

**PETITION TO LIST THE
CHIHUAHUA SCURFPEA
(*Pediomelum pentaphyllum*)
UNDER THE U.S. ENDANGERED SPECIES ACT**



Photo by: Mike Howard, BLM 2006

**In the Office of Endangered Species
U.S. Fish and Wildlife Service
United States Department of Interior**

Petitioner:

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October 9, 2008



Executive Summary

WildEarth Guardians hereby petitions the U.S. Fish and Wildlife Service (FWS) to list the Chihuahua scurfpea (*Pediomelum pentaphyllum*) under the Endangered Species Act (ESA). This rare plant has only been collected eight times since it was first observed in 1744. The Petitioned species appears to be quite rare in the U.S. and its status in Mexico is unknown, but assumed to be extirpated. The Chihuahua scurfpea does not send up an aerial portion in extremely dry years, making the task of relocating populations and finding new locations more difficult. Although surveys may be difficult during dry years it does not fully explain why there have been so few collections of this plant over the past 260 years. One argument may be that the plant is naturally rare but this does not hold true, as the species used to be relatively common in markets of Chihuahua City, Mexico. This species is currently facing endangerment or extinction and appears to be in decline. The Chihuahua scurfpea therefore biologically warrants listing under the ESA.

The Chihuahua scurfpea is a poorly understood plant. It is unknown whether the habitat in which this plant is found in New Mexico is optimal. Known locations are in areas that were historically grasslands, but have been converted to scrub due to grazing pressure. Botanists have questioned if the Chihuahua scurfpea is just “hanging on” in the habitats where it is currently found. The Petitioned species is currently found in areas that are subject to grazing. While cattle have not been documented grazing on this species, the response of this plant to domestic livestock and other disturbances is not well understood.

Much, if not all, of the New Mexico populations occurs on New Mexico State and U.S. Bureau of Land Management (BLM) lands. The population recently documented in Arizona is on private land. State and federal status of this plant does not provide any protection for this species with the exception of state regulations which prohibit collection. No state or federal management plans exist for this species, nor have any population monitoring plans been established to follow known plants, locate new plants, or determine optimal habitat and its extent.

There are only approximately 300 known individuals of this species in the world. One population of approximately 260 plants is known in New Mexico and one population of a few dozen plants is known in Arizona. The population in New Mexico has been threatened and adversely affected by the application of herbicide by the BLM. In 2006, the State of New Mexico elevated the species to endangered due to the concerns of over-collection and management practices by federal agencies. Federal listing is now required for habitat protection, protection from known or suspected threats, and so that this rare plant can be brought back from the brink of extinction.

Introduction

The Chihuahua scurfpea is a wide-ranging, but rare species. The Chihuahua scurfpea is a desert grassland legume associated with the Chihuahua Desert floristic region. Its historic range included Chihuahua, Arizona, New Mexico, and Texas. In New Mexico, it is found in gravelly, sandy loam soils that consist of mesquite and creosote scrub/grassland habitat. There is little known about this plant's biology, ecology or optimal habitat. Questions have been raised as to whether the habitat in which this plant is currently found is suitable for the species, as it has been shown that the current habitat has been converted from a grass-dominated to shrub-dominated habitat.

Population surveys for the Chihuahua scurfpea can be difficult during years of low precipitation. The species has a long tuberous root that allows it to stay dormant during periods of low water or drought. The flowering and growth season for *P. pentaphyllum* is during early spring (April/May) and late summer (August), although such activity is dependent on levels of precipitation. It is at this time of year that plant surveys are conducted. If water is not present during these survey times the plant will not emerge from the ground or flower, hindering population surveys.

Historically the plant was known in the vicinity of Chihuahua City, in the state of Chihuahua, Mexico; two counties in Arizona; one county in New Mexico; and one county in Texas. It was collected in Mexico by the Tarahumara people, as the plant has medicinal properties that help to reduce fevers. Until 2006, it was believed that the populations of this plant in Mexico, Arizona, and Texas were extirpated. In 2006, one population of a couple of dozen plants was relocated in Arizona. The initial documentation of the plant in New Mexico was in 1937. It was not until 1995 the plant was re-documented in New Mexico, even though surveys were conducted in the intervening years to locate the plant. The 1995 surveys documented the Chihuahua scurfpea in Hidalgo County, New Mexico, the county it had been initially observed in 1937. The plant has not been relocated in Texas. Only approximately 300 plants are known collectively from the two locations in New Mexico and Arizona.

A known threat to this plant is herbicide spraying. Brush encroachment and livestock grazing may also threaten the persistence of the Chihuahuan scurfpea. While the threat of collection has been addressed by state protection of the species in New Mexico, it is not protected from collection elsewhere in its range.

Endangered Species Act Implementing Regulations

Section 424 of the regulations implementing the Endangered Species Act (50 C.F.R. § 424) is applicable to this petition. Subsections that concern the formal listing of the Chihuahua scurfpea as an Endangered or Threatened species are:

424.02(e) “Endangered species” means a species that is in danger of extinction throughout all or a significant portion of its range.”...(k) “species” includes any species or subspecies that interbreeds when mature.

“Threatened species” means a species that “is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (16 U.S.C § 1532(20)).

424.11(c) “A species shall be listed...because of any one or a combination of the following factors:

1. The present or threatened destruction, modification, or curtailment of habitat or range;
2. Overutilization for commercial, recreational, scientific, or educational purposes;
3. Disease or predation;
4. The inadequacy of existing regulatory mechanisms; and
5. Other natural or manmade factors affecting its continued existence.”

Multiple factors set forth in 50 C.F.R. § 424.11(c) and ESA Section 4 (16 U.S.C. § 1533(a)(1)) have resulted in the continued decline of the Chihuahua scurfpea and are causing the species to face endangerment and extinction.

Petitioner

WildEarth Guardians is a non-profit environmental organization whose mission is to protect and restore wildlife, wild places, and wild rivers in the American West. In fulfilling this mission, WildEarth Guardians has worked to conserve species that face high levels of imperilment, especially those who play important umbrella and keystone functions within their ranges. WildEarth Guardians aims to prevent the extinction of all native plants and animals in the western U.S., including the Chihuahua scurfpea.

Classification and Nomenclature

Common Name. The common name for *Pediomelum pentaphyllum* (Rydberg 1919) is the Chihuahua scurfpea. Other common names include but are not limited to: contra yerba, five-leaf scurfpea, three-nerved scurfpea, and small Indian breadroot.

Taxonomy. The Chihuahua scurfpea was originally collected sometime before 1744 in Mexico but the type locality was not documented until 1908 (L’Aine 1744; Palmer 1908).

The precise location in Mexico where the type locality' specimen was collected is unknown but authors place it in the "vicinity of Chihuahua" (Sivinski 1993). The description presented in Palmer's notebook places the collection at El Gallego, which is on a railroad line approximately 137 km north of Chihuahua City. Apparently, indigenous people had brought the plant to Palmer in Chihuahua City (Sivinski 1993).

There are approximately 30-39 species of *Pediomelum* in North America, including synonyms (USDA 2007). Synonyms for *P. pentaphyllum* L. Rybd. include *P. trinervatum* Rydberg; *Psoralea pentaphylla* L.; and *Psoralea trinervata* (Rydberg) Standley. The taxonomic classification for *P. pentaphyllum* is as follows:

Table 1. Taxonomy of Chihuahua scurfpea.

Kingdom	<i>Plantae</i> – Plants
Subkingdom	<i>Tracheobionta</i> – Vascular plants
Superdivision	<i>Spermatophyta</i> – Seed plants
Division	<i>Magnoliophyta</i> – Flowering plants
Class	<i>Magnoliopsida</i> – Dicotyledons
Subclass	<i>Rosidae</i>
Order	<i>Fabales</i>
Family	<i>Fabaceae</i> – Pea family
Genus	<i>Pediomelum</i> Rydb. – Indian breadroot

The authority for this species and its taxonomic history is rather complex. In the most recent past the plant was known and published as *P. trinervatum* but is currently recognized as *P. pentaphyllum*. Linnaeus is the recognized author of the species (*Hortus upsaliensis*, p. 225). He based his 1748 description on the work of Jussieu L'Aine who used the name *Psoralea (Pediomelum) pentaphylla (pentaphyllum)* to describe the plant (L'Aine 1744). The original description and illustration were based on a cultivated plant grown from seeds that were collected in Mexico around 1744 (Warren 1994).

Much of the confusion begins with Rydberg's (1919) description of a species he erroneously associated with *P. pentaphyllum*. Rydberg described *P. pentaphyllum* based on numerous specimens he collected from Mexico. These collections were later assigned to *P. palmeri* (Rydberg 1919; Ockenden 1965; Warren 1994). *P. palmeri* is a common and widespread species found throughout Mexico and should not be synonymized with the name *pentaphyllum* (Warren 1994). Rydberg also described *P. trinervatum* (what is now known as *P. pentaphyllum*) but recognized this plant as distinct from the species he categorized as *P. pentaphyllum* (Rydberg 1919; Warren 1994).

In 1965, Ockendon reviewed the subgenus *Pediomelum* (Ockenden 1965). In his review he compared Linnaeus's original description of *P. pentaphyllum* with Rydberg's description and other specimens that were available to him (Sivinski 1993; Warren 1994). Based on this information, Ockenden determined that Jussieu's original description did

not fit any known species. He therefore discontinued the use of the name *pentaphyllum* for the species described by Linnaeus. This conclusion resulted in part because Jussieu's description gave few measurements and did not mention certain critical characteristics (Ockenden 1965). Ockenden went on to give a new name to the species that had been known as *pentaphyllum*: *Pediomelum palmeri*. Ockenden felt that *P. trinervatum* was the least likely of three species to which the name *pentaphyllum* might apply. He recognized *P. palmeri* and *P. trinervatum* as two distinct species. Ockenden assigned the name *Pediomelum pentaphyllum* to the species that is now known as *Pediomelum hypogeum* var. *scaposum* of Texas (Sivinski 1993; AZGFD 2001).

Another review of the genus was conducted by Grimes in 1990 (Grimes 1990). Grimes also reviewed Jussieu's description and concluded that "the identity is decisive." With certitude he identified Jussieu's plant as *P. trinervatum*. Grimes resurrected the name *pentaphyllum* and gave it priority over *trinervatum*. Grimes also recognized *P. palmeri* as distinct from *trinervatum/pentaphyllum* (Warren 1994). In doing so, Grimes submerged Rydberg's *P. pentaphyllum* into synonymy with *P. palmeri* and placed *P. trinervatum* into synonymy with his concept of *Pediomelum pentaphyllum*.

