost or if the ground is sterilized in occupied sites.

Local native ungulates graze in the area. Herd levels are not a concern in this area. No monitoring has been conducted to specifically study the effects of this grazing.

Past Conservation Actions: Field surveys and evaluation of development alternatives through the NEPA process have minimized disturbances to the extent possible.

Forest Plan Standards and Guidelines call for the immediate suppression and containment of wildfires to 10 acres or less.

Past Monitoring: The unit was last visited in August, 1997.

Proposed Conservation Actions: Management guidelines for this unit include:

1) Routine maintenance and operation actions which do not disturb new ground will continue without the need to prepare a Biological Evaluation for Goodding's onion or to mitigate impacts to the plant. This is an exception to regionwide guideline B.1. (page 20). This exception is justified due to the demonstrated ability of Goodding's onion to persist and thrive under these routine actions, which have been performed since construction of the ski area.

2) Development of new ski runs, ski lifts, or lodge facilities and other improvements which are ground-disturbing will receive analysis and evaluation under the NEPA process. Through the alternative development process, the attempt will be made to find suitable alternatives which minimize adverse impacts to the onion while meeting the intended purpose of the proposed action. The Biological Evaluation will display the effects of the selected alternative on Goodding's onion.

3) Prescribed burns will be proposed in the future to allow a determination of the response of Goodding's onion.

4) The Lincoln National Forest will request that ski area permittees schedule mowing of those ski runs with Goodding's onion present as late in the summer as possible, after onion seed has matured.

5) All plant occurrences will be documented with a Lincoln N.F. Population Site Report and the boundaries recorded with a GPS unit.

Proposed Monitoring: Seven monitoring plots were established in June, 1995, within an area to be cleared for a new ski run and within the adjacent timber stand which will be retained. These plots will allow the beginning of an understanding of the response of Goodding's onion to ski run clearing.

Levels of Monitoring (see Appendix 2 for description of monitoring levels):

1) Selected, representative polygons containing onions will be monitored at Level 1 every third year.

2) Level 2 monitoring of estimated number of individuals and measured surface area occupied at the selected, representative polygons will be carried out every sixth year.

3) The seven monitoring plots established in and adjacent to newly cleared ski runs in June, 1995, will be read in 1997 and then every third year until data indicate that the numbers of onion plants have stabilized.

2. Goodding's Onion Management Unit: LNF 1b - White Mountain Wilderness Sub-population

Location: T. 10 S., R. 11 E., Secs. 29 and 32 NMPM. All plant occurrences within this sub-unit are within the White Mountain Wilderness.

Land Ownership: Lincoln National Forest, Smokey Bear Ranger District

Forest Plan Management Area/Emphasis: 1F - White Mountain Wilderness/Dispersed Recreation, Wilderness Management

Number of Known Plant Occurrences: 17

Area of Occupied Habitat: 100 acres (estimated). This is an undisturbed area and it is predicted that the plants occupy all suitable areas under a natural regime.

Mapping: Plant occurrences have been mapped manually on the Nogal Peak, NM, 7 1/2 minute Quad #349 NE. Scale = 1:24,000. The maps are located in the botany files in the Supervisor's Office and at the Smokey Bear Ranger District Office.

Description of Population and Existing Conditions: This sub-population occurs in the headwaters of the South Fork of Three Rivers and the South Fork of Rio Bonito. The plants occur within an elevation range of 10,320 to 11,250 feet. Overstory species include Engelmann spruce and corkbark fir. The management unit includes all plants currently known in the White Mountain Wilderness. The area has been managed as a Wild Area or as Wilderness since 1957. Natural ecological processes function in the area. Naturally occurring fires are very rare in this vicinity.

Grazing Allotment: Closed since 1949

Livestock Management Unit: N/A

Site-specific Concerns: Musk thistle, an invasive noxious weed, occurs to the west and further north in the wilderness. It has not been observed in this management unit, but could potentially invade the area, either on its own or through movement along hiking trails by recreationists or their livestock.

An uncontrolled wildfire in this area could render the habitat unsuitable for Goodding's onion.

Past Conservation Actions: A prescribed natural fire plan for the wilderness is currently being developed (8/96).

Past Monitoring: The unit was last visited in July and August, 1997.

Proposed Conservation Actions: Management guidelines for this unit include:

1) Wildfires with predicted or observed flame heights of more than 3 feet will be immediately suppressed and held to 10 acres or less, using Minimum Impact Suppression Techniques (MIST) within areas occupied by Goodding's onion .

