PETITION TO LIST THE WRIGHT'S MARSH THISTLE *(Cirsium wrightii)* UNDER THE U.S. ENDANGERED SPECIES ACT

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

Petitioner:
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Executive Summary

The Wright's marsh thistle *(Cirsium wrightii)*, faces extinction or endangerment in the foreseeable future and therefore warrants federal protection under the Endangered Species Act (ESA). While it historically occurred in Arizona, New Mexico, Texas, and northern Mexico, it is currently known only from five locations in New Mexico. Remaining populations face threats from habitat loss and degradation, weed control, and non-native species.

The historical range and total population of Wright's marsh thistle has been reduced as the eastern and western periphery of its range has shrunk. The westernmost range of the Wright's marsh thistle was believed to be in Yuma County, Arizona and populations in Trans-Pecos Texas were considered the eastern most expanse. The reduction in the range of Wright's marsh thistle is due to misidentification of voucher specimens and to the extirpation of confirmed populations. Populations identified as Wright's marsh thistle present in Yuma County, Arizona and throughout the Trans-Pecos area of west Texas are now known to have been *C. texanum*. One population of Wright's marsh thistle is thought to be present in Presidio County, Texas, but information is contradictory on this point. Communications between botanists indicate that this location has not been recently verified and there is no formal evidence to certify that the Presidio County population was indeed Wright's marsh thistle, rather than *C. texanum*. The type locality for Wright's marsh thistle was in San Bernardino Cienega, Cochise County, Arizona. After the loss of the Yuma County population as a known location for Wright's marsh thistle, the San Bernardino Cienega population was the western periphery of this species' range. Recent surveys have indicated that the wetland is still present at San Bernardino Cienega, but Wright's marsh thistle has not been observed in many years and a recent survey suggested that the species has been extirpated from this location. Regarding the southern border of this species' range, there is no information on the present status of the Wright's marsh thistle in northern Mexico.

It is likely that this species survives today only in New Mexico. In New Mexico the Wright's marsh thistle is considered extirpated in 3 of 5 historical locations, although two previously unknown locations have been discovered. Historical populations were present in Sierra and Chaves Counties. Populations of the thistle are no longer present as the wetlands in the historical localities have either been converted to agriculture or water was diverted for municipal use, drying up wetlands. Surveys conducted in 1995 and repeated again ten years later in 2005 showed the loss of two historical locations of this thistle in Haynes Canyon (Sacramento Mountains, Otero County). These surveys also showed that the population in Tularosa Creek (Sacramento Mountains, Otero County) was reduced by three-quarters between 1995-2005. This location had been considered the most extensive of all known populations in the Sacramento Mountains. Plants were also fewer and more scattered in Fresnal Canyon (Sacramento Mountains, Otero County). Botanists concluded that the loss and reduction of Wright's marsh thistle in these locations was caused by the decrease of surface water within wetlands. New locations of Wright's marsh thistle were observed in 1998 at Bitter Lakes National Wildlife Refuge (Chaves County) and in 2005 at Alamosa Springs (Socorro County).

As human populations expand in New Mexico more water is diverted from desert habitats. In Otero County, where many Wright's marsh thistle populations are found, water use by the City of Alamogordo and surrounding communities has and will continue to dry up that area's wetlands. The City of Alamogordo has water rights which include 11,563 acre-ft/year (AFY) of water from both La Luz and Fresnal Canyons. It is in these two canyons that populations of Wright's marsh thistle are located. Private wells in this area also divert and drain groundwater in these canyons. The number of wells in this area has increased nearly 94% since the 1950s. This appropriation of groundwater became an issue in 2002 and the Office of the State Engineer of New Mexico declared the City of Alamogordo and surrounding communities to be a "Critical Management Area." The declaration stopped all drilling of wells and use of groundwater for non-domestic purposes. It would appear that this order averts threats to the Wright's marsh thistle's wetland habitat, but the U.S. Forest Service (USFS) stated that "It could be expected in the future that more wells may be drilled on the Lincoln National Forest (Sacramento Mountains) as one of the few areas that remain relatively untouched in establishing more groundwater wells." Although small populations of Wright's marsh thistle exist on USFS land, this land is adjacent to the main populations of Wright's marsh thistle. Any reduction, diversion, or appropriation of the aquifer within the thistle's habitat is a threat to the wetlands on which this species depends.

The American southwest, including New Mexico, has been experiencing a severe drought for approximately eight years. This has caused surface water to decrease in many wetlands. The desiccation of wetlands is only exacerbated through alteration of wetland hydrology by the diversion, draining, and capturing of springs and other groundwater for human use.
In addition, weed control activities threaten the Wright's marsh thistle. Musk thistle (*Carduus nutans*) is an invasive thistle that is aggressively treated and is found in similar habitats as Wright's marsh thistle. A project was proposed in 2001 to control musk thistle through the introduction of insects. This project was located within Wright's marsh thistle occupied habitat. It was only by luck that a plant collection was made in the project area, and the samples were sent to a botanist. The botanist identified plant samples to be Wright's marsh thistle. If the plant collection had not been conducted, the project would have likely destroyed one of the few remaining populations of Wright's marsh thistle. In a biological evaluation written by the US Forest Service for a water pipeline for the City of Alamogordo, permission was given for maintenance of areas around the pipeline. This pipeline was in an area in which Wright's marsh thistle was known to exist, although surveys did not locate the plant along the pipeline. Approved methods of weed control included mowing and clearing of old trees and the use of weed-eaters. City personnel that are unaware of the Wright's marsh thistle may easily and inadvertently destroy small populations of this species from these activities.

The invasion of exotic animal and plant species also threaten the Wright's marsh thistle and its habitat. In 1969, a European weevil was introduced into the Great Basin, which feeds on the heads of various species of thistle. In 1995 the weevil entered northwestern New Mexico. While it is not known to have migrated to south-central New Mexico, the potential exists that it could continue to move south into the current range of the Wright's marsh thistle. Exotic and invasive species such as the Russian olive (*Elaeagnus angustifolia)*, salt cedar *(Tamarix ramosissima)* and hyssop loosestrife (*Lythrum hyssopifolium*) have been found within or

adjacent to populations of Wright's marsh thistle. These invasive and exotic species have long extensive roots that can dry up wetlands and can also directly compete for habitat.

In 2005, New Mexico Forestry Division personnel stated that it might be necessary to list Wright's marsh thistle as a federally threatened species. Petitioner agrees and believes that unless this species is given protection under the ESA, the threat of extinction will be imminent. This species cannot survive without its wetland habitat, which was naturally rare and has diminished due to human activities and natural occurrences. There are strong pressures within Wright's marsh thistle's present range to divert ground and surface water, depleting the aquifer on which riparian areas depend and drying up wetlands to which this species is constrained. ESA protection is necessary to safeguard the species and the habitat on which it depends.

Introduction

Wright's marsh thistle is a rare species whose current and historic distribution is limited to the Basin and Range Province of the American Southwest and northern Mexico. Wright's marsh thistle is one of 200 species of the genus *Cirsium* in the United States and is one of the few thistles restricted to boggy soil. Suitable habitat for this species is confined and minimal as Wright's marsh thistle is an obligate of low to moderate elevation wetlands in the arid desert Southwest.

The first voucher specimens of Wright's marsh thistle were collected in 1851 and the species was formally named and described in 1853 (Gray).Wright's marsh thistle is very similar to another thistle, *C. texanum*. The similarities between these two species have resulted in erroneous identifications of Wright's marsh thistle populations. The majority of verified Wright's marsh thistle populations are found in south-central New Mexico (Otero, Guadalupe, Chaves and Socorro Counties). An historical locality in Arizona has been extirpated as recent surveys have been unsuccessful at locating the thistle in the wetland it once occupied. One herbarium specimen indicates that a population may be found in northern Mexico, but there is no current information to confirm the present status of the population. Populations in western Texas may also be present but formal documentation of these populations is lacking.

The largest threat to face the Wright's marsh thistle is the disappearance of its habitat due to loss of water in the wetlands it occupies. Both ground and surface water in this thistle's range have been diverted for municipal consumption through pipelines and well-drilling. These activities have greatly added to the draining of wetlands. New Mexico and other parts of the Southwest have been in a drought since the late 1990s, with the exception of 2005. Drought exacerbates the dry conditions of wetlands and the diversion of groundwater for municipal, agricultural and livestock use, reduces available surface water and therefore causes wetlands to be sensitive to drought and more likely to dry-up.

Wright's marsh thistle is also threatened by human efforts to control weeds, as some thistles are exotic and invasive. To workers who unaware that the petitioned species is a rare, indigenous plant, the thistle may be identified as a weed and treated with any number of eradication measures. These measures include herbicides, mechanical removal, and introduction of exotic insect predators.

