

Interim Core Map Documentation for the Arizona Eryngo

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Draft Interim Core Map Developer: Center for Biological Diversity

Species Summary

The Arizona eryngo is a perennial flowering plant in the carrot family (Apiaceae). This species is endemic to Arizona, New Mexico, and the states of Chihuahua and Sonora in Mexico. The Arizona eryngo is wetland dependent and is only found in open, sunny, cienega wetlands. Cienega wetlands are a type of permanent spring-fed wetland in the Southwest with permanently saturated soils. The Arizona eryngo is found in 11 sites, three historic and eight reintroduced sites all in Arizona (Cochise, Pima, and Santa Cruz Counties). The wetland habitats are primarily threatened by groundwater pumping for agriculture and urban development.

EPA Review Notes

The developers created this core map using the U.S. Environmental Protection Agency's (EPA) process available at: <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas>. EPA reviewed the core map and documentation and evaluated if: (1) the map and documentation are consistent with the agency's process; (2) areas included or excluded from the core map are consistent with the biology, habitat, and/or recovery needs of the species; (3) data sources are documented and appropriate; and (4) the GIS data and mapping process are consistent with the stated intention of the developer. EPA agrees that this map is a reasonable depiction of core areas for this species and was consistent with the agency's mapping process. This documentation was not prepared by EPA, and EPA may have edited this documentation for clarity or other purposes. Some views included in this documentation may not necessarily be the views of EPA or its staff.

The core map developed for this species is considered interim and has not yet been reviewed by the U.S. Fish and Wildlife Service (FWS) species expert(s). EPA intends to use this core map to develop pesticide use limitation areas (PULAs). This core map incorporates information developed by FWS and made available to the public. This core map may be revised in the future after FWS species expert review and as additional relevant information becomes available.

This core map does not replace or revise any range or designated critical habitat developed by FWS.

Description of Core Map

The Arizona eryngo core map is biological information type based on known locations. The occupied wetlands are relatively small and highly localized within the species range (Cochise, Pima, and Santa Cruz Counties in Arizona). Based on location information presented in the 2025 Recovery Plan, the Center created a core map using described areas of public and private lands.

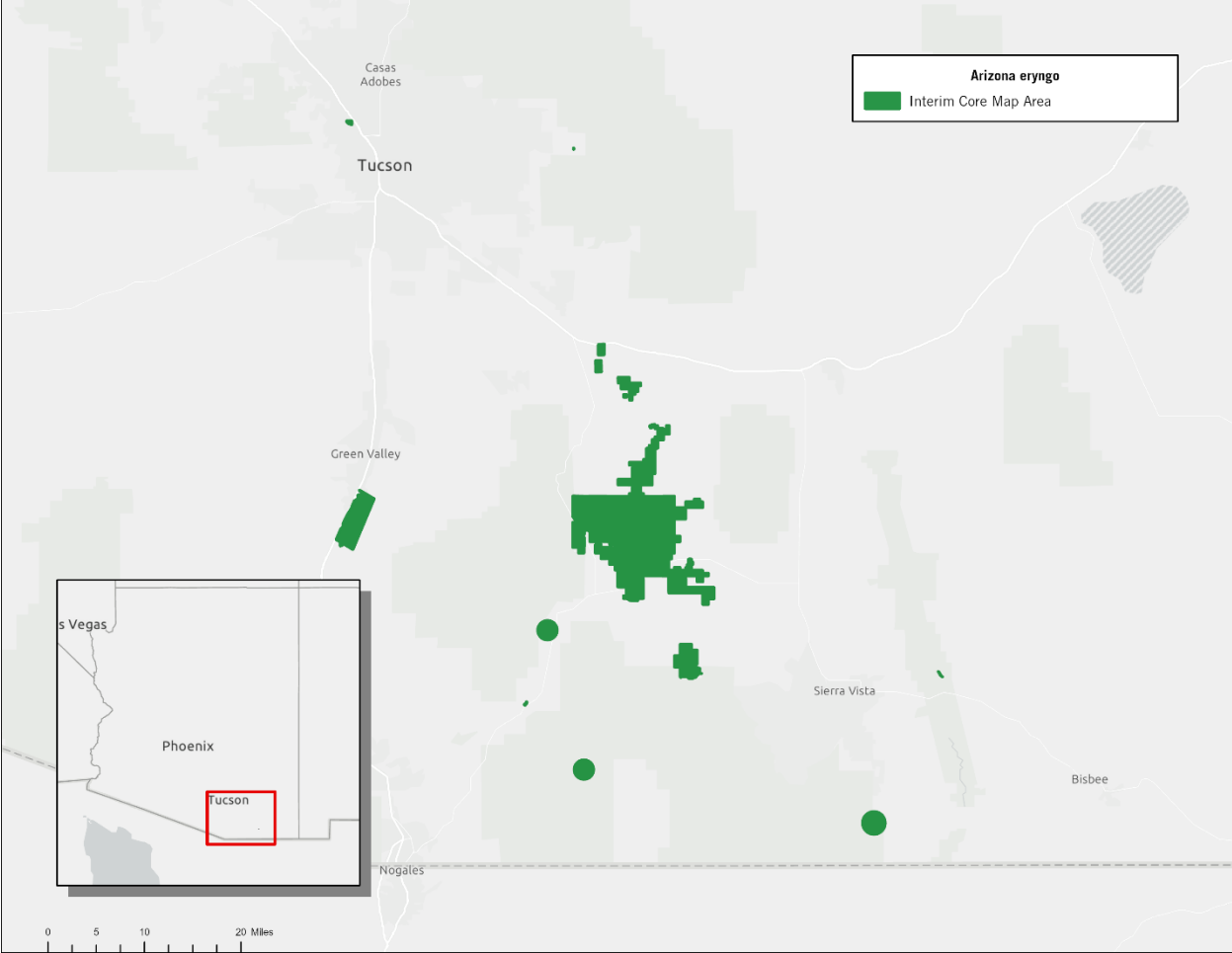


Figure 1. Interim core map for the Arizona eryngo. (approximately 60,877acres)

