Interim Core Map Documentation for the Holmgren Milk-Vetch

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

Species Summary

The Holmgren milk-vetch (*Astragalus holmgreniorum*; Entity ID #1020) is an endangered terrestrial plant (dicot). This species' locations are restricted to Washington County, Utah and Mohave County, Arizona. This species blooms from March-April and is pollinated by solitary bees (primary pollinators; e.g., Porter's Digger Bee), hawkmoths, hummingbirds, and nectar-robbing wasps. There is a designated critical habitat for this species. Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the Holmgren milk-vetch is biological information type based on the designated critical habitat with an addition of one extant population documented to occur outside of the critical habitat. **Figure 1** depicts the interim core map for the Holmgren milk-vetch (green areas on map). The core map represents 7,325 acres.

The core map developed for the Holmgren milk-vetch is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Holmgren 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" (3) best professional judgment classification to describe uncertainties/limitations.

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

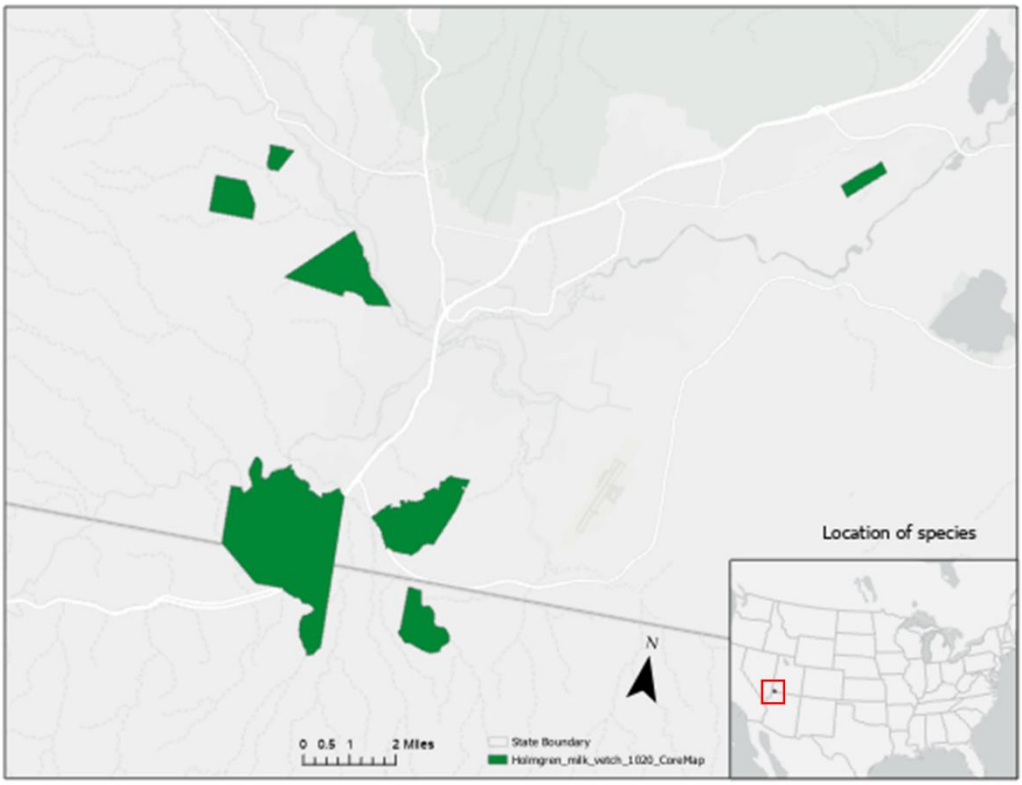

Figure 1. Interim core map for the Holmgren milk-vetch. The total acreage of the core map is approximately 7,325 acres.