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 Wright's marsh thistle 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 (bolded above) set forth in 424.11(c) and in ESA Section 4 (16 U.S.C. § 1533(a)(1)) have resulted in the continued decline of the Wright's marsh thistle and are causing the species to face extinction or endangerment in the foreseeable future. A taxon needs to meet only one of the listing factors outlined in the ESA to qualify for federal listing.

Classification and Nomenclature

Common Name. The common name for *Cirsium wrightii* (Gray 1853) is the Wright's marsh thistle. There are no other frequently used common names for this species.

Taxonomy. Wright's marsh thistle was originally collected in 1851 at San Bernardino Cienega in Cochise County, AZ, by Charles Wright. This is the type locality for this species. The name and species description was published by Gray (1853) in *Plantae Wrightianae*. There are approximately 200 species of *Cirsium* in North America. The taxonomic classification for *Cirsium wrightii* is shown in Table 1.

Table 1. Taxonomy of Wright's Marsh Thistle.

Subkingdom	*Tracheobionta* – Vascular plants
Superdivision	*Spermatophyta* – Seed plants
Division	*Magnoliophyta* – Flowering plants
Class	*Magnoliopsida* – Dicotyledons
Subclass	*Asteridae*
Order	*Asterales*
Family	*Asteraceae* – Aster family
Genus	*Cirsium* (P. Mill.) – thistle
Species	*Cirsium wrightii* (Gray) – Wright's thistle

The following information on the taxonomic history of *C. wrightii* is adapted from Sivinski (1996). The original description from Gray (1853) emphasized the tall growth form, nearly

glabrous habit, and small heads of this plant. Nothing further was published on the taxonomy of this species until Correll and Johnston (1979) included it as a synonym in the *Manual of the Vascular Plants of Texas*. They tentatively placed *C. wrightii* into synonymy with the very similar species *C. texanum* (Buckl.) and suggested that *C. wrightii* may be a hybrid between *C. texanum* and *C. undulatum*. Siviniski (1996) argues that this hypothesis is untenable because *C. undulatum* shares no significant characteristics with *C. wrightii*. Sivinski states that *C. texanum* does have certain characteristics in common with *C. wrightii* such as strongly decurrent leaves, small heads, and slender spineless phyllaries, but *C. texanum* does not exclusively inhabit wetland habitats and is frequently found in dry road ditches (pers. obs. Sivinski). *C. wrightii* differs from *C. texanum* by being an obligate wetland species. It also has nearly glabrous leaves and a stem with thick succulent leaves and a tall (up to 2.5 m), strict growth form, which is not found in *C. texanum*. *C. texanum* rarely exceeds 1 m in height and often forms secondary branches rather than a strict central stalk. In eastern New Mexico *C. texanum* only blooms once in late May while the type locality (Arizona) and New Mexico populations of *C. wrightii* flower during late summer and early autumn (August - October). Sivinski concluded that *C. texanum* and *C. wrightii* are confusing but distinct species.

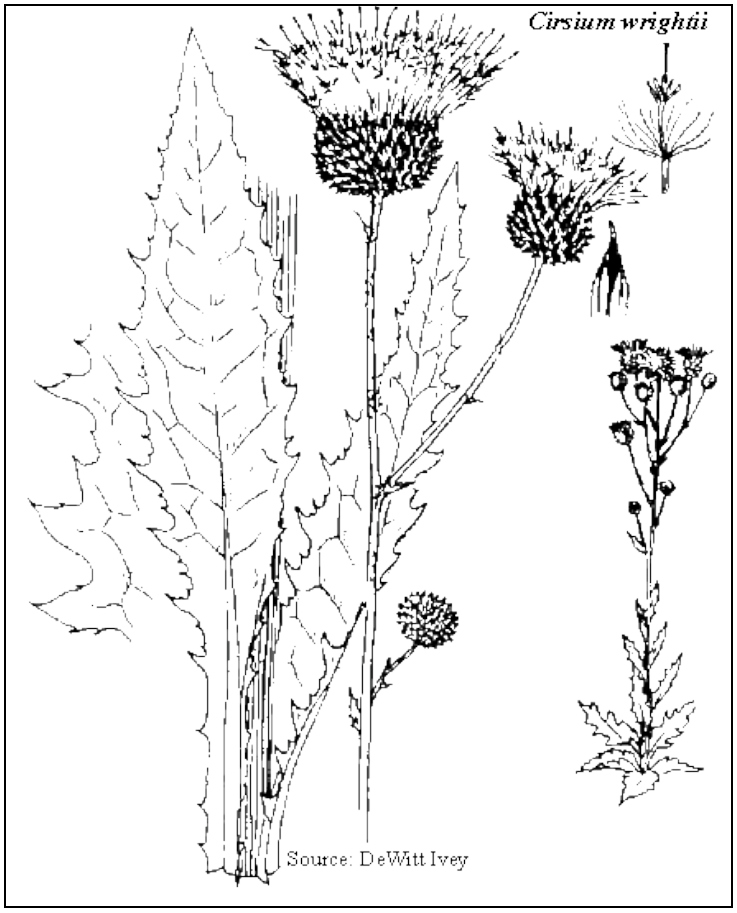

Figure 1. Sketch of Wright's Marsh Thistle. Source: DeWitt Ivey 2003.

Description

Wright's marsh thistle is distinctive among southwestern thistles. It is characterized by its tall (1-2.5 m) strict growth form which has a single central stalk that is densely covered with strongly decurrent, succulent leaves. Both the basal and stem leaves are ample and succulent. The basal leaves are long and can measure up to 30 cm or more. These leaves are sinuate or pinnatifid. Leaves are weakly prickly with short black spines, nearly glabrous and have a thin web like wool that is tardily deciduous. The stem leaves are sessile, strongly decurrent and gradually reduce in size up the stem. Numerous slender flowering branches emerge from the stalk at broad angles starting from one-third up the length of the plant. The flowering branches at the top of the plant are the longest. Each branch is terminated by one or a few small flowering heads which have numerous slender phyllaries. The heads terminate with thin branches of naked panicles. The phyllaries are hemispherical and small (about 2-3 cm) with papillose projections on the upper surface. The phyllaries and leaf teeth are callus pointed, but not spiny. The outer phyllaries are subulate and cuspidate tipped. The corollas are white or pink and the style tips are about 3 mm long.[1]

Distinctive traits

See discussion of differences between *C. texanum* and *C. wrightii* in Classification and Nomenclature section. Wright's marsh thistle's flowers are white to pale pink in the Sacramento Mountains of New Mexico, but are vivid pink in the Santa Rosa, New Mexico population.

Range distinction

The Wright's marsh thistle is restricted to wetland habitats, and it is only found within low to moderate elevation in these wetlands. The Wright's marsh thistle is presently only extant in four counties in New Mexico. Populations in Texas and Mexico are unconfirmed, and populations in Arizona are apparently extirpated.

Geographic Distribution: Historic and Current

Wright's marsh thistle is strictly a wetland species that occupies alkaline spring seeps and cienegas at low to moderate elevations. It was historically found in the Basin and Range Province of the southwestern U.S. and northern Mexico (Figure 2). It inhabits the Chihuahuan Desert floristic region and can occur at moderate elevations in pinyon-juniper woodlands within this region (Sivinski 1996). Wright's marsh thistle was believed to range from its northern boundary in south-central New Mexico, east to Arizona, west to Texas and south to the Mexican states of Chihuahua and Sonora. Populations throughout Wright's marsh thistle's range were likely as disjunct as the rare wetland habitats that this plant requires. Currently, Wright's marsh thistle is only known to be extant in south-central New Mexico.

[1]This description is adapted from Barlow-Irwick (2006) and Sivinski (1996).

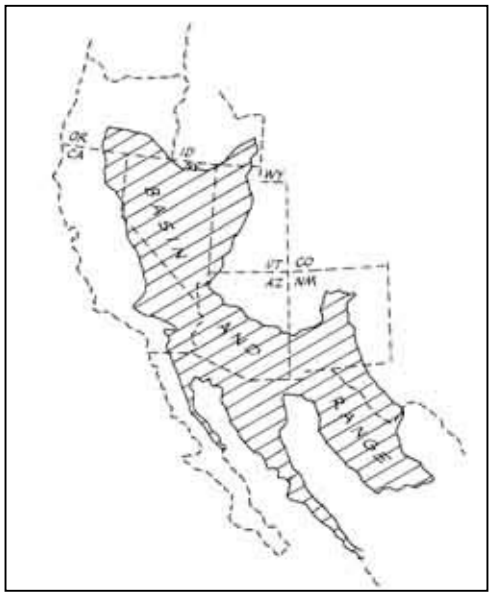

Figure 2. Basin and Range Province of the southwestern United States and northern Mexico. Source: National Park Service.