Table 1. Percentage of Interim Core Map Represented by NLCD Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Land Cover (Value)	% of core map represented by landcover	% of core map represented by example pesticide use
Forestry	Deciduous Forest (41)	0%	.9%
Forestry	Evergreen Forest (42)	.9%	.9%
Forestry	Mixed Forest (43)	0%	.9%
Agriculture	Pasture/Hay (81)	0%	0%
Agriculture	Cultivated Crops (82)	0%	0%
Mosquito adulticide, residential	Open space, developed (21)	1.3%	1.6%
Mosquito adulticide, residential	Developed, Low intensity (22)	.3%	1.6%
Mosquito adulticide, residential	Developed, Medium intensity (23)	0%	1.6%
Mosquito adulticide, residential	Developed, High intensity (24)	0%	1.6%
Invasive species control	Woody Wetlands (90)	.7%	97.4%
Invasive species control	Emergent Herbaceous Wetlands (95)	.3%	97.4%
Invasive species control	Open water (11)	0%	
Invasive species control	Grassland/herbaceous (71)	7.6%	
Invasive species control	Scrub/shrub (52)	88.8%	
Invasive species control	Barren land (rock/sand/clay; 31)	0%	
Total Acres	Interim Core Map Acres	~60,877	

Evaluation of Known Location Information

The Center evaluated location information presented in the 2025 Recovery Plan (FWS 2025) and the Species Status Assessment (FWS 2022a). Service documents are considered the best and most reliable sources of information for the location of a species. The Recovery Plan provides a summary table and map of known historic and reintroduced sites. Based on these documents, we judged that the distribution of the Arizona eryngo is well known, and all populations are likely described in Service documents. The Center did not evaluate any additional sources of location information.

Approach Used to Create Core Map

Based on location names of historic and reintroduced wetlands, the Center used the Public Areas Database (PADUS) and private ownership parcel information to identify occupied areas. Critical habitat areas were also included as these areas are still considered occupied since designation in 2022. Location areas were cross-referenced with locations depicted in Figure A1-3.

Of the 11 occupied sites, we located nine sites using PADUS or critical habitat. Two sites on private land, referred to as Ash Canyon and Harshaw, could not easily be identified with PADUS. For these sites we used site elevation, general named areas, and satellite imagery to narrow down and identify the most likely locations of the cienega wetland habitats. After identifying the most likely location of the wetlands we added a 1-mile buffer to the areas to account for uncertainty. See Appendix 2 for our specific methods for identifying these sites.

Based on our approach to creating this core map, we introduced uncertainty to the core map by adding additional areas outside of the critical habitat. Overall, we judge that the uncertainty score for this core map is limited (2). Occupied areas are small in scale, localized, mostly within public land areas, and have had very recent survey data. For all but two sites, selecting public land areas was adequate to create a well-defined and narrow core map.

Discussion of Approaches and Data that were Considered but not Included in Core Map

Range Map Approach for Core Map

A core map based on the species range was rejected because the ECOS range map is overly broad and contains large areas of unoccupied habitat. The ECOS range map is county level and was last updated in 2023. The 2025 Recovery Plan (Figure A1-3) shows that the extant populated areas are small and highly localized across the occupied counties.

Critical Habitat Approach for Core Map

A core map based on critical habitat was rejected. As a result of successful reintroductions, the Arizona eryngo is reestablished at eight additional locations outside of the designated critical habitat. Therefore, the critical habitat alone is insufficient as a core map. Critical habitat areas were included in the final core map.

Habitat Modeling Approach for Core Map

A core map based on modeled habitat was rejected because sufficient location information was available to describe the known locations. Furthermore, there is no known habitat model available for the Arizona eryngo.

Other sources of information reviewed but not included

No location or biological information was reviewed beyond what was presented in the 2025 Recovery Plan and the 2022 Species Status Assessment.

Appendix 1. Information compiled for species during Step 1

1. Recent FWS documents

FWS. 2022a. Species Status Assessment Report for *Eryngium sparganophyllum* Arizona Eryngo. Available at <https://iris.fws.gov/APPS/ServCat/DownloadFile/216376>.

FWS. 2022b. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Arizona Eryngo and Designation of Critical Habitat. Federal Register 87 FR 35431. Available at <https://www.govinfo.gov/link/fr/87/35431>.

FWS. 2025. Arizona Eryngo (*Eryngium sparganophyllum*) Recovery Plan. Available at [https://ecos.fws.gov/docs/recovery_plan/Recovery%20Plan%20for%20the%20Arizona%20Eryngo%20\(Eryngium%20sparganophyllum\).pdf](https://ecos.fws.gov/docs/recovery_plan/Recovery%20Plan%20for%20the%20Arizona%20Eryngo%20(Eryngium%20sparganophyllum).pdf)

2. Background information

Status: ENDANGERED Listed 3/4/2021

Resiliency, redundancy, and representation (the 3Rs):

From 2022 Species Status Assessment Chapter 4

Resiliency –

The SSA assessed each occupied area for resiliency in three categories (high, moderate, low) based on population and habitat factors. The specific resilience values can be found in the SSA Table 4.3. The overall results are summarized below:

“Two populations (La Cebadilla and Lewis Springs) fall into the moderate category, but overall La Cebadilla scores the highest and is the only population that has no factors in the low category and has abundance in the high category. Two populations (Ojo Vareleño and Rancho) fall into the low category, but overall Ojo Vareleño scores the lowest and is the only population that has no juvenile presence and whose factors all fall into the low category. The only population whose current condition category was capped by abundance was Rancho Agua Caliente, where population and habitat factors fall into the moderate to high range, with the exception of abundance, which falls in the low category.” (FWS 2022a p. 55)

