Interim Core Map Documentation for the Pariette Cactus

Version 1
Review Completed: February 2026
Core Map Developer: U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs (OPP)

Species Summary

The Pariette cactus (*Sclerocactus brevispinus*, Entity ID #9338) is a flowering cactus found in Duchesne and Uintah Counties of northeastern Utah FWS (2023a). The Pariette cactus grows in fine soils of clay badlands derived from the Uinta geologic formation between 4,265 to 5,250 ft (1,300 to 1,600 m) in elevation. Habitat typically consists of stony, gravelly, hilly terrain, and is frequently, although not always, associated with desert pavement and channery. The Pariette cactus is found in plant communities dominated by saltbush, rabbitbrush, galleta, and numerous native forbs.

The Pariette cactus was listed as endangered under the Endangered Species Act (Act) in 1979. Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the Pariette Cactus is based on the species biological information (FWS core areas) with habitat refinements (elevation and removal of cultivated crop lands).

Figure 1 depicts the resulting interim core map for the Pariette Cactus. The size of this core map is approximately 172,685 acres. Landcover categories within the core map area are included in **Table 1**.
Landcover within the core map is predominantly grassland/herbaceous, scrub/shrub, and barren land, which is consistent with the habitat of this species.

The core map developed for Pariette cactus is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include Pariette cactus. This core map incorporates information developed by the U.S. Fish and Wildlife Service (FWS) and made available to the public; however, the core map has not been formally reviewed by FWS. This interim core map may be revised in the future to incorporate expert feedback from FWS. This interim core map has an “average” (3) best professional judgment classification to describe major uncertainties/limitations. The map is based on biological information described by FWS, with areas removed based on the biological need and known locations of the species. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

