

Interim Core Map Documentation for the Shivwits milk-vetch

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Draft Core Map Developer: U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs

Species Summary

The Shivwits milk-vetch (*Astragalus ampullarioides*, Entity ID 1088) is an endangered herbaceous perennial. This species is endemic to Washington County, Utah, between 3,018 to 4,367 feet (ft) (920 to 1,330 meters (m)) in elevation. Shivwits milkvetch reproduces sexually by seeds and is not known to be clonal. The species is capable of self-pollination; however, seed production is much more successful when plants are cross-pollinated. Typical pollinators of this species are native, ground nesting solitary bees in the families Apidae and Megachilidae and the introduced honeybee *Apis mellifera*. Threats facing the species were recreational land uses (including offroad vehicle (ORV) use), invasive plants and associated wildfires, mineral development, and herbivory. Additional information on the species is provided in **Appendix 1**.

Description of Core Map

The core map for the Shivwits milk-vetch is biological information type. The outer extent of this core map is defined by species range. EPA further refined this area to create the core map using the species' elevation range (920 to 1,330 meters).

The core map developed for the Shivwits milk-vetch is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Shivwits milk-vetch. 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 species expert feedback from FWS. This interim core map has an "average" best professional judgment classification to describe major uncertainties/limitations. The map is based on range with modifications based on habitat and supported by known locations described by FWS. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

Figure 1 depicts the resulting interim core map for the Shivwits milk-vetch. The size of this core map is approximately 19, 377 acres. Landcover categories within the core map area are included in **Table 1**. Landcover is predominantly shrub/scrub areas.