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)	0%
Mosquito adulticide, residential	Developed Open Space (21)	1%
Mosquito adulticide, residential	Developed Low Intensity (22)	1%
Mosquito adulticide, residential	Developed Medium Intensity (23)	1%
Mosquito adulticide, residential	Developed High Intensity (24)	0%
Invasive species control	Woody Wetlands (90)	1%
Invasive species control	Emergent Herbaceous Wetlands (95)	0%
Invasive species control	Open Water (11)	0%
Invasive species control	Grassland/Herbaceous (71)	1%
Invasive species control	Shrub/Scrub (52)	94%
Invasive species control	Barren Land (31)	0%
Total Acres	**Interim Core Map Acres**	**7,325 acres**

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 sets of data before selecting the type of and developing the core map. FWS' most recent 5-year review (2021) detailed known locations of this species. FWS described seven documented occurrences that are extant, six of which have locations that are consistent with the critical habitat. iNaturalist had 18 research grade observations. GBIF contained no additional data that were not already included in iNaturalist or NatureServe. Given the scale and resolution of the data, the occurrences were consistent with the locations of the range and critical habitat. **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"). This core map was developed by EPA and was developed 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
4. Document the core map

For step 1, EPA compiled available information for the Holmgren milk-vetch from FWS as well as observational information available from various publicly available sources (discussed in previous section). The information compiled for the Holmgren milk-vetch is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- Current existing populations occur in locations consistent with the critical habitat with one additional population occurring outside on private lands in the Green Valley neighborhood of St. George, Utah.
- The species' critical habitat is highly refined.

For step 2, EPA used the compiled information to identify the core map type, including the species range, critical habitat, and known location information. EPA compared known location data to the range and critical habitat and found that the FWS known locations of currently existing (extant) population are generally consistent with the location of the designated critical habitat, except for the additional extant population in Green Valley. The species range is much larger than the areas where known locations occur. Based on this information, EPA used the designated critical habitat and the known location of the seventh extant population to create a biological information core map.

For step 3, EPA used the designated critical habitat provided by FWS. EPA downloaded the critical habitat from FWS's ECOS (https://ecos.fws.gov/ecp/). See Appendix 2 for additional information on GIS data and processes.

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

EPA did not explore approaches other than those described in this documentation.

[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 Species

1. **Recent FWS Documents/Links**

- Holmgren milk vetch 5-year review 2021 – (07/21/2021)
- Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 21 Species in the Mountain-Prairie Region – (05/27/2016)
- Astragalus holmgreniorum (Holmgren Milk-Vetch) and Astragalus ampullarioides (Shivwits Milk-Vetch) Recovery Plan – (09/22/2006)
- Designation of Critical Habitat for Astragalus ampullarioides (Shivwits milk-vetch) and Astragalus holmgreniorum (Holmgren milk-vetch) – (12/27/2006)

2. **Background information**

- Status: Federally listed as endangered in 2001
- Resiliency, redundancy, and representation (the 3Rs)
    - There are currently seven populations with an estimated 7,100 individuals on BLM, state, and private lands. This estimate is lower than the 2001 and 2006 estimates due to declining populations trends on BLM lands (2021 Five-Year Review).
    - 2006 Recovery Plan "Four of the six A. holmgreniorum populations are entirely in Washington County, Utah, while one population crosses into Mohave County, Arizona, and another is only found in Mohave County, Arizona. While this represents the known historic distribution, it is probable, due to human induced impacts, that both species occupied more habitat in the past."
    - 2021 Five-Year Review: "Plants are generally short-lived (less than 3 years) with low survivorship (Van Buren et al. 2021). The average survival of seedlings through the first-year dormant season (summer) is 16 percent, ranging from zero to 45 percent annually (Meyer et al. 2018)."
    - Resiliency, redundancy, and representation are likely to be low due to their limited geographic range, low survivorship and seed limitation, and threats, such as human disturbances and potentially some herbicide use.