2) Fires with unplanned ignitions within prescribed conditions may be allowed to burn, initially on an experimental basis, to reduce the threat of wildfire in this unit.

3) Monitoring for noxious weed occurrences will be carried out and prompt control will be recommended if they are found.

4) Other than routine trail maintenance, man-caused disturbances will avoid Goodding's onion occurrences.

5) Recreational-user impacts will be assessed along Trail 25 by September 1, 1997. Restrictions necessary to maintain healthy Goodding's onion occurrences will be instituted.

6) All plant occurrences will be documented with a Lincoln N.F. Population Site Report and the boundaries recorded with a GPS unit.

Proposed Monitoring: Levels of Monitoring (see Appendix 2 for description of monitoring levels):

1) Selected, representative polygons containing onions will be monitored at Level 1 every third year.

2) Level 2 monitoring of estimated number of individuals and measured surface area occupied at the selected, representative polygons will be carried out every sixth year.

3. Goodding's Onion Management Unit: LNF 1c - Rio Bonito Sub-population

Location: T. 10 S., R. 11 E. Secs. 28 and 33 (portions), NMPM.

Land Ownership: Lincoln National Forest, Smokey Bear Ranger District

Forest Plan Management Area/Emphasis: 1H - South Fork Bonito/Developed Recreation

Number of Known Plant Occurrences: 10

Area of Occupied Habitat: 80 acres (estimated). This is an undisturbed area and it is predicted that the plants occupy all suitable areas under a natural regime.

Mapping: Plant occurrences have been mapped manually on the Nogal Peak, NM, 7 1/2 minute Quad #349 NE. Scale = 1:24,000. The maps are located in the botany files in the Supervisor's Office and at the Smokey Bear Ranger District Office.

Narrative Description of Population and Existing Conditions: This sub-population occurs along drainages and on north-facing slopes in the headwaters of the South Fork of Rio Bonito, with a small portion of one occurrence lying within the upper Rio Ruidoso drainage. The plants occur within an elevation range of 9,300 to 11,120 feet. Overstory species include Engelmann spruce and corkbark fir. The area was managed as a Primitive Area from 1933 to 1957 and was closed to grazing in 1965.

Grazing Allotment: Closed since 1965

Livestock Management Unit: N/A

Site-specific Concerns: Musk thistle, an invasive noxious weed, occurs to the west and further north in the wilderness. It has not been observed in this management unit, but could potentially invade the area, along hiking trails, either on its own or through movement by recreationists or their livestock.

An uncontrolled wildfire in this area could render the habitat unsuitable for Goodding's onion .

The Lincoln National Forest Plan calls for the expansion of the Ski Apache Ski Area into this Management Area. The Plan specifies, however, that no new roads will be allowed to be built within the South Fork of Rio Bonito drainage for the purposes of ski area expansion. The Environmental Impact Statement for the Forest Plan states that expansion of Ski Apache, without development of new transportation facilities, will result in serious congestion and unsafe conditions on the existing access road. A new access route has

been reconned to the south through Reservation lands, but no plans currently exist to develop this route. Expansion along Elk Ridge, on the southern boundary of the ski area partially on Reservation land, was approved through the EA process in 1989. No proposals or plans currently exist which would expand the ski area northward into this Management Unit.

Past Conservation Actions: Forest Plan Standards and Guidelines call for the immediate suppression and containment of wildfires to 10 acres or less.

Past Monitoring: The unit was last visited in July and August, 1989.

Proposed Conservation Actions: Management guidelines for this unit include:

1) Wildfires will be immediately suppressed and held to 10 acres or less, using Minimum Impact Suppression Techniques (MIST) within areas occupied by Goodding's onion.

2) Prescribed underburns, and fires with unplanned ignitions, may be used, initially on an experimental basis, to reduce the threat of wildfire.

3) Monitoring for noxious weed occurrences will be carried out and prompt control will be recommended if they are found.

4) Other than trail maintenance, human-caused disturbances will avoid Goodding's onion occurrences.

5) Recreational-user impacts will be assessed along Trail 25 by September 1, 1997. Restrictions necessary to maintain healthy Goodding's onion occurrences will be instituted.

6) All plant occurrences will be documented with a Lincoln N.F. Population Site Report and the boundaries recorded with a GPS unit.

Proposed Monitoring: Levels of Monitoring (see Appendix 2 for description of monitoring levels):

1) Selected, representative polygons containing onions will be monitored at Level 1 every third year.