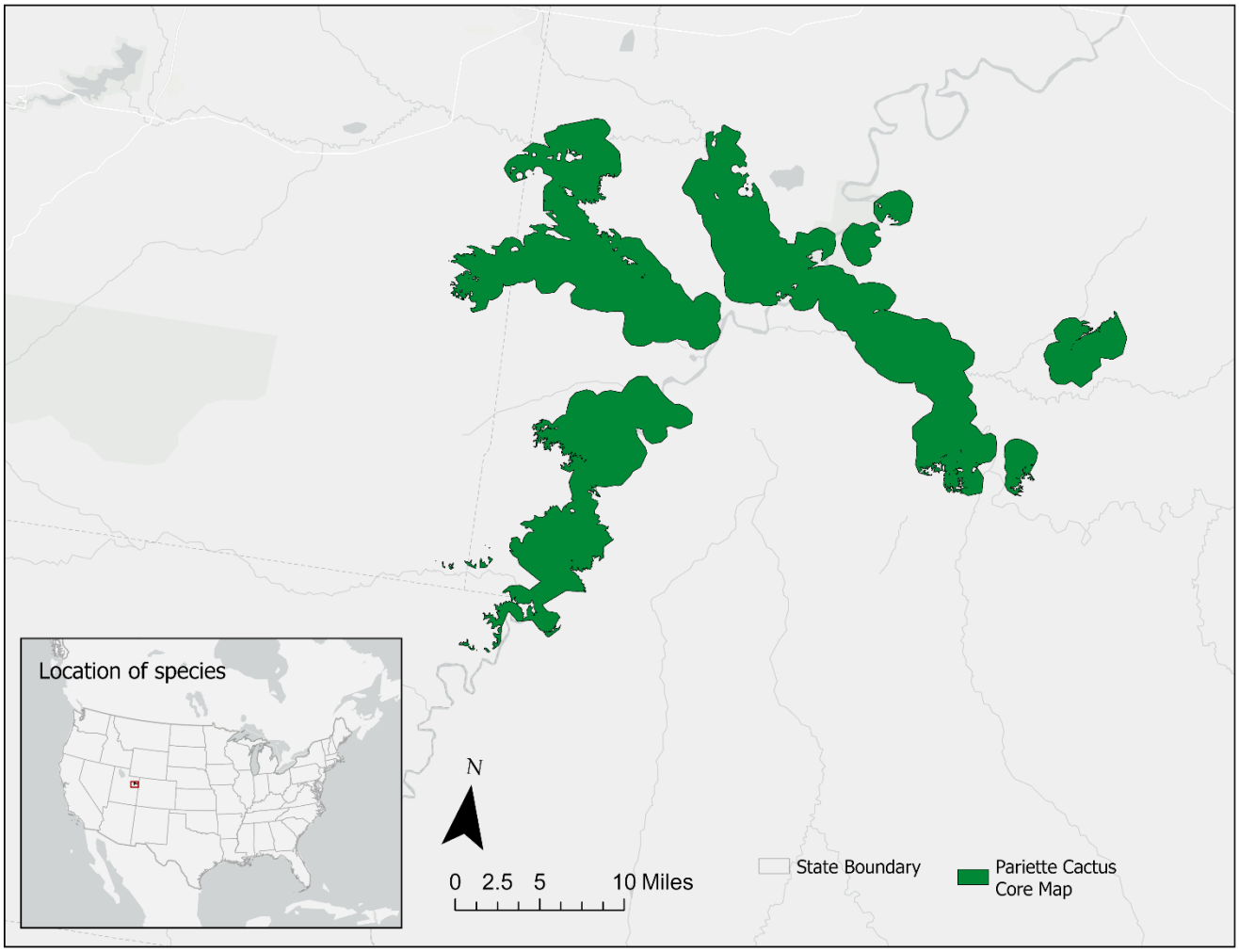

Figure 1. Interim core map for the Pariette cactus. The total acreage of the core map is approximately 172,685 acres.

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

Example pesticide use sites/types	NLCD Class/Value	% Area
Forestry	Deciduous Forest (41)	0%
Forestry	Evergreen Forest (42)	0%
Forestry	Mixed Forest (43)	0%
Agriculture	Pasture/Hay (81)	0%
Agriculture	Cultivated Crops (82)	1%
Mosquito adulticide, residential	Developed Open Space (21)	1%
Mosquito adulticide, residential	Developed Low Intensity (22)	1%
Mosquito adulticide, residential	Developed Medium Intensity (23)	0%
Mosquito adulticide, residential	Developed High Intensity (24)	0%
Invasive species control	Woody Wetlands (90)	6%
Invasive species control	Emergent Herbaceous Wetlands (95)	1%
Invasive species control	Open Water (11)	2%
Invasive species control	Grassland/Herbaceous (71)	24%
Invasive species control	Shrub/Scrub (52)	46%
Invasive species control	Barren Land (31)	18%
Total Interim Core Map Acres		**172,685 acres**

NLCD: National Land Cover Dataset

Evaluation of Known Location Information

There are four datasets with known location information for this species:

- Descriptions of locations provided by FWS
- Occurrence locations in iNaturalist
- Occurrence locations in the Global Biodiversity Information Facility (GBIF)
- Occurrence locations in NatureServe

EPA evaluated these four sets of data before selecting the type of and developing the core map. Occurrences in iNaturalist, GBIF, and NatureServe were consisted with the general locations discussed in FWS documentation. However, some known locations reported in GBIF occurred outside of the core areas, but with a large amount of uncertainty. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

EPA compiled available information for the Pariette cactus from FWS, as well as observation information available from various publicly available sources (including iNaturalist, NatureServe, and GBIF). The information compiled for the Pariette cactus is included in **Appendix 1**.

[1] Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, https://doi.org/10.5066/P9JZ7AO3

EPA used this information to identify the core map type, which included suitable habitat within the species' range. Influential information that impacted the development of the core map included:

- FWS (2023a) states that the Pariette cactus is a narrow endemic found in Duchesne and Uintah Counties of northeastern Utah. The Pariette cactus grows in fine soils of clay badlands derived from the Uinta geologic formation between 4,265 to 5,250 ft (1,300 to 1,600 m) in elevation.
- Identified core areas by FWS
- The Pariette cactus is found in plant communities dominated by saltbush, rabbitbrush, galleta, and numerous native forbs and not cultivated lands.

