# ARIZONA GAME AND FISH DEPARTMENT
# HERITAGE DATA MANAGEMENT SYSTEM

**Plant Abstract** **Element Code:** PDAPI0Z0T0

**Data Sensitivity:** No

## CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

**NAME:** *Eryngium sparganophyllum* Hemsl.
**COMMON NAME:** Arizona Eryngo

**SYNONYMS:** *Eryngium longifolium* Gray

**OTHER COMMON NAMES:** Ribbonleaf Button Snakeroot
**FAMILY:** Apiaceae

**AUTHOR, PLACE OF PUBLICATION:** *Eryngium sparganophyllum* W. B. Hemsley, Hooker's Icones, Plantarum 26(1): pl. 2508. 1897.

**TYPE LOCALITY:** Las Playas Springs, near Sierra de las Animos, New Mexico, United States.

**TYPE SPECIMEN:** HT: NY 405897. Charles Wright #1103, 1851. IT: GH, US.

**TAXONOMIC UNIQUENESS:** *Eryngium sparganophyllum* is one of 35 (Integrated Taxonomic Information System 2024) or 36 species Eryngium (National Resources Conservation Service 2024) in the genus in North America, and one of four found in Arizona (Kearney et al. 1960). The common name Arizona Eryngo has also been applied in past literature to *Eryngium lemmonii*. However, the accepted common name of *E. lemmonii* is Chiricahua Mountain Eryngo.

**DESCRIPTION:** Herbaceous perennial with a basal rosette of leaves and a scapose stem to 1.5 m tall; basal leaves linear, up to 1 m long, entire or rarely with one or two spinose teeth; cauline leaves few and reduced; inflorescence a compound umbel with compact head-like umbels terminating the branches; heads ovoid or ovoid-oblong, 12–25 mm long, 10–15 mm wide, with several ovate or lanceolate basal bracts and similar, but smaller bractlets within the head that barely exceed to the length of the fruits; corolla cream colored or bluish purple; fruit ovoid, 3–4 mm long with scales at the angles and smaller scales between (Sivinski 2013)

**AIDS TO IDENTIFICATION:** Species differs from other New Mexico congeners in having linear leaves and parallel venation.

**ILLUSTRATIONS:**
Color photo (flowers) and herbarium mounts (SEINet 2024)
Color Photo (flowers) (Makings 2006, p. 84)
Black and white photo and line drawings (flowers, habitat, plant, seeds) (Stromberg et al. 2020)

**TOTAL RANGE:** The known historic range of *E. sparganophyllum* was one site each in New Mexico (type locality), Chihuahua in Mexico, and Sonora in Mexico, and three sites in Arizona (U.S. Fish and Wildlife Service 2020). It has also been reported from farther south in Mexico, from Durango, Jalisco, Nayarit and Zacatecas. The New Mexico population has not been documented since the original collection in 1851. The Las Playas Springs wetlands were destroyed by various human interventions. Recent surveys of this area and other remaining ciénegas in New Mexico revealed no *E. sparganophyllum* and it is presumed extirpated in the state (Stromberg et al 2020). In Chihuahua, Mexico, the species was documented in 1982 and 1997 at the base of the Piedras Verdes Mountains in the San Miguel River drainage, and there are plans to revisit this site in the near future. In March 2018, a small population (at least 56 plants) was found at one of the historic sites in Ojo Varelano (in the municipio of Casas Grandes) Chihuahua (Escalante et al. 2019). The plant was not found at a second historic site in 2017, where a once sizable spring complex was found to have dried due to excessive ground water pumping. In Sonora, Mexico, the Agua Caliente ciénega population at the base of the Sierra del Tigres has been collected multiple times between 1980 and 2018. It was often referred to as a dominant plant in collection notes and the ciénega appears to occupy five hectares (Stromberg et al. 2020). There are various questions regarding the collections reported farther south in Mexico, including questionable identity, missing records, and possibly some specimens being a different taxon. It seems probable that the range of *E. sparganophyllum* does not extend this far south (Stromberg et al. 2020). Two of the three known populations in Arizona are extant. In summary, populations remain extant at four sites: two in Arizona, one in Sonora, and on in Chihuahua (U.S. Fish and Wildlife Service 2020).