Habitat Requirements

Wright's marsh thistle is a rare wetland thistle that occupies marshes and wet cienegas in the northern part of the Chihuahuan Desert. These marshy wetlands are in otherwise semi-arid to arid areas. Wright's marsh thistle is specifically found in wet, alkaline soils in spring seeps and marshy edges of streams in elevations of 3,450-8,500 ft (1,130-2,600 m). In these moderate elevations, the thistle can also occur in wetlands of pinon-juniper and ponderosa pine-Douglas fir woodlands. Plant associations in which this thistle has been located include *Typha latifolia* (broadleaf cattail), *Salix* spp.(willow), *Scirpus olneyi* (e.g., Olney's bulrush or salt marsh sedge), *Juncus mexicanus* (Mexican rush), *Baccharis glutinosa* (e.g., seepwillow, sticky Baccharis), *Populus fremontii* (e.g., western cottonwood, Fremont cottonwood), *Solidago* spp. (goldenrod), and *Helianthus paradoxus* (Pecos sunflower). The Pecos sunflower is federally protected as threatened under the ESA. 50 C.F.R. § 17.12.

Photo of Wright's marsh thistle in its wetlands habitat. © Robert Sivinski

The habitat this thistle occupies is hard to categorize as some populations can be found at high altitudes such as the Silver Springs population in the Sacramento Mountains which is found at 7,850 ft, (2,392 m) (Worthington 2002a). Other populations grow at considerably lower elevations. *Id*. The Mescalero Apache Reservation populations appear to grow only in seeps over calcareous substrates, yet Wright's marsh thistle has also been found in deep sediment and marshes (Sivinski 2005a). One population of Wright's marsh thistle was found within an urbanized area. These plants were remarkable as they were able to root on cement at the edge of fast flowing water. This population was located in the town of Mescalero at a waterline in cement in a contained stream located between a highway and a football field (Worthington 2002a).

Reproduction and Dispersal

Little information exists on the reproduction and dispersal behavior of Wright's marsh thistle. It is known to be a robust biennial or monocarpic perennial, which is typical of the genus

Cirsium (Cronquist, Holmgren et al. 1994). It may be a misnomer to call the Wright's marsh thistle a biennial, as no plants may have an obligate biennial lifecycle and biennial plants might better be referred to as short-lived semelparous (producing off-spring all at one time) perennials (Harper 1977; Barbour, Burk et al. 1987). The biennial life history is an adaptation to a short growing season because it makes it possible for plants to produce a much larger seed crop than they could in only one year (Barbour, Burk et al. 1987). This strategy is considered costly as there is a significant chance that the second year will not be favorable for growth or that a disturbance will occur. Biennials are often found in sites that are disturbed periodically but not every year as is the case for the Wright's marsh thistle whose wetland habitat may not always be saturated (Panjabi and Anderson 2004).

Wright's marsh thistle likely reproduces sexually although apomixis is a common phenomenon among members of the genus *Cirsium* (Panjabi and Anderson 2004). Apomixis is an asexual type of reproduction in which the plant embryos grow from egg cells without the benefit of fertilization by pollen.

A thistle closely related to *C. wrightii* is *C. vinaceum*. *C. vinaceum* is found within similar habitats as *C. wrightii* and the two species have been known to hybridize (Sivinski 1996). Therefore, these two species may reproduce and disperse in similar ways. Rhizomatic reproduction has been observed in *C. vinaceum* and may also occur in *C. wrightii* as the Wright's marsh thistle has been observed in dense stands which indicates vegetative reproduction (McDonald 1999). In general, *Cirsium* spp. have large seeds, and generally rely on current seed production for their establishment and persistence (Harper 1977).

There is no specific information on the pollination, spore and seed dissemination for *C. wrightii*. *C. vinaceum* pollen disseminating agents include bees, hummingbirds, and beetles (VTI 1996). Of the pollinators, bees are probably the most vulnerable as they are susceptible to pesticide application.[2] Seeds may be dispersed over large distances by the wind but it is unknown if wind is the main mode of dispersal for *C. wrightii.* Craddock and Huenneke (1997) found the seeds of *C. vinaceum* move in substantial numbers for considerable distances along streams. There is no information about the seed biology, annual seed production, seed viability, percent germination or germination requirements for either *C. vinaceum* or *C. wrightii*. The extremely mesic nature of these two species' habitat would suggest that seeds probably do not have long viability in the field and it is likely that in the moist condition of their habitat, seeds either germinate or rot (VTI 1996).

New Mexico and Arizona populations of *C. wrightii* flower during late summer and early autumn (August-October) (Sivinski 1996). Germination dates are unknown. Leafing for *C. vinaceum* occurs in May, budding occurs in late June and seed/fruit dispersal occurs from September to December (VTI 1996). *C. vinaceum* sets seeds in late summer, but the seeds are

[2]Recent research indicates that many bee and butterfly pollinators are at risk in the United States. The loss of pollinators threatens ecological and economic systems across the country. Xerces Society Red List of Pollinators of North America, http://www.xerces.org/Pollinator_Red_List/Table_Lepidoptera.htm, visited May 29, 2007; Committee on the Status of Pollinators in North America, National Research Council. 2006. *Status of Pollinators in North America*. Washington, DC: National Academies Press.

not dispersed until after the first frost. It is possible that *C. wrightii* behaves in a similar fashion.

Population density

In Wright's marsh thistle studies conducted by Sivinski (1995 and 2005) the number of individuals observed in a given location varied greatly. In Santa Rosa several hundred to a few thousand plants were observed in various localities. In the Sacramento Mountains some locations only contained a few dozen plants (Haynes Creek) whereas in other locations several thousands plants were observed (Tularosa Creek) (Figure 4). Similar observations of differing sizes of populations from a few individuals to a few thousand have been noted by other researchers (Bridge 2001; Barker 2002; Worthington 2002a).

Mortality

As with the aspects of reproduction and dispersal little is known of Wright's marsh thistle mortality although there is some information about *C. vinaceum*. The limiting factor for *C. vinaceum* is primarily availability of habitat (VTI 1996). This appears to be the same condition for *C. wrightii*. The habitat of the Wright's marsh thistle is sensitive. If the water fluctuates in the habitat, populations enter a decline. There are no indications that the Wright's marsh thistle has the ability to enter dormancy during periods when the habitat is dry.

Historic and Current Population Status & Trends

Historic Range

Historical records do not provide data on number of individuals or sizes of populations within a given historical location.

New Mexico

In New Mexico this species was known from the Pecos River Valley and the western slope of the Sacramento Mountains. At the University of Texas Herbarium, Dr. Guy Nesom studied Texas *Cirsiums*. Herbarium specimens he reviewed confirmed that Wright's marsh thistle occurred sporadically in the Pecos River Valley. This species was also known to occur in the Sacramento Mountains and lower Pecos River valley, which include the watersheds of Tularosa Valley, Pecos headwaters, and Upper Pecos-Long Arroyo. Historic records document the presence of Wright's marsh thistle in Sierra, Otero, Chaves, and Guadalupe Counties (Figure 3).

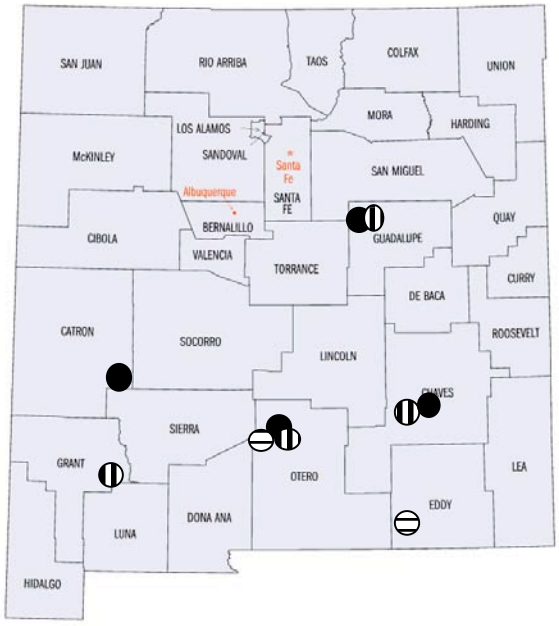

Figure 3. Counties in New Mexico with historical and currently confirmed occurrences of Wright's marsh thistle (Symbols in general location of Wright's marsh thistle herbaria specimen collection) (USDA 2007). Solid circles = extant populations; vertical line circles = extirpated populations; horizontal line circles = possible hybridized populations.