Redundancy –

“Currently, there are four extant Arizona eryngo populations range wide; however, each of the four aforementioned representation areas, have one population each for redundancy (Figure 4.1). Requirements of the species may be specific enough that Arizona eryngo did not commonly occur at all historical cienegas in the International Four Corners Region, however, given the historical distribution of functional aridland cienegas, it is likely that Arizona eryngo populations were historically more abundant, occurred closer to one another, and were more connected (through pollination and seed dispersal) than they are currently. If further plantings at Agua Caliente are successful and a viable population can be sustained over time, this reintroduced population would add redundancy to the Santa Cruz River Basin representation area, within which the La Cebadilla population is extant. An introduction effort began in November 2019 at the Historic Canoa Ranch, owned and managed by Pima County Natural Resources, Parks and Recreation, in Pima County, Arizona. Six plants were planted at the Canoa pond in 2019, and 12 more were planted in January 2020 at the newly constructed Canoa cienega. This site is also within the Santa Cruz River Basin representation area; therefore, if this introduction effort is successful in the long-term it will add further redundancy. Another introduction effort began in 2020 at the Las Cienegas National Conservation Area, owned and managed by the BLM, in Pima and Santa Cruz Counties. This site is within the Cienega Creek Watershed within the Santa Cruz River Basin representation area; therefore,

if this introduction effort is successful in the long- term it will add further redundancy.” (FWS 2022a p. 55).

Representation –

“We consider Arizona eryngo to currently have representation in the form of genetic diversity (see section 2.2 and 3.2.2.) and ecological diversity (see section 3.1 and 3.2.2), as it occurs at four isolated sites in separate river basins. The four populations and river basins of representation are: 1) the La Cebadilla population in the Santa Cruz River Basin, 2) the Lewis Springs population in the San Pedro River Basin, 3) the Rancho Agua Caliente population in the Rio Bavispe River Basin, and 4) the Ojo Vareleño population in the Mimbres Basin. The representation areas are approximately depicted in Figure 4.1. It is possible that representation boundaries could be adjusted in the future after further investigation of the genetic and ecological diversity of the species.” (FWS 2022a p. 55)

Habitat, Life History, and Ecology

Habitat:

The Arizona eryngo is a wetland-dependent plant found in specific desert cienega wetlands. The cienega wetlands are permanent spring-fed wetlands occur below ~5000ft elevation. The wetlands can be freshwater or alkaline with permanently saturated soils that support grassy meadows in an otherwise desert environment (FWS 2022a p. 11).

Taxonomy:

The Arizona eryngo (*Eryngium sparganophyllum*) is a flowering plant in the Apiaceae (carrot) family. It is one of five Eryngium species found in Arizona. This species was first described from the Las Playas population by botanist William Hemsley (FWS 2022a p. 5). It is considered a full species and the currently accepted taxonomy is shown in Table A1-1.

Table A1-1. Integrated taxonomic information service (ITIS) taxonomy of the Arizona eryngo.

Kingdom	Plantae – plantas, Planta, Vegetal, plants
Subkingdom	Viridiplantae – green plants
Infrakingdom	Streptophyta – land plants
Superdivision	Embryophyta
Division	Tracheophyta – vascular plants, tracheophytes
Subdivision	Spermatophytina – spermatophytes, seed plants, phanérogames
Class	Magnoliopsida
Superorder	Asteranae
Order	Apiales
Family	Apiaceae
Genus	Eryngium L. - eryngo
Species	Eryngium sparganophyllum Hemsl. – Arizona eryngo

Relevant Potential Pesticide Use Sites:

- Conservation uses such as invasive species removal
- Grasshopper control
- Livestock parasite application
- Herbicide use for clearing vegetation for stormwater and irrigation infrastructure
- Urban/residential use of herbicide and other pesticides

Relevant Recovery Criteria and Actions:

Objective:

“Recovery objectives identify outcomes that will lead to achieving the goal of recovery and delisting.

Recovery objectives for Arizona eryngo are:

1. Increase the size and number of populations (i.e., improve resiliency and redundancy) through Arizona eryngo augmentation and introduction success.
2. Ensure long-term Arizona eryngo conservation through the establishment of ex-situ plants and seed collections housed at multiple Center for Plant Conservation approved botanical institutions and seed banks.
3. Improve our understanding of the status and conservation needs of Arizona eryngo and its habitat through monitoring and research, and practice adaptive management in which recovery is monitored and recovery activities are updated by the USFWS in coordination with partners as new information becomes available.
4. Reduce threats of loss and alteration of cienegas and water loss from cienegas through the protection, restoration, and proper management of adequate quantity and quality of functional cienega habitat within existing, newly discovered, and introduced Arizona eryngo populations.
5. Reduce threats from changes in co-occurring native and nonnative vegetation to Arizona eryngo habitat within existing, newly discovered, and introduced Arizona eryngo populations.
6. Identify and reduce other threats (e.g., unsustainable levels or timing of predation or herbivory, trampling, pollinator loss), as needed, to ensure Arizona eryngo growth, reproduction, and recruitment within existing, newly discovered, and introduced Arizona eryngo populations.
7. Ensure long-term Arizona eryngo conservation through adequate funding, public education and outreach, and partnerships.” (FWS 2025 p. 9).

Criteria:

Downlisting Criteria

“The following are objective, measurable criteria which, when met, would result in a determination that Arizona eryngo will be considered for reclassification as a threatened species:

1. Fourteen or more populations of Arizona eryngo are viable throughout the species’ geographic range in the U.S. and Mexico, including populations in the four representation areas as follows:
 - a. Santa Cruz River Basin: at least four populations, including La Cebadilla and three additional populations that are newly discovered or introduced (these may include Agua Caliente, Canoa, Bar V, and LCNCA).
 - b. San Pedro River Basin: at least two populations, including Lewis Springs and one additional population that is newly discovered or introduced.
 - c. Rio Bavispe River Basin: at least two populations, including Rancho Agua Caliente and one additional population that is newly discovered or introduced, or two populations that are newly discovered or introduced.
 - d. Rio Casas Grandes Basin (Mimbres): at least four populations, including Ojo Vareleño and three additional populations that are newly discovered or introduced, or four populations that are newly discovered or introduced.
 - e. Two additional populations that are newly discovered or introduced in any existing or new representation area.