Grimes assigned the authority as *Pediomelum pentaphyllum* (L.) Grimes. However, Grimes failed to realize that in a previous transfer of the genus *Psorelea* to *Pediomelum* by Rydberg, the resultant combination (*Pediomelum pentaphyllum*) must be retained for the species to which the type *Psorelea pentaphylla* belongs, and that *Pediomelum pentaphyllum* must be attributed to Rydberg, even though Rydberg erroneously applied his combination to a different species (ICBN Art. 55.2) (Sivinski 1993). The proper sequence of authority is *Pediomelum pentaphyllum* (L.) Rydb. (Kartesz and Gandhi 1992).

In summary, despite much confusion, *P. pentaphyllum* refers only to the species of which only two populations are currently known globally (1 population in New Mexico and 1 population in Arizona, and no known locations in either Texas or Mexico, as described in this Petition).

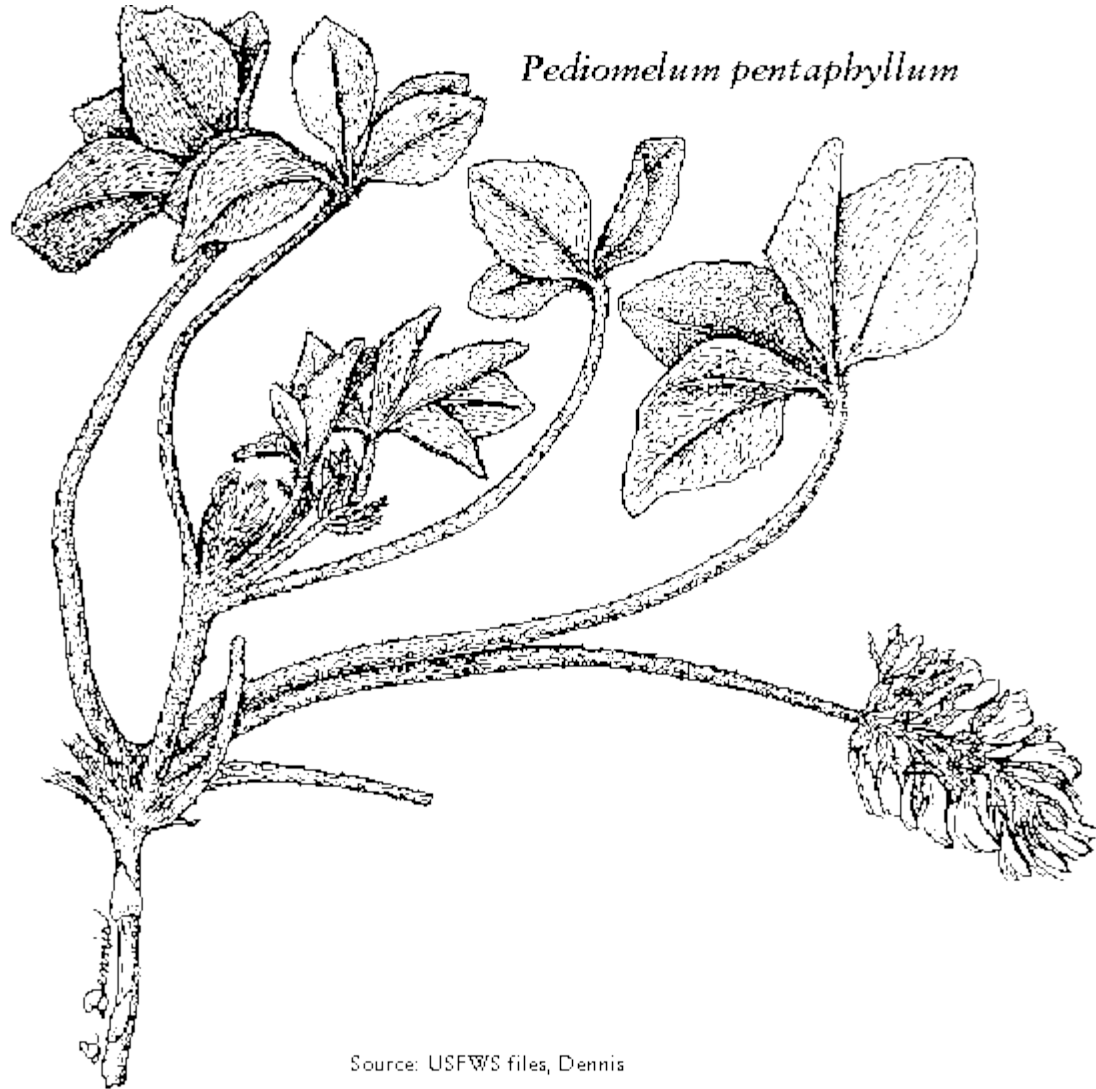


Figure 1. Drawing of a Chihuahua scurfpea. Source: USFWS.

Description

The original description of *Pediomelum pentaphyllum* was based on a cultivated plant. The description did not provide many measurements and did not mention certain characteristics that are currently considered critical in distinguishing this species (L'Aine 1744; Ockenden 1965). Palmer was the first to describe a specimen from the field (Palmer 1908). His brief description states that the tuber is approximately 20 cm and the branches are 60 cm, which is an unusually large plant for this species (Palmer 1908; Sivinski 1993). Few collections of this plant have been made in the last 260 years and the most modern full description of *P. pentaphyllum* comes from Correll and Johnson's (1970) treatment of the vascular plants of Texas:

Perennial from a deep, enlarged, fusiform taproot 40-55 mm long and 12-22 mm thick; stem 2-3 dm tall; pubescence conspicuous, appressed or somewhat spreading; leaves palmately (or very short pinnately) 5(6) foliolate; petioles 8-15 cm long; lanceolate, rhombic or oblanceolate, with an obtuse mucronate apex and crinkly margins, 2-5 cm long, 2-2.5 cm wide, gland dotted and less densely pubescent above; stipules scarious, lanceolate to linear, to 15 mm long; racemes dense, globose or more elongate, to 6 cm long; peduncles 4-9mm long, shorter than the petioles; pedicels short, to 2 mm long; flowers 12-18 mm long; corolla weakly exceeding the calyx lobes; calyx tube (in flower) 4-5 mm long, calyx lobes 10-22 mm long, enlarging considerably in fruit, very unequal, the upper 4 linear subulate, the lower 1 elliptic, about 3 mm wide in flower and to 7 mm in fruit; lower calyx lobe (in fruit glabrate) sparsely punctuate, with 3 prominent veins; beak of fruit stout, flat, broad, 10-15 mm long, projecting somewhat beyond the calyx lobes; seed large, rather thick and of uniform thickness, markedly reticulate.

A less technical description is given by Spellenberg (1999):

Perennial herb up to about 25 cm tall, with straight gray hairs that lie against the surface of the foliage; stems with a thin, cord like, easily broken, subterranean portion bearing a few small bracts and a short aerial, leafy portion; root a deeply buried spindle-shaped taproot; leaves with minute, dark, glandular dots, palmately (or very shortly pinnately) compound, with petioles 8-15 cm long; leaflets 5 (rarely 6), lanceolate, rhombic or oblanceolate, 25-50 mm long, 15-23 mm wide, the lower surfaces more densely hairy than upper; flowers in a dense ovoid grayish-hairy cluster 2-4 cm long, 2-2.5 cm wide, on a peduncle 4-9 mm long, each flower bilaterally symmetrical, pea-like, 14-18 mm long, purple; fruit a small pod 7-8 mm long, barely surpassing the calyx teeth.

Distinctive Traits

Chihuahua scurfpea plants are short stemmed, with the appearance that they are stemless. The stems are grayish, or whitish, with pubescent herbage. The roots are quite long and tuberous and the calyx lobes are very unequal (NatureServe 2001). In New Mexico no other *Pediomelum* species grows within the range of *P. pentaphyllum*. In Arizona, *P. megalanthum* is similar, but has leaves that are more perfectly palmately compound, rather than shortly pinnately compound as in *P. pentaphyllum*. *P. megalanthum* has 5-8 leaflets, *P. pentaphyllum* has 5 and rarely 6 leaflets and is more often broadly rounded at the tip (rather than more rhombic, which characterizes *P. megalanthum*) (Spellenberg 1999).

The characteristic long taproot of this species allows it to survive in harsh desert conditions. The plant is believed to restrict growth to a minimum during dry years; the tuber apparently being an adaptation to accomplish this (Howard 2004a). The plant responds directly to precipitation levels and may remain dormant if water is not present (Tonne 2000; Howard 2005a; Howard 2005b; Howard 2006a). It is unknown how many

years the plant can remain dormant without dying (Howard pers. comm.). During periods of adequate rainfall, the plant is fairly obvious and exhibits growth and flowering during both the spring and summer monsoon periods (Howard 2004a). These characteristics make surveys for the plant rather difficult during drought or dry years.

The Chihuahua scurfpea is known as a medicinal plant. It has been used by the Tarahumara people to reduce fever and could potentially have other pharmaceutical properties (Sivinski 1993; Tonne 2000).

Range Distinction

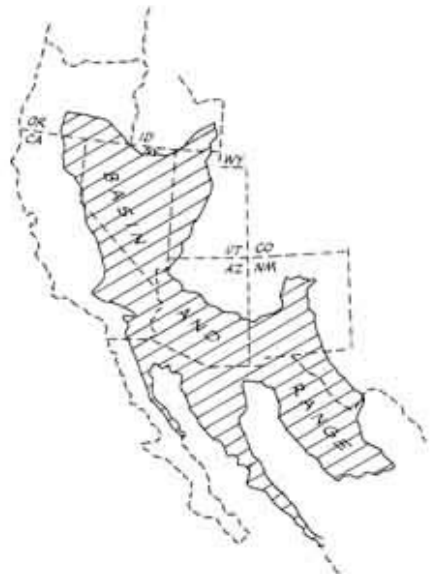
Until 2006, only one population of this plant had been located in the U.S. during the last 34 years (Tonne 2000). This population occupies 80 acres within southwestern New Mexico (BLM 2006). In 2006, a BLM biologist re-documented a population in southeast Arizona (Howard 2006c). This is the first known occurrence of this species in Arizona since 1963. The Chihuahua scurfpea was known to be present in Chihuahua, Mexico and Texas but is currently believed to be extirpated in both of these states.