A search of herbaria by several botanists for voucher specimens in New Mexico resulted in the location of seven historic localities (collections before 1960) (Table 2) (Sivinski 1996; Worthington 2002a; Barlow 2003).

Table 2. Herbarium specimens of Wright's marsh thistle collected in New Mexico. NMC = New Mexico College, currently the herbarium at New Mexico State University; USNH = United States National Herbarium, currently the herbarium at the Smithsonian Museum; and UNM = University of New Mexico.

Collector	Date	Location	County	Herbaria
Wooton, E.O..	30 July 1897	White Mts.	Lincoln	NMC
Wooton, E.O.	21 July 1899	Sacramento Mts. Fresnal	Otero	USNH
Wooton, E.O.	18 August, 1899	Sacramento Mts. Tularosa Creek	Otero	USNH
Beale, Ida	Unknown	Lake Valley	Sierra	USNH
Earle and Earle	August 1900	Roswell	Chaves	USNH
Arsene and Benedict	4 August 1926	Vicinity of Santa Rosa	Guadalupe	USNH
Dittmer, H.	25 August 1952	Santa Rosa, ditch	Guadalupe	UNM

Arizona

In Arizona, Wright's marsh thistle was believed to be found in two locations. The type specimen was collected at San Bernardino Cienega (Cochise County) in 1851 (Wright). This location is near the border with Sonora, Mexico. In 1980, a thistle identified as Wright's marsh thistle was collected in Yuma County, in the southwestern part of Arizona (Sivinski 1994b). This collection was considered the westernmost observation for this species.

Texas

The distribution of Wright's marsh thistle in Trans-Pecos Texas was confused by the presence of *C. texanum,* which is difficult to distinguish from herbarium sheets. Populations in Trans-Pecos Texas region were reportedly rare and have not been formally documented (Sivinski 2005c).

Mexico

Wright's marsh thistle was reportedly rare in Mexico and has not been surveyed for in this country. Dr. Guy Nesom found a Wright's marsh thistle herbarium specimen for a location in the northern state of Chihuahua, where it was thought to be sporadic and uncommon (Sivinski 1996).

Current Range

The current known range of Wright's marsh thistle still falls within the Basin and Range Province of the southwestern U.S. and northern Mexico (Figure 2). Extant populations are highly disjunct and are sometimes separated by more than 200 miles (Figure 3). Presently, this species is only known as extant in southcentral to southern New Mexico. One population is believed to exist in Presidio County, Texas but has not been verified. The western and eastern range of this species has been reduced as the thistle has been extirpated at its type locality in the San Bernardino Cienega, Cochise County, AZ. The population thought to be present in Yuma County, AZ is now know to have been misidentified. The majority of populations thought to be present in the Trans-Pecos Texas region, as determined by herbaria specimens, are now known to have been misidentified. The location of the University of Texas herbarium specimen documenting Wright's marsh thistle in northern Chihuahua, Mexico has not been surveyed in recent times (Sivinski 1996). The current status of the species is unknown in Mexico.

New Mexico

The following are locations of Wright's marsh thistle in New Mexico that were historically documented by herbaria collections, surveyed in 1995 and resurveyed again in 2005 by Dr. Robert Sivinski of the New Mexico Department or Resources Forestry Division (Sivinski 1996; Sivinski 2005a) (Table 3, Figures 3-4).

Sacramento Mountains:

Location A-F (Figure 4): Otero Co., Sacramento Mountains, Tularosa Creek, elevation 6,496-7,217 ft (1980-2200 m). Wright's marsh thistle was found in marsh and wet meadows of a broad valley bottom within pinon-juniper woodland up to ponderosa pine-Douglas fir forest. The initial observations of this location came from Wooton, E.O. in 1899 (Table 2). The land is owned by the Mescalero Apache Reservation. In 1995, this location was found to have the most extensive population of Wright's marsh thistle in the Sacramento Mountains. It consisted of several thousand plants in marshes and boggy meadows along the broad valley floor of the South Fork of Tularosa Creek. Wooton, E.O. also made an 1897 collection with an ambiguous label location of "White Mountains." Tularosa Creek is the dividing line between the White and Sacramento Mountains. Since the Tularosa Creek collection is not cited in Wooton and Standley's (1913) *Flora of New Mexico*, but the White Mountains collection is, these two collections may have been from the same location. The habitat and population observed in the 2005 survey was strikingly different from the observations of 1995. Much of the previously wet valley floor appeared drier and the cattail marshes were being replaced by dense stands of common reed (*Phragmites australis*). The stands of Wright's marsh thistle in 2005 were more scattered and fewer than in 1995. There were still several hundred plants in this population, but less than one quarter the number observed a decade earlier. Specifically, four of six known metapopulations were extinct by 2005 (Figure 4: A, C, E and F). One metapopulation contained a similar number of plants in 2005 as in 1995 (Figure 4: B), and one population only contained half the number of individuals in 2005 as observed in 1995 (Figure 4: D).

Location G (Figure 4): Otero Co., Sacramento Mountains, La Luz Canyon, elevation 6,725 ft (2,050 m). This population was first located by Sivinski (1995). A population of Wright's marsh thistle was found in the wet soil of a small seep within a juniper-mesquite scrubland. This small population was on private land with only 10 adult plants visible from the road. In 2005, the visible area was found to be completely dry and lacked Wright's marsh thistle and cattail. It is believed that these wetland plants may persist further up the drainage. Salt cedar was observed to be infesting this drainage channel during both 1995 and 2005 surveys.

Location H (Figure 4): Otero Co., Sacramento Mountains, La Luz Canyon, elevation 6,463 ft (1,970 m). This population of Wright's marsh thistle was just east of the Lincoln National Forest boundary on National Forest land. It was first located by Sivinski (1995). The species was found in wet soils of a spring seep in a pinon-juniper woodland. The population consisted of approximately 50 mature plants and an equal number or rosettes. The spring feature was in the valley bottom and provided approximately 20 meters of habitat. The adjacent drier valley bottom was densely infested with Russian knapweed (*Acroptilon repens*). During 2005 surveys the habitat and the population of Wright's marsh thistle was found to be unchanged from 1995. Encroaching salt cedar was noted in both the 1995 and 2005 surveys.

Location K-L (Figure 4): Otero Co., Sacramento Mountains, Haynes Creek, elevation 6,710 ft (2,045 m). This population of Wright's marsh thistle was first located in 1995 and found in a marshy valley bottom on private land. A few dozen mature plants were visible from the road

in Location K. This location was less than ½ mile north of Location L. Most of the valley in this area consisted of intense rural home development and agriculture. The 2005 report does not mention this population. Therefore the current status of this population is unknown, although Location M, a population 1 mile upstream from Locations K and L, was extirpated as of 2005.

Location M (Figure 4): Otero Co., Sacramento Mountains, Haynes Canyon, elevation 7,180 ft (2,188 m). This population was first located in 1995 (Sivinski). Wright's marsh thistle was found in a marshy area of a creek bottom in ponderosa woodland. This population was on private land where less than 10 adult plants were visible from the road. This location was less than 1 mile up stream from Location K and L. The 2005 survey found the cattails replaced by common reed and no Wright's marsh thistles were visible. No surface water was visible in the valley bottom in 2005.

Location N-O (Figure 4): Otero Co., Sacramento Mountains, Karr Canyon, elevation 6,840 ft (2,084 m). This population was first observed collected in 1981 by Ward and Spellenberg. In 1995, Wright's marsh thistle was found and confirmed at this location on a wet travertine of a spring seep on the east side of a road in a woodland of pinon-juniper-Gamble oak-ponderosa pine. The small population was approximately 50 m long and a few meters wide and consisted of a few 100 plants within a county road right-of way (Location N). In 2005 the same number of plants were seen in this area. The 2005 survey also found several dozen plants in the marshy area below the fill slope side of the road (Location O). It was assumed that these plants were missed during the 1995 survey, although data exists to indicate that another botanist, Barker, located this population in 1995. Barker counted approximately 100 plants on 0.76 acres, whereas Sivinski's 2005 survey counted several dozen plants.