2) Level 2 monitoring of estimated number of individuals and measured surface area occupied at the selected, representative polygons will be carried out every sixth year.

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APPENDICES

APPENDIX 1

SOUTHWESTERN REGION FOREST PLANS AMENDMENT FOR MANAGEMENT OF THE MEXICAN SPOTTED OWL AND NORTHERN GOSHAWK

On June 5, 1996, the Regional Forester for the Southwestern Region of the FS amended the Forest Plans for all National Forests in Arizona and New Mexico to incorporate the Mexican Spotted Owl Recovery Plan (USFWS 1995) and the Management Recommendations for the Northern Goshawk in the Southwestern United States (Reynolds *et al.* 1992). Although the amendment does not directly address Goodding's onion, the direction is likely to reduce or eliminate certain threats to many Goodding's onion sites.

A. MEXICAN SPOTTED OWL STANDARDS AND GUIDELINES

The Mexican Spotted Owl Recovery Plan provides management guidelines for "protected areas" (*eg*. "protected activity centers", steep slopes within mixed-conifer and pine-oak types where timber harvest has not occurred in the past 20 years, and reserved lands including wilderness, *etc*.), and "restricted areas" (*eg*. all mixed-conifer, pine-oak forests not included in "protected areas", and riparian forests). The recovery plan does not propose specific guidelines for "other forest and woodland types" (*eg*. pinyon-juniper, ponderosa pine, spruce-fir, aspen) where they occur outside of protected activity centers. The recovery plan also identifies grazing and recreation management guidelines for all "protected" and "restricted" areas.

Most of the management guidelines in the recovery plan would likely promote the conservation of Goodding's onion by restricting or moderating timber harvest and road/trail construction within protected areas, and by promoting "good to excellent" range conditions within "key grazing areas" such as riparian areas.

Impacts of fire on Goodding's onion are not understood. Therefore, the effects of recovery plan guidelines allowing or promoting the use of prescribed and prescribed natural fires are uncertain. However, the emphasis of the recovery plan on implementing prescribed fire as a means of reducing the risk of catastrophic fires, while maintaining existing forest structure, is likely to promote the continued existence of Goodding's onion.

1. Standards

- Allow no timber harvest except for fuelwood and fire risk abatement in established protected activity centers. For protected activity centers destroyed by fire, windstorm, or other natural disasters, salvage timber harvest or declassification may be allowed after evaluation on a case-by-case basis in consultation with the FWS.

- Allow no timber harvest except for fire risk abatement in mixed conifer...on slopes greater than 40 percent where timber harvest has not occurred in the last 20 years.

- In protected and restricted areas, when activities conducted in conformance with these S&Gs may adversely affect other threatened, endangered, or sensitive species or may conflict with other established recovery plans or conservation agreements; consult with the FWS to resolve the conflict.

2. Guidelines

- In protected activity centers, road or trail building should be avoided but may be permitted on a case-by-case basis for "pressing" management reasons.

- Fuels may be treated in portions of some protected activity centers by harvesting trees less than 9 inches in diameter, mechanical fuel treatment, and prescribed fire.

- Outside of protected activity centers, mixed-conifer forests that have slopes greater than 40 percent and that have not been logged within the past 20 years may be treated for fuel accumulation by using a combination of thinning trees less than 9 inches in diameter, mechanical fuel removal, and prescribed fire.

- Within wilderness and research natural areas, prescribed fire may be used where appropriate.

- In all mixed-conifer outside of protected areas, manage at least 10 percent of the mixed-conifer forest for 170 basal area, and an additional 15 percent of the mixed-conifer forest for 150 basal area. Within these areas, manage for at least 20 large trees per acre (18 inches diameter or larger). These minimums are likely to maintain at least 50 percent canopy cover in mixed-conifer stands (D. Beal, pers. comm.).

B. NORTHERN GOSHAWK STANDARDS AND GUIDELINES

This management direction applies to forest communities that are outside of Mexican spotted owl protected and restricted areas. Therefore, management direction would

impact Goodding's onion sites in spruce-fir habitats outside of wilderness areas and not associated with spotted owl activity areas.

1. Standards

– Manage for old age trees such that as much old forest structure as possible is sustained over time across the landscape.

– When activities conducted in conformance with these standards and guidelines may adversely affect other threatened, endangered, or sensitive species or may conflict with other established recovery plans or conservation agreements; consult with FWS to resolve the conflict.