Introduced populations are created using appropriate genetic stock and are placed in suitable habitat and microhabitat.

Of the 14 populations referenced above, at least:

- a. One population supports more than 30,000 adult individuals (i.e., genets),
- b. One population supports more than 1,840 adult individuals (i.e., genets), Arizona Eryngo (*Eryngium sparganophyllum*) Recovery Plan
- c. Six populations support more than 800 adult individuals (i.e., genets),
- d. Six populations support more than 100 adult individuals (i.e., genets). The total number of adult individuals may be spatially distributed in subpopulations within a population (i.e., the subpopulations must be close enough to interact via pollination). These population numbers will be maintained (natural recruitment is greater than or equal to documented plant loss) for a total of at least 5 years over the last 10-years of the period prior to downlisting (20 years), as indicated by monitoring every 1 to 3 years, including during the three most recent monitoring events. This allows for some fluctuation in population abundance due to drought or other threats.

2. A collection of seed representing the geographical, morphological, and genetic diversity of Arizona eryngo is started within 5 years of the finalization of this recovery plan, with regular supplemental collections, and maintained in at least one Center for Plant Conservation partner, or botanical or seed storage institution for conservation purposes.

3. A living collection of plants representing the geographical, morphological, and genetic diversity of Arizona eryngo is started within 5 years of the finalization of this recovery plan, with needed supplemental collections, and maintained long-term in at least one botanical institution for educational and conservation purposes.

4. Lands supporting 10 of 14 populations of Arizona eryngo are protected in perpetuity through a conservation easement, habitat conservation plan, or other conservation mechanism appropriate to the land status.

5. Conservation and management programs and plans address the threats to Arizona eryngo, including cienega habitat loss, drying, and alteration; changes in co-occurring vegetation; and direct harm to Arizona eryngo. The following must be met:

- a. site-specific plans are developed and at least partially implemented, such that:
 - i. competing native and nonnative vegetation is reduced to a level that ensures Arizona eryngo is not shaded and that the vigor of mature plants and seedlings is not negatively affected (Factor A),
 - ii. a more natural fire or other disturbance regime (e.g., mechanical vegetation removal, prescribed grazing) is promoted (Factor A),
 - iii. natural spring flow supporting cienegas is increased by reducing water loss (from groundwater pumping, etc.) and increasing water conservation and recharge (Factor A),
 - iv. moist soil cienega habitat is increased (Factor A)
 - v. herbivory and trampling are managed to benefit species survival (Factor C), and
 - vi. native plant diversity is maintained or increased, thus promoting native pollinators; and
- b. data on the conservation and management of Arizona eryngo are collected and shared among landowners, managers, and researchers.” (FWS 2025 pp. 10-11)

Delisting Criteria

“The following are objective, measurable criteria which, when met, would result in a determination that Arizona eryngo will be considered for removal from the endangered species list:

1. Fourteen or more populations of Arizona eryngo are viable throughout the species’ geographic range in the U.S. and Mexico, including populations in the four representation areas as follows:
 - a. Santa Cruz River Basin: at least four populations, including La Cebadilla and three additional populations that are newly discovered or introduced (these may include Agua Caliente, Canoa, Bar V, and LCNCA).
 - b. San Pedro River Basin: at least two populations, including Lewis Springs and one additional population that is newly discovered or introduced.
 - c. Rio Bavispe River Basin: at least two populations, including Rancho Agua Caliente and one additional population that is newly discovered or introduced, or two populations that are newly discovered or introduced.
 - d. Rio Casas Grandes River Basin: at least four populations, including Ojo Vareleño and three additional populations that are newly discovered or introduced, or four populations that are newly discovered or introduced.
 - e. Two additional populations that are newly discovered or introduced in any existing or new representation area.

Introduced populations are created using appropriate genetic stock and are placed in suitable habitat and microhabitat.

Of the 14 populations reference above, at least:

- a. One population supports more than 30,000 adult individuals (i.e., genets),
- b. One population supports more than 1,840 adult individuals (i.e., genets),
- c. Six populations support more than 800 adult individuals (i.e., genets),
- d. Six populations support more than 100 adult individuals (i.e., genets).

1. The total number of adult individuals may be spatially distributed in subpopulations within a population (i.e., the subpopulations must be close enough to interact via pollination). These population numbers will be maintained (natural recruitment is greater than or equal to documented plant loss) for a total of at least 5 years over the last 10-years of the period prior to delisting (30 years), as indicated by monitoring every 1 to 3 years, including during the three most recent monitoring events. This allows for some fluctuation in abundance due to drought or other threats.

To count toward achieving this criterion, existing or introduced populations that are used to evaluate this criterion may be augmented for the first 20 years of recovery to achieve population numbers. To show that populations are viable, no augmentation can occur within populations being evaluated under this criterion in the last 10 years for populations considered as contributing to possible delisting.

2. A collection of seed representing the geographical, morphological, and genetic diversity of Arizona eryngo is started within 5 years of the finalization of this recovery plan, with regular supplemental collections, and maintained in at least one Center for Plant Conservation partner botanical or seed storage institution for conservation purposes.

3. A living collection of plants representing the geographical, morphological, and genetic diversity of Arizona eryngo is started within 5 years of the finalization of this recovery plan, with needed supplemental collections, and maintained in long-term in at least one botanical institution for educational and conservation purposes.

4. Lands supporting 12 of 14 populations of Arizona eryngo are protected in perpetuity through

a conservation easement, habitat conservation plan, or other conservation mechanism appropriate to the land status.