Geographic Distribution Historic and Current

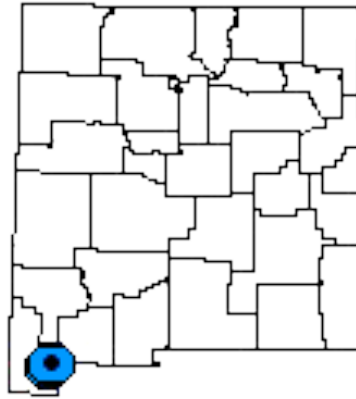
The historic geographic distribution of the Chihuahua scurfpea was the lower portion of the Basin and Range Province of the southwestern United States and northern Mexico (Figure 2). *Pediomelum pentaphyllum* was believed to have been wide-ranging, but sparsely populated in this province, which consists of the northern Chihuahuan Desert region. It was known in Chihuahua, Mexico, Texas, New Mexico, and Arizona. The first collection of this species was in Mexico sometime before 1744. The type locality was also collected in Mexico but not until 1908 (L'Aine 1744; Palmer 1908). The first U.S. collection was made circa 1853, “in fields near the Presidio del Norte,” in Presidio Co., Texas (Table 2) (Correll and Johnston 1970; Sivinski 1993). Since then, it was collected in Arizona in 1936 (Graham Co.) and in 1963 and 2006 (Cochise Co.) (Tables 2 and 3). In New Mexico, *Pediomelum pentaphyllum* was collected in Hidalgo Co. in 1937 and again in 1995 (Table 2) (Sivinski 1993; Tonne 2000).

Figure 2. Basin and Range Province of the southwestern United States and northern Mexico. Source: USGS 2000.

As discussed previously, until 2006, there was only one known population of this species, located in the southwestern portion of New Mexico, Hidalgo Co. (Figures 3-6). The current known range in New Mexico is less than 12 square miles (7,680 acres), with the Petitioned species inhabiting 80 acres within this range (NatureServe 2001). The population in Texas has yet to be relocated, and it is questionable as to whether



it is still extant (Sivinski 2004). It is believed that populations in the vicinity of Chihuahua, Mexico are extirpated or extremely rare. *Id.* In 2006 a population in Arizona, where the species had also been believed to be extirpated, was relocated (Howard 2006c). The population was found in the Sulfur Springs Valley on private land in Cochise County. *Id.*



**Figure 3. Current range distribution of *Pediomelum pentaphyllum* in New Mexico.
Source: NMRP 1999b.**

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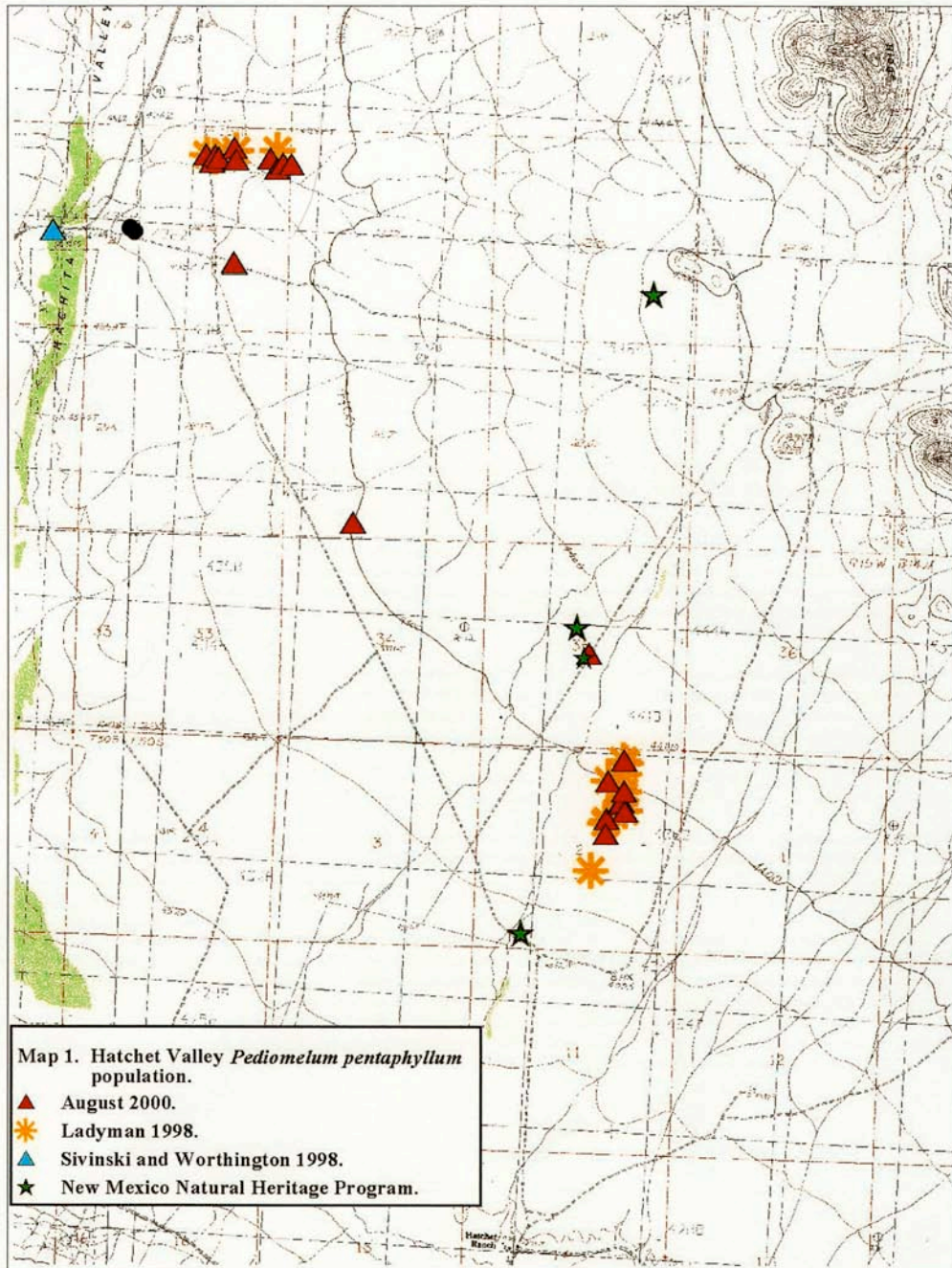
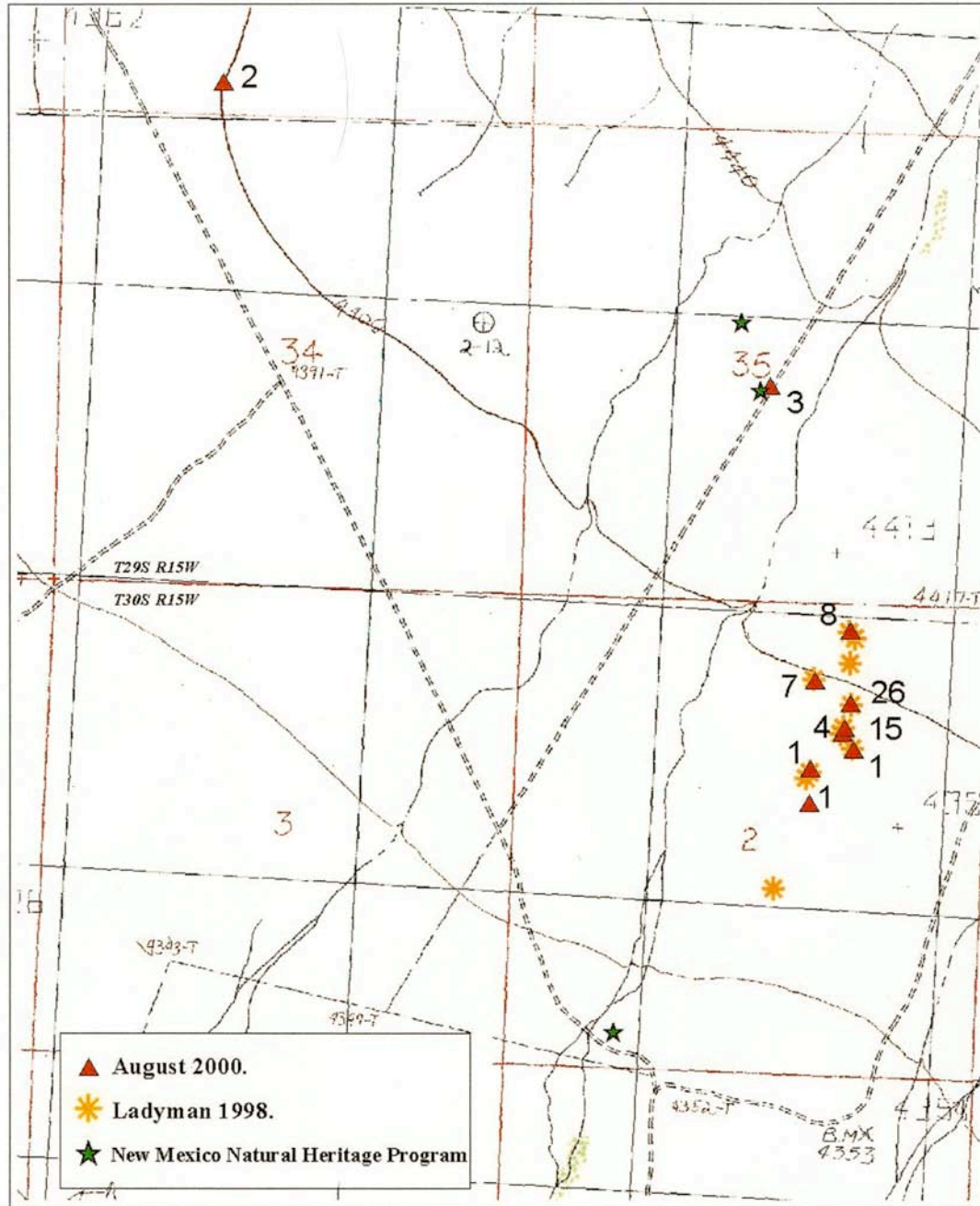


Figure 4. Location and distribution of *Pediomelum pentaphyllum* plants in Hidalgo Co., NM. Source: Tonne 2000.



Map 2. Southeast portion of the *Pediomelum pentaphyllum* population. Numbers are plant counts from August 2000 surveys for this plant. USGS 7.5' quads: Doyle Peak and Hatchet Ranch, New Mexico.

Figure 5. Southeast portion of *Pediomelum pentaphyllum* population, with individual plant numbers in New Mexico. Source: Tonne 2000.

