5-YEAR REVIEW

Chisos Hedgehog Cactus (*Echinocereus chisoensis* ssp. *chisoensis*)

1.0 GENERAL INFORMATION

1.1 Listing History

Species: *Echinocereus chisoensis* var. *chisoensis*
Date listed: September 30, 1988
FR citation(s): 53 FR 38453
Classification: Threatened

Critical habitat/4(d) rule/Experimental population designation/Similarity of appearance listing: Not applicable

1.2 Methodology used to complete the review:

The U.S. Fish and Wildlife Service (USFWS) most recently evaluated the biology and status of Chisos hedgehog cactus as part of a status review completed on July 6, 2018 (USFWS 2018, entire). We examined whether new information was available and whether that new information would alter or affect analyses and conclusions made in the previous status review. Data for this review were solicited from interested parties through a *Federal Register* notice announcing the review on July 15, 2025. We also contacted Texas Parks and Wildlife Department (TPWD), Big Bend National Park (BIBE), and researchers, to request any data or information we should consider in our review. Additionally, we conducted a literature search and a review of information in our files.

1.3 FR Notice citation announcing the species is under active review:

90 FR 31677. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 3 Species in the Southwest. July 15, 2025

2.0 REVIEW ANALYSIS

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of "endangered species" or "threatened species." The Act defines an "endangered species" as a species that is "in danger of extinction throughout all or a significant portion of its range," and a "threatened species" as a species that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The Act requires that we determine whether a species meets the definition of "endangered species" or "threatened species" due to any of the five factors described below.

Section 4(a) of the Act describes five factors that may lead to endangered or threatened status for a species. These include: A) the present or threatened destruction, modification,

or curtailment of its habitat or range; B) overutilization for commercial, recreational, scientific, or educational purposes; C) disease or predation; D) the inadequacy of existing regulatory mechanisms; or E) other natural or manmade factors affecting its continued existence.

The identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an "endangered species" or a "threatened species." In assessing whether a species meets either definition, we must evaluate all identified threats by considering the expected response of the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species—such as any existing regulatory mechanisms or conservation efforts. The Service recommends whether the species meets the definition of an "endangered species" or a "threatened species" only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

2.1 Distinct Population Segment (DPS) policy (1996):

Not applicable

2.2 Updated Information and Current Species Status

2.2.1 Biology and Habitat:

Taxonomic Classification

There are two recognized infra-taxa of *Echinocereus chisoensis* that have been described as varieties. Chisos hedgehog cactus is var. *chisoensis*; the entire known population occupies a small area of BIBE (Figure 1). Variety *fobeanus* occurs about 400 kilometers (km) (248 miles (mi)) to the south, along the border of southwestern Coahuila and eastern Durango, Mexico. Due to the wide geographic separation, Taylor (2005, entire) described the two taxa as subspecies: *Echinocereus chisoensis* W.T. Marshall ssp. *chisoensis*, and *Echinocereus chisoensis* ssp. *fobeanus* (Oehme) N.P. Taylor. As discussed in the previous status review (USFWS 2018, p. 7 and Figure 2), the geographic isolation and consistent morphological differences between these taxa justifies recognition as full subspecies, rather than as varieties.

Figure 1. Photographs of Chisos hedgehog cactus.

1. Flowering Chisos hedgehog plants, Big Bend National Park, March 19, 2019. Photo:Chris Best, USFWS.
2. Propagated *Echinocereus chisoensis* ssp. *fobeanus*. Photo: Peter Berresford.
3. Chisos hedgehog cactus transect crew, Big Bend National Park, March 19, 2019. Photo: Chris Best, USFWS.

Estimated Population Size at Big Bend National Park

Four listed plant species occur at BIBE: Guadalupe fescue (*Festuca ligulata*), Lloyd's mariposa cactus (*Sclerocactus mariposensis*), Chisos hedgehog cactus, and bunched cory cactus (*Coryphantha ramillosa* ssp. *ramillosa*). Beginning in the 1980s and 1990s, researchers established monitoring plots for these species, which were monitored annually by researchers and BIBE personnel. Populations of all four species within the monitoring plots had declined by 2016. Based on these declines, park personnel asked USFWS whether the three cactus species should be reclassified from threatened to endangered.