5. Conservation and management programs and plans address the threats to Arizona eryngo, including cienega habitat loss, drying, and alteration; changes in co-occurring vegetation; and direct harm to Arizona eryngo. The following must be met:

- a. site-specific plans are developed and fully implemented, such that: competing native and nonnative vegetation is reduced to a level that ensures Arizona eryngo is not shaded, and that the vigor of mature plants and seedlings are not negatively affected (Factor A),
 - i. a more natural fire or other disturbance regime is promoted (Factor A),
 - ii. natural spring flow supporting cienegas is increased by reducing water loss (from groundwater pumping, etc.) and increasing water conservation and recharge (Factor A),
 - iii. moist soil cienega habitat is increased (Factor A),
 - iv. herbivory and trampling are minimized (Factor C), and
 - v. native plant diversity is maintained or increased, thus promoting native pollinators; and
- b. data on the conservation and management of Arizona eryngo are collected and shared among landowners, managers, and researchers.” (FWS 2025 pp. 12-13).

Recovery Actions:

The Service has taken multiple recovery actions for the Arizona eryngo. The most important actions for the recovery of the species have been the reintroductions of the Arizona eryngo to multiple cienega wetlands in the region. The 2025 Recovery Plan does not summarize previous recovery actions.

Recommendations for Future Actions:

The 2025 Recovery Plan outlines recommendations for future recovery actions in Table 4 (FWS 2025 pp. 20-27). There are recommendations relevant to every recovery criteria. Table 4 is too long to reproduce here. Broadly, the Recovery Plan calls for monitoring, habitat restoration, and reintroductions for the Arizona eryngo.

3. Description of Species Range:

The Arizona eryngo is endemic to Arizona, New Mexico, and the Mexican states of Chihuahua and Sonora. The species is only found in spring-fed cienega wetlands. Historically, the species was known from three wetland sites in Arizona (Agua Caliente, Lewis Springs, and La Cebadilla) and one wetland in New Mexico (Las Playas) (FWS 2025 p. 2). The New Mexico, Las Playas, site is extirpated, but after recent reintroductions, the Arizona eryngo is present in 11 wetlands across Cochise, Pima, and Santa Cruz Counties.

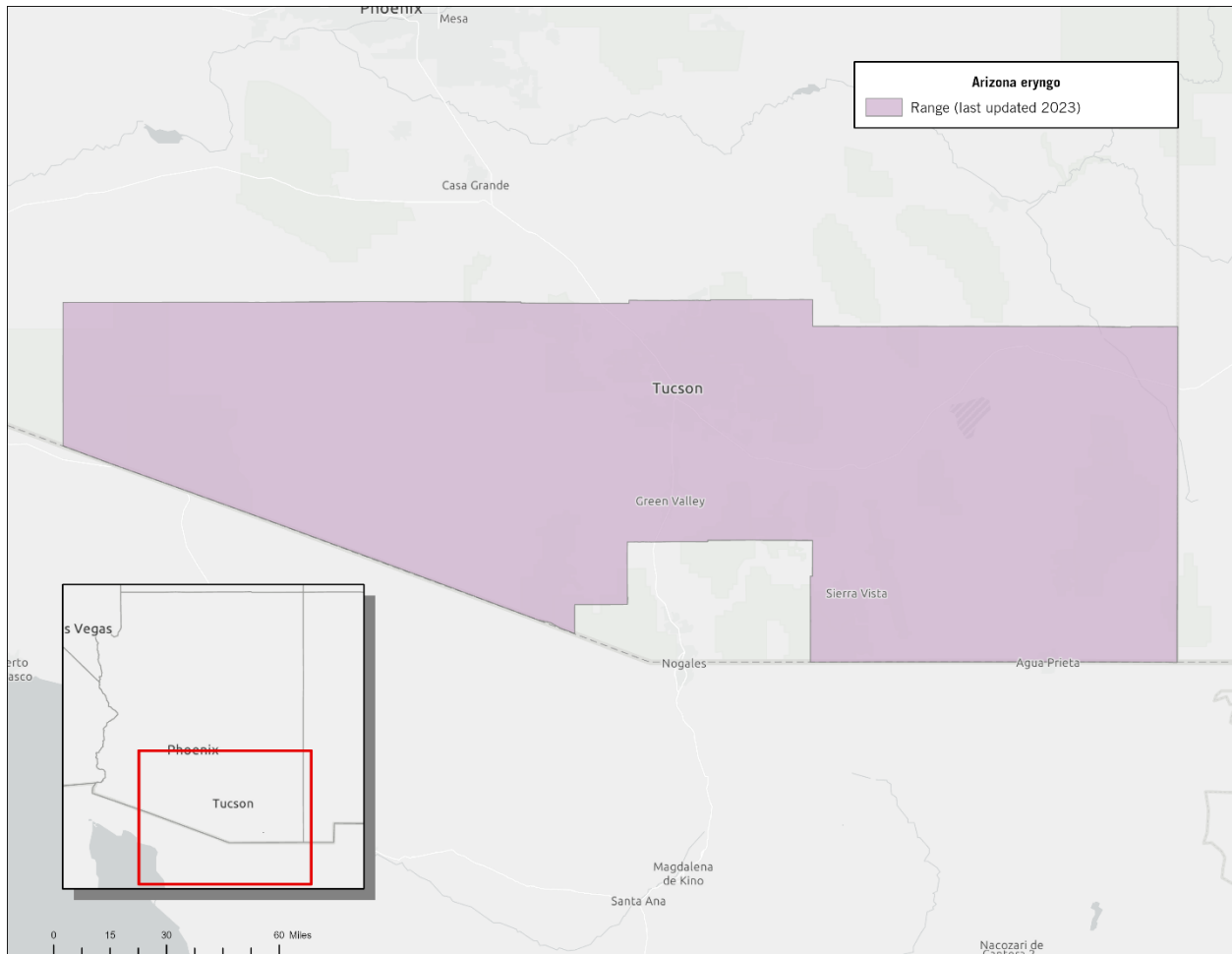


Figure A1-1. ECOS range map for the Arizona erylgo. (<https://ecos.fws.gov/ecp/species/10705>) Map was last updated 5/26/2023. The total ECOS range is approximately 9,860,094 acres.