- **Habitat, Life History, and Ecology (Source: 2021 Recovery Plan)**
    - **Habitat**: "A. holmgreniorum occurs at elevations between 2,480-2,999 feet (ft) (756-914 meters (m)) in areas that drain to the Santa Clara and Virgin rivers. It is typically found on the skirt edges of hill and plateau formations slightly above or at the edge of drainage areas; it occurs on soils characterized by small stone and gravel deposits and where living cover averages less than 15% of the landscape. *A. holmgreniorum* is associated with geological layers or parent materials found within the Moenkopi formation." (2006 Recovery Plan)

    - **Reproduction/pollinators**:
        - Blooms in spring; Flowering around March and April. Fruit by late April.
        - Pollinators include: solitary bees (primary pollinators; e.g., Porter's Digger Bee), hawkmoths, hummingbirds, and nectar-robbing wasps.

- **Taxonomy**
    - Terrestrial plant. Flowering dicot; herbaceous, non-woody perennial

- **Essential Physical Biological Features (PBFs) for Designated Critical Habitat:**
  - "Appropriate geological layers or soils that support individual Astragalus holmgreniorum plants. A. holmgreniorum is found on the Virgin Limestone member, middle red member, and upper red member of the Moenkopi Formation and the Petrified Forest member of the Chinle Formation (Harper and VanBuren 1997; Hughes 2005). Associated soils are defined by USDA et al. (1977 and 2000) as Badland; Badland, very steep; Eroded land-Shalet complex, warm; Hobog-rock land association; Isom cobbly sandy loam; Ruesh very gravelly fine sandy loam; Gypill Hobog complex, 6 to 35 percent slopes; Gypill very cobbly sandy loam, 15 to 40 percent slopes; and HobogGrapevine complex, 2 to 35 percent slopes. These soils are generally found at elevations from 2,430 to 3,000 ft (756 to 914 m), support associated native plant species, and have a low presence or lack of *Larrea tridentata* (creosote bush)." (2006 Critical Habitat Designation)
  - "Topographic features/relief (mesas, ridge remnants, alluvial fans, and fan terraces, their summits and backslopes, and gently rolling to steep swales) and the drainage areas along formation edges with little to moderate slope (0 to 20 percent)." (2006 Critical Habitat Designation)
  - "The presence of insect visitors or pollinators, such as Anthophora captognatha, A. damnersi, A. porterae, Anthophora spp., Eucera quadricincta, Omia titus, and two types of Dialictus." (2006 Critical Habitat Designation)

- **Relevant Pesticide Use Sites in FWS Documents**
  - Herbicide use at the Utah-Arizona border (2006 Recovery Plan):
    - "Herbicide use may affect the State Line population due to vegetation control on Interstate highway I-15 (Northwest Economic Associates 2006). Herbicide use within or adjacent to other A. holmgreniorum populations has not been documented. The threat of herbicide use is thus localized and of lesser concern with regard to A. holmgreniorum survival and recovery. However, it should be noted that threat scenarios can change over time, and all activities thought to pose a current or future threat to the species should be monitored and addressed."

- **Relevant Recovery Criteria and Actions (Source: 2006 Recovery Plan)**
  - Downlisting criteria include:
    - 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 A. holmgreniorum and A. ampullarioides populations.

o De-listing criteria include:

- Two additional populations of each species are either located or successfully introduced to habitat in proximity to extant populations. Thus, a minimum of eight recovery populations will be needed to delist each species.
- The available habitat base for each newly discovered or introduced 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 needed gene flow within and among populations.
- Population trends for all A. holmgreniorum and A. ampullarioides recovery populations are primarily stable or improving, as indicated as indicated by species presence, occupied habitat, density of occupied habitat, and demographic modeling.
- Each of the eight A. holmgreniorum and eight A. ampullarioides recovery populations has a post-delisting conservation plan with the species' conservation as a primary objective.
- Permanent land conservation is achieved for all recovery populations whether extant or introduced (a minimum of 8 populations), such that Endangered Species Act (ESA) protection is no longer needed to compensate for regulatory inadequacies.
- Adverse population-level effects from herbivory, disease, or predation, if any, are identified and abated within all A. ampullarioides and A. holmgreniorum recovery populations.