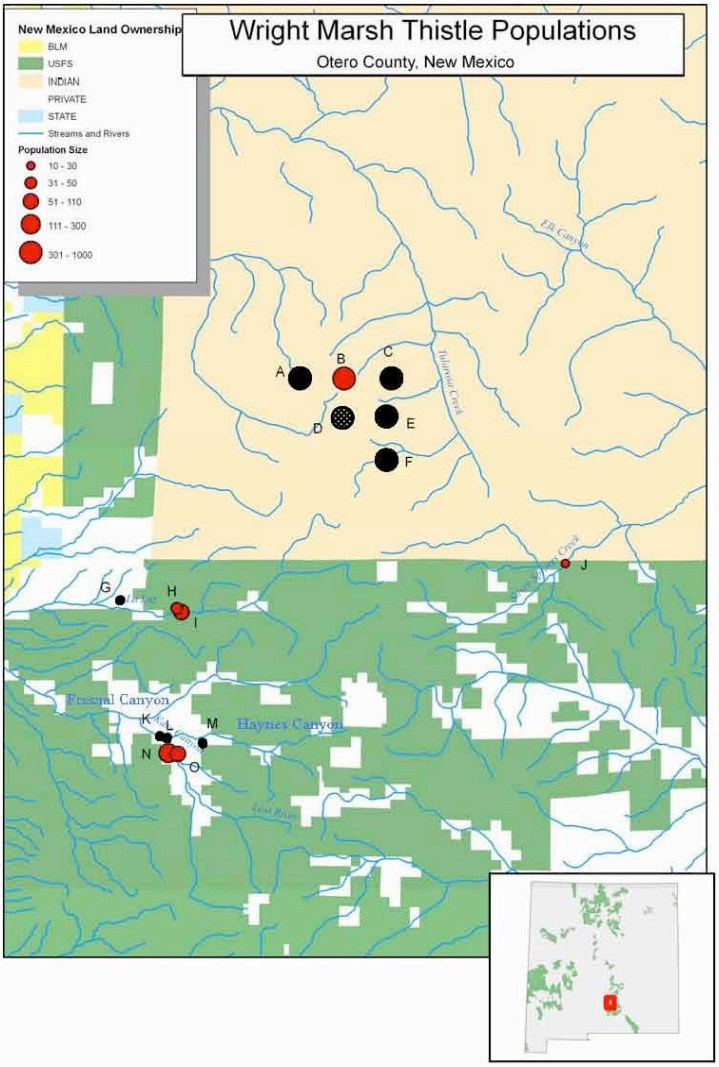

Figure 4. Population size and presence/absence of Wright's marsh thistle between 1995 and 2005 surveys in Otero County. Red circles = extant populations; black circles = populations were extirpated by 2005; black and white stippled = population reduced by half.

Roswell (Figure 3):

This Wright's marsh thistle location is in Chaves County at an elevation of 3,800 ft (1,158 m). Initial observations of this population were made in 1900 by Earle and Earle. The location of this collection is rather ambiguous. However, most of the spring features in the vicinity of Roswell were thoroughly investigated during the 1995 field survey. No Wright's marsh thistles were located. At the turn of the century there were several springs within the town of Roswell. All but one of these were completely captured for municipal water. The remaining spring is a cemented pool at the Roswell Country Club, which retains no native vegetation. Sivinski concluded that the Roswell population of Wright's marsh thistle may have been extirpated. In 1998 a population was found at Bitter Lake National Wildlife Refuge (NWR), located approximately 15 miles northeast of Roswell. Wright's marsh thistle in this location is associated with a few permanent cienegas and marshes. The population consists of a few thousand plants. Wright's marsh thistle distribution and abundance were no different at Bitter Lake NWR in 2005 than that observed by Sivinski when he visited the population in 1999 (Sivinski 2005a; Sivinski 2006a).

Santa Rosa (Figures 3 and 5):

This Wright's marsh thistle location is in Guadalupe Co. at an elevation of 4,560-4,600 ft (1,389-1,402 m). Historic records show populations of Wright's marsh thistle to be scattered throughout the wet cienegas at spring seeps and sink-hole lakes east of the Pecos River in Santa Rosa. The 1995 survey found the Wright's marsh thistle to still exist in Santa Rosa. The population was found to be large but scattered on a mixture of private and municipal lands in and adjacent to the town of Santa Rosa. The largest concentration of several hundred to a few thousand plants was at old fish hatchery ponds adjacent to Blue Hole Spring. The thistle was found to be sporadic in the cienega below the spring and along El Rito Creek down to the fishing park at Power Dam Reservoir. A few plants also occurred at the Perch Lake Scuba and Fishing Park. The Pecos sunflower shares this habitat and is listed as Threatened under the ESA. The sunflower genus is actually more widespread and abundant at this location than the thistle genus. No significant differences in habitats or population size were evident between the 1995 and 2004 surveys of this area. The small reservoir at Power Dam fishing park was drained in 2001 and a small group of about 10 Wright marsh thistles were no longer extant at that location in 2004. The Santa Rosa population still consists of a few thousand plants.

Alamosa Springs (Figure 3):

This Socorro County location was first observed in 2005 and expands the western range of the Wright's marsh thistle within New Mexico. The population consists of a few thousand plants and is located at the Alamosa Springs wetlands at the mouth of Monticello Box (Sivinski 2005c).

Cirsium wrightii locations found still extant in 1995.
Santa Rosa, NM 1:100,000 Quad

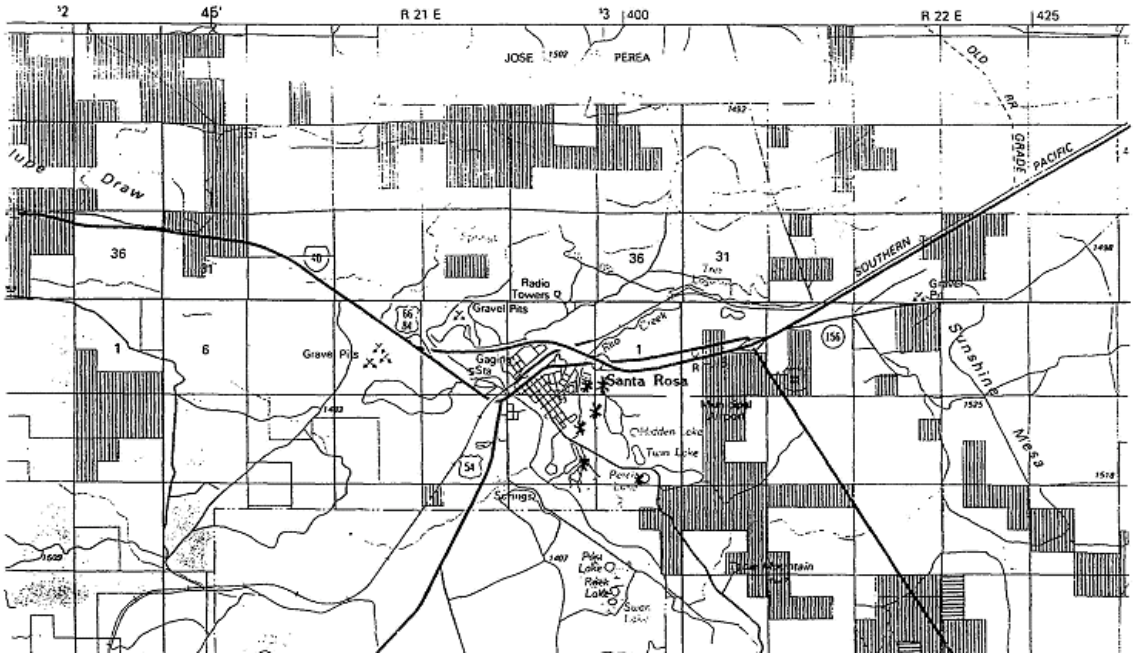

Figure 5. Santa Rosa, Guadalupe Co., New Mexico. Populations of Wright's marsh thistle indicated by asterisks. Source: Sivinski 1996.

Additional locations:

In 2001 a hydrologist for the Mescalero Apache tribe located a population of Wright's marsh thistle in the Tularosa valley about nine miles downstream from the start of Tularosa creek, head springs. It was seen in three isolated wetland locations close together. In two locations there were solitary plants, but in one location there was a scattered clump of approximately 20 plants (Bridge 2001). It is likely but unconfirmed that these plants were observed by surveys conducted by Sivinski (Figure 4, Locations A-F).

In 2002 a botanist contracted with the Lincoln National Forest surveyed for Wright's marsh thistle. Of the 12 sites surveyed, Wright's marsh thistle was found in two locations (Figure 4: Locations I and J). Wright's marsh thistle was found near a known population documented by Sivinski (Figure 4: Location I). A total of 110 plants were observed on 10.02 acres. Wright's marsh thistle was also located along Silver Springs (Figure 4: Location J). Sixteen plants were found occupying 2.69 acres (Worthington 2002a). This was the first documentation of the thistle within this drainage.

Extirpated population:

The population in Lake Valley, Sierra Co. (Figure 3) was surveyed in 2005 by Sivinski and found to be extirpated (Sivinski 2005c). The extensive wetlands had been drained and converted to agriculture many decades before. The small remaining spring seep had no

Wright's marsh thistle. Sivinski determined that suitable spring seeps no longer occurred in Sierra County in this area and the population of Wright's marsh thistle was likely extirpated.