4. Critical Habitat:

In 2022, the Service designated 12.7 acres of critical habitat for the Arizona erylgo in Cochise and Pima Counties, Arizona (FWS 2022b p. 35431) (depicted in Figure A1-2). The critical habitat consists of two units that were both occupied at the time of listing and CH designation (FWS 2022b p. 35448). In Cochise County, the Lewis Springs Unit is on 9.6 acres of Bureau of Land Management (BLM) lands. In Pima County, the La Cebadilla Unit is on 3.1 acres of private and County Flood Control District lands.

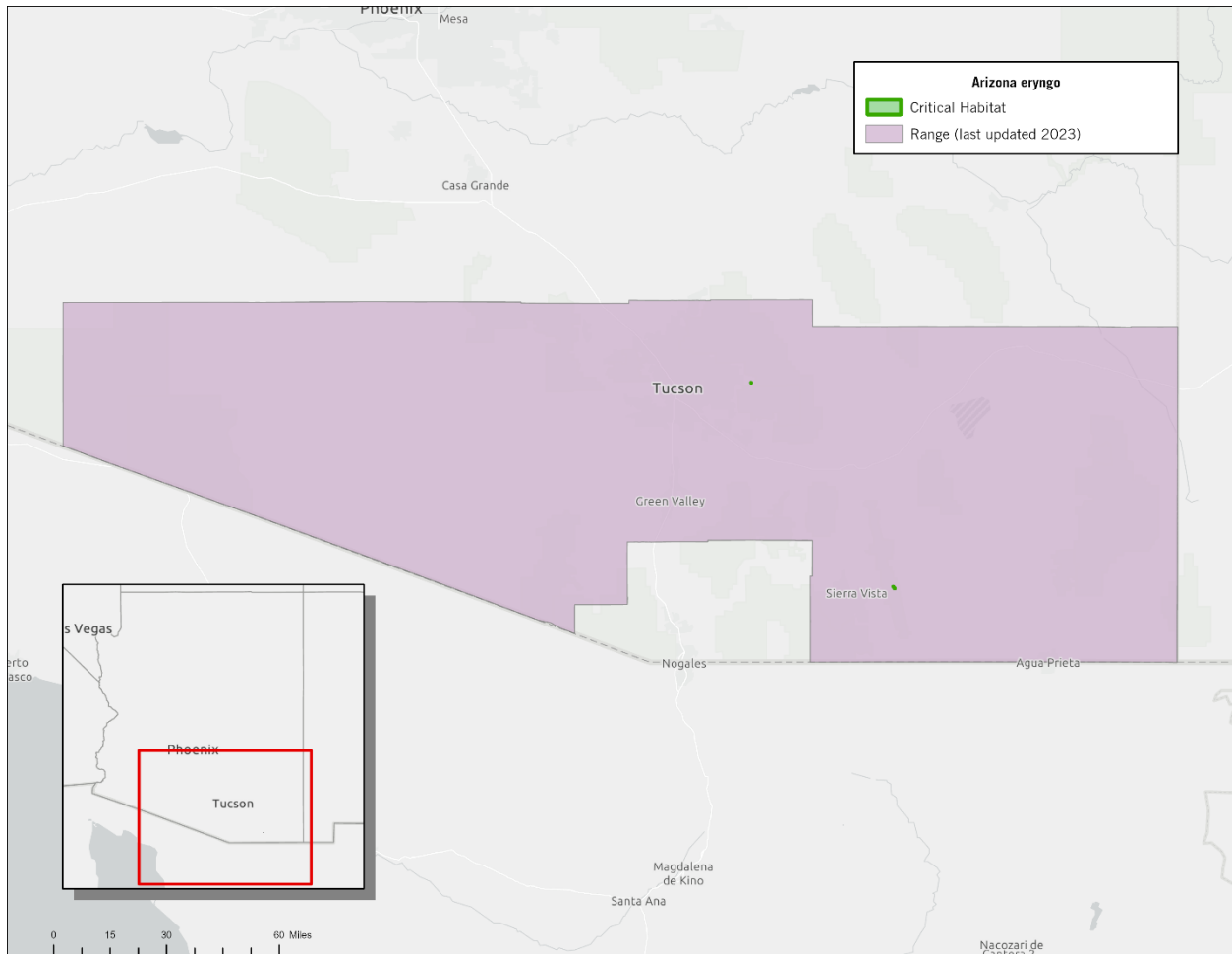


Figure A1-2. Critical habitat units for the Arizona Eryngo. The total acreage of critical habitat is 12.7 approximate acres.

5. Known Locations

Historically, the species was known from three wetland sites in Arizona (Agua Caliente, Lewis Springs, and La Cebadilla) and one wetland in New Mexico (Las Playas) (FWS 2025 p. 2). The New Mexico wetland became extirpated since listing. The three historic Arizona sites remain extant with Agua Caliente receiving a reintroduction effort in 2016-2020. From 2019 to 2022 eight sites have had Arizona eryngo reintroduced and according to the 2025 Recovery Plan, all these sites had successful transplantation and are now extant (FWS 2025 pp. 3-5). The historic and reintroduced sites are summarized in Table A1-1 and depicted in Figure A1-3.

Table A1-1. Populations of Arizona Eryngo in Arizona and New Mexico. Information from 2025 Recovery Plan pp. 3-5.