- A long-term offsite conservation program is ongoing for all milk-vetch recovery populations.

3. Description of the species range

- Known populations of A. holmgreniorum occur within approximately 10 miles (mi) (16 kilometers (km)) of St. George in Washington County, Utah, and Mohave County, Arizona. The largest concentration of this species spans the Utah-Arizona border, extending from the Atkinville Wash area eastward across Interstate 15 (I-15) to the Arizona Strip Highway; this concentration comprises three populations--State Line, Gardner Well, and Central Valley. Two populations, South Hills and Stucki Spring, are found south of the City of Santa Clara. An isolated population called Purgatory Flat is associated with a limestone outcrop found east of St. George. About half of the areas occupied by A. holmgreniorum are on lands owned and managed by the State of Utah (2006 Recovery Plan).
- Figure A1-1 depicts the current FWS species range (last updated 04/28/2021).
- The species range is approximately 43,000 acres.

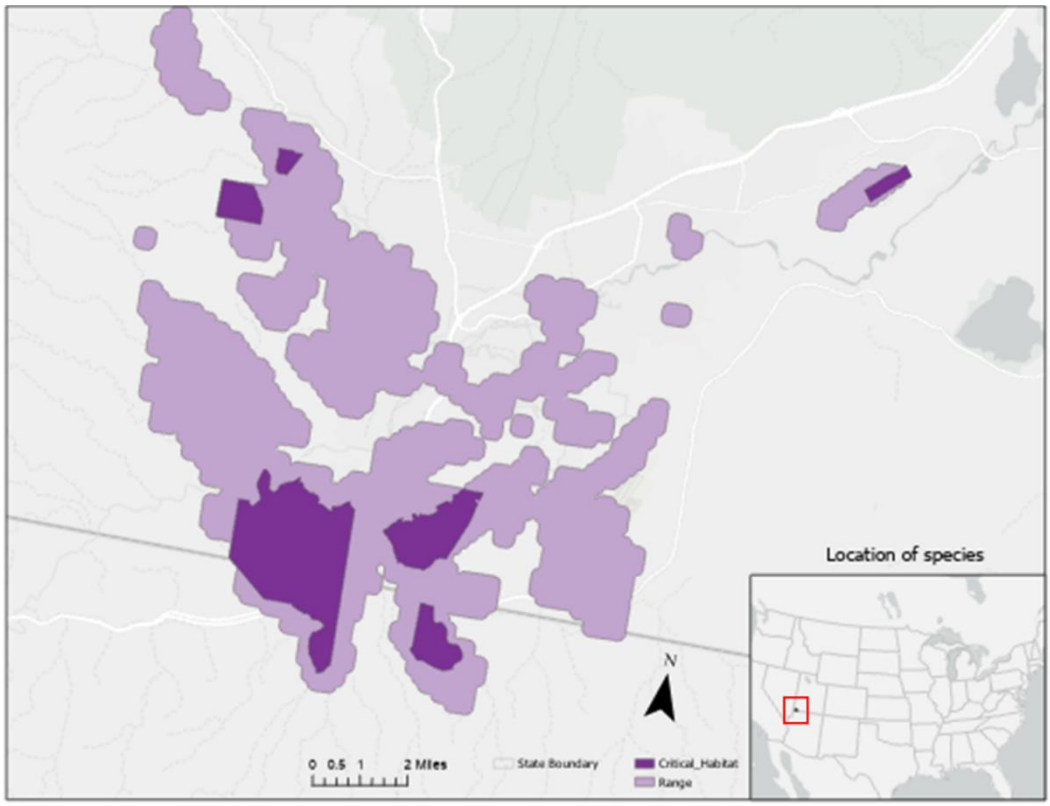

Figure A1-1. FWS range and critical habitat of the Holmgren milk-vetch.