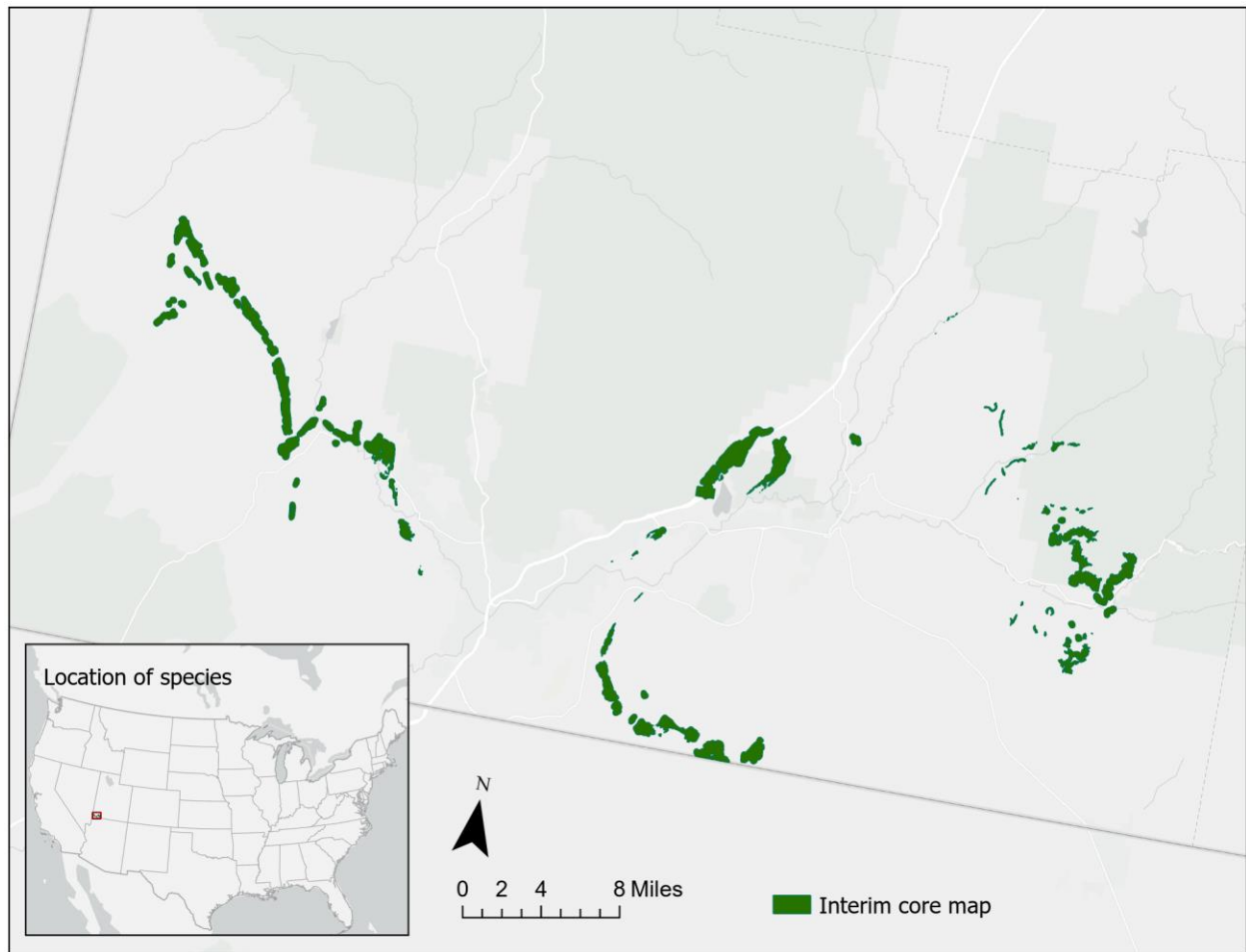


Figure 1. Interim core map for the Shivwits milk-vetch.

Table 1. Percentage of Interim Core Map Represented by NLCD¹ Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Class/Value	% Area	Total area for landcover type
Forestry	Deciduous Forest (41)	0%	8%
Forestry	Evergreen Forest (42)	8%	8%
Forestry	Mixed Forest (43)	0%	8%
Agriculture	Pasture/Hay (81)	0%	0%
Agriculture	Cultivated Crops (82)	0%	0%
Mosquito adulticide, residential	Developed Open Space (21)	2%	3%
Mosquito adulticide, residential	Developed Low Intensity (22)	1%	3%
Mosquito adulticide, residential	Developed Medium Intensity (23)	0%	3%
Mosquito adulticide, residential	Developed High Intensity (24)	0%	3%
Invasive species control	Woody Wetlands (90)	0%	89%
Invasive species control	Emergent Herbaceous Wetlands (95)	0%	89%
Invasive species control	Open Water (11)	0%	89%
Invasive species control	Grassland/Herbaceous (71)	0%	89%
Invasive species control	Shrub/Scrub (52)	88%	89%
Invasive species control	Barren Land (31)	0%	89%
Total Acres	Interim Core Map Acres	~ 19, 377	

Evaluation of Known Location Information

There are four datasets with known location information:

- Descriptions of locations provided by FWS;
- Occurrence locations in iNaturalist;
- Occurrence locations in NatureServe; and
- Occurrence locations in GBIF.

EPA evaluated these four sets of data before selecting the type of and developing the core map. FWS appeared to have the finest resolution of the location information. Occurrences in iNaturalist, GBIF, and NatureServe did not support expanding the core map outside of species range. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

The core map was developed using the “Process EPA Uses to Develop Core Maps for Draft Pesticide Use Limitation Areas for Species Listed by the U.S. Fish & Wildlife Service (FWS) and their Designated Critical

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

Habitats”² (referred to as “the process”). EPA developed the core map using the 4 steps described in the process document:

1. Compile available information for a species;
2. Identify core map type;
3. Develop the core map for the species; and
4. Document the core map.

For step 1, EPA compiled available information for Shivwits milk-vetch from FWS, as well as observation information available from various publicly available sources (including iNaturalist, NatureServe, and GBIF). The information compiled for Shivwits milk-vetch is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- Shivwits milk-vetch is endemic to Washington County, Utah
- This species occurs in the elevation between 3,018 to 4,367 feet (ft) (920 to 1,330 meters (m)).

For step 2, EPA used the compiled information to identify the core map type including species range, critical habitat, and known location information. The extant populations are located within the species’ range. Therefore, EPA based the core map on the range. EPA further refined this area by narrowing down to the required elevation range. The entire range of the species was not used as the core map because the range contains areas where the species does not occur. Core map included FWS’s critical habitat.

For step 3, EPA used the best available data sources to generate the core map. Data sources are discussed in the process document. **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

Alternative approaches and data not already described in this documentation were not explored in the development of this interim core map.