The entire range of the species was not used as the core map because the range contains areas where the species does not occur. Additionally, core areas identified by FWS do not all coincide within the species range. **Appendix 2** provides more details on the GIS analysis and data used to generate the core map.

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

EPA considered using the species range as the core map, however, it included developed and agricultural and developed land where the species is not expected to occur. EPA also considered further refinements by soil type. However, given the wide range of soils where this species occurs and the importance of core two areas to the species recovery, these refinements would not likely result in meaningful improvements given the uncertainty in the dataset (see **Appendix 1, Recovery Criteria**). EPA considered adding known locations from GBIF, however, given the level of uncertainty and recency of the development of the species range (last updated April 27, 2021), decided expansion was not necessary. See **Appendix 1, Additional Known Location** for a description of the known locations, with and without buffers to account for the uncertainty, compared to the proposed interim core map.

Appendix 1. Information Compiled for Species

1. **Recent FWS Documents/Links**
   Unita Basin Hookless Cactus and Pariette Cactus Recovery Plan (2020)
   Unita Basin Hookless cactus and Pariette Cactus 5-Year Review (2020)
   Species Biological Report for Uinta Basin Hookless Cactus and Pariette Cactus (2023)

2. **Background Information**
   - **Status:**
     Prior to 2009, the Unita Basin Hookless Cactus, Pariette Cactus, and Colorado Hookless Cactus were recognized as one species and were listed as threatened on November 13, 1979 (FWS, 2023a; FWS, 2023b). The Pariette Cactus was listed on September 15, 2009.

   - **Taxonomy**
     According to FWS (2023b), the Colorado hookless cactus (Sclerocactus glaucus) was originally listed as a threatened species in 1979. However, based on newer genetic studies, common garden experiments, and morphological characteristics, FWS currently recognizes the Colorado hookless cactus as four distinct species: Pariette cactus (*S. brevispinus*), Uinta Basin hookless cactus (*S. wetlandicus*), and Colorado hookless cactus (*S. glaucus and S. dawsonii*).

     As discussed in FWS (2023b), FWS has since proposed to remove Colorado hookless cactus from the List of Endangered and Threatened Plants due to recovery. There is continued debate in the botanical community regarding the genetic distinction between the Pariette cactus and Uinta Basin hookless cactus. However, FWS states that they will continue to recognize the two distinct species until taxonomic experts review the best available science and recommend a different taxonomic grouping.

Kingdom:	Plantae – plantes, 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:	Caryophyllanae
Order:	Caryophyllales
Family:	Cactaceae Juss. – cactus, cacti
Genus:	Sclerocactus Britton & Rose – fishhook cactus
Species:	Sclerocactus brevispinus K.D. Heil & J.M. Porter – shortspine fishhook cactus, Pariette cactus

   - **Resiliency, Redundancy, and Representation**
     According to FWS (2023a):
     Resiliency:
     The Pariette cactus is found in four subpopulations, of which three have moderate resiliency and one has unknown resiliency

Redundancy:
The Pariette cactus has limited distributions, but both species are present throughout their historical ranges and are represented by multiple subpopulations and genetic groups across the range, which helps reduce catastrophic risk.
Representation:
Pariette cactus currently exhibits high genetic diversity and low levels of inbreeding but has a restricted range and inhabits limited ecological settings (low habitat diversity) and exhibits low adaptability

- **Life History**
  - **Habitat**
    FWS (2023a) states that the Pariette cactus is a narrow endemic found in Duchesne and Uintah Counties of northeastern Utah. The Pariette cactus grows in fine soils of clay badlands derived from the Uinta geologic formation between 4,265 to 5,250 ft (1,300 to 1,600 m) in elevation. Habitat typically consists of stony, gravelly, hilly terrain, and is frequently, although not always, associated with desert pavement and channery. The Pariette cactus is found in plant communities dominated by saltbush, rabbitbrush, galleta, and numerous native forbs. Typically, the Pariette cactus is more restrictive in habitat than Uinta Basin hookless cactus.

  - **Biology**
    FWS (2023a) states that the Pariette cactus is morphologically unique in the genus *Sclerocactus* due to a single small central spine that is strongly hooked with a tip almost touching the surface of the tip of the tubercule where the spine originate.