4. Critical Habitat (Source: 2021 Five Year Review)

- The Holmgren milk-vetch critical habitat was designated in 2006. Approximately 6,289 acres were designated in Washington County, Utah and Mohave County, Arizona.
- "This coincided with the 6 known populations at the time (State Line, Central Valley, Stucki Springs, South Hills, Purgatory Flat, and Gardner Well) in Arizona and Utah. To

date, development has resulted in the loss of approximately 497 acres of critical habitat in the State Line (subunit 1a), Central Valley (subunit 1c), and Purgatory Flat (Unit 3)) populations (Lewinsohn 2021). Approximately 166 acres of critical habitat in the State Line (subunit 1) population will be transferred to Federal ownership in 2021 as part of the Utah Test and Training Range legislation (Public Law 114-328) (Appendix 1; Roe 2020). Approximately 200 to 300 acres of critical habitat in the Central Valley (subunit 1c) population will be protected in-perpetuity as part of the commitments identified in the Washington County Habitat Conservation Plan (Appendix 1; Washington County Commission 2020)."

5. Known Locations

- **Known Locations Described in FWS Recovery Documents**
  - The Recovery Plan lists six extant populations of Holmgren milk-vetch.
  - "Four of the six A. holmgreniorum populations are entirely in Washington County, Utah, while one population crosses into Mohave County, Arizona, and another is only found in Mohave County, Arizona."
  - **Figure A1-2** depicts the known location data in FWS' Recovery Plan. **Table A1-1** also provides demographic for three of the six extant populations.
  - When considering the locations of the current extant populations (**Figure A1-2**), they are consistent with the location of the Critical habitat (**Figure A1-1**).
  - The 2021 Five-Year Review describes a seventh extant population on private lands along a utility corridor outside of designated critical habitat in the Green Valley neighborhood near St. George Utah.