2. Guidelines

– Emphasize maintenance and restoration of healthy riparian ecosystems through conformance with forest plan riparian standards and guidelines. Management strategies should restore degraded riparian areas to good condition as soon as possible. Damage to riparian vegetation, stream banks, and channels should be prevented.

– Low intensity ground fires are allowed at any time in all forested cover types.

– Outside Goshawk Post-Fledgling Family Areas:

  Spruce-Fir. Canopy cover for mid-aged forest (VSS 4) should average ⅓ at 60 percent and ⅔ at 40 percent; mature forest (VSS 5) should average 60+ percent; and, old forest (VSS 6) should average 60+ percent.

  Mixed-Conifer. Canopy cover for mid-aged forest (VSS 4) should average⅓ at 60+ percent, and ⅔ at 40+ percent; mature forest (VSS 5) should average 50+ percent; and, old forest (VSS 6) should average 60+ percent.

– Within Goshawk Post-Fledgling Family Areas:

  Spruce-Fir. Canopy cover for mid-aged forest (VSS 4) should average 60+ percent and for mature (VSS 5) and old forest (VSS 6) should average 70+ percent.

  Mixed-Conifer. Canopy cover for mid-aged (VSS 4) to old forest (VSS 6) should average 60+ percent.

– Within Goshawk Nesting Areas:

In spruce-fir and mixed-conifer, the nesting area contains only mature to old forest (VSS 5 and 6) having a canopy cover of 50-70 percent.

C. GRAZING MANAGEMENT

"Forage use by grazing ungulates will be maintained at or above a condition which assures recovery and continued existence of threatened and endangered species."

APPENDIX 2

MONITORING

Monitoring is necessary to determine if Goodding's onion populations are being sustained and is thus a critical component of the species' conservation strategy. But, the same intensity of monitoring is not needed for all management units. Populations with few management concerns in remote localities such as wilderness areas can be monitored less frequently and less intensively than populations in areas where some ongoing activity may detrimentally affect them. The following table describes five levels of monitoring for Goodding's onion. Each succeeding level is more complex than the previous and increases the amount of information gained. But, each succeeding level also increases the amount of time and effort needed to gather the information. It is anticipated that level 1 or level 2 monitoring will be satisfactory to track most Goodding's onion populations. If declining populations are found, or if new management concerns arise, higher levels of monitoring may be needed to document impacts and formulate corrective actions.

Goodding's Onion Monitoring Levels

Level	Field Data Collected	Can Determine
1 - Presence/ absence	Determine presence or absence of species at the site.	Basic population persistence.
2 - Population estimates	Estimate numbers of individuals in a population by extrapolating from macroplots or making an overall approximation. Approximate the areal extent of population.	Gross assessment of changes in population size and areal extent. Over long term, permits tracking of population movements and general size changes.
3 - Population counts	Count number of individuals or calculate from controlled sample plots if population is large. Count or calculate number of individuals with reproductive activity, damage, or other indices of interest. Measure population area, recording perimeter.	Accurate measurement of population size and area, metapopulation size, reproduction, and damage. Over long term, permits modeling natural range of variation of population and metapopulation dynamics, mean reproductive rates, effects of herbivory and other damage, correlation with environmental parameters, and population trends.
4 - Individual measurements	Measure and record for each individual: size, reproductive activity, damage, and other indices.	Population structure, class reproductive rates, disturbance impact, class growth rates, and phenology. Over long term, allows understanding of natural range of variation in population size structure, population-level correlation of size and reproduction, and differential impacts of disturbance.

Goodding's Onion Monitoring Levels		
5 - Individual tracking	Identify individual plants by location, usually within a monitoring plot. Measure and record individual size, reproductive activity, damage, and other indices.	Survival/mortality, recruitment, individual growth, and reproductive effort. Over long term, allows correlation of survival with growth and reproduction, detailed understanding of changes in population size structure over time, individual persistence and life history attributes, vegetative propagation activity, and detailed disturbance monitoring.