  - **Pollination**
    FWS (2023b) summarizes the pollination requirements for the Pariette cactus as follows:
    > This species is an obligate out-crosser that relies on pollinators for reproduction, meaning they require pollen from the flower of a different plant to produce viable seeds. Flowers typically open in mid-day and close late in the afternoon for three to five days. A broad assemblage of native, ground-nesting bees, mostly from the family Halictidae, pollinate the Pariette cactus. These bees can travel from 0.2 to 0.6 miles (mi; 0.4 to 1 kilometer (km)) between plants. Pollen limitation may be a problem for the Pariette cactus, but more studies are needed to confirm this supposition. A healthy pollinator population, with high pollinator abundance and species richness, is important for maintaining healthy populations of Sclerocactus.

- **Relevant Pesticide Use Sites**

Pesticide threats to the species were not discussed in the FWS documentation for this species.

- **Threats**

The biological report identifies the primary threats to the Sclerocactus as mineral extraction, livestock grazing, and invasive species; and regulatory mechanisms are lacking to address these threats (FWS, 2023b). Over the past several decades, all four of these activities have increased in scope and density across the range of both species and Sclerocactus are facing greater effects from these threats currently than at the time of listing (FWS, 2023a).

- **Recovery Criteria**

FWS (2023a) includes recovery criteria for the Pariette cactus. Recovery criteria 1, 3, and 4 reference core areas for this species. According to FWS (2023a),there are two categories of core areas, core 1 and core 2, which are based on *Sclerocactus* density analysis and average pollinator travel distance. Core 1 areas have a higher density of *Sclerocactus* individuals and are nested within the larger core 2 areas. The core 2 areas have lower densities but provide connectivity between the core 1 areas. For the Pariette cactus, FWS identified four core 1 areas that will be used for management and recovery purposes (FWS, 2023b). A total of 22,795 ac (9,225 ha) of core 1 areas are located within the larger core 2 areas (FWS, 2023b).