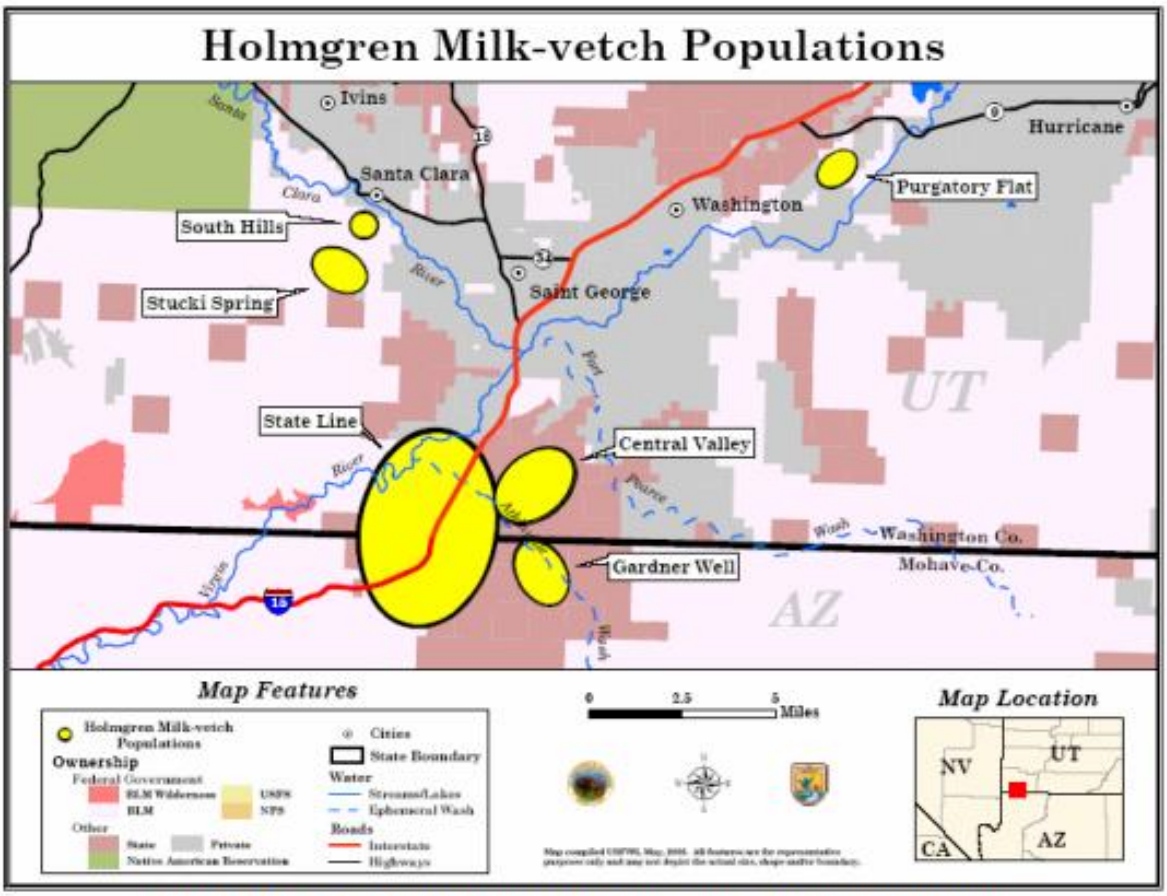

FIGURE 3. Distribution and range of *A. holmgreniorum*.

Figure A1-2. Known locations of the Holmgren milk-vetch. Reproduced from Recovery Plan (2006).

Table A1-1. Demographic data for three of six Holmgren milk-vetch populations (2006 Recovery Plan).

THREE POPULATIONS DESCRBED IN FINAL RULE	RECOVERY PLAN POPULATIONS	YEAR OF INTENSIVE SURVEY	APPROX ACREAGE SURVEYED	LANDOWNER	TOTAL PLANTS	FLOWERING ADULTS	SEEDLINGS	EST DENSITY PER ACRE
UTAH-ARIZONA BORDER	State Line	2004	600	SITLA	15,902	1	15,819	56.5
UTAH-ARIZONA BORDER	State Line	2005	1,100	BLM	11,254	2,338	8,462	10.2
UTAH-ARIZONA BORDER	Gardner Well	-	-	State	-	-	-	-
UTAH-ARIZONA BORDER	Central Valley	2003	700	STILA	12,315	6	12,290	17.5
SANTA CLARA	South Hills	2005	80	BLM	208	157	24	2.6

THREE POPULATIONS DESCRBED IN FINAL RULE	RECOVERY PLAN POPULATIONS	YEAR OF INTENSIVE SURVEY	APPROX ACREAGE SURVEYED	LANDOWNER	TOTAL PLANTS	FLOWERING ADULTS	SEEDLINGS	EST DENSITY PER ACRE
SANTA CLARA	Stucki Spring	-	-	BLM	-	-	-	-
PURGATORY FLAT	Purgatory Flat	-	-	BLM	-	-	-	-
TOTALS	**-**	**-**	**2,500**	**-**	**39,679**	**2,502**	**36,595**	**15.8**

Occurrences in iNaturalist

- Searched on 07/31/25
- https://www.inaturalist.org/observations?d1=2000&d2=2025&quality_grade=research&subview=map&taxon_id=158908 There are 8 research grade observations available from 2019-2024.
- There were 18 research-grade observations.
- **Figure A1-3** depicts the locations of these observations.
- The locations of these observations are likely masked. Therefore, it is unclear if these observations are in the core map area or not.