APPENDIX 3

PERSONS CONTACTED DURING DEVELOPMENT AND REVIEW OF THE CONSERVATION STRATEGIES

Persons Contacted for the Apache/Sitgreaves National Forests Strategy

	AFFILIATION/POSITION	CONTRIBUTION
Robert Leaverton	ASNF/Ecosystem Staff	Timber recommendations
Don Wood	ASNF/LMP Staff	Review draft
Gary Loving	ASNF/Fire Management Officer	Review draft
John MacIvor	Springerville R.D./Ranger	Review draft
John Moore	Springerville R.D./Staff	Livestock management
Linda White-Trifaro	Springerville R.D./Biologist	Review draft
Vicente Ordonez	Springerville R.D./Biologist	Review draft
Mitchell White	Alpine R.D./Range Specialist	Review draft
James Copeland	Alpine R.D./Biologist	Review draft
Bill Jackson	Alpine R.D./Fire Management	Prescribed fire
Angie Brooks	USFWS, Arizona	Review draft
Terry Myers	ASNF/Biologist	Preparer

Persons Contacted for the Coronado National Forest Strategy

Debra Bieber	Santa Catalina R.D./Biologist	Review draft
Jennifer Ruyle	Santa Catalina R.D./Ecologist	Review draft
Randall Smith	CNF/Natural Resources Staff	Review draft
Peter Warren	The Nature Conservancy	Contributor/Review draft
Mima Parra-Falk	CNF/Forest Botanist	Preparer

Persons Contacted for the Gila National Forest Strategy

Paul Boucher	GNF/Wildlife Biologist	Review draft
Joe Anderson	Reserve R.D./Biologist	Review draft
Pat Morrison	Quemado R.D./Biologist	Review draft
Jerry Hibbetts	Quemado R.D./Ranger	Review draft
Buck McKinney	Quemado R.D./Range Staff	Review draft
Margaret Kirkeminde	Quemado R.D./Biologist	Preparer

Persons Contacted for the Lincoln National Forest Strategy

	AFFILIATION/POSITION	CONTRIBUTION
Jose Martinez	LNF/Forest Supervisor	Review
Jerry Hawkes	LNF/District Ranger	Review/Recommendations
Don DeLorenzo	LNF/Rare Plant Staff Officer	Review/Recommendations
Johnny Wilson	LNF/Recreation Staff Officer	Review/Recommendations
Renee Galeano-Popp	LNF/Forest Biologist	Review/Recommendations
Larry Cordova	LNF/District Biologist	Review/Recommendations
Dave Cummings	LNF/District Fire Staff	Review/Recommendations
Sam Tobias	LNF/District Recreation Staff	Review/Recommendations
Charlie McDonald	USFWS/Botanist	Review/Recommendations
Linda Barker	LNF/Forest Botanist	Preparer

APPENDIX 4

GOODDING'S ONION CONSERVATION AGREEMENT

BETWEEN

U.S. FISH AND WILDLIFE SERVICE
SOUTHWEST REGION
500 GOLD AVENUE, SW
ALBUQUERQUE, NEW MEXICO 87102

AND

U.S. FOREST SERVICE
SOUTHWESTERN REGION
517 GOLD AVENUE, SW
ALBUQUERQUE, NEW MEXICO 87102

I. INTRODUCTION

Goodding's onion (*Allium gooddingii*) is a Forest Service sensitive species and a candidate (61 FR 7596; February 28, 1996) for listing as threatened or endangered under the Endangered Species Act of 1973, as amended. This conservation agreement addresses Goodding's onion management on National Forest System lands. Final approval of the Goodding's Onion Conservation Agreement represents a commitment by the Forest Service (Apache/Sitgreaves, Coronado, Gila, and Lincoln National Forests), and the Fish and Wildlife Service to manage this plant in a manner consistent with this agreement and with each agencies' policies in order to alleviate threats and ensure that the species does not require listing under the Endangered Species Act. This agreement incorporates the management direction and commitments contained in the Goodding's Onion (*Allium gooddingii*) Conservation Assessment and Strategy (U.S. Forest Service and U.S. Fish and Wildlife Service 1997).

Goodding's onion is a herbaceous perennial plant in the lily family (Liliaceae). It occurs most frequently in drainage bottoms and on moist north-facing slopes of mature mixed-conifer and spruce-fir forests at 7,500-11,250 feet elevation. Goodding's onion sites are currently known from the White Mountains of Arizona, the Mogollon Mountains of New Mexico, and from three isolated locations: the Santa Catalina Mountains of southern Arizona, near Sierra Blanca Peak in southern New Mexico, and the Chuska Mountains that straddle the Arizona/New Mexico border.

Several types of impacts, both in the past and potentially in the future, have altered Goodding's onion habitat in ways that are detrimental to its survival. These impacts include, but are not limited to, livestock grazing, timber harvest, ski resort operation, and wildfire.