The previously established Chisos hedgehog cactus monitoring plots yielded important information on the species' life history. Unfortunately, data from those plots could not be validly extrapolated to total population sizes or be used to accurately estimate demographic trends because plot placement was biased to cover only high-density portions of occupied habitat, and therefore did not adequately represent the populations. Furthermore, dense clusters of cactus individuals are more vulnerable to decline due to density-dependent parasitism or herbivory (Anderson and Schmalzel 1997, p. 19). For example, dense populations of Tobusch fishhook cactus (*Sclerocactus brevihamatus* ssp. *tobuschii*), a threatened species of the Edwards Plateau of Texas, are more likely to incur catastrophic declines due to beetle and weevil parasites (USFWS 2017, pp. 11–12, 39–40). Consequently, population estimates based on monitoring plots or transects that are established specifically where there are dense clusters of individuals often lead to spurious conclusions that total populations are declining.

Population sizes and demographic trends—the species' resilience—are essential components of a species' conservation status. However, like many rare plant species, Chisos hedgehog cactus has extremely uneven (patchy) distribution; this greatly complicates population size estimates. Heil and Anderson (1982, p. 7) estimated that the total population was less than 1,000 individuals, and Heil et al. (1985, p. 20) state that the total population is 1,000 individuals within an area of 17 by 5 km (10.6 by 3.1 mi) entirely within BIBE; unfortunately, neither source described how this estimate was derived.

As reported in the previous status review (USFWS 2018, entire), Evans (1986, entire) surveyed Chisos hedgehog cactus along transects through the known habitat at BIBE. He detected 127 individuals on 13 transects totaling 99.54 km (61.8 mi) in length. The transects were distributed in an unbiased manner using USGS topographic maps and a hand-held compass. However, this researcher did not attempt to extrapolate the transect data to the total population size.

To address this problem, Whiting and Fowler (2022, pp. 10, 11, 25–29, 32–33, 38) estimated the total population size of Chisos hedgehog cactus at BIBE using transects distributed without bias throughout the areas with suitable habitat characteristics. These habitat characteristics were determined from the attributes of known populations at BIBE. The area of suitable habitat to be sampled (the "sampling universe") was defined

by an elevation range of 550 to 850 meters (m) (1,804 to 2,789 feet (ft)) and within or near the soil types where the species has been observed. These soil types were: Chillon very gravelly fine sandy loam, 1 to 3 percent slopes; Corazones very gravelly sandy loam, 1 to 8 percent slopes; and Corazones very gravelly sandy loam, 1 to 30 percent slopes. Each map unit was buffered by 200 m (656 ft). Additionally, in the field, transect segments were omitted if they crossed paved roads or slopes that were too steep to safely transect. Finally, due to the large amount of potential habitat and limited amount of surveyor time, this study only sampled habitats that were within 200 m (656 ft) of previously documented Chisos hedgehog plants. The final area of the sampling universe was 3,495 hectares (ha) (8,636 acres (ac)).

Transect distribution was pre-determined in ArcMap with a north to south or east-west orientation (Figure 2). Surveyors collected transect data in March 2019 and March 2020, during peak flowering seasons to aid detection of the plants. The surveyed transects totaled 40.8 km in length and 58.5 ha (144.6 ac) in area, which was 1.7 percent of the sampling universe area. The surveyors observed 115 Chisos hedgehog cactus individuals within the transects. The estimated total population extrapolated to the area of the sampling universe was 6,868 individuals. This is far greater than the estimated minimum viable population (MVP) size of 1,000 to 1,500 mature individuals (USFWS 2018, p. 12). Whether the estimated numbers represent a single large population, one population with multiple metapopulations, or several smaller populations, is an unanswered question; regardless, it is safe to conclude that there is at least one resilient population of Chisos hedgehog cactus.

However, during the surveys, 56 Chisos hedgehog cactus individuals were observed in areas that were not identified as habitat, which reveals that the modeled habitat (the sampling universe) was too restrictive. Hence, the actual population size is likely to be greater than this estimate (Whiting and Fowler 2022, p. 32). Although these authors did not determine confidence intervals for the extrapolated total population, due to the uneven spatial distribution, the intervals would likely be very large.