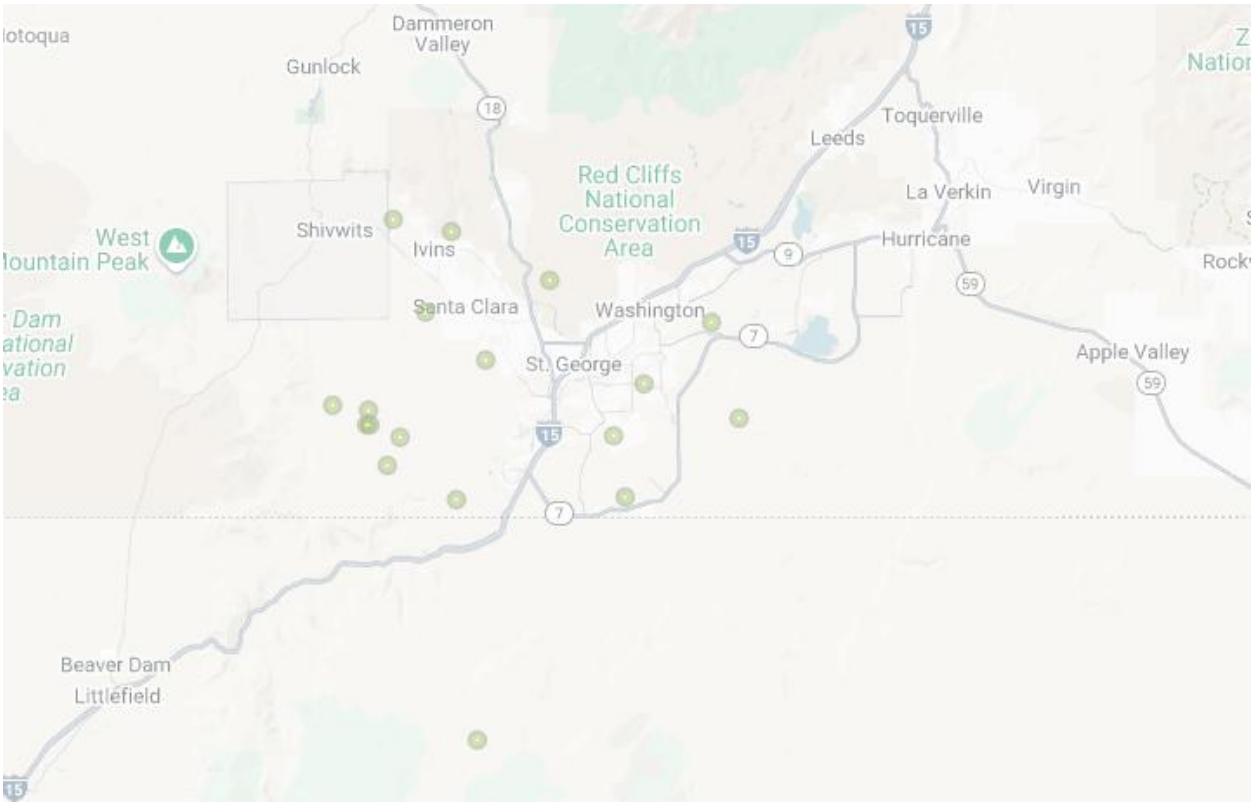

Figure A1-3. Screenshot from iNaturalist observations for Holmgren milk vetch. Area depicted is on similar scale and location as species range depicted in Figure A1-1.

Occurrences in NatureServe

- NatureServe was searched on 08/05/2025
- https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.128690/Astragalus_holmgreniorum
- NatureServe. 2025. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed: August 5, 2025).
- These locations are generally consistent with the location of the range and critical habitat.

Occurrences in GBIF

- GBIF was searched on 07/31/25.
- There were 14 "human observations" available for this species.
- All observations were included in either iNaturalist or NatureServe.
- https://www.gbif.org/occurrence/download?q=holmgren%20milkvetch&basis_of_record=HUMAN_OBSERVATION&taxon_key=5345822
- The locations of these observations are likely masked. Therefore, it