**RANGE WITHIN ARIZONA:** NE of Tucson, Pima County, at the La Cebadilla Ciénega, near Tanque Verde Wash, and the Lewis Springs Cienega along the San Pedro River in Cochise County (U.S. Fish and Wildlife Service 2020). A third locality, also NE of Tucson at Aqua Caliente is no longer extant, although there are ongoing efforts to transplant a new population (Fonesca 2018, U.S. Fish and Wildlife Service 2020) The La Cebadilla Cienega is about 1.2 hectares, and the segment of the Lewis Springs Cienega that hosts *E. sparganophyllum* is estimated to be 225 square meters.

## SPECIES BIOLOGY AND POPULATION TRENDS

**GROWTH FORM:** Perennial forb.

**PHENOLOGY:** Flowering is from June to August and into September, with the dry fruits ripening through October (Stromberg et al. 2020, also based on specimens at the Missouri Botanical Garden Herbarium and AZGFD Heritage Data Management Program records).

**BIOLOGY:** Although it has been calculated that a single plant could produce several hundreds of seeds per season, the patterns of seed dispersal, germination percentages, and the rates of seedling establishment in the wild are not known, nor the plant's lifespan or lifetime reproductive potential. Seed germination under nursery conditions, without dormancy breaking

treatments, was about 30%. The species also reproduces vegetatively via rhizomes and adventitious roots (Stromberg et al. 2020)

Arizona observations note that flowers were visited by bees, wasps, flies, true bugs, butterflies, moths, beetles, weevils, and hummingbirds, but success rates from these pollinators is not known (Stromberg et al. 2020)

**HABITAT:** Occurs in riparian zones and marshes within Pinyon-Juniper Woodland and Madrean Evergreen Woodland (a mild winter-wet summer woodland of oaks and pines such as the Emory Oak and Chihuahua Pine) (NatureServe 2019). The newest documented population at Lewis Cienega occurs surrounded by desertscrub (Makings 2005). NatureServe (2019) and Makings (2006) consider this species to be a ciénega obligate.

Hendrickson and Minckley (1985) describe ciénegas as mid-elevation wetlands characterized by permanently saturated, highly organic, reducing soils and stable, persistent aquatic climax communities. Ciénegas are perpetuated by permanent, scarcely-fluctuating sources of water. The Center for Biological Diversity (2018) estimated 95% of historic ciénegas have been lost. Multiple factors have contributed to the decline of ciénegas including overgrazing, altered patterns of water infiltration and runoff, increases in flood intensity, reductions in stream base flows, groundwater pumping, surface water diversions, stream channel incisions, extirpation of beavers, drought, and climate change.

Stromberg et al (2020) suggests that E. *sparganophyllum* might also have a preference for alkaline and, frequently, hot-spring fed ciénega habitats.

**ELEVATION:** The three documented sites for this species in Arizona are at 2,720, 2,760 and 4,000 feet (830, 842 and 1,220 m). In New Mexico, the reported range is 4,500–5,000 feet (1,373–1,525 m), and in Mexico the species has been collected from 4,918–6,885 feet (1,500–2,100 m).