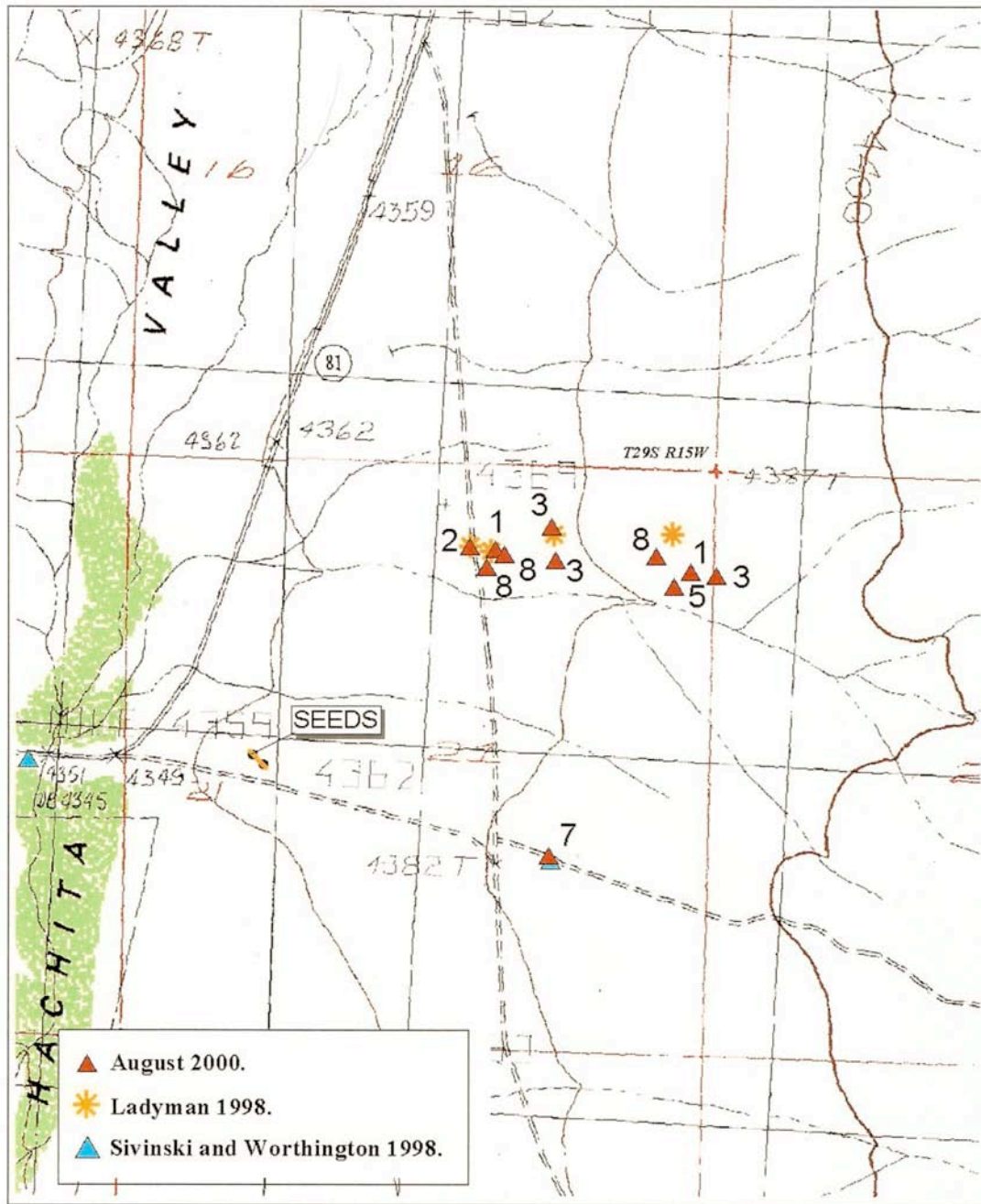


Figure 6. Northeast portion of *Pediomelum pentaphyllum* population, with individual plant numbers in New Mexico. Source: Tonne 2000.

Habitat Requirements



Figure 7. Photo of Chihuahua scurfpea habitat. Source: Mike Howard, BLM.

The Chihuahua scurfpea inhabits the Chihuahua Desert floristic region. The habitat in which this species is found is poorly documented outside of New Mexico. The physical habitat in which plants have been found in New Mexico are flat to gently sloping sandy or gravelly loam soils, with the proportion of small-sized (0.5 cm 1 cm diameter) gravel ranging from sparse to moderate (Spellenberg 1999). This area receives about 10.55 inches of rain per year and is at an elevation of 1,350-2000 m (4,400-6,600 ft) (Spellenberg 1999; WRCC 2000). Historical collection locations from Arizona show this plant in a slightly lower elevation 1,098–1,373 m (3,600–4,500 ft).

The Chihuahua scurfpea is found in at least three different plant communities in New Mexico (Spellenberg 1999):

- 1) A honey mesquite (*Prosopis glandulosa*)/little leaf sumac (*Rhus microphylla*) community. Other shrubs that can be in equal or lower abundance are creosote bush (*Larrea tridentata*), mariola (*Parthenium incana*), Torrey yucca (*Yucca torreyi*) and soaptree yucca (*Yucca elata*).
- 2) A sparsely distributed, but dominant, creosote bush community with mesquite, longleaf jointfir (*Ephedra trifurca*), snakeweed (*Gutierrezia sarothrae*) and desert zinnia (*Zinnia acerosa*) in lower abundance.
- 3) An open grassland habitat with burrograss (*Scleropogon brevifolius*) and scattered mesquite.

Plant communities in which populations have been found in New Mexico consist of highly degraded black grama/soaptree yucca grassland and transitional to mixed desert scrub on basin sandy plains (Tonne 2000). It is notable that *P. pentaphyllum* plants are generally found in bare areas between other plants (NatureServe 2001). Although habitat

requirements do not seem to be very stringent, plants were found in a very low percentage of apparent potential habitat surveyed in New Mexico. *Id.* Based on current understanding of the habitat in which plants are found, an initial GIS model suggests there is a substantial amount of potential habitat in the southwestern portion of New Mexico, approximately 2.4 million acres (Howard 2006b). In a survey conducted in New Mexico, 68 (58%), of the *P. pentaphyllum* individuals were associated with sandy patches within honey mesquite (*Prosopis glandulosa*) and creosote bush shrublands (Tonne 2000). The remaining 49 (42%) individuals were found at the periphery of highly degraded black grama/soaptree yucca grasslands within sandy loam soils. The soaptree yucca was associated with both distributions and is believed to be the best indicator of habitat for the Chihuahua scurfpea. *Id.*

The more common sandy shrubland habitat of the Chihuahua scurfpea in New Mexico is actually a mosaic created by vegetation and soils that vary considerably over short distances. This mosaic includes sparse vegetation on clay flats, dense tobosagrass (*Pleuraphis mutica*) on sandy-clay soils, honey mesquite and creosote on low sandy rises and creosote on gravelly loams. The clay surfaces are often cracked, indicating cycles of wetting and drying and ephemeral standing water. Floral diversity is also variable and is highest on sandy soils, decreasing on clays and gravelly soils which have been converted to mesquite and creosote shrublands over the past 100-150 years (Buffington and Herbel 1965). The patchy soil/vegetation is hard to explain based solely on the history of grazing in this area, though cattle likely play a role in the rate of change in both soils and vegetation. Indicators point to a pre-settlement black-grama/soaptree-yucca-dominated landscape with a much smaller shrub component (Buffington and Herbel 1965).

It is unknown if the present habitat in which the Chihuahua scurfpea is found is optimal, as the area in which populations have been located has been heavily grazed and were previously grasslands. A number of studies have shown that vast expanses of former black grama grasslands on sandy soils in southern New Mexico were historically present (Buffington and Herbel 1965; York and Dick-Peddie 1969; Rich et al. 1999). Soaptree yucca, a current indicator of Chihuahua scurfpea habitat, is a primary component of desert grasslands and may indicate former grasslands converted to shrublands (Dick-Peddie 1993). Thus, there is evidence that the Chihuahua scurfpea is associated with current or former desert grasslands, although it is unclear whether it ever occupied high quality black grama grasslands since it now occurs only near degraded grasslands or in shrublands possibly converted from former grasslands (Tonne 2000). Botanists have stated that known populations of the Chihuahua scurfpea may be “hanging on in marginal habitat.” *Id.*

Reproduction and Dispersal

The Chihuahua scurfpea is a perennial which reproduces sexually, presumably through outcrossing (Tonne 2000). Plants flower in April and May. Depending on precipitation, this species has been known to flower a second time in July and August (Spellenberg 1999). In New Mexico it commences flowering in April and apparently dies back by August (NatureServe 2001). Nothing is known about the pollination biology of this

species nor the method of seed dispersal. Seeds do remain in the fruits and the fruits persist in the inflorescence. The whole inflorescence breaks away from the plant at maturity, and it appears likely that the entire inflorescence is easily moved by wind or some other dispersal agent (Tonne 2000).

There are no closely sympatric congeners associated with the New Mexico population. Therefore, it is unlikely that any hybridization with other species has taken or is taking place in New Mexico. *Id.* Information regarding possible hybridization is not known for the population in Arizona.

Population Density

Populations of Chihuahua scurfpea in known locations in New Mexico vary in extent from 1-34 individuals (Tonne 2000; Howard 2005c) (Table 2, Figures 4-6). The population located in Arizona consists of a few dozen plants (Howard 2006c).

Mortality

No diseases are known to be associated with the Chihuahua scurfpea. Overutilization through collection, herbicide application, and habitat degradation are considered the greatest threats to this species (Sivinski 2004; AP 2006). The plant is considered to have medicinal properties and collection in Mexico for such purposes may have caused its extirpation (Bye 1986). The herbicide tebuthiuron has been applied to land in New Mexico in habitat occupied by the Chihuahua scurfpea. Results of monitoring studies show that this species is negatively affected by this herbicide (Hauser 2004b; Howard 2005a; Howard 2005b). Other causes of mortality may include herbivory and trampling by livestock but these direct impacts on the Petitioned species have not been documented (Tonne 2000). Habitat degradation is also a considerable threat to the survival of *Pediomelum pentaphyllum*. Areas in which this species has currently been located have been heavily overgrazed. In these areas there is little vegetation to anchor soils. The soil is therefore easily and rapidly eroded or altered during periodic flooding events as well as subject to wind erosion (Tonne 2000). It has also been demonstrated that the habitat used to consist of grasslands and has been converted to a shrub-dominated habitat due to livestock grazing, leaving the Chihuahua scurfpea to persist in a highly disturbed habitat. Livestock grazing therefore appears to have harmful indirect effects (habitat degradation) on the Petitioned species.

Historic and Current Population Status & Trends

The Petitioned species appears to be extremely rare, with only approximately 300 individuals known to exist. There is also evidence of extirpation and therefore decline. Due to the Chihuahua scurfpea's biological characteristics and ecology, minimal or no growth during low rainfall years makes ground survey for the plant very difficult during dry years (Howard 2004a). Much of the plant's lifetime is spent dormant. There are only a few times each year that the Chihuahua scurfpea growth may be found above ground.

This is during the wet seasons of April/May and August. Even during these times, if there has not been enough precipitation, the plants may remain dormant.

Historic

As discussed previously, the species name *pentaphyllum* has been applied to three distinct plant species. This has caused confusion as, at times, differences in naming would assume that the plant was widespread and common throughout its range (Warren 1994). To add to the name confusion, the common name contra yerba is applied to a *Kallstroemia* species in New Mexico.