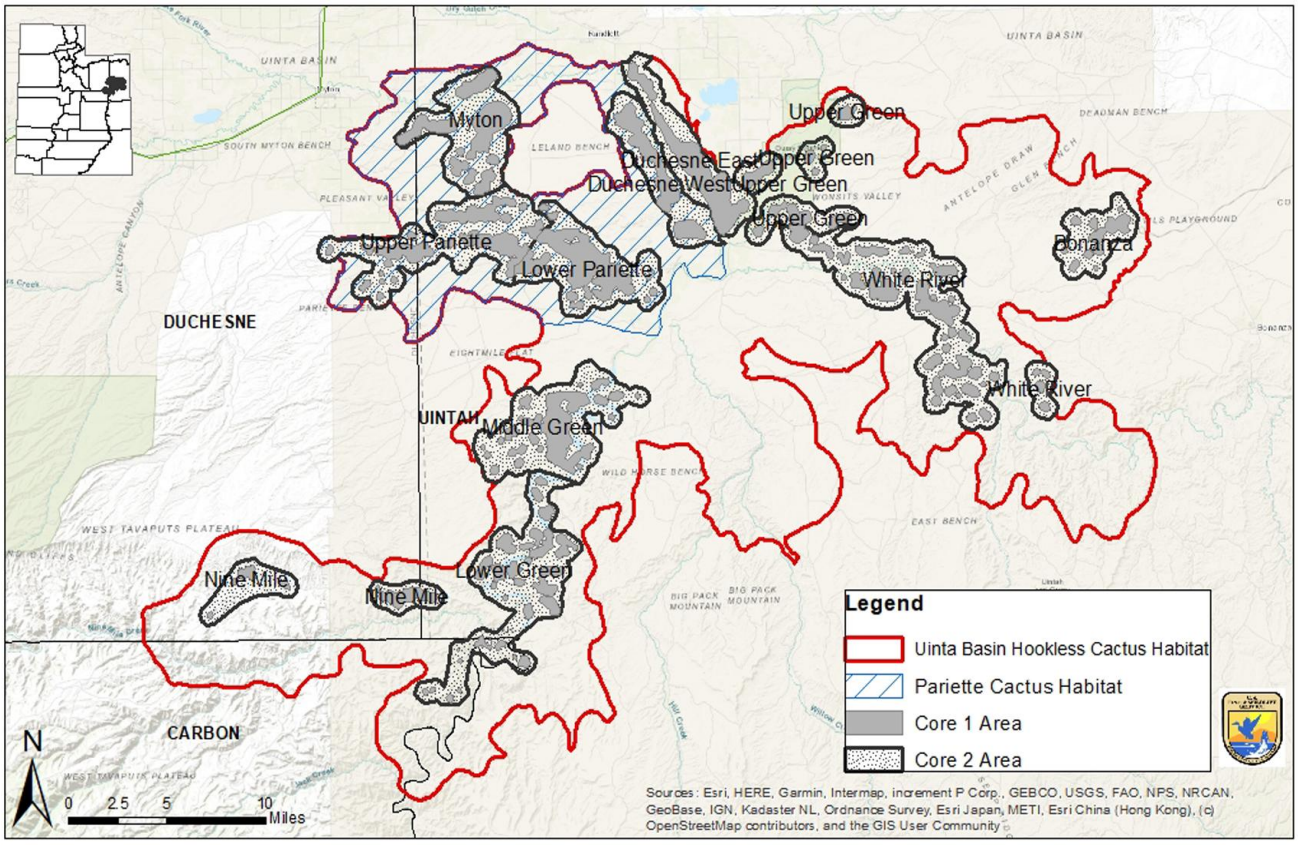

Figure 2. Core 1 and Core 2 areas within the species ranges, taken from FWS (2020).

Recovery Criterion 1

All four core 2 areas have a stable or increasing growth trend (average lambda (λ) ≥ 0.095) over a minimum period of 10 consecutive years and predictive modeling (using data from a minimum of a 10-year monitoring period) indicates that the likelihood for long-term survival of the metapopulation is at least 95 percent over a 100-year period.

Recovery Criterion 2

The metapopulation maintains a size distribution that contains individuals in all size classes over a 5-year minimum period and where the largest size class maintains a stasis rate no less than 0.85. Size classes for the Pariette cactus are defined as: class 1:<19.7 mm; class 2: 19.7–40 mm; class 3: 40.1–75 mm; and class 4: >75 mm.

Recovery Criterion 3
Genetic diversity across the metapopulation is maintained at levels such that there is a high probability (95 percent) of two core 1 populations persisting over the long term (100 years) within each core 2 area.

Recovery Criterion 4
Disturbance that contributes to the degradation and loss of habitat (e.g., roads, recreation, livestock) does not exceed established tolerance thresholds for each core 2 area (percent of habitat).

Recovery Criterion 5
Protected areas will be formally established by land managers for at least one genetically important population and at least one connectivity corridor (as identified using connectivity analysis) to provide long-term protection from anthropogenic threats. Methods may include but are not limited to ACECs, Resource Management Plan special designations, Tribal resolutions, conservation agreements, and conservation easements

3. Description of the Species Range

The species range was last updated on April 27, 2021. FWS (2023a) estimates between 33,268 and 44,504 individuals exist in the species range. The range for the Pariette cactus has an area of 111,092 ac (44,957 ha) and is contained entirely within the western portion of the range of Uinta Basin hookless cactus (**Figure 3**). Both species are found in smaller subpopulations that function together as a larger metapopulation at the range-wide scale