² Dated 2024, available online at: <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas>

Appendix 1. Information Compiled for the Shivwits Milk-Vetch

1. Recent FWS documents/links and other data sources

- Five Year Review (2021) (https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3314.pdf)
- Five Year Review (2007) (https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1042.pdf)
- Recovery Plan (2006) (https://ecos.fws.gov/docs/recovery_plan/060929.pdf)

2. Background information

- **Status:** Federally listed as endangered in October 2001
- **Resiliency, redundancy, and representation** (the 3Rs)

Resiliency: Resiliency, in the context of conservation biology and species recovery, refers to the ability of a population to withstand and recover from stochastic events, such as environmental changes, natural disasters, or human-induced disturbances. For *Astragalus ampullarioides*, resiliency involves ensuring that each population is viable, sufficiently large, and genetically diverse to endure such events without significant risk of extinction. This principle is integral to the recovery strategy outlined in the document, which emphasizes maintaining stable or improving population trends, protecting habitat, and addressing threats to ensure the long-term survival of these species. (Five Year Review 2007)

Redundancy: Redundancy, in the context of species recovery, refers to having multiple populations of a species distributed across its range to provide a safety net against catastrophic events. This ensures that if one population is lost due to localized threats (e.g., habitat destruction, drought, or fire), other populations can sustain the species' survival and genetic diversity. For *Astragalus ampullarioides*, redundancy is a key recovery principle. The recovery plan emphasizes the need to maintain all six existing populations of each species and establish or discover at least two additional populations (for a total of eight) to ensure long-term survival. This approach reduces the risk of extinction by spreading populations across different habitats and geographic areas, thereby safeguarding against localized threats. (Five Year Review 2007)

Representation: Representation, in the context of species recovery, refers to conserving the genetic diversity and ecological variation of a species across its range. This ensures that the species retains its adaptive potential to survive in changing environmental conditions and maintain its evolutionary processes. For *Astragalus holmgreniorum* and *Astragalus ampullarioides*, representation involves protecting populations across their current geographic and ecological ranges. The recovery plan highlights the importance of maintaining the genetic diversity of these species by conserving all six existing populations and ensuring that these populations represent the full range of their ecological and genetic variability. This principle is critical for the long-term adaptability and resilience of the species in the face of environmental changes and threats. (Five Year Review 2007)

- **Habitat**
 - endemic to Washington County, Utah
 - predominately found in isolated pockets of purple-hued, soft clay soil found on Chinle formation around St. George.

- Occupied sites are small, and populations are found between 3,018-4,363 ft (920-1,330 m) in elevation in sparsely vegetated habitat with an average 12% cover.
- **Pollinator/reproduction**
 - The species is capable of self-pollination; however, seed production is much more successful when plants are cross-pollinated.
 - Typical pollinators of this species are native, ground nesting solitary bees in the families Apidae and Megachilidae and the introduced honeybee *Apis mellifera*.
 - Flowering occurs between April and late May; by the end of June plants dry up, although vestiges of dried plants may persist for several months.
- **Taxonomy**
 - Terrestrial Plant
 - is considered a tall member of the pea family
- **Relevant Pesticide Use Sites**
 - Ampullarioides included habitat loss and fragmentation caused by land development and urban expansion in the St. George area; habitat degradation caused by ORV use, mineral exploration and development, and cattle trampling; competition and displacement by exotic weeds, with associated fires; loss or restriction of pollinators; herbicide and pesticide use (Five Year Review 2007) .
- **Recovery Criteria/Objectives (2006 recovery plan)**
 - Species presence is maintained at all recovery populations.
 - Population trends for four out of six recovery populations of each species are primarily stable or improving, as indicated by occupied habitat, density of occupied habitat, and predictive modeling.
 - The habitat base for each recovery population is large enough to allow for natural population dynamics, population expansion where needed, and the continued presence of pollinators, with sufficient connectivity to allow for gene flow within and among populations.
 - Population and habitat management is implemented for all recovery populations of each species in accordance with site-specific management plans.
 - Permanent land protection is achieved for at least four recovery populations of each species.
 - Site-specific conservation agreements are in place for all recovery populations and their habitat to protect these milk-vetches within existing State laws. The conservation of these species is included in a long-term State plant conservation agreement.
 - Adverse population-level effects from herbivory, disease, or predation, if any, are identified and abated within *A. ampullarioides* and *A. holmgreniorum* recovery populations.
 - For at least four recovery populations of each species, effective measures are in place to control potential negative effects on invasive nonnative species that could harm these milk-vetches and/or their habitats.
 - The protected habitat base for at least four recovery populations of each species is large enough to offset loss or restriction of the species' pollinators.
 - Use of pesticides or herbicides detrimental to either of the milk-vetches or their pollinators is prohibited in the vicinity of all recovery populations.