II. PURPOSE

The purpose of this agreement is to provide for the long-term conservation of Goodding's onion through proactive management of the species and its habitat. This will require the implementation of multiple use management strategies that maintain the integrity of the entire ecosystem upon which Goodding's onion depends. Such strategies will benefit other threatened, endangered, and sensitive species that share this ecosystem.

Conservation Goals and Objectives

The following goals and objectives define each Forest's management direction as established through the Goodding's Onion Conservation Assessment and Strategy document. This management direction should be sufficient to ensure the conservation of the ecosystem and the long-term survival of Goodding's onion throughout its natural range.

Goals:

A. Pursue opportunities to conserve and restore the entire ecosystem where Goodding's onion occurs.

B. Protect and maintain existing Goodding's onion sites to ensure their long-term conservation and viability on the Forests.

C. Develop opportunities to increase the number and size of Goodding's onion sites where habitat potential will allow and where the increase will lower the likelihood of local or regional extirpations.

Objectives:

1. Implement Forest Plan and Forest Service Manual direction for Goodding's onion as a sensitive plant species by developing management strategies and guidelines sufficient to provide for the continued viability of Goodding's onion.

2. Prevent and alleviate impacts from management activities that degrade Goodding's onion habitat and cause declines at occupied sites.

3. Monitor Goodding's onion sites and if significant declines are detected assess the causes and initiate corrective actions.

4. Initiate research opportunities within the Forest Service and with other agencies or private groups.

III. AUTHORITY

A. Involved Parties

1. U.S. Department of Agriculture, Forest Service
2. U.S. Department of Interior, Fish and Wildlife Service

B. Authorities

Endangered Species Act of 1973, as amended
National Forest Management Act (1976)
U.S. Forest Service Manual (FSM 2670) on endangered, threatened, and sensitive species
National Memorandum of Understanding for the conservation of species tending toward Federal listing issued January 25, 1994 (94-SMU-058).

IV. STATEMENT OF MUTUAL BENEFIT

It is mutually beneficial for the parties involved to secure all Goodding's onion sites from habitat loss and degradation. Goodding's onion and other species will benefit from conservation actions that maintain and improve healthy ecosystems. The participating agencies will benefit from the flexibility of managing Goodding's onion without its listing under the Endangered Species Act.

V. RESPONSIBILITIES

A. Forest Service Shall:

1. Implement conservation actions and monitoring as specified in the Goodding's Onion Conservation Assessment and Strategy.

2. Retain Goodding's onion on the Regional Forester's sensitive species list to ensure that Biological Evaluations are conducted to determine effects of planned projects within existing Goodding's onion sites or suitable habitat.

3. Fully involve the Fish and Wildlife Service and interested State agencies during the National Environmental Policy Act process for all projects that may impact Goodding's onion or its habitat.

4. Conduct surveys for Goodding's onion in areas of potential habitat and provide data to the Fish and Wildlife Service and interested State agencies.

5. Support studies and other scientific research to better understand the biology and ecology of Goodding's onion.

B. U.S. Fish and Wildlife Service Shall:

1. Provide technical assistance in the implementation of Forest's conservation strategies.

2. Assess the listing of Goodding's onion under the Endangered Species Act if biological information indicates the species is likely to become in danger of extinction throughout all or a significant part of its range in the foreseeable future. Listing would follow the rulemaking process

C. Both Parties Shall:

1. Work together under the terms of this conservation agreement to manage, protect, and restore the ecosystems upon which Goodding's onion and other species depend.

2. Annually review implementation of the Forest's conservation strategies, share data and information, conduct field reviews as needed, and provide recommendations to the Regional Forester and Regional Director on any proposed changes to the strategies or amendments to this conservation agreement.

3. Meet together as soon as mutually deemed necessary, but at least before the sixth year of this agreement, to review the Forest's conservation strategies and recommend any changes in their content or implementation.

3. Fulfill their administrative responsibilities to oversee the implementation of the Goodding's Onion conservation strategies, which includes the allocation of staff time for technical supervision and project administration, and the programming of outyear budget needs and botanical skills.

VI. AGREEMENT TERM

This agreement shall remain in force for 10 years from the date of signature. The Goodding's Onion Conservation Agreement will be reviewed and amended as needed.

VII. SPECIAL PROVISIONS

A. This agreement may be modified or amended as necessary upon review of the proposed amendments and written consent of all parties. This agreement may be terminated by either party with a 60 day written notice to all other parties.

B. This agreement is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds among the parties of this agreement will be handled in accordance with applicable laws, regulations, and procedures.