The species now known as *Pediomelum pentaphyllum* or Chihuahua scurfpea has been collected only eight times during the last 260 years, at widely separated localities (Tonne 2000). In 1908, the plant was thought to be locally common in the vicinity of Chihuahua City due to its appearance in the markets (Bye 1986). In Wooten and Standley’s 1915 account of New Mexico flora, this species was not recorded in the state (Spellenberg 1999). In 1859 a plant was collected along the New Mexico/Mexico border, initially identified as *Psoralea esculenta* and later considered to be *Pediomelum pentaphyllum*. It was not until 1937 that another *P. pentaphyllum* specimen was collected in New Mexico and it was in 1936 that a specimen was collected in Arizona (Table 2).

Table 2. Herbarium specimens label localities and information for *Pediomelum pentaphyllum*. Sources: Sivinski 1993; Tonne 2000.

Collector	Date	Location	Herbaria	Notes
Palmer, E.	1908 (June 5 to 10)	Vicinity of Chihuahua	US, NY	Specific location discussed in previous section.
Perry, C.C., Bigelow, J.M., Wright, C. and Schott, A.	~ 1859	U.S. Mexico Boundary, Rio Grande below Dona Ana	US	No date on specimen label but identified as <i>Psolarea esculenta</i> by Torrey, Bot. U.S. Mex Bound pg 49, 1859.
Rhinchart, D.A.	1936 (1 April)	Graham Co., AZ, near lower end of San Simon plot	NMC	Sandy soil, heavy erosion, distribution common.
Gooding, L.N.	1937 (1 May)	10 miles south of Hatchita, NM sandy mesa	SCS	Confused label with multiple written hands. There are no “Sandy mesas” south of Hatchita.

Deaver, C.F.	1963 (1 September)	Hwy 181 near Chiricahua National Monument, SE of Wilcox, Cochise Co., AZ	SCS	
Worthington, R.D.	1995 (8 April)	Hidalgo Co., NM. Hatchita Valley. 12 air miles S of Hatchita, 8 air miles NE from the top of Big Hatchet Peak, along a dirt road traveling E-W from the graded dirt road	NMC, UNM	Sandy flats with igneous alluvium, with <i>Yucca elata</i> , <i>Ephedra trifurca</i> . In flower. Elevation 4,350.
McIntosh, L.	1998 (23 April)	Hidalgo Co., NM. 8 air miles NE of Big Hatchet Peak. (S 35 T29S R15W)	NMC	Opening in <i>Larrea tridentata</i> , bare areas between other plants, level loamy soil with small amount of gravel; heavily grazed in past.
Ladyman, J. Chauvin, Y.	1998 (April)	Hidalgo Co. NM. T30S R15W sec. 02 NE 4	UNM	With <i>Rhus microphylla</i> and <i>Prosopis glandulosa</i> .

Current

In 1993, a search of the literature and herbaria resulted in the location of only five specimens (Sivinski 1993). Surveys were conducted by Sivinski in 1993 to verify the herbaria collections within the U.S., in Arizona and New Mexico. No plants were found at the historical sites of collection. *Id.* It wasn't until 1995 that populations in New Mexico were located and 2006 that the Arizona population was re-documented (Tonne 2000; Howard 2006c). Presently populations of Chihuahua scurfpea in Texas and Chihuahua, Mexico appear to be extirpated (Bye 1986; Sivinski 2004). It is unknown how stable the populations are in New Mexico (NatureServe 2001). The population in Arizona has been so recently relocated that the status of populations of this plant in Arizona is also unknown (pers. comm. Mike Howard, BLM).

Based on surveys conducted on BLM lands in 2004 and data from Tonne's 2000 survey, there are approximately 260 known *Pediomelum pentaphyllum* plants in New Mexico (Hauser 2004b; Howard 2005c) (Figures 4-6 and 8). A few dozen plants were recently documented in Arizona (Howard 2006c). In New Mexico, two herbicide treatment projects have occurred in 2004 and 2006 within potential or suitable Chihuahua scurfpea

habitat. It is known that the herbicide treatment directly and negatively affect 25 individuals (~ 7% - 9% of the known New Mexico population) (Howard 2005a; 2005b; 2006a). It is unknown how many other individual plants were present in the treated areas as the initial survey ceased due to dormancy of plants. The actual population is likely higher on BLM lands than recorded within the New Mexico population, as 2004 surveys were cut short due to the onset of dormancy (Howard 2005c; 2006d).

Table 3. Confirmed New Mexico locations of Chihuahua scurfpea. All locations are restricted to Hidalgo County. Sources: Tonne 2000 (state land locations), Howard 2004a (BLM locations).

# of Plants	Legal Description	Ownership
7	29S 15 W 21 center of SE4	State Trust land
5	29S 15 W 21 NE4NE4	State Trust land
1	29S 15 W 21 NW4NE4	State Trust land
2	29S 15 W 21 NW4NE4	State Trust land
8	29S 15 W 21 NW4NE4	State Trust land
1	29S 15 W 21 NW4NE4	State Trust land
8	29S 15 W 21 NW4NE4	State Trust land
3	29S 15 W 21 NW4NE4	State Trust land
8	29S 15 W 21 NW4NE4	State Trust land
3	29S 15 W 21 NW4NE4	State Trust land
3	29S 15 W 22 NW4NW4	Bureau of Land Management
2	29S 15 W 27 SE4SW4	Bureau of Land Management
3	29S 15 W 35 Center	Bureau of Land Management
8	30S 15W 02 NW4NE4	State Trust land
9	30S 15W 02 NW4NE4	State Trust land
26	30S 15W 02 NW4NE4	State Trust land
1	30S 15W 02 NW4NE4	State Trust land
1	30S 15W 02 NW4NE4	State Trust land
4	30S 15W 02 NW4NE4	State Trust land
15	30S 15W 02 NW4NE4	State Trust land
1	30S 15W 02 NW4NE4	State Trust land

Land Ownership

In New Mexico, Chihuahua scurfpea is only found in Hidalgo Co. (Figures 3-6). Lands on which this species has been found are owned by the New Mexico State Land Office and by the BLM (Table 3). The Arizona population was found on private land in the Sulfur Springs Valley, Cochise County (Howard 2006c). Historic locations in Arizona were on National Park Service lands of the Chiricahua National Monument and possibly

on BLM land (AZGFD 2001). The landownership for the historic locality of this species in Texas is unknown.

Identified Threats to the Petitioned Species: Criteria for Listing

A petitioned species needs to meet only one of the five criteria for ESA listing. The Chihuahua scurfpea meets multiple criteria (criteria met are bolded):

- 1. Present and threatened destruction, modification, and curtailment of habitat and range;**
- 2. Overutilization for commercial, recreational, scientific, or educational purposes;**
3. Disease or predation;
- 4. The inadequacy of existing regulatory mechanisms; and**
- 5. Other natural or manmade factors affecting its continued existence.**

The habitat of the Chihuahua scurfpea has been degraded by livestock grazing. Additional threats include collection of the plant for medicinal use and harm to the species from herbicide application. Current regulatory mechanisms are not adequate to protect this species from endangerment or extinction.

I. Present and Threatened Destruction, Modification, or Curtailment of Habitat or Range

Livestock Grazing

The New Mexico population occurs in an area that has a long history of cattle grazing (Tonne 2000). There has been no documentation of direct grazing by cattle on this plant, but past and current grazing pressures may account for some of the seemingly accelerated soil erosion taking place in this area and rarity of the plant due to a degraded habitat. Areas occupied by *P. pentaphyllum* and cattle are essentially devoid of any significant grass component. Areas with little vegetation to anchor the soils are rapidly eroded or altered during periodic flooding events and may be subject to wind erosion. Extensive flood events remove deep sandy soils which this plant occupies. Wind erosion is also of concern although it is unknown how strong a role wind plays with regard to soil migration in the area occupied by *P. pentaphyllum* and its impact on suitable habitat. *Id.*

The effects of disturbance on this species are unknown, although it occupies a highly disturbed area in New Mexico. One cause of disturbance is cattle grazing and it is difficult to assess whether grazing has decreased habitat for this species. As noted previously, based on the habitat characteristics in which *P. pentaphyllum* plants have currently found, an initial GIS model suggested that there is approximately 2.4 million acres of suitable habitat (Howard 2006b). Grazing converts grasslands into scrub-dominated habitat (Buffington and Herbel 1965). The presence of yucca soaptree in

areas occupied by *P. pentaphyllum* indicated that such a conversion occurred within the Chihuahua scurfpea's habitat. Research has not been conducted to determine if the Petitioned species is currently occupying optimal habitat or just "hanging on" in marginal habitat (Tonne 2000).

Oil and Gas Exploration

Gas development projects in southern New Mexico may be a potential threat (Spellenberg 1999). Oil and gas exploration in southwestern New Mexico has historically been quite low compared to other areas of the state. However, the State Land Office has recently received bids on mineral leases in the area and this may become an issue in the near future (Natalie Runyan pers. comm. in Tonne 2000). It is unknown what effect oil and gas exploration activities might have on Chihuahua scurfpea populations (Tonne 2000).

II. Overutilization for commercial, recreational, scientific, or educational purposes

Collection likely posed an historical threat to the Petitioned species. The Tarahumara Indians of Mexico used *P. pentaphyllum* as a medicinal plant to reduce fever (Bye 1986). This species was regularly available in the Chihuahua City market in 1908, but has not been available in recent years. The reasons for the plant's disappearance from the market are unclear but likely due to over collection. *Id.*

In New Mexico, the Petitioned species' state-listing prohibits its collection in that state (NMAC 2007). It does not enjoy similar protections anywhere else in its historic range.

III. Disease or predation

At present, there are no known diseases or incidences of predation shown to affect *Pediomelum pentaphyllum* (Tonne 2000). There is one documented case of a plant succumbing to termites but this does not appear to be common (Howard 2005a). As discussed previously, it is not known whether livestock graze on this plant.

IV. The inadequacy of existing regulatory mechanisms

Existing regulatory mechanisms are not adequate to protect the Chihuahua scurfpea from the threats it faces.

Species Status Rankings

The Chihuahua scurfpea appears to be a wide-ranging, but uncommon species (Grimes 1990; Spellenberg 1999). This plant is afforded little or no protection by law, as current state and federal status/rankings do not provide any policy or regulatory mechanisms for protection.

NatureServe Global Status: G1 – (last reviewed in 1999, last changed in 1998)
G1 Critically Imperiled - Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 5 or fewer occurrences or very few remaining individuals (<1,000) or acres (<2,000) or linear miles (<10).

NatureServe National status: N1- Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

Neither NatureServe rank provides any regulatory or policy mechanisms to protect *Pediomelum pentaphyllum*.

USFWS: Species of Concern - Taxa that are at-risk or potentially at-risk due to rarity, restricted distribution, habitat loss, and/or other factors.