- Research indicates genetic fitness, alleviating concern about inbreeding or outbreeding depression.
- Seed collection/storage is underway for all extant.
- **Recovery Actions (from 2006 recovery plan)**
 - Conserve known extant *A. holmgreniorum* and *A. ampullarioides* populations and their habitat.
 - Locate and conserve additional extant populations, if any.
 - Monitor *A. holmgreniorum* and *A. ampullarioides* sites for population information and trends.
 - Establish a set of need-based research priorities aimed at abating or reducing threats and increasing population health and numbers.
 - Develop and implement a rangewide strategy for augmentation and/or introduction of milk-vetch populations.
 - Augment extant populations and/or establish new populations of each species in accordance with the rangewide strategy.
 - Promote effective communications with partners and stakeholders regarding the milk-vetches' recovery needs and progress.
 - Develop and implement educational and outreach programs.
 - Provide oversight and support for implementation of recovery actions.
 - Establish a technical working group to regularly review the status of the species and track the effectiveness of recovery actions.
 - Revise the recovery program when indicated by new information and recovery progress.

3. Description of Species Range

- Figure A1-1 depicts the FWS range. The range was last updated on Dec. 29, 2020. The total acreage of the range is around 57, 371 acres.

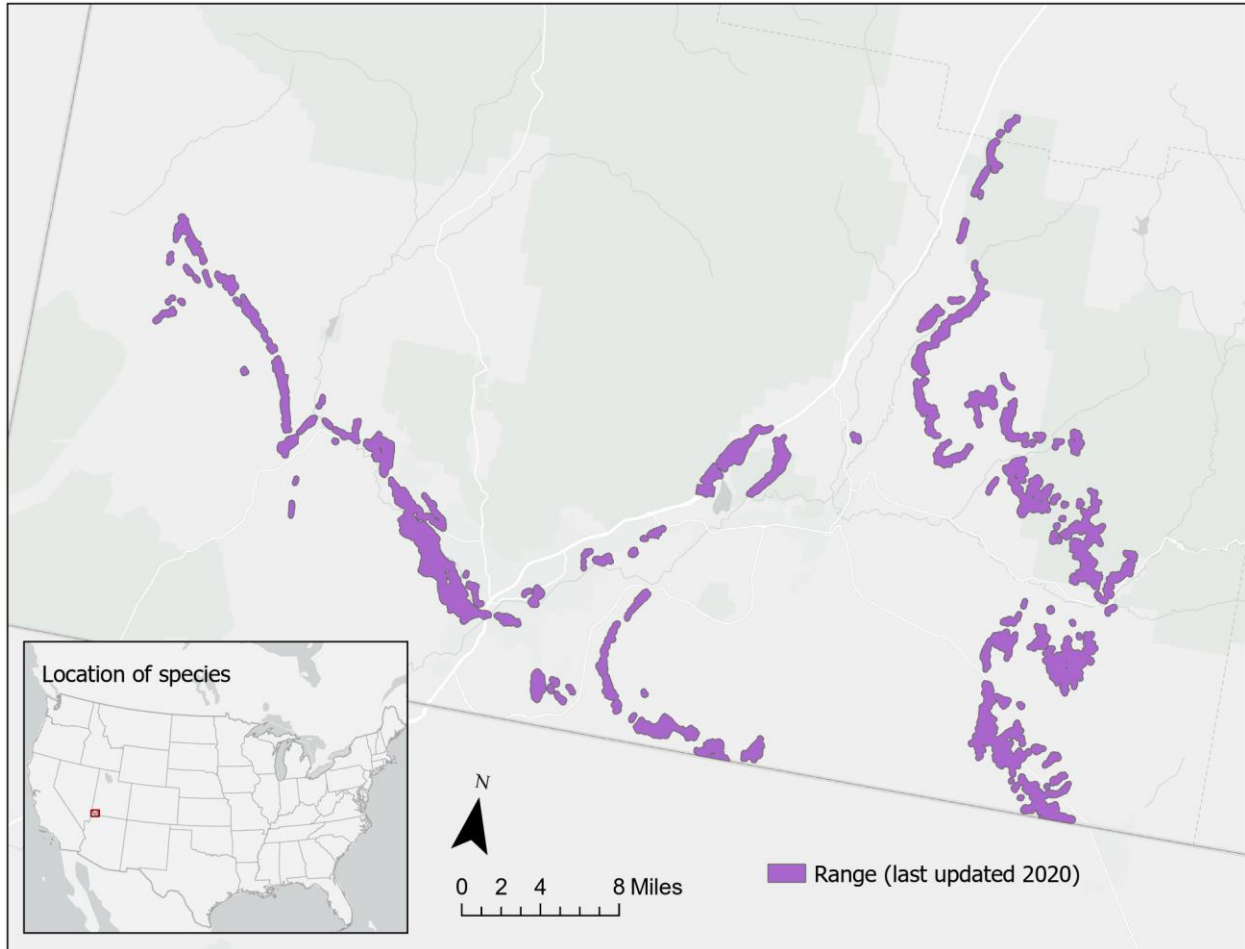


Figure A1-1. FWS range for the Shivwits milk-vetch. The total acreage of range is around 57,371 acres.

4. Critical Habitat

- Shivwits milk-vetch's critical habitat was designated in 2006 ([71 FR 77972](#), December 27, 2006).
- Figure A1-2 depicts the current critical habitat.
- The total acreage of the current critical habitat is around 2,182 acres.