Summary

Currently, there are four general confirmed locations in New Mexico where the Wright's marsh thistle is found: Otero, Chaves, Guadalupe, and Socorro Counties (Figure 3). In Otero County the Wright's marsh thistle is totally extirpated in three of seven localities. The largest population in Otero County, Tularosa Creek, has experienced greater than 75% decline since 1995. The thistle is extirpated in two other historical localities in New Mexico: in Roswell, Chaves County and Lake Valley, Sierra County.

Population Status

Habitat and population sizes of Wright's marsh thistle have fluctuated. Table 3 presents changes in habitat and population sizes from Sivinski's 1995 and 2005 surveys.

In New Mexico, hybridization is likely occurring between Wright's marsh thistles and other thistle species (Figure 3). Wright's marsh thistle may be present in Eddy Co., but is likely a hybrid. The population is found at Rattlesnake Springs in Carlsbad Caverns National Park. The thistles in this location show characteristics that are intermediate between *C. wrightii* and *C. texanum*. This population blooms in May rather than in August-October as do typical *C. wrightii* (Barlow-Irwick 2006). In the Sacramento Mountains (Otero Co.), *C. wrightii* sometimes occurs with the threatened *C. vinaceum*. A few hybrids between these rare taxa have been observed here (Sivinski 2005a).

Arizona

Currently, no populations of *C. wrightii* are found in Arizona. Attempts by The Nature Conservancy (TNC) to find populations of the Wright's marsh thistle in the San Bernardino Cienega (Cochise Co., AZ) have not resulted in successful findings. It is believed that this population is extirpated (TNC survey cited by Sivinski 2006). TNC personnel indicated that surveys have been conducted over the past three years but the thistle has not been seen on U.S. border since 1999 (Pers. comm., Swartz, Arizona Game and Fish Department, 2007). The Yuma County population has since been understood to have been misidentified.

Texas

The majority of Texas specimens identified by Guy Nesom as *C. wrightii* were actually found to be *C. texanum* (Sivinski 1994b). At this time, the only population of *C. wrightii* believed to be present in Texas is in the Trans-Pecos Texas region. A few plants are believed to be present at a spring seep in the Chianti Mountains of Presidio County, but recent surveys have not verified this occurrence (Sivinski 2006a).

Table 3. Changes in population size or habitat. Source: Sivinski 1995-2005 surveys.

Location	Habitat present 1995	Change	Habitat present 2005	Population size 1995	Population size 2005	Trend
Santa Rosa	Yes	Yes	One reservoir drained in 2001	A few thousand	A few thousand with ~ 10 extirpated from drained reservoir	Stable
Bitter Lake	Yes (1999)	No	Yes	A few thousand (1999)	A few thousand	Stable
Tularosa Creek	Yes	Yes	Valley floor dry and marsh replaced by reeds	Several thousand	¼ of that observed in 1995	Decline
La Luz Canyon	Yes	No	Yes	50 mature plants	50 mature plants	Stable
La Luz Canyon	Yes	Yes	Completely dry	10 mature plants	No plants	Decline
Haynes Creek	Yes	Yes	Marsh replaced by reeds	A few dozen	No plants	Decline
Karr Canyon	Yes	No	Yes	~ 100 plants	In addition to the ~100 plants several dozen located	Increase

Mexico

There have been little to no surveys for populations of the Wright's marsh thistle in Mexico (Pers. comm., Barlow-Irwick of New Mexico Rare Plants Council, 2007). No information is present to document the current population of Wright's marsh thistle in Mexico.

Land ownership

Current populations of Wright's marsh thistle are found on a variety of public, municipal, tribal and private lands (Figure 4). The extent of acreage each population of Wright's marsh thistle occupies is unknown, except for four populations (Location I: 10.02 acres, extant; Location J: 2.69 acres, extant; Location L: 1.01 acres, extirpated: and Location O: 0.76 acres, extant).

Identified Threats to the Petitioned Species: Criteria for Listing

The Wright's marsh thistle meets several of the criteria for listing under the ESA (factors met are bolded):

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

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

Habitat Loss and Degradation Through Water Use

The most significant threat to the Wright's marsh thistle is alteration to the hydrology of its rare wetland habitat. Desert springs and cienegas are naturally susceptible to drying-up in a desert environment and the magnitude of such a threat is increased when water in this habitat is diverted or drained, and if springs are captured. Such activities increase the potential for extirpation of the Wright's marsh thistle due to desiccation of its habitat.

The depletion of water due to human actions appears to be the cause for the probable extirpation of the Roswell, Lake Valley and Haynes Creek populations (Table 3) (Sivinski 2006a). It is also believed that the Wright's marsh thistle existed in the Sacramento Mountains in abundance along Fresnal Creek at the turn of the century (Wooton and Standley 1913). Any marshes that may have existed along Fresnal Creek have since been drained and the creek water diverted for agriculture in the valley bottom (Sivinski 2006a). The springs in La Luz Canyon, where two populations are currently extant, are relatively small seeps susceptible to drying if the ground water feeding them is intercepted or lowered (Sivinski 2006a). There are several additional springs in the La Luz/Laborcita area that may have previously supported Wright's marsh thistle, but are now diverted to irrigate local orchards (Sivinski 2006a). The Santa Rosa springs and cienegas where Wright's marsh thistles were observed are owned by a variety of municipal and private parties and occur within an extensive area of four square miles. Both Tularosa Creek and Santa Rosa populations of Wright's marsh thistle may suffer impacts from localized draining and development (Sivinski 2006a).

La Luz and Fresnal Canyons

The threat of diversion, draining of water, and capturing of springs is exemplified by the municipal use of water from the La Luz and Fresnal Canyons by the City of Alamogordo. In the 1950s the City of Alamogordo obtained a Special Use Permit (SUP) from the U.S. Forest Service (USFS) to maintain and operate their water transmission system on USFS property.

These pipelines capture water from 71 springs located in La Luz, Fresnal and Maruche Canyons (USFS 2007). In the 1950s the City of Alamogordo bought water rights in La Luz and Fresnal Canyon watersheds. Presently, the City of Alamogordo has the right to divert up to 22,348.02 AFY (acre-ft/yr) of water. *Id*. Alamogordo has 6,366.2 AFY of water rights from La Luz Canyon and 4,418.82 AFY of rights from Fresnal Canyon along with an additional 11,563 AFY of water rights from the combined system (Tularosa Basin report cited in USFS 2007).

Private wells also divert and drain surface water in canyons in which the Wright's marsh thistle is or used to be found. The number of wells drilled on both the US Forest Service lands (Lincoln National Forest) and private lands within the La Luz and Fresnal Canyon watersheds has increased since the 1950s (USFS 2007). Nearly 94% of the wells drilled are on private lands with the most recent decades (1980s and 1990s) being the most active years for wells drilled. The total declared ground water right is approximately 2,400 AFY (equivalent to 3.32 cubic feet/second (cfs) flow year round) with each well having a diversion limit of 3 AFY (0.0041 cfs) (Tularosa Basin report cited in USFS 2007). Currently there is a cessation order by the Office of the Sate Engineer of New Mexico for new groundwater appropriations for non-domestic purposes within the La Luz, Fresnal, and Laborcita Canyon watersheds (NMSEO 2002). This order was put into effect in December of 2002 by designating the canyons a "Critical Management Area." Due to this designation the USFS stated that "It could be expected in the future that more wells may be drilled on the Lincoln National Forest (Sacramento Mountains) as one of the few areas that remain relatively untouched in establishing more groundwater wells" (USFS 2007).

While the US Forest Service considers Wright's marsh thistle a Sensitive Species, it permits the destruction of this rare plant's potential habitat. When the City of Alamogordo applied for its Special Use Permit renewal for its pipelines, the Biological Evaluation (BE) determined that three acres of habitat suitable for Wright's marsh thistle were present within the project area (USFS 2007). Suitable habitat was defined as areas containing facultative and obligate riparian wetland plants, comprised of species such as sedge, willow, rush, columbine, and a variety of grass species. Three wetlands near the pipeline were identified. One wetland was identified as Springer Springs, which is between known locations of Wright's marsh thistle (about halfway between Locations I and J in Figure 4). Another area was found within a small perennial stream that flows on USFS land south of the Mescalero Apache Indian Reservation. This stream is just north of extirpated and extant *Cirsium wrightii* populations (Locations G-I in Figure 4). The third wetland was found at the bottom of a deeply incised portion of La Luz Canyon in the approximate location of known extant populations of Wright's marsh thistle (Locations H and I in Figure 4).