This status requires that the species be considered in biological and environmental evaluations but does not require any protection or mitigation for populations or its habitat.

USFS/BLM: Sensitive – Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by:
a. Significant current or predicted downward trends in population numbers or density.
b. Significant current or predicted downward trends in habitat capability that would reduce a species existing distribution.

This status requires that the species be considered in biological and environmental evaluations but does not require any protection or mitigation for populations or its habitat.

New Mexico State listed: Endangered - The taxon is a rare plant across its range within the state, and of such limited distribution and population size that unregulated taking could adversely impact it and jeopardize its survival in New Mexico.

In 2006, the State of New Mexico amended the New Mexico Endangered Plant Species List to include the *Pediomelum pentaphyllum*. While this is a positive step forward in protecting this species, the New Mexico Administrative Code ((NMAC) 19.21.2) under which the Endangered Plant Species List falls, provides little protection for the plant and no protection for its habitat. The NMAC prohibits collection of the Chihuahua scurfpea in New Mexico (NMAC 2007), but it is not protected from habitat destruction.

NatureServe rank for New Mexico: S1 – Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

NatureServe rank for Texas: SH – possibly extirpated.

NatureServe rank for Arizona: S1 – Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

Although they signify critical imperilment throughout the range of the Petitioned species, none of the NatureServe state rankings provide any regulatory or policy mechanisms to protect the Chihuahua scurfpea.

Prior History as an ESA Candidate Species

The Chihuahua scurfpea was previously designated by FWS as an ESA Category 2 candidate species. The 1990 Candidate Notice of Review (CNOR) ranked the species as a candidate under the scientific name *Pediomelum trinervatum* (55 FR 6184, 6217 (Feb. 21, 1990)). The 1993 CNOR ranked the species as a candidate under the scientific name *Pediomelum pentaphyllum* and considered its trend to be declining (58 FR 51144, 51179 (Sept. 30, 1993)). It remained a Category 2 candidate until 1996, when FWS dropped all Category 2 and 3 species from its ESA candidate list (61 FR 7596-7613 (February 28, 1996)). It has not since been listed as an ESA candidate.

Management

Conserving the Petitioned species requires better understanding of its habitat requirements and distribution, as the needs of this plant are currently poorly understood (Tonne 2000). This investigation and development of an adequate recovery plan will likely not occur without federal ESA protection. State and federal agencies have not heeded the continuous and repeated opinions of botanists to monitor known populations, search for additional populations, determine specific habitat preferences, total area of such habitat, and monitor the response of this plant to natural disturbances and management practices (Spellenberg 1999; Tonne 2000; Sivinski 2004; Howard 2006a). General management concerns include the impact of livestock grazing and the insufficiency of information as to what constitutes suitable habitat (Spellenberg 1999). While it is unknown how grazing affects this species, it has been suggested that grazing needs to be controlled in areas occupied by the Chihuahua scurfpea until studies on how well this species tolerates disturbance can be assessed. *Id.*

At the present time, the only research being conducted on Chihuahua scurfpea is a study on the effects of the herbicide tebuthiuron. Grazing is not being managed to monitor or prevent impacts on the Chihuahua scurfpea on BLM. In New Mexico, state and BLM lands are surveyed on an irregular basis by the respective botanists in charge of managing sensitive plant species in New Mexico (Spellenberg 1999).

While the Chihuahua scurfpea has been assessed in relation to projects proposed in its habitat adequate time was not given to determine the effect of such projects. This is due to the ephemeral nature of the Chihuahua scurfpea and the unrealistic expectation that projects can and should receive ground clearances and inventories in the same year that a treatment is proposed (Howard 2006d). Sufficient lead time in project planning is required to conduct reliable surveys during favorable conditions. Such time has not been allowed in previous projects proposed in Chihuahua scurfpea habitat (Hauser 2004a; Howard 2006d).

Caution regarding livestock management and other projects is warranted not only in occupied habitat but also potential habitat, as habitat preferences for the plant are not clear at this time, meaning more extensive precautionary measures need to be taken until a better understanding of the plant, its distribution, and its habitat needs can be gained (Howard 2006a). Giving emphasis to the species would mean a slow down on completion of authorization and projects (Howard 2006d). This rush to complete projects at the potential expense of Chihuahua scurfpea individuals was exemplified by the Hatchet Ranch and Wamel's Pond projects in which money, allotment schedules, and a short survey season were the primary concerns, not the well-being of the Petitioned species (Hauser 2004a; BLM 2006).

New Mexico State Listing as Endangered

The State of New Mexico placed the Chihuahua scurfpea on its Endangered Plant list in 2006. There was concern as early as 2000 that the plant needed to be elevated to State Endangered in New Mexico (Tonne 2000). It was also suggested at this time that if no additional populations in Arizona, Texas, and Mexico were located, the species should be proposed for listing by the USFWS (Tonne 2000). The final move to elevate the Chihuahua scurfpea to Endangered in New Mexico, was due to historical over-collection of the species and concerns regarding the potential impacts of vegetation manipulation projects, specifically herbicide treatment within occupied and potential habitat on BLM lands (Tonne 2000; Sivinski 2004; Howard 2006a; Howard 2006d).

State listing by New Mexico does not change the status or protection provided by BLM. State listing only protects the species from collection (Howard 2006d; NMAC 2007). A BLM botanist states that, "listing [State listing] could be viewed primarily as an indicator of increased management concern, suggesting that BLM should increase emphasis on management of the species" (Howard 2006d) but does not require the BLM to adopt measures that avoid jeopardizing the species' survival.

V. Other natural or manmade factors affecting its continued existence

Herbicide Treatments

In 2004 a multi-pasture (Hatchet Ranch) creosote control project was proposed on 3,150 acres of BLM and State lands, containing the only extant population of Chihuahua scurfpea known at the time (Howard 2004a; Hauser 2004b). The project entailed treating

existing pastures with the herbicide Spike 20P to reduce brush species. The purpose stated in the Environmental Assessment (EA) for this project was to assist the permittee in increasing his management options by enable thing permittee to rest more pastures and utilize the resources more uniformly (Hauser 2004b).

The stated long-term goals were to:

improve watersheds, increase vegetative diversity and production, increase wildlife populations, sustain or increase populations of species status, both plant and animal, increase flexibility of current and future ranching operations and create sustainability of the western livestock industry and communities that are dependent upon productive, healthy rangelands.

The EA also stated that, “one result should be that fewer species become endangered or threatened.” The proposed project was said to be consistent with the Mimbres Resource Management Plan (RMP).

Tebuthiuron is the active ingredient in Spike 20P. Tebuthiuron is a broad-spectrum herbicide extensively used to control weeds in non-cropland areas, rangelands, rights-of-way and industrial sites. It is effective on woody and herbaceous plants in grasslands. Weeds that are controlled by tebuthiuron include, for example, alfalfa (a legume), bluegrasses, chickweed, clover (another legume), dock, goldenrod, and mullein. Tebuthiuron is sprayed or spread dry on the soil surface, as granules or pellets, just before or during the time of active weed growth in order to stunt that growth. Rainfall enhances the initial control provided by this herbicide (EXTOXNET 1993).

More specifically, Spike 20P is a dry-pelleted herbicide that when applied to the soil surface moves through the soil profile when dispersed by precipitation. The chemical is absorbed by the roots of plants and translocated to the leaves where it inhibits photosynthesis (Hauser 2004b). With the onset of each precipitation event, plants essentially take up additional chemical resulting in an accumulation of the chemical, amplifying its affect. Woody plants die slowly over a period of 1 to 3 years.

In laboratory studies, tebuthiuron leached slowly through mulch soil but leached more readily through sandy soil, such as the type in which the Petitioned species grows. The chemical can be dispersed widely in the event of storms, as laboratory studies using tebuthiuron found the chemical in runoff water in field studies on controlled watersheds when storms occurred immediately after application. The average half-life of this chemical is 12-15 months in soil. In areas of low rainfall, such as that in which the Chihuahua scurfpea occurs, the half-life can be much longer: as many as five or more years. *Id.*

Populations of Chihuahua scurfpea were considered in the development of the Hatchet Ranch treatment (Sivinski 2004; Tonne 2004; Howard 2004a; Hauser 2004b). Initial and past surveys of the treatment area documented a total of approximately 260 plants at 22 locations in and around the project area (Howard 2004a). This is the entire known

population of Chihuahua scurfpea in New Mexico and the only known extant population at the time. Plants were found to be situated in two major colonies just north of the project area and one south of the project area. Three small “colonies” were located between the two larger ones, within the proposed project area. The three small colonies comprised a total of approximately 20 plants each. Both large colonies occurred on State land, while the three smaller colonies occurred on BLM land. While five surveys were conducted in the area, it was not apparent whether the entire proposed treatment had been searched, as surveys were cut short due to the onset of dormancy (Howard 2004a).

Based on opinions solicited from New Mexico botanists who had studied the Chihuahua scurfpea, it was expected that tebuthiuron would be highly toxic to this plant (Sivinski 2004; Tonne 2004; Howard 2004a). Another concern was that the effect of the treatment on the habitat was unknown. It was noted that further degradation of the habitat by increasing erosion would cause subsequent unearthing of plants due to lack of vegetative cover if there was no response of herbaceous vegetation following treatment (Howard 2004a). Botanists also questioned whether brush control in the desert on lands that would continue to be grazed, was worth the loss of the only, then known, population of the Chihuahua scurfpea (Sivinski 2004; Tonne 2004). The state botanist further stated that the BLM should “try to save this population, and not intentionally spray an herbicide on it” (Sivinski 2004).

The EA determined that application of tebuthiuron to areas occupied by the Chihuahua scurfpea “may or may not cause mortality of plants”(Hauser 2004b). The EA stated that, while studies have indicated that some members of the legume family are killed by the herbicide (alfalfa for certain), others, such as mesquite, are not negatively affected, given the rate of application presented in the EA. The EA further stated:

The root system of the *Pediomelum pentaphyllum* is a deeply buried fusiform taproot. The effectiveness of any translocatable chemical is affected by density of plants, their parent root system and the soil’s reactivity to the chemical. To date the specific effects that tebuthiuron may have on the *P. pentaphyllum* is unknown. A number of information searches have been performed by BLM, and there have been no conclusive studies conducted indicating whether this particular species would be affected by the herbicide. Literature searches indicated that species within the legume family may or may not be sensitive to tebuthiuron.

Although there was no conclusive evidence that the Chihuahua scurfpea would not be impacted by the herbicide treatment it was concluded that there would be no impact on this species due to the treatment (Hauser 2004a), an extremely non-precautionary conclusion. The author of the EA stated that in past treatments using Spike 20P, grass and forb species were not impacted unless directly hit with a pellet. It was therefore determined that with a pellet landing every meter, it was unlikely that the entire population of Chihuahua scurfpea would be affected (Hauser 2004a). It was stated that the only impact that the herbicide treatment might have on the Chihuahua scurfpea would be by direct competition from increased grasses and forbs (Hauser 2004a).