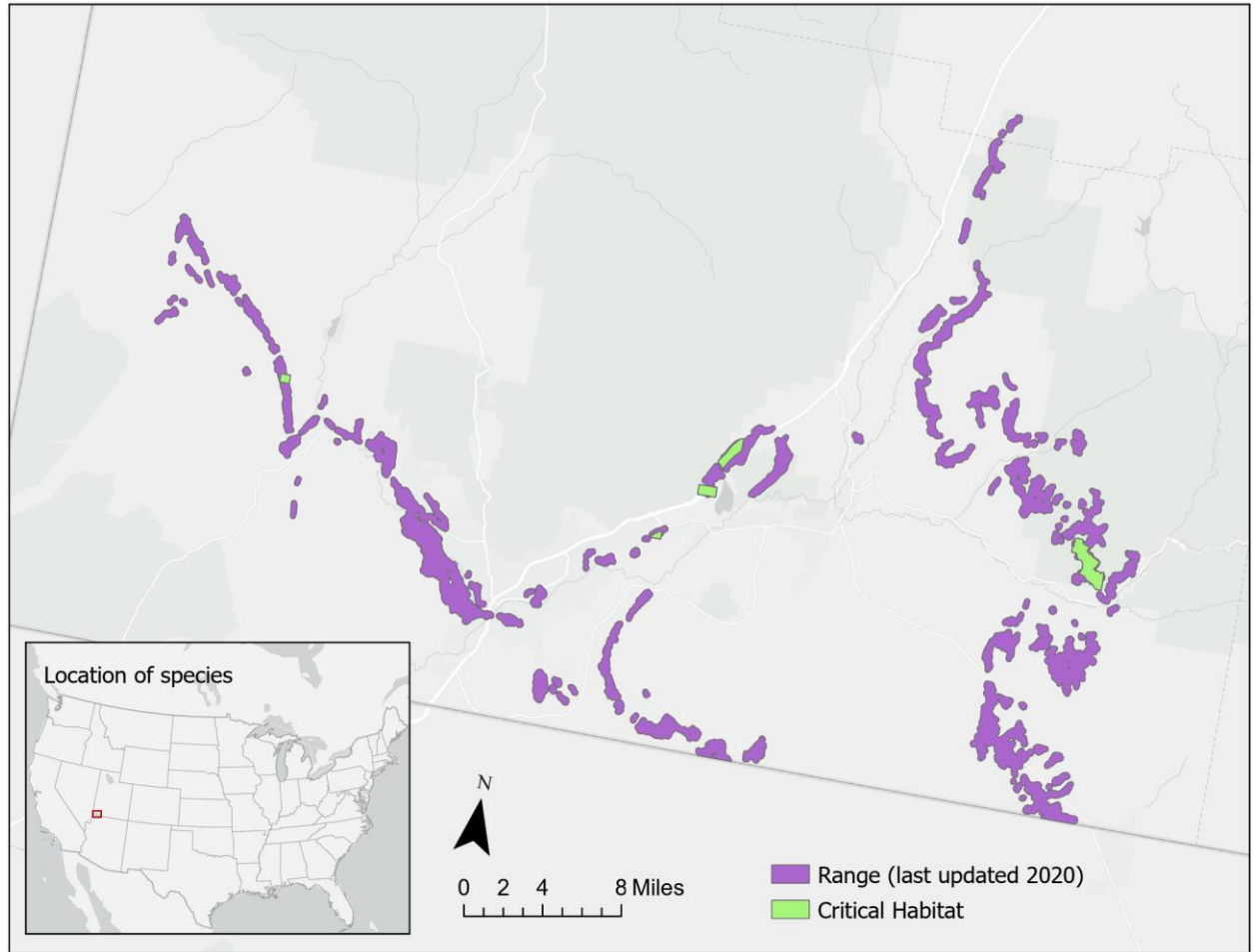


Figure A1-2. FWS current critical habitat for the Shivwits milk-vetch.

5. Known Locations

- Known Locations Described in FWS Recovery Documents
 - “All known locations of *A. ampullarioides* occur within Washington County, Utah. To the west of St. George, the Shivwits population is found on the Shivwits Indian Reservation, and the Pahcoon Spring Wash population located adjacent to the Reservation. East of St. George, the most southerly population, Coral Canyon, is located adjacent to a golf course and residential subdivision. Another population is located south of Quail Creek and contains two main areas of occupancy, Harrisburg Bench and Cottonwood; these populations occur within 1 mi (1.6 km) of each other, and one Cottonwood is in the median of I-15. The Silver Reef population (its name references the silver mining that once occurred in the area) is found north of Harrisburg Bench. An additional disjunct population occurs within Zion National Park (Van Buren and Harper 2003a, 71 FR 15979) and is managed by the National Park Service (NPS)”.