**EXPOSURE:** Within the La Cebadilla ciénega, *E. sparganophyllum* is more abundant in open areas than in areas shaded by riparian trees (Stromberg et al. 2020)

**SUBSTRATE:** Grows in organic muck and saturated silty clay-loam in marshy areas. Stromberg et al (n.d.) report that the soil in La Cebadilla Cienega was high in organic matter, but were also saline and alkaline. At Lewis Springs, the soil was "violently effervescent" using the hydrochloric acid test for assessing carbonates in the field (Stromberg et al. 2020)

**PLANT COMMUNITY:** Pinyon-Juniper and Madrean Evergreen Woodlands, and Desertscrub. At La Cebadilla ciénega, a cluster analysis showed that *E. sparganophyllum* was most closely affiliated with *Eleocharis palustris,* a wetland perennial graminoid. The next closest species clusters are *Muhlenbergia asperifolia-Schoenoplectus americanus* and *Anemopsis californica.* Other associates of *E. sparganophyllum* at La Cebadilla ciénega were *Almutaster pauciflorus*, *Distichlis spicata, Eustoma exaltatum, Juncus arcticus var. mexicanus,* and *Sisyrinchium demissum* (Stromberg et al. 2020) Additional species recorded from other collections, excluding

those listed above, include *Scirpus americanus. Cynodon dactylon, Eleocharis palustris, Fraxinus velutina, Juncus balticus, Muhlenbergia asperifolia, Populus fremontii, Prosopis juliflora, Prosopis velutina, Baccharis sarothroides, Isocoma tenuisecta, Fraxinus velutina, Sporobolus wrightii, Ambrosia psilostachya, Bouteloua* spp*., Echinochloa crus-galli, Elymus* spp*., Hopia obtusa, Muhlenbergia rigens,* and *Salix goodingii.*

Common associates of *E. sparganophyllum* at Lewis Springs in 2014 and 2018 were *Andropogon glomeratus, Juncus balticus*, *Lythrum californicum*, *Muhlenbergia asperifolia*, and *Schoenoplectus americanus*. Other plants documented from the ciénega include *Almutaster pauciflorus*, *Anemopsis californica, Asclepias subverticillata, Carex praegraclis, Helianthus anuus,* and *Lobelia cardinalis* (Stromberg et al. 2020)

**POPULATION HISTORY AND TRENDS:** There are only six historical and extent populations documented for this species. Two have been extirpated from the impacts of water mining and manipulation of waterways (the New Mexico type locality and the originally documented site at Agua Caliente near Tucson). The Chihuahua, Mexico populations had not been verified for over 20 years, until a survey by Escalante et al (2019) found at least 56 plants at Ojo Vareleno.

The short-term trend "appears to be one of decline" (10–50%), and the long-term is a decline of >70% (NatureServe 2019). It is estimated that approximately 95% of the ciénega habitat where this species occurs has been lost given that these sensitive habitats have been utilized by settlers for water and cattle grazing (Makings 2013). Surface and ground water exploitation that impacts the unique water flows to these ciénega habitats continues to this day. The Global Ranking is critically imperiled (G1G2, and this is also its rank in Arizona (S1). The "possibly extirpated" ranking for New Mexico is probably generous.

Comments from collection records in Arizona suggest that the species is dominant, very common or locally common at the two known sites (La Cebadilla near Tucson and Lewis Springs along the San Pedro River). Stromberg et al (2020) state that the La Cebadilla ciénega is about 1.3 hectares, and Lewis Springs is 0.8 hectares. Based on extrapolation from quadrate sample counts, the *E. sparganophyllum* population at La Cebadilla numbers in the "low thousands." The ciénega at Lewis Springs, along the Upper San Pedro River in Cochise County, from an aerial view, appears as a series of five discrete elongated wetlands. One of these five polygons, with an area of approximately 225 $m^2$, supports a good population of *E. sparganophyllum*, and Stromberg et al (2020) estimate this population to be 1,275 plants. Other ciénegas along the River, including the much larger St. David ciénega, do not host the species.