Botanists who specialized in Chihuahua scurfpea and were consulted on this project, suggested that the known colonies be buffered from treatment, that surveys be conducted in continual wet years, potential habitat be avoided, and that habitat requirements and trends be understood prior to jeopardizing the, then, only known populations of Chihuahua scurfpea (Sivinski 2004; Tonne 2004; Howard 2004a). The New Mexico State botanist stated that the project could seriously impact the species leading to an elevated listing of the species by the State and could begin to move it towards federal listing under ESA (Sivinski 2004). Ignoring these clear warnings, the EA concluded with a finding of no significant impact (Hauser 2004b). The potential loss of Chihuahua scurfpea plants in the herbicide treatment area was deemed an acceptable risk (Howard 2005c).

The final project as described in the EA only treated BLM lands. One large colony and one small colony was present within the BLM lands. The larger colony (24+ plants initially, with 2005 surveys documenting 35 plants) was buffered but herbicide was applied to lands on which the small colony was located (17 plants initially, with 2005 surveys documenting 25 plants) (Hauser 2004b; Howard 2005c). Additional surveys throughout the project area were not conducted in wet years and potential habitat was not avoided, as was suggested by the botanists as discussed above. The EA required a study plan be developed to determine the effects of tebuthiuron application on Chihuahua scurfpea (Howard 2005c). This plan classified the larger colony, which was buffered, as the control and the smaller colony, on which herbicide was, as the treatment.

In the fall of 2004 at a ratio of ½ lb/acre, Spike 20P was applied to the pastures of Hatchet Ranch. Application of the chemical was done in the fall to take advantage of fall and winter precipitation. This allowed the chemical to dissipate into the soil rather than running off with alluvial flows which would result in off site movement of chemical (Hauser 2004b). Grazing of the area was authorized during the treatment year and the first summer following the treatment as well as during the dormant season. Grazing was deferred during the second and third growing season during July 1 through Sept 30 to allow growth of grasses and forbs (Hauser 2004b).

The results of tebuthiuron application on the Chihuahua scurfpea show that this species is negatively affected and possibly killed by application of this herbicide. Spring 2005 surveys showed a large percentage (72%) of the plants in the treatment area were yellowing or brown, had dry leaves, and were prostrate, rather than upright, which is the normal appearance for this plant (Figure 8). There was also a difference between presence and absence data between the control and treatment areas with plants lost in the treatment area (Figure 8) (Howard 2005a). All of the plants in the control area were considered to have a healthy appearance. The control area also had significant forb growth (particularly *Astragalus nuttallianus*), while the treatment area was depauperate in forbs (Howard 2005a). The treatment area had an appearance of not receiving the same amount of rainfall in comparison to the control area. It was also documented that habitat 600 meters from the treatment area showed similar good health as the control area. Investigations of an untreated Chihuahua scurfpea colony on the far side of the treated plants showed plants there to be in generally the same condition as the control plants, with only a very small amount of leaf margin yellowing. These data suggested

that the appearance of the treated area was due to the effects of the herbicide and not lack of rainfall. *Id.* They also suggested that concerns initially raised by botanists were valid, as vegetation decreased in the treated area, increasing the potential for erosion and unearthing of Chihuahua scurfpea plants whose health was already compromised.

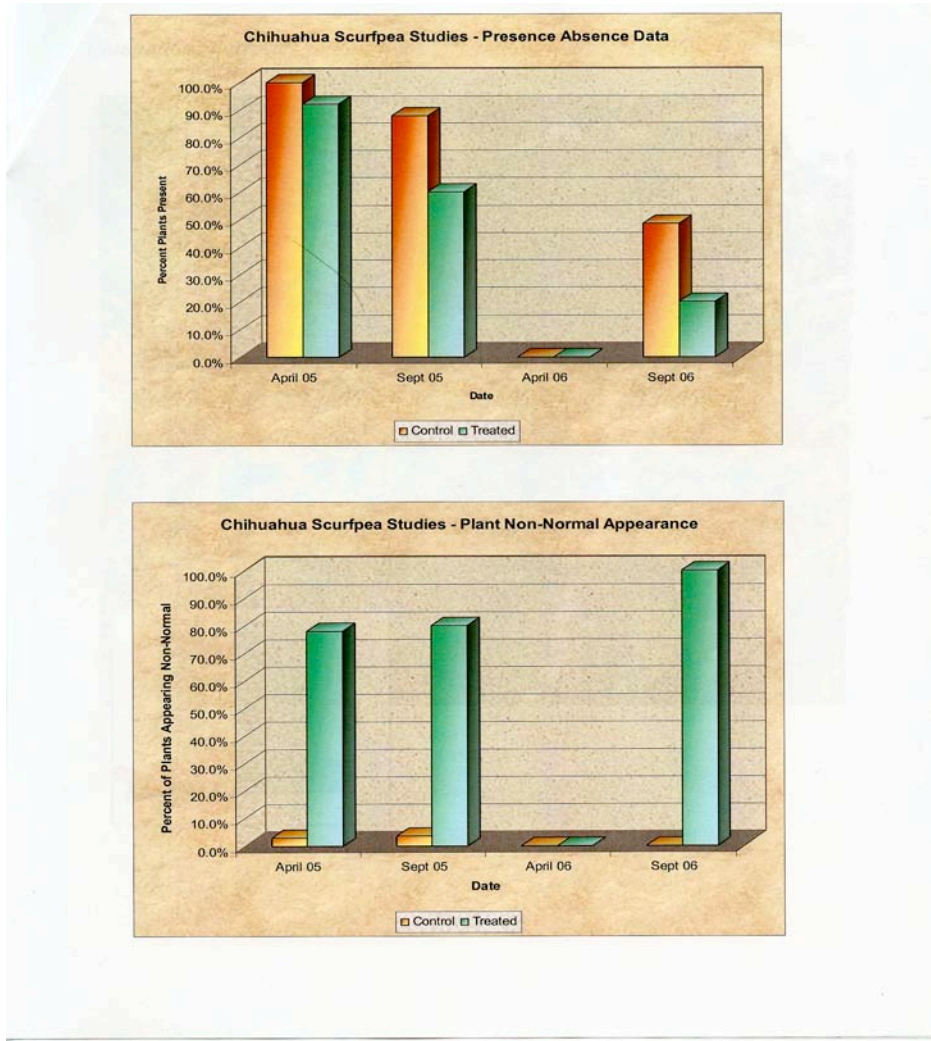


Figure 8. Presence/Absence and Normal/Non-normal appearance of control (orange) and treated (green) Chihuahua scurfpea plants after tebuthiuron treatment in fall 2004. Source: Howard 2005a.

Summer 2005 surveys demonstrated that Chihuahua scurfpea plants in the treatment area experienced harmful effects from tebuthiuron (Howard 2005b) (Figure 9). Survey notes stated that:

In spring 2005, apparent herbicide effects in the treatment area appeared as: a greater proportion of absent plants, greater proportion of non-normal appearing plants and greater proportion of non-flowering plants. With the summer 2005 monsoon growth period, effects of the herbicide on the treatment population

appear to have become more pronounced. Size classes between treatment and control were quite noticeable. A number of treatment plants showed very small leaflets and very low leaf volumes. Leaves of plants in the treatment area were light green colored compared to the dark green of plants in the control area. Plant presence proportion in the treatment area decreased further, with apparent mortality suggested by presence of depression in the soil where several missing plants were previously growing.

The 2005 summer survey, as with the spring survey, documented that the treatment area displayed apparent less vegetative cover than did the control area (Photo 1 in Howard 2005b). The field notes stated that, "It appears that the herbicide which is in full effect on tarbush and creosotebush has also affected the perennial forb community." Grasses in the treatment area were considered to be doing as well as in the control area. Soil in the treatment area was moist 2-3 inches below soil surface. These data represented conditions near the one year anniversary of the tebuthiuron treatment (Howard 2005b). Surveys in the spring of 2006 were unsuccessful as precipitation was minimal and plants did not emerge (Howard 2006d). Data for summer of 2006 have not been analyzed. *Id.*

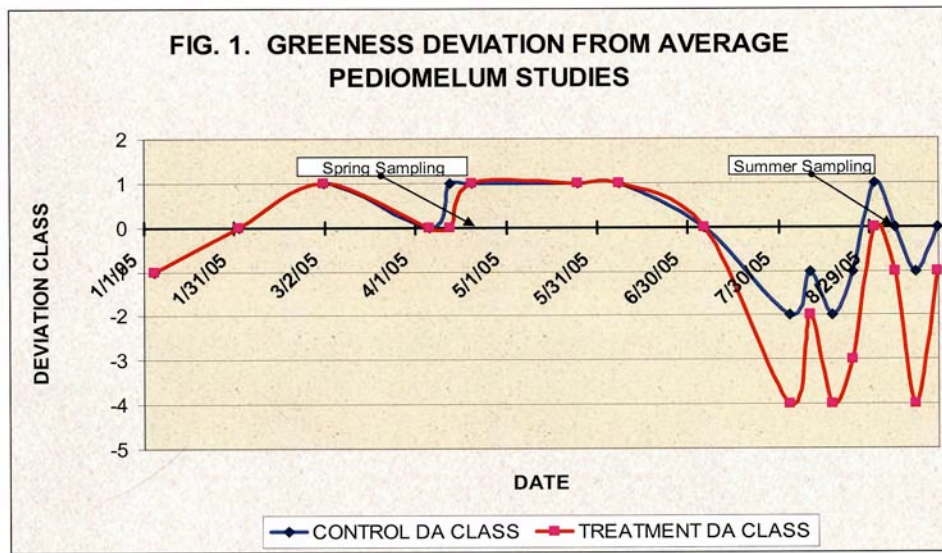


Figure 9. Deviation of greenness between control and treated Chihuahua scurfpea plants in tebuthiuron study. Source: Howard 2005b.

In 2005, another project related to range improvements on Hatchet Ranch was conducted. A 1.5-mile water pipeline and trough were installed to improve distribution within the pasture (Hauser 2005). This proposed project was said to complement the brush control, herbicide treatment, implemented in 2004 by improving management options. *Id.* The initial project proposal routed the pipeline through a known population of Chihuahua scurfpea. The proposal was redesigned to avoid this known population. *Id.* A site and route specific survey was completed in the summer of 2005 along the proposed pipeline

and no individuals or populations of Chihuahua scurfpea were identified within the area affected by pipeline installation. The EA stated that,

...direct impacts would occur to potential habitat of Chihuahua scurfpea but the impacts would not be substantial as to affect the species at the population level. Changes in utilization patterns may alter plant community composition, thus, modifying habitat potential for *Pediomelum pentaphyllum*. *Id.*

There is no information available on long term population effects on *Pediomelum pentaphyllum* from habitat modification. Therefore, it is unknown whether a change in plant community composition would affect *Pediomelum pentaphyllum*. *Id.*

The project proposal and ground survey for Chihuahua scurfpea were completed within the same year. This is another example of the lack of adequate time given to surveys for Chihuahua scurfpea in project areas.