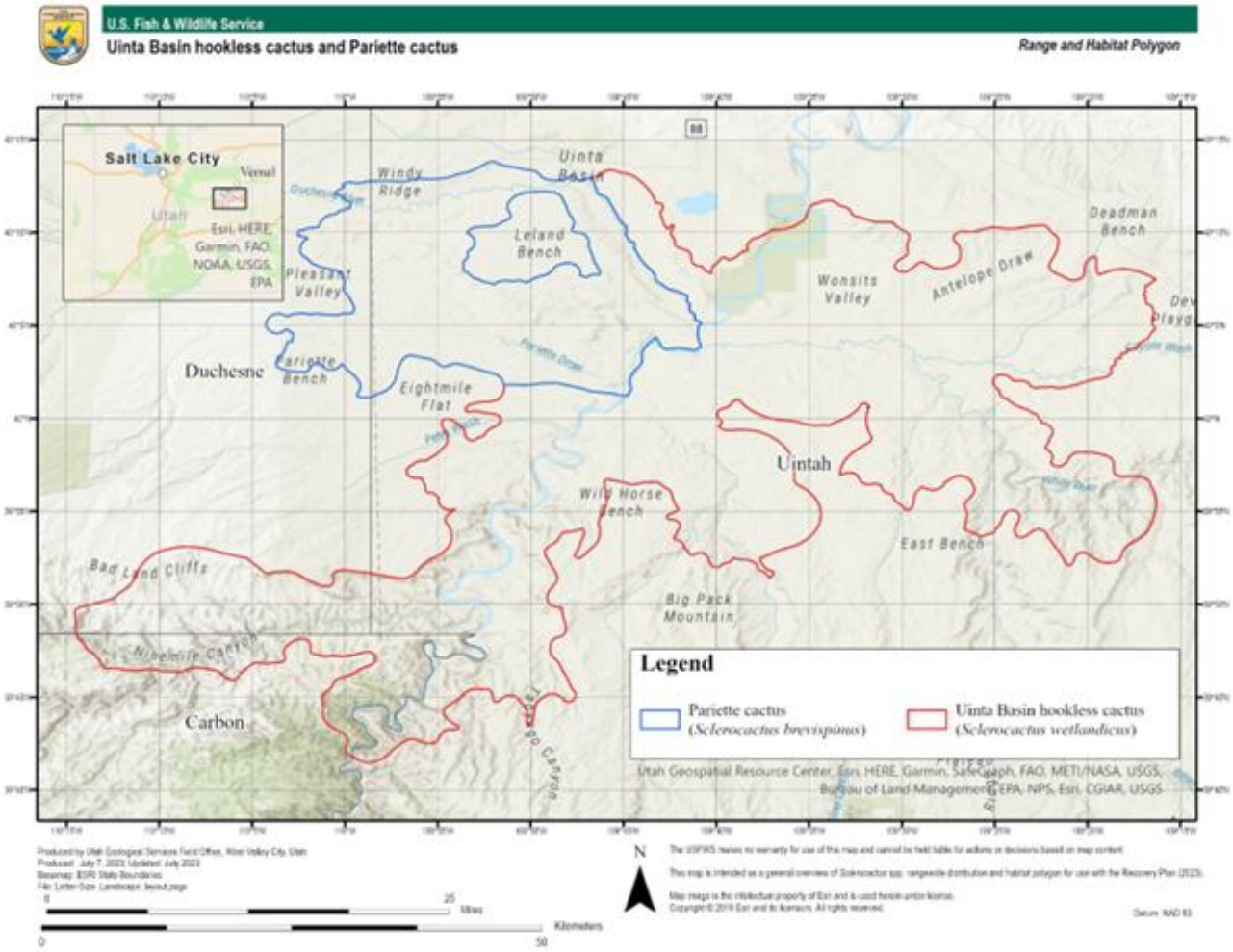

Figure 3. Overlapping potential habitat (species range) for the Uinta Basin hookless cactus (red) and the Pariette cactus (blue) Taken from FWS (2023a).

4. Critical Habitat

FWS has not designated a critical habitat for this species. FWS (2023a) states that a critical habitat was not designated for this species due to concern for increased poaching of rare cacti.

5. Additional Known Locations

- iNaturalist
  - Searched on 7/22/2025
  - 14 research grade and verifiable observations made between November 2016 – May 2025

- GBIF
  - Searched on 7/22/2025
  - 17 observations made between 1992 –2025, 13 observations made between May 2017 – April 2025
  - 13 more recent observations are replicates of iNaturalist observations. The older four observations are replicates of NatureServe observations.

- Known locations occurred outside of the species range and proposed interim core map. However, many observations are reported to have a high degree of uncertainty in the coordinates (28,000 m).