## SPECIES PROTECTION AND CONSERVATION

Status definitions: https://bit.ly/hdms-status-definitions
Heritage Network Conservation Status Rank definitions: https://bit.ly/hdms-rank-definitions

**ENDANGERED SPECIES ACT STATUS:** LE (USDI FWS 2022)
**STATE STATUS:** None

**OTHER STATUS:** Bureau of Land Management Sensitive (USDI, BLM 2017)

**MANAGEMENT FACTORS:** In the U.S., the species is only found in two cienegas: Lewis Springs in SPRNCA and La Cebadilla near Tucson (a third historic site near Tucson was surveyed in 2014 with negative findings, and the species has not been seen in NM since 1851 (CBD 2018). There is a third known population in Sonora, Mexico and afourth population in Chihuahua, Mexico, both of which are extant as of 2018 (U.S. Fish and Wildlife Service 2020).

Habitat and potential habitat for *Eryngium sparganophyllum*, a cienega obligate, has suffered significant losses in recent decades and is still threatened (NatureServe 2019). Such habitats are frequently disturbed, suffer invasive weeds, and, at least in the southwest US, are in serious decline from activities such as ground water extraction, livestock grazing, agricultural and urban development (Makings 2013).

Climate change and water mining (e.g., pumping of groundwater or diversion of spring discharge) are the primary threats to extant populations. Laws that regulate ground water use in the American Southwest, such as the Arizona Groundwater Management Act, do not expressly restrict harm to wetlands or other biotic resources. Pumping at sites even several kilometers from the river can jeopardize the regional groundwater flow to the wetlands along the river (Stromberg et al. 2020)

The encroachment of woody vegetation is another threat to Arizona Eryngo. Not only can this encroachment represent a lowering of the water table in the wetland that favors the woody plants with deeper roots, it can also be detrimental to species such as *E. sparganophyllum* that prefer open rather than shady settings. It is unknown if *Eryngium sparganophyllum* is a competitive species.

**PROTECTIVE MEASURES TAKEN:** The Center for Biological Diversity (2018) petitioned the U.S. Fish and Wildlife Service (USFWS) to protect the species under the Endangered Species Act (ESA). The Petition asserted that the Arizona Eryngo is threatened by modification or curtailment of habitat or range, and other factors that diminish its chance for continued existence including climate change, and lack of existing regulatory mechanisms to protect it from these threats. In response to this petition, the USFWS (2019) issued a 90-day finding on April, 2019 indicating that the petitioned action "may be warranted". On 4 March 2021, the USFWS proposed listing the Arizona Eryngo as an endangered species and designating critical habitat in Arizona under the Endangered Species Act of 1973 (U.S. Fish and Wildlife Service 2021). On 10 June 2022, the USFWS determined endangered species status for the Arizona Eryngo, and designated 12.7 acres of critical habitat in Pima and Cochise counties (U.S. Fish and Wildlife Service 2022).

The La Cebadilla Cienega population near Tucson is on land owned by Pima County, but the spring which feeds the ciénega is on private property and flow has been partially diverted. Additionally, urban development is occurring all around the site. This population is threatened

by modification of its limited habitat. The La Cebadilla property is an undeveloped parcel that was acquired by the Pima County Flood Control District to protect the adjacent Tanque Verde Creek from ongoing channel disturbance. The spring that feeds the wetlands at La Cebadilla is located on private property north of the site. The hydrology of the feeder spring property and of La Cebadilla has been altered as evidenced by constructed berms and ditches throughout both properties. The flows that support the ciénega at La Cebadilla are partially diverted to support a pond. Maintaining both the ciénega and the pond may require trade-offs during dry years as regional groundwater levels decline. This will be detrimental to the original ciénega habitat. The open wet meadow habitat is also threatened by the encroachment of shrubs (Center for Biological Diversity 2018).

The La Cebadilla population is threatened because the spring that feeds the wetland is on private land and there are potentially conflicting uses for the water. Arizona Eryngo needs ESA protection to make sure that the plant's survival is taken into consideration by the county when making management decisions for the property. The management of the spring (on private property) that feeds the cienega also occurs in the absence of regulatory mechanisms that would conserve this rare species.