In 2006, a second pasture treatment project using tebuthiuron was conducted on Wamel's Pond, Victoria Ranch, in New Mexico. This project treated 2,680 acres (Phillips and LaCasse 2006). Initial surveys in the area showed that there was potential habitat for Chihuahua scurfpea as there were extensive gravelly loam soils (McCormick 2006). Known populations of Chihuahua scurfpea were located approximately 8 miles southwest of the proposed treatment area (BLM 2006). A conditional clearance for Chihuahua scurfpea was issued until surveys could be conducted following precipitation in May or July/Aug 2006. The area was surveyed in September of 2006, at a time when Chihuahua scurfpea is known to have already become dormant. Not surprisingly, no Chihuahua scurfpea plants were observed during the September survey. *Id.* The project was given clearance, although there was a communication from a BLM botanist which stated that rainfall in the area was spotty during August of that year and of the 50 study plants in the Hatchet Ranch project, only one had emerged (Howard 2006b). A BLM botanist commented that this project exemplified a project that was so quickly implemented that adequate surveys were not conducted to determine if Chihuahua scurfpea populations were actually within the treatment area (Howard 2006d).

Invasive species

It is unknown if Chihuahua scurfpea can tolerate competition from invasive weeds (Spellenberg 1999), but FWS should further investigate this potential threat further.

Common management practices

The impact of common management practices such as burning, mowing, and mechanical soil disturbance on this species are unknown (Spellenberg 1999), but FWS should further investigate these potential threats to the Petitioned species.

Summary

The Chihuahua scurfpea merits listing as Endangered or Threatened species under the Endangered Species Act. This species has likely suffered habitat degradation due to indirect effects of livestock grazing. Livestock grazing has been shown to convert desert grasslands to scrub-dominated habitat which may be suboptimal habitat for this species. Grazing also increases erosion, which can degrade soil characteristics and may directly unearth Chihuahua scurfpea plants. While additional information needs to be obtained to determine the status of this plants populations in Arizona, it has been demonstrated that very few individuals are currently known: likely less than 300 individual plants range-wide. No monitoring programs, management plans, or enforceable regulatory mechanisms for protection or conservation exist for this species or the habitat in which it is found, except for restrictions on collection in New Mexico. Recent management actions by the federal government and evidence that the species is extirpated in Mexico and Texas convinced the State of New Mexico to up-list the species to Endangered. This petition is submitted with the hope that federal agencies will take similar steps as have state governments in acknowledging the vulnerability of this species to extinction and move to ensure the survival and recovery of the Chihuahua scurfpea. We believe ESA listing is vital to motivate research and a recovery program for this species and its habitat.

Need for Ecosystem Management

Petitioners believe that classification of the Chihuahua scurfpea as an Endangered or Threatened species under the ESA will insure that state and federal agencies develop an effective form of ecosystem protection. The Chihuahua scurfpea is a native desert grassland species. This ecosystem has been transformed into scrubland and needs to be protected.

Moreover, the protection of ecosystems is stated as the very purpose of the ESA. Where single species play keystone roles, the ESA's single-species protection provisions can correlate to ecosystem-wide protection. Livestock grazing in particular has turned desert grasslands into shrub dominated communities. A return to healthy desert grasslands is a desirable management goal. As an imperiled plant which indicates the demise of desert grassland habitats, the Chihuahua scurfpea's listing as Endangered or Threatened species should be among the FWS's highest priorities.

Requested Designation

WildEarth Guardians hereby petitions the U.S. Fish and Wildlife Service under the Department of Interior to list the Chihuahua scurfpea (*Pediomelum pentaphyllum*) as an Endangered or Threatened species pursuant to the Endangered Species Act. This listing action is warranted, given the extreme rareness of this species and the current and past degradation of the grasslands it inhabits as well as the threat from herbicide application. Current regulatory mechanisms are inadequate to protect this species from imperilment and extinction.

Critical habitat

Given the likely threat this species faces from habitat degradation and loss, this petition requests that critical habitat be designated for the Chihuahua scurfpea concurrent with ESA listing.

References

- Associated Press (AP) (2006). Two plants added to NM endangered - species list. Sun-News. Albuquerque.
- AZGFD (2001). *Pediomelum pentaphyllum*: Unpublished abstract compiled and edited by the Heritage Data Management System. Phoenix, AZ, Arizona Game and Fish Department: 5.
- BLM (2006). Environmental Assessment: Wamels Pond GRT, Bureau of Land Management.
- Buffington, L. C. and C. H. Herbel (1965). "Vegetational changes on a semidesert grassland range from 1858 to 1963." Ecological Monographs **35**(2): 139-164.
- Bye, R. (1986). "Medicinal plants of the Sierra Madre: comparative study of Tarahumara and Mexican market plants." Economic Botany **40**: 103-124.
- Correll, D. S. and M. C. Johnston (1970). Manual of vascular plants of Texas. Renner, TX, Texas Research Foundation.
- Dick-Peddie, W. A. (1993). New Mexico vegetation past, present and future. Albuquerque, NM, University of New Mexico Press.
- EXTOXNET. (1993). "Pesticide information profile: Tebuthiuron." Extension Toxicology Network Retrieved 18 April, 2007, from <http://pmep.cce.cornell.edu/profiles/extoxnet/pyrethrins-ziram/tebuthiuron-ext.html>.
- Grimes, J. W. (1990). "A revision of the New World species of Psoraleae (Leguminosae: Papilionoideae)." Memoirs of the New York Botanical Garden **61**: 1-114.
- Hauser (2004a). Email: hatchet brush control. M. Howard, Bureau of Land Management.
- Hauser, L. (2004b). Environmental Assessment: Hatchet Ranch 12 Miles Well Grassland Restoration and Fence, Bureau of Land Management: Las Cruces Field Office.
- Hauser, L. (2005). Environmental Assessment: Hatchet Ranch 12-mile Well pipeline, Bureau of Land Management.
- Howard, M. (2004a). Comments on EA for Hatchet Ranch 12-mile Well Fence and Creosote Control, Special Status Plants, Bureau of Land Management.
- Howard, M. (2005a). Field notes: *Pediomelum* studies 4/19-21/2005, Bureau of Land Management.

- Howard, M. (2005b). Field notes: *Pediomelum* studies 9/8/2005, Bureau of Land Management.
- Howard, M. (2005c). Study plan for Chihuahua scurfpea response to herbicide application, revised 9/21/2005, Bureau of Land Management.
- Howard, M. (2006a). Short Note Transmittal: monitoring update for studies completed on tebuthiuron treated Chihuahua scurfpea. Bureau of Land Management.
- Howard, M. (2006b). Email: Scurfpea update. BLM.
- Howard, M. (2006c). Phone conversation notes: John Anderson, BLM Botanist AZ, relocation of *P. pediomelum*.
- Hunt, C. B. (1967). Natural Regions of the United States and Canada. San Francisco, CA, W.H. Freeman and Company.
- Kartesz, J. T. and K. N. Gandhi (1992). "Nomenclatural notes-X." Phytologia **72**(2): 86.
- L'Aine, J. (1744). "Memoires de mathematique et physique." Academie Royale des Sciences: P. 381, plate 17.
- McCormick, J. (2006). Finding of No Significant Impact and Decision Record: Wamels Pond GRT, Division of Renewable Resources.
- NatureServe. (2001). "*Pediomelum pentaphyllum* (L.) Rybd." An online encyclopedia of life (web application). Version 1.6 Retrieved 17 April, 2007, from <http://www.NatureServe.org/explorer>.
- NMAC. (2007). "New Mexico Administrative Code." Retrieved 2 April 2007, from http://www.nmcpr.state.nm.us/NMAC/_titles.htm.
- NMRP. (1999b). "*Pediomelum pentaphyllum* Chihuahua scurfpea distribution map." New Mexico Rare Plants Technical Council Retrieved 14 April, 2007, from http://nmrareplants.unm.edu/rarelist_single_line.php?SpeciesID=128.
- NMRP. (2007). "*Pediomelum pentaphyllum* Chihuahua surfpea line drawing." Retrieved 14 April, 2007, from http://nmrareplants.unm.edu/rarelist_single_line.php?SpeciesID=128.
- Ockenden, D. J. (1965). "A taxonomic study of *Psoralea* subgenus *Pediomelum* (Leguminosae)." Southwestern Naturalist **10**(2): 81-124.
- Palmer, E. (1908). "356." US, NY June 5 to 10: Vicinity of Chihuahua; alt. about 1300 m.

- Phillips, L. and R. LaCasse (2006). Project information: Wamels Pond GRT, Bureau of Land Management.
- Rich, K. M., E. Muldavin, et al. (1999). Historical vegetation of the Borderlands ecosystem management area. Albuquerque, NM, New Mexico National Heritage Program: University of New Mexico.
- Rydberg, P. A. (1919). "*Psoralea*." North American Flora **24**(2): 1-64.
- Sivinski, R. (1993). Section 6 Progress Report: *Pediomelum pentaphyllum*, USFWS: Region 2 Office.
- Sivinski, R. (2004). Email: re: *Pediomelum pentaphyllum*. M. Howard, New Mexico State Forestry Division.
- Spellenberg, R. (1999). "Species report: *Pediomelum pentaphyllum* " New Mexico Rare Plants Technical Council Retrieved 14 April 2007, from http://nmrareplants.unm.edu/rarelist_single_line.php?SpeciesID=128.
- Tonne, P. (2000). Status report for Chihuahua Scurfpea (*Pediomelum pentaphyllum*; Fabaceae). Albuquerque, USFWS.
- Tonne, P. (2004). Email: re: *Pediomelum pentaphyllum*. M. Howard, Natural Heritage of New Mexico.
- USDA. (2007). "Name Search: *Pediomelum*." Retrieved 13 April 2007, from <http://plants.usda.gov/java/nameSearch>.
- USGS. (2000). "Geologic provinces of the United States." from <http://www2.nature.nps.gov/geology/usgsnps/province/basinrange.html>.
- Warren, P. (1994). Taxonomic history of *Pediomelum pentaphyllum* (*P. trinervatum*). Arizona Chapter, Unpublished: Nature Conservancy: 2.
- WRCC. (2000). "Regional weather data." from <http://weather.nmsu.edu/nmcccooperator/index.htm>.
- York, J. C. and W. A. Dick-Peddie (1969). Vegetation changes in southern New Mexico during the past hundred years. Tucson, AZ, University of Arizona Press.