- **NatureServe**
  - Searched on 7/22/2025
  - Occurrences were encompassed by other data sources.

Appendix 2. GIS Data Review and Method to Develop Core Map

EPA developed the interim core map by refining the species range based on the land cover and elevations where this species is known to occur.

1. **Datasets and Software**
   Datasets used:
   1.1. USFWS species range
   1.2. USA Annual NLCD Land Cover
   1.3. USGS 3DEP Elevation – 30 m

   Software used: ArcGIS Pro, version 3.5.1

2. **Creating the core map**
   2.1. Determining outside extent of the core map
   The species range, readily downloadable from ECOS, was used as the outer extent of the core map. As discussed in Appendix 1, FWS have not designated a critical habitat for this species.
   2.2. Refining species range based on suitable habitat
   A review of FWS's documentation discovered several key aspects of the suitable habitat for this species:

   FWS (2023a) states:
   - The Pariette cactus is a narrow endemic found in Duchesne and Uintah Counties of northeastern Utah. The Pariette cactus grows in fine soils of clay badlands derived from the Uinta geologic formation between 4,265 to 5,250 ft (1,300 to 1,600 m) in elevation.
   - The Pariette cactus is found in plant communities dominated by saltbush, rabbitbrush, galleta, and numerous native forbs.
   - FWS identified core areas for the species.

   Therefore, the species range was refined by the FWS identified core areas. Once refined by the core areas, elevations outside of 1,300-1,600m were excluded. Lastly, cultivated lands were removed from the core map as this species is not expected to occur on cultivated lands.

   The known locations of the species were then overlaid to determine whether all were captured in the map. Several known locations appear to occur outside of the interim core map. However, when buffered to the uncertainty provided in GBIF (28,000 m), these buffered locations partially overlap with the interim core map. Given the level of uncertainty in these locations and considering that FWS updated the core map in 2021, EPA determined that expanding the core map was not appropriate at this time.

3. **GIS Process Used**
   3.1. Georeferencing
   To refine the range by FWS core areas, FWS map created was georeferenced using the georeferenced tool into ArcGIS. Core areas were traced, and polygons were formed. A 200-meter buffer was added to account for any inaccuracy in tracing polygons.

   3.2. Refining NLCD
   Added the NLCD dataset to the map and clipped the rater to extent of the species core areas for efficient data processing:

Clip Raster (tool):

- Input raster: *USA NLCD Land Cover*
- Output extent: *pariette_cactus_core_areas*

The clipped NLCD raster was then converted to polygon format, using the *Raster to* Polygon tool to be able to create a new layer that only represents the area within the extent of the combined area and named location layer. Duplicate attributes were merged by using the Pairwise *Dissolve* tool.

3.3. Refining by elevation

The Pariette Cactus is found at elevations between 1,300 – 1,600 m. These areas were identified using the USGS National Map (TNM) tool and selecting for elevation:

The USGS elevation files were added and clipped to the core areas for the selected elevation range using the mosaic to new raster and extract by mask tools.

3.4. Refining by cultivated crops

Since this species is not expected to occur on cultivated lands using the U.S. Environmental USDA Cultivated Land layer.

References

FWS, 2020. *Uinta Basin hookless cactus (Sclerocactus wetlandicus) and Pariette cactus (Sclerocactus brevispinus) 5 Year Review: Summary and Evaluation*. August 10, 2020. Utah Ecological Services Field Office, U.S. Fish and Wildlife Service.

FWS, 2023a. *Recovery Plan for Uinta Basin Hookless Cactus (Sclerocactus wetlandicus) and Pariette Cactus (Sclerocactus brevispinus)*. September 2023. Mountain-Prairie Region, U.S. Fish and Wildlife Service.

FWS, 2023b. *Species Biological Report for Unita Basin Hookless Cactus (Sclerocactus wetlandicus) and Pariette Cactus (Sclerocactus brevispinus)*. August 2023. Utah Ecological Services Field Office, U.S. Fish and Wildlife Service.

EPA, 2024. USDA Cultivated Land layer.
https://epa.maps.arcgis.com/home/item.html?id=159e70ce4c284f5b972c687037f8a668