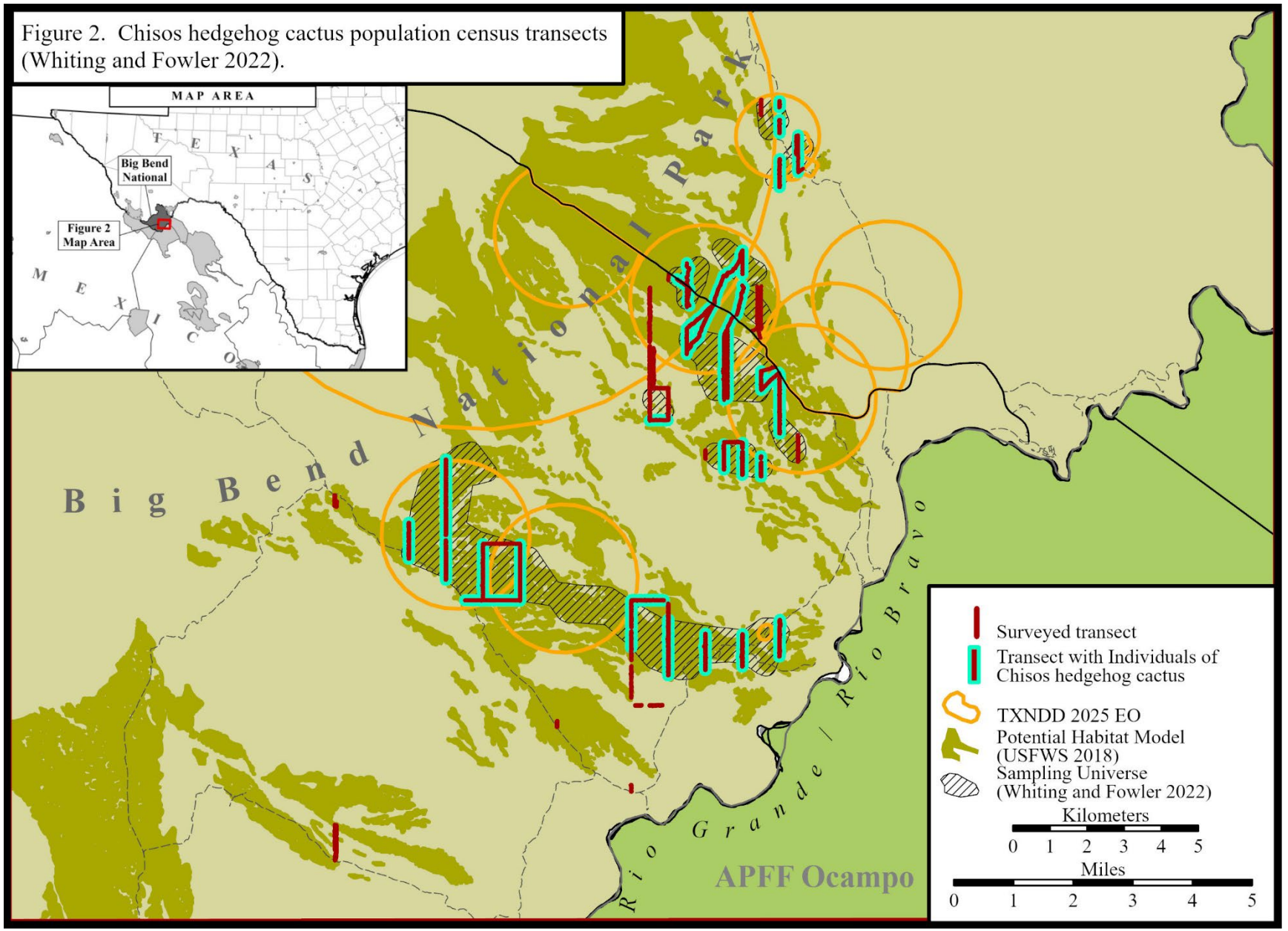
Figure 2. Chisos hedgehog cactus population census transects (Whiting and Fowler 2022).
MAP AREA
TEXAS
Big Bend National
Figure 2 Map Area
MEXICO
Big Bend National Park
Rio Grande / Rio Bravo
APFF Ocampo
Surveyed transect
Transect with Individuals of Chisos hedgehog cactus
TXNDD 2025 EO
Potential Habitat Model (USFWS 2018)
Sampling Universe (Whiting and Fowler 2022)
Kilometers
0 1 2 3 4 5
Miles
0 1 2 3 4 5