The Lewis Springs population of Arizona Eryngo is found in the San Pedro Riparian National Conservation Area (SPRNCA), which was created in 1988 and is managed by the U.S. Bureau of Land Management (BLM). Though the habitat is protected in theory because it is federally managed, the Lewis Springs Cienega faces several threats that are not being adequately addressed by existing regulatory mechanisms, leaving the plant at high risk of extirpation at the site. Though livestock grazing is technically prohibited, trespass cattle are commonly found in the SPRNCA and enforcement is lacking. Lewis Springs is also under dire threat from groundwater decline resulting from increased demand for water resources with development activities in the surrounding area. There are no mechanisms in place to regulate the demands on the regional aquifer in a manner that will sustain the hydrology that supports the maintenance of the ciénega habitat on which Arizona Eryngo depends for survival.

Experimental reintroductions of Arizona Eryngo occurred at the Agua Caliente Ranch east of Tucson in Pima County in 2017-2018 using nursery-grown plants with 20 plants in 2017 and 15 plants in 2018 (U.S. Fish and Wildlife Service 2020). The initial reintroduction effort in 2017 had limited success due to young plants being damaged by javelina and water stress from site placement. Success improved with the 2018 planting but a number of plants still suffered mortality (Fonseca 2018). Additional plants have been established with more recent reintroductions, but the establishment of a viable Arizona Eryngo population has not yet been accomplished (U.S. Fish and Wildlife Service 2020).

Ex-situ seed banks for *Eryngium sparganophyllum* have been established at the Desert Botanical Garden and the National Tropical Botanical Garden (Stromberg et al. 2020)

There are no regulatory mechanisms in place in Mexico to protect *E. sparganophyllum*.

**SUGGESTED PROJECTS:** Although surveys to identify new locations for *Erygium sparganophyllum* would be beneficial since there are only 3–4 currently (2018) documented populations, the level of effort may not be justified. First, most of the ciénegas still extant in Arizona and New Mexico are known and have been surveyed for various reasons. Although it is certainly possible that the species was overlooked, it is unlikely that enough new populations would be encountered to significantly change the status of this species. Second, *E. sparganophyllum* seems to have extremely specific habitat requirements, and these are not entirely understood. While it was found at one of the five Lewis Springs wetland areas, it was not found at the other four or other wetland/ciénegas within the SPRNCA (including the larger St. David ciénega). The status of the known population area in Chihuahua, Mexico, however, should definitely be verified.

Given that the most major threat to the continued survival of *E. sparganophyllum* are continuing modifications to its ground water sources, isotopic analysis is an important research need (Stromberg et al. 2020). Such information would help to define the ultimate origins of the water feeding into the two ciénegas with an extant Arizona Eryngo population and therefore facilitate future management decisions.

Encroachment of woody vegetation is another threat. Declining water tables in wetlands can favor the more deeply rooted riparian trees and shrubs at the expense of the herbaceous vegetation. Aerial photos can be used to determine over time if woody vegetation is indeed encroaching into the ciénegas, and at what rate (Stromberg et al. 2020)

Pima County has started transplant efforts for the species (Stromberg et al. 2020, U.S. Fish and Wildlife Service 2020). Work has been undertaken at the original Tucson site at Agua Caliente, and there are plans to try to establish a new population at Historic Canoa Ranch in Green Valley (south of Tucson). Plants have been produced from seed at the Desert Botanical Garden. This work will require both short- and long-term monitoring to determine survival rates and fecundity.

**LAND MANAGEMENT/OWNERSHIP:** BLM – Tucson Field Office, San Pedro National Conservation Area. Pima County (Flood Control District); Private.

## SOURCES OF FURTHER INFORMATION

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**ADDITIONAL INFORMATION:** Plants in the *Eryngium* genus are rich in pharmaceuticals and produce valuable cytotoxic and anti-inflammatory compounds (Stromberg et al. 2020)

**Revised:** 2004-08-20 (AMS)
2004-09-30 (SMS)
2019-05-15 (BDT)
2019-10-30 (BDT)
2024-11-03 (CPS)