Site Name	County, State	Status	Land Ownership
Las Playas Springs	Hidalgo, New Mexico	Extirpated	Private
Agua Caliente	Pima, Arizona	Extirpated, but then reintroduced in 2016-2020. 20 seedlings found in 2023, no plants observed in 2024	Pima County Natural Resources, Parks, and Recreation (PCNRPR); Agua Caliente Regional Park
Le Cebadilla Cienega	Pima, Arizona	Extant Most recent observation in 2023.	La Cebadilla Estates; and Pima County Regional Flood Control District (PCRFCD)
Lewis Springs	Cochise, Arizona	Extant Most recent observation in 2024.	Bureau of Land Management (BLM) San Pedro Riparian National Conservation Area
Canoa Ranch	Pima, Arizona	Reintroduced in 2020; Most recent observation 2024	PCRFCD Historic Canoa Ranch
Bar V Ranch (Mescal Spring)	Pima, Arizona	Reintroduced in 2022; Most recent observation 2024	PCRFCD, Bar V Ranch
Las Cienegas	Pima and Santa Cruz, Arizona	Reintroduced in 2022; Most recent observation 2024	BLM Las Cienegas National Conservation Area
Sweetwater Wetlands	Pima, Arizona	Reintroduced in 2022; Most recent observation 2024	City of Tucson, Sweetwater Wetlands
St. David Cienega (Donlavy Wetlands)	Cochise, Arizona	Reintroduced in 2022; Most recent observation 2024 0 plants site extirpated	BLM SPRNCA
Ash Canyon	Cochise, Arizona	Reintroduced in 2022; Most recent observation 2025	Private
Harshaw	Santa Cruz, Arizona	Reintroduced in 2021; Most recent observation 2025	Private
Paton Center for Hummingbirds Pond	Santa Cruz, Arizona	Reintroduced in 2019; most recent observation 2024	Private

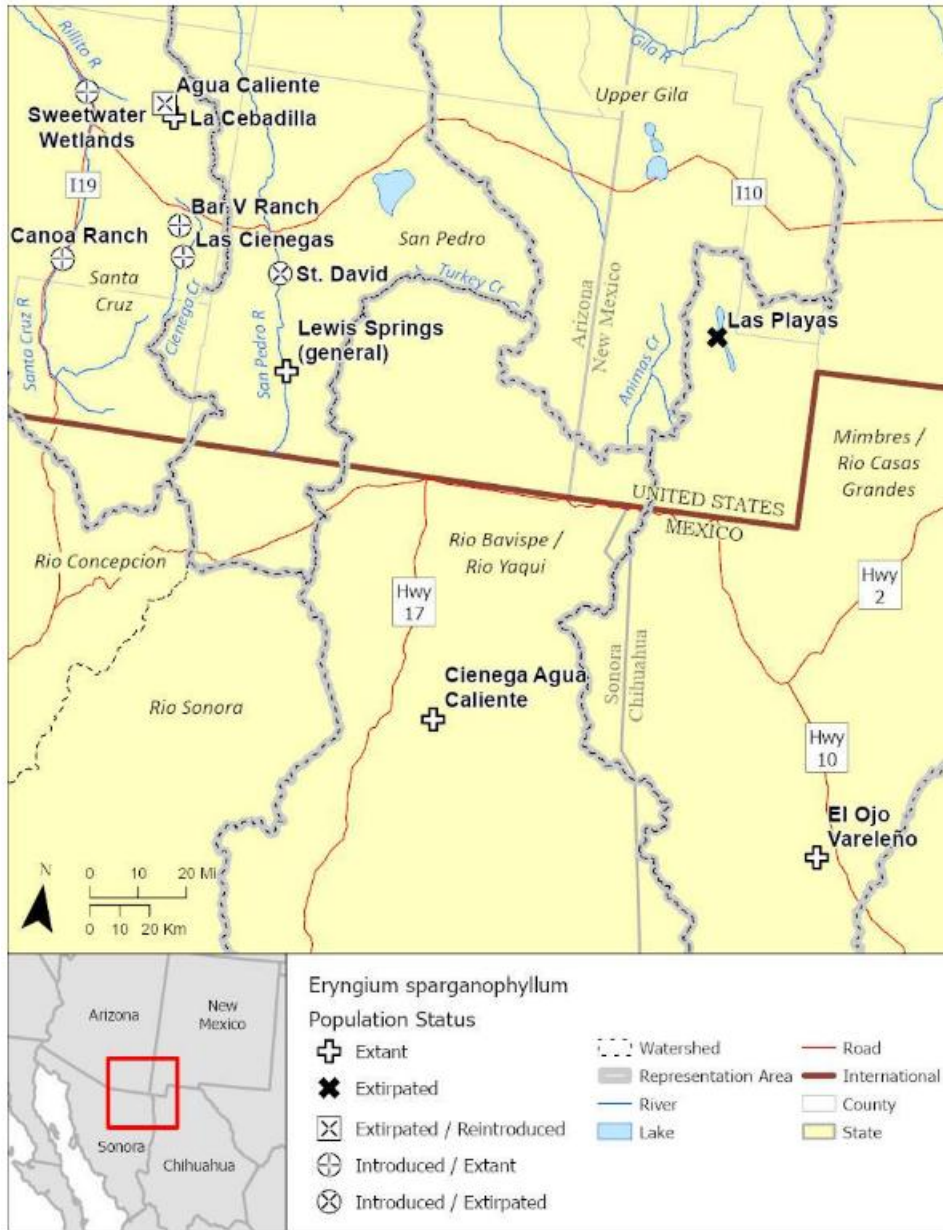


Figure A1-3. Arizona eryngo historic and current occupied areas in Arizona, New Mexico, and Mexico. Map taken from the 2025 Recovery Plan (page 6).

Appendix 2. GIS Data Review and Method to Develop Core Map (Step 3)

The core map type for this species is based on biological information, including extant known locations as noted in tables 1 and 2 from the 2025 FWS Arizona eryngo recovery plan.

This section details the data and steps used to create the core map for the Arizona Eryngo based on this biological information.