 - Figure A1-2 depicts the currently known locations from FWS.

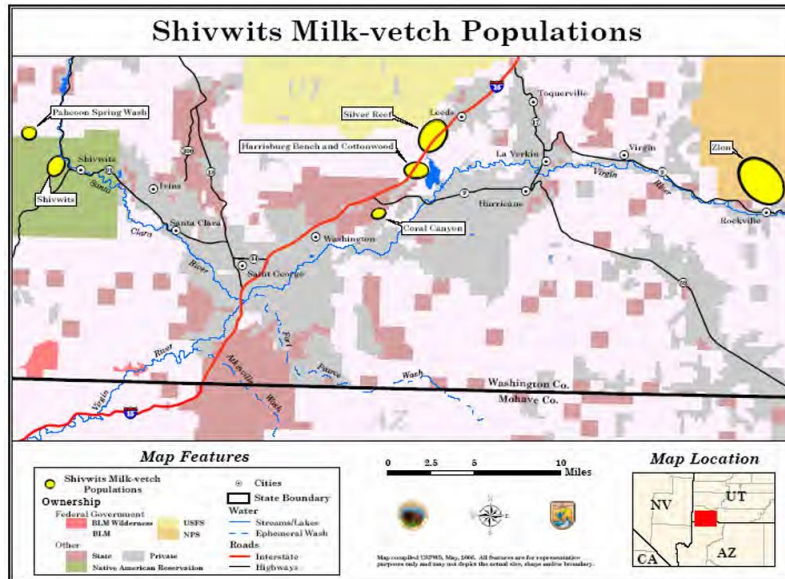


Figure A1-3. Known location information from FWS. Map from FWS 5-year review (2007).

- **Occurrences Included in Public Databases**

EPA queried iNaturalist, GBIF, and NatureServe. Occurrences in NatureServe were also consistent with other occurrence data.

iNaturalist (available [here](#)) had 18 research grade observations for this species, nine of which appear to fall outside of the species range; however, the positional accuracy of the points do not allow EPA to determine if these occurrences were in or out of the occupied watersheds.

GBIF (available [here](#)) included 20 occurrences and human observations (from 2010-2024). All these observations are also included in iNaturalist.

Figure A1-4 displays iNaturalist and GBIF species occurrences.