2.2.2 Threats Analysis (threats, conservation measures, and regulatory mechanisms):

No new information

2.3 Synthesis:

The best-justified taxonomic classification for Chisos hedgehog cactus is recognition as a subspecies rather than variety of *Echinocereus chisoensis*. The entire global distribution of Chisos hedgehog cactus occurs within a small area of BIBE. Whiting and Fowler (2022, entire) estimate that this population is at least 6,868 individuals, which is far greater than the estimated MVP of 1,000 to 1,500. The total population may consist of one large population, one population with several metapopulations, or several smaller populations. Considering the very limited geographic range and the discontinuous distribution of modeled habitat, the most likely interpretation is that a number of metapopulations interact on spatial and temporal scales to create a large, highly resilient population. It is also possible that portions of the total population have migrated over time and are now isolated from the main group. If small, isolated populations are discovered, one conservation objective would be to augment gene flow and numbers of individuals in these small groups to prevent inbreeding and other risks incurred by small populations.

We conclude that there is at least one resilient population of Chisos hedgehog cactus. The entire population benefits from the protection of BIBE. Nevertheless, the entire global population is restricted to a very small geographic range; hence, the species has essentially no redundancy, and remains vulnerable to catastrophic losses that might result from extended drought, parasite infestations or microbial pathogens, or encroachment of invasive plants. Therefore, we recommend that Chisos hedgehog cactus continue to be classified as a threatened species.

3.0 RESULTS

3.1 Recommended Classification:

No change is needed

3.2 New Recovery Priority Number:

No change.

Brief Rationale:

Not applicable

3.3 Listing and Reclassification Priority Number:

Not applicable.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- The best-justified taxonomic classification is *Echinocereus chisoensis* subspecies *chisoensis*; this should be included in the next Technical Corrections to be published in the *Federal Register*.
- Continue to improve the potential habitat model as we learn more about the ecological requirements. Conduct expanded surveys based on this model, using representative sampling and appropriate statistical methods to determine reliable estimates of the total population size. Design an efficient sampling protocol that can be repeated at intervals to determine demographic trends.
- Establish a controlled propagation and reintroduction plan; collect seeds, following Center for Plant Conservation Guidelines, representing the range of the subspecies' ecological and genetic diversity; develop propagation methods; and reintroduce the propagated Chisos hedgehog cactus plants into other portions of the potential habitat range to create redundant populations and to augment genetic diversity and population sizes of small, disjunct populations.
- Investigate the population genetics to determine the genetic structure, genetic diversity and extent of inbreeding, evidence of gene flow, and other parameters that will be useful in the conservation and recovery of Chisos hedgehog cactus.

5.0 REFERENCES

Anderson, E.F. and R.J. Schmalzel. 1997. Final report on Lloyd's mariposa cactus survey (*Sclerocactus* [*Neolloydia*] *mariposensis*). Prepared for Joint Task Force Six. Desert Botanical Garden, Phoenix, Arizona. 109 pp. + 2 Appendices.

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U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW of CHISOS HEDGEHOG CACTUS (*ECHINOCEREUS CHISOENSIS* SSP. *CHISOENSIS*)

Current Classification: Threatened

Recommendation resulting from the 5-Year Review:

No change needed

Appropriate Listing/Reclassification Priority Number, if applicable:

FIELD OFFICE APPROVAL:

Acting Field Supervisor, Fish and Wildlife Service, Austin Ecological Service Field Office, Austin, Texas

Approve MICHAEL WARRINER Digitally signed by MICHAEL WARRINER Date: 2025.08.28 12:43:46 -05'00'