1. References and Software

- FWS Species Range (last updated 06/10/2021)
<https://ecos.fws.gov/ecp/species/10705>
- FWS Critical Habitat (06/20/2022)
https://ecos.fws.gov/docs/crithab/zip/FCH_Eryngium_sparganophyllum_20220610.zip
- U.S. Geological survey. *National Land Cover Database 2024 (NLCD 2024)*
- https://www.mrlc.gov/downloads/sciweb1/shared/mrlc/data-bundles/Annual_NLCD_LndCov_2024_CU_C1V1.zip
- USGS (Protected Areas Database US) PAD-US file Version 4.0
<https://www.usgs.gov/programs/gap-analysis-project/science/pad-us-data-download>
- World UTM Grid:
https://services.arcgis.com/P3ePLMYs2RVChkJx/arcgis/rest/services/World_UTM_Grid/FeatureServer
- Santa Cruz County Property Information Assessor Department Search
<https://parcelsearch.santacruzcountyaz.gov/santacruzwebpay/propertyinformation#>
- Santa Cruz County AZ, Town of Patagonia Parcel Search Web App
<https://experience.arcgis.com/experience/cbb250354b44486ba6b2c499e0e4a98c>
- Arizona State Land Department 50ft Contour Lines
https://azgeo.az.gov/arcgis/rest/services/asld/50ft_Contour_Lines/FeatureServer
- Personal communication from baselineSHIFT regarding additional site 6.25 miles SE on Sonoita, AZ
- Software used: ArcGIS Pro version 3.5.3

2. Datasets Used in Core Map Development

Datasets used are described above.

3. Core Map Development

- 3.1.** Use “Definition Query” with the following query to select “Sweetwater Wetlands Park,” “Bar V Ranch,” “Las Cienegas National Conservation Area,” and “Canoa Ranch:”
Unit_Nm IN ('Sweetwater Wetlands Park','Bar V Ranch','Las Cienegas National Conservation Area','Canoa Ranch') And Own_Type <> 'PVT'. Select all and export the six features as a feature class named “PADUS_export.” Use the “Dissolve” tool using the “Unit Name” as the dissolve field. This will create a feature class named, “PADUS_export_dissolve.” Use “Calculate Field” with expression, “USGS PAD-US 4.0 ” + !Unit_Nm!” to create text for the description field.
- 3.2.** Create an empty template feature class named, “EPA_Arizona_eryngo_Poly.” Copy and paste features from “PADUS_export_dissolve” to “EPA_Arizona_eryngo_Poly.”

- 3.3. Copy and paste features from Arizona eryngo final critical habitat to "EPA_Arizona_eryngo_Poly." Update the "Descriptio" field to "US FWS 06/10/2022 Arizona eryngo occupied critical habitat La Cebadilla and Lewis Spring areas."
- 3.4. Use site elevations, noted in table 2 of the 2025 recovery plan, for locations "Harshaw" and "Ash Canyon" to create definition queries to refine the area of concern. The source of the contour feature is "Arizona State Land Department 50ft Contour Lines. In Cochise County, AZ 50 ft contour feature class, create a "Definition Query," "*feet IN (5150, 5200)*". In the Santa Cruz County, AZ 50 ft contour feature class, create a "Definition Query," "*feet IN (4850, 4800)*." Zoom to each location and based on the location area, location of stream and river and elevation, create a circle with a 1-mile radius at the center of where all three conditions exist. Update the "Descriptio" field for Harshaw location with "A one-mile radius circle located at Harshaw, AZ. within an elevation range of 1,569 and 1,584 meters and near two streams." Update the "Descriptio" field for Ash Canyon location with "A one-mile radius circle located at Ash Canyon, AZ. within an elevation range of 1,463 and 1,478 meters and near two streams."
- 3.5. Personal communication information received from baselineSHIFT was used to zoom to the area defined and create a 1-mile radius circle around this new additional location.
- 3.6. Based on Santa Cruz County's County Property Information search where Owner name = "TUCSON AUDUBON SOCIETY". The following Tax ID Numbers were in the result: 10611004, 10611003, 10610002B, and 10610008A. These parcels define the boundaries of the Audubon's Paton Center for Hummingbirds near Patagonia, AZ. Create two screen shots of same four parcels from Santa Cruz County AZ, Town of Patagonia Parcel Search Web App. Geo-reference the screenshots and create a polygon based on the outline of the four parcels. Update the "Descriptio" field to "Audubon's Paton Center for Hummingbirds from Santa Cruz, AZ parcels owned by Tucson Audobon Society."
- 3.7. Used the "Select By Location" tool where "CultivatedAreas_Over25acres" intersects "EPA_Arizona_eryngo_Poly." No cultivated area intersects. So, it is not necessary to use the "Pairwise Erase" to remove cultivated areas from the core map area.
- 3.8. Use "Eliminate Polygon Part" tool to fill in gaps and holes less than 25 acres. The parameters are "Condition" is "Area," "Area" is "25" and "US Survey Acres," and the "Eliminate contained parts only" is checked. Resulting output is named, "EPA_Arizona_eryngo_Poly_Final" and "EPA_Arizona_eryngo.gdb."
- 3.9. Update attributes and "Calculate Geometry" of the "EPA_Arizona_eryngo_Poly_poly_Final" feature class.
 1. Use the "Calculate Field" tool to update fields as below.
 - a) CommName = "Arizona eryngo"
 - b) SciName = "Eryngium sparganophyllum"
 - c) EPA_Code = "11531"
 - d) FWS_Code = "Q3ST"
 - e) Heritage = "0"
 - f) ECOS_WebPg = "https://ecos.fws.gov/ecp/species/10705"
 2. Use the "Calculate Geometry" tool to update the "Acres" field with US Survey Acres under the NAD_1983_UTM_Zone_12N coordinate system.
- 3.10. Use the U.S. Geological survey. National Land Cover Database 2024 (NLCD 2024) downloaded on July 8, 2025, with the "Extract by Mask" tool with the "EPA_Arizona_eryngo_Poly_poly_Final" feature class as the extent. The output is named, "NLCD_MaskArea1."

- 3.11.** Use the “Tabulate Area” tool with “NLCD_MaskArea1” to determine the count of area for each NLCD code. The output is named, “AE_TabulateArea1.” Add a double field named, “Per” to the “CFS_TabulateArea1” table. Right click on field and select “Calculate Field.” Enter the formula “(!Count!/ 273776)*100.” This calculates the percentage of NLCD within the core map area. Review results and input into (Table 1. Percentage of Interim Core Map Represented by NLCD Land Covers and Associated Example Pesticide Use Sites/Types.)