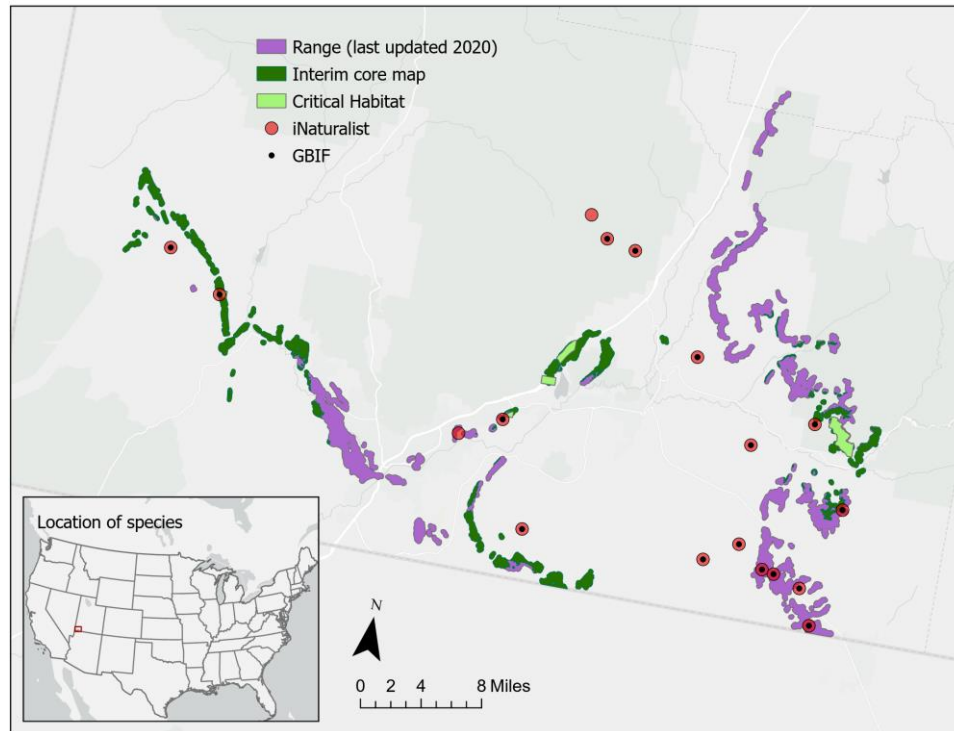


Figure A1-4. iNaturalist and GBIF occurrences.

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

This core map was created based on biological information, including occupied location and species habitat. EPA used the PULA provided by FWS during the Enlist consultation as the starting point (outer extent) for developing this core map. The initial PULA consists of three adjacent HUC12s containing Barton's Creek, Spring Creek, and Cedar Creek. These HUC12 sub-watersheds were further refined to remove areas with dense canopy cover.

1. Dataset References and Software

- Software used: ArcGIS Pro 3.2
- FWS Species Range – last updated on Dec. 29, 2020
- FWS Critical Habitat 2020
- USGS 3DEP Elevation data <https://elevation.arcgis.com/arcgis/services/NED30m/ImageServer>

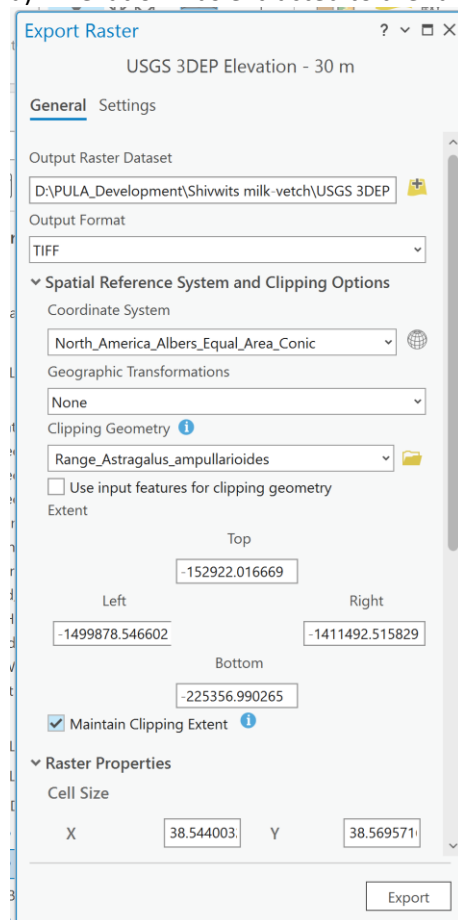
2. Datasets Used in Core Map Development

All datasets used in core map development are described in EPA's process document.