The analysis of impacts in the BE included the consideration of two factors:

A) No impact to the species is determined by the proposed action if no individuals are found, or their habitat characteristics will not be altered; and
B) When the following condition is met, it is assumed that the activity may impact individuals, but is not likely to result in a trend toward federal listing or loss of viability: 1) The activity will disturb suitable habitat or individuals but will retain

specified habitat requirements and will not affect populations in a way that viability of the species is not met.

Direct, indirect and cumulative effects where defined as applying to Wright's marsh thistle in the following ways:

> Direct Effects
> Situations where emergency repair is warranted will not have prior survey and avoidance. Heavy equipment associated with emergency repair may directly remove adults or seedlings without proper mitigation. Ground disturbing activities associated with the pipeline may create short term increase in soil accumulation in suitable habitat. Impacts to this species by inspection or maintenance will be lessened by mitigation measures that survey and avoid known locations.
>
> Indirect Effects
> Additional sedimentation of suitable habitat may increase mortality for adult or seedling plants. The removal of seedlings associated with maintenance may reduce the longer term success of the species within a given area.
>
> Cumulative Effects
> Grazing, prescribed fires, water diversion from suitable habitat on private land, off-highway vehicles, power-line corridor clearing, drought conditions and other activities add to the cumulative effects to this species by reducing the amount of viable habitat that it uses. Past operation of the pipeline and water extraction systems on forest land and on adjacent private land are cumulative effects to the species and its habitat. The bypass of water in suitable habitat may reduce the chance that adult plants may flower and the success of germinating seeds. The cumulative effects associated with water extraction provide the majority of effects to this species and its habitat. This action is outside the US Forest Service jurisdiction and control. The bypass of water or lowering of the water table in suitable habitat may impact the vigor of adult plants and seedlings. The known foreseeable projects that may impact suitable habitat are associated within a program that deals with private land fuels reduction, road maintenance, pipeline maintenance and new private land home construction

The final determination for this project was it might have some form of direct, indirect or cumulative effects on the species. The BE stated that the temporal and spatial scale of potential disturbance on Wright's marsh thistle did not meet Condition A but the temporal and spatial scale of the project and mitigation measures with regards to maintenance would result in Condition B being met. The formal finding was that the project "May impact individuals, but is (was) not likely to result in a trend toward federal listing or loss of viability."

Tularosa Creek

Alluvial marshes and spring cienegas along Tularosa Creek are extensive. In the locations where Wright's marsh thistle have been found, the marshes and spring cienegas extend for approximately four miles along the valley bottom, containing the largest populations of

Wright's marsh thistle in the Sacramento Mountains (Sivinski 2005a). Although this water belongs to the Mescalero Apaches, who are unlikely to sell their water rights and transport water to off-reservation urban and agricultural areas, it is likely that diversions of the creek have contributed to drying up the area (Sivinski 2006a). Although US Geological Survey data is incomplete for Tularosa Creek, annual discharge (cubic feet/second) appears to have decreased since 1980. From 1980-89 the average discharge was 17.66 (ft^3/sec). The six years of data in the 1990s shows the average discharge to increase to 22.46 (ft^3/sec). While discharge was at its lowest from 2003-2006 with an average of 15.1 (ft^3/sec) (Figure 6).

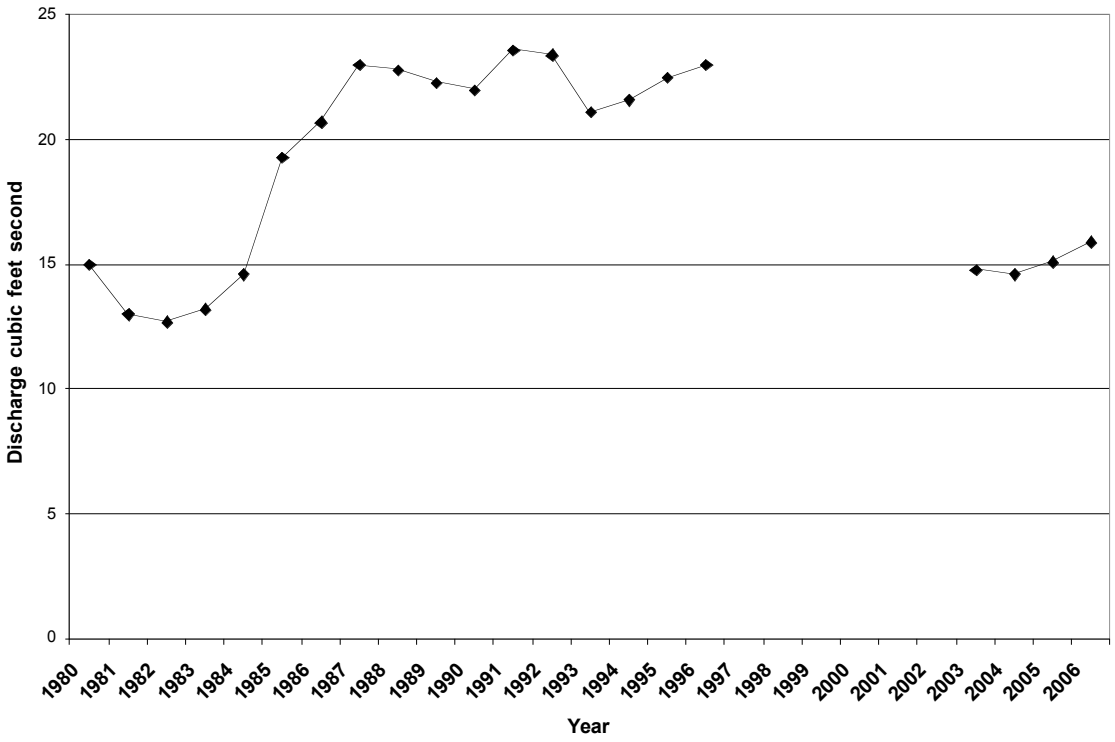

Figure 6. Discharge of Tularosa Creek, Otero County. Source: USGS Water Data.

Habitat Loss and Degradation Through Livestock Grazing

The direct effects of grazing on the Wright's marsh thistle are not known. None of the Wright's marsh thistles populations visited during the 1995 or 2005 surveys showed evidence of being grazed by domestic or wild herbivores (Sivinski 1996; Sivinski 2005a).
Cattle may indirectly affect the Wright's marsh thistle by degrading its habitat. Water is commonly captured or diverted for livestock use and as stated previously, water diversion causes natural wetlands to dry. The diversion of water from wetland areas for livestock use has been observed in two small springs in La Luz Canyon (Sivinski 1996). Livestock also physically affect riparian habitats, a habitat in which they are known to congregate (Baker, Boren et al. 2001). Plants such as reed canarygrass, river bullrush, and cattails can be severely injured by livestock grazing. FWS has stated that "extensive root systems are literally shredded by the cows' hooves as they trail through the wetland" (USFWS 2007). Livestock can also cause soil compaction, reducing infiltration, preventing salts from leeching

from the soil, and thus changing the soil chemistry (Reeves and Champion 2004). Increase in water turbidity and loading of nitrates has been documented to occur due to high grazing pressures. *Id*. Although there is no direct research on how such changes in soil structure, chemistry, and water quality affect the growth and reproduction of Wright's marsh thistle, there are likely adverse affects for this rare plant. Three known populations of thistle are present on US Forest Service cattle allotments in the Lincoln National Forest, Sacramento Mountains: Location H - cattle allotment #00208 and Location J - cattle allotment "James Canyon" (Figure 4).

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

At present, this factor is not known to affect Wright's marsh thistle.

III. Disease

At present there are no diseases known to affect Wright's marsh thistle.

IV. The inadequacy of existing regulatory mechanisms

The Wright's marsh thistle is not adequately protected by federal or state laws or policies to prevent its endangerment or extinction.

NatureServe Global Status: G2 – (last reviewed and changed in November 2003 from G3 to G2)

> **G2 Imperiled** - Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction or elimination. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000) or acres (2,000 to 10,000) or linear miles (10 to 50).
>
> **G3 Vulnerable -** At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

NatureServe National Status: N2- Imperiled in the nation because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation.

While indicating biological imperilment, these rankings does not provide any regulatory or policy mechanisms to protect Wright's marsh thistle.

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: 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 Wright's marsh thistle (NMNRD 2006). 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 only protection the NMAC provides for Wright's marsh thistle is to prohibit the plant's collection (NMAC 2007), which is not currently known to be a threat. No protection is afforded to the thistle's habitat through the NMAC, although habitat loss is likely the major threat to this species.

NatureServe State Rank for New Mexico: S2 - Imperiled because of rarity or because of some factor(s) making it very vulnerable to extirpation from New Mexico. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000).

NatureServe State Rank for Texas: 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 State 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.

While indicating biological imperilment, these rankings does not provide any regulatory or policy mechanisms to protect Wright's marsh thistle.