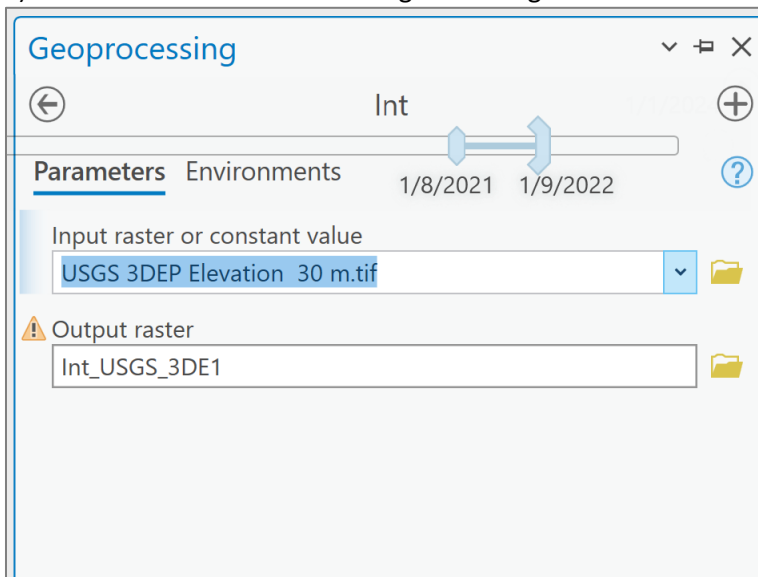
3. Core Map Development

- EPA started with the FWS species range and critical habitat.
- Further the refine the range by selecting elevation criteria.

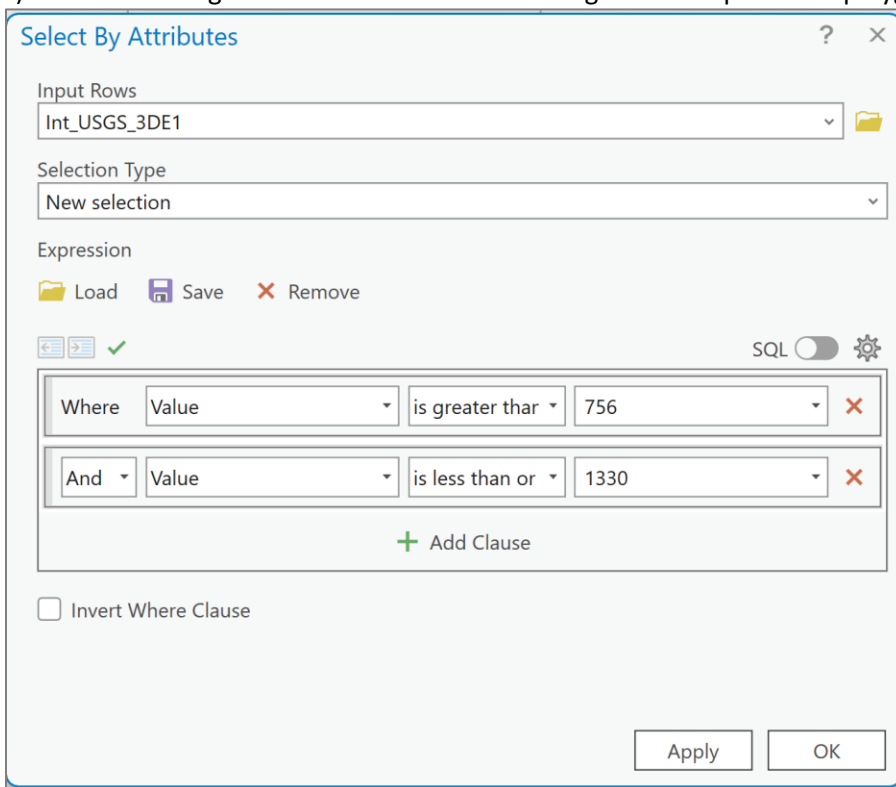
a) Elevation was extracted to the range



b) Extracted elevation was changed to integer.



c) Elevation range was selected and selected region was exported as polygon.



Geoprocessing

Raster to Polygon

Parameters

Environments

Input raster

Int_USGS_3DE1

Field

Value

Output polygon features

RasterT_Int_USG1

☒ Simplify polygons

☐ Create multipart features

Maximum vertices per polygon feature

d) Using selected area, core map was identified from range.

Geoprocessing

Clip

The **Pairwise Clip** tool provides enhanced functionality or performance.

Parameters

Environments

Input Features or Dataset

Range_Astragalus_ampullarioides

Clip Features

Coremap

 Output Features or Dataset

Range_Astragalus_ampull_Clip