V. Other natural or manmade factors affecting its continued existence

Weed control

Thistles are typically classified as invasive plants by weed control specialists, farmers, and ranchers (Bridge 2001). The very large size of Wright's marsh thistle makes it conspicuous and susceptible to eradication efforts by people who are not skilled at distinguishing between a rare native plant and a noxious introduced weed. The Karr Canyon population in the

Sacramento Mountains is susceptible to herbicide weed control treatments as it is within the right-of-way of a well-used county road (Locations H and I in Figure 4) (Sivinski 1996). Wright's marsh thistle is also associated with *Arctium minus* (burdock) which is an introduced weed that is frequently targeted for eradication (Bridge 2001). The largest La Luz Canyon population is surrounded by a dry valley bottom that is choked with dense stands of Russian knapweed (Sivinski 1996). Russian knapweed is an invasive and exotic species that looks like a thistle and is in the same family as the Wright's marsh thistle. In La Luz Canyon, Wright's marsh thistle could fall victim to large scale herbicide applications designed to control nearby Russian knapweed.

Exotic species

Most alkaline riparian wetlands in the southwestern states are becoming dominated by the non-native tree species salt cedar and Russian olive to the exclusion of native riparian plants. These introduced trees are present at many locations of Wright's marsh thistle (Sivinski 2005a). Wright's marsh thistle occurs in perennially water-saturated substrates that are not suitable habitat for either of these exotic trees. The threat of these tree species comes from the fact that they are both phreatophytes, deep-rooted plants that obtain water from a permanent ground supply or from the water table, effectively drawing down groundwater. Both salt cedar and Russian olive are known to degrade wetlands by decreasing surface water (Wiesenborn 1996; Muzika and Swearingen 2006; VCRCD 2006). Salt cedar is also highly evapotranspirative, transpiring up to 300 gallons of water/day (VCRCD 2006). Salt cedar draws this great amount of water to use in its process of secreting salt. Salt secretion then creates high saline surface soils (VCRCD 2006), which inhibit many native plants' germination and growth (Wiesenborn 1996).

Introduced wetland species such as *Lythrum hyssopifolium* (whorled loosestrife) and *Lythrum salicaria* (Purple loosestrife or spiked loosestrife) could severely impact the habitat of the Wright's marsh thistle, as both species could out-compete *Cirsium wrightii*. *Lythrum hyssopifolium* is spreading throughout the west coast states but is not known to be present in New Mexico (USDA 2003). *Lythrum salicaria* is found in New Mexico and is listed as a noxious weed by the USDA and State of New Mexico. As of 2003, this species has not been found to occur in the counties where Wright's marsh thistle is located (USDA 2003).

Wright's marsh thistle is susceptible to damage by exotic insects introduced to North America for the purpose of controlling weedy introduced thistles, especially bull thistle. Weed control specialists introduced a European weevil (*Rhinocyllus conicus*) to the Great Basin states in order to control bull thistles. The weevil has now established itself in northeast New Mexico on the musk thistle and continues to migrate south (Thompson 2006). It is believed that by 2007 the weevil would impact the Sacramento Mountains. *Id*. New Mexico botanists have expressed great concern that this exotic weevil will prey upon native thistles and become a significant threat to such a rare species as Wright's marsh thistle (Sivinski 1996; Thompson 2006).

The Tularosa population of Wright's marsh thistle was threatened by the introduction of biological control agents in the form of insects. In 2001 the Mescalero Apache Tribe Division

of Resource Management and Protection planned to control musk thistle using introduced insects. Fortunately, the tribe hydrologist collected several plants unknown to her and had the specimens identified by a BLM botanist. One of these plants was Wright's marsh thistle. The hydrologist then contacted the New Mexico Rare and Plants Council and was informed that the introduced bugs could adversely affect Wright's marsh thistle. The recommendation to use bugs to control musk thistle was not advanced (Bridge 2001).

Drought

Another threat to Wright's marsh thistle botanists is drought. After his 2005 survey, Sivinski states the following in regards to drought and its effect on *Cirsium wrightii* populations (Sivinski 2005a):

> Only two large populations of Wright's marsh thistle in the Pecos River valley have not been effected by short-term drought. These marshy habitats are maintained by large regional aquifers. Some of the springs and wet-valley habitats in the Sacramento Mountains have become drier and have had a rapid change in vegetation. The relatively dry conditions in Tularosa, La Luz and Haynes canyons, altered vegetation and diminished populations are problematic. It is not certain that the cattail marshes seen in 1995 and converted to dense stands of common reed by 2005, will recover as suitable Wright's marsh thistle habitats during wetter times.

As is shown in Figure 7, the Sacramento Mountains have experienced drought conditions during 6 of the last 10 years that Sivinski surveyed for populations of Wright's marsh thistle (1995 and 2005). As stated previously, drought conditions exacerbate the drying up of wetlands affected by water diversion, ground water appropriation, and spring capping. This decreases occupied and potential habitat of the Wright's marsh thistle.

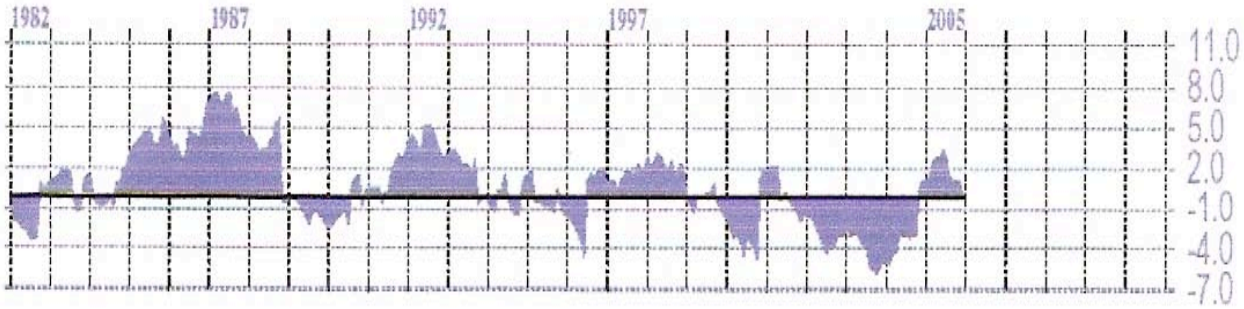

Figure 7. Monthly Palmer Drought Severity Index for region 6 which includes the Sacramento Mountains. An index of 0 = normal precipitation, -2 = moderate drought, -3 = severe drought, and -4 = extreme drought. Source: National Climate Data Center.

The additive impact of drought conditions and the corresponding increase in water diversion is further complicated by climate change. The drought conditions experienced throughout the southwestern United States and presented specifically for the Sacramento Mountains in Figure 7 have historically been even more severe. A similar drought in the 1950s had less

precipitation during a four-year period and resulted in a shift in the *Pinus ponderosa* ecotone throughout New Mexico. The more recent drought was coupled with higher temperatures and contributed to an even more extensive rapid die-off of *Pinus edulis* (Breshears et al. 2005). These regional landscape scale vegetation changes are strong indicators for the potential loss of wetland habitat through the combined effects of drought and increased temperature due to climate change.

Summary

Wright's marsh thistle merits listing as an Endangered or Threatened species under the Endangered Species Act. The species has suffered habitat degradation due to extensive water diversion and ground water appropriation for municipal and agricultural uses. The drying up of wetlands on which this thistle depends has been exacerbated by drought. Livestock grazing degrades riparian habitat and in locations where both the thistle and cows are present, habitat degradation has likely occurred.

Wright's marsh thistle was once thought to range across three U.S. states and northern Mexico. Its current known distribution is only four counties in one state: New Mexico. New Mexico populations of Wright's marsh thistle comprise eight population centers. No monitoring programs, management plans, or mechanisms for protection or conservation exist for this species or the habitat in which it is found. Evidence that the species does not currently occur in Mexico, Texas, and Arizona convinced the State of New Mexico to upgrade the species to Endangered. This petition is submitted with the hope that federal protection will be granted and will prevent this species' extinction. We believe ESA listing is vital to motivate research and conservation programs for this species and its habitat.

Requested Designation

WildEarth Guardians hereby petitions the U.S. Fish and Wildlife Service under the Department of Interior to list the Wright's marsh thistle (*Cirsium wrightii*) 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 drying-up of its wetland habitat. The Wright's marsh thistle is threatened by at least three of the five listing factors: present and threatened destruction, modification and curtailment of habitat and range; the inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence.

Critical habitat

Given that habitat loss and degradation is a significant cause of imperilment for the Wright's marsh thistle, Petitioner requests that critical habitat be designated for this species concurrent with final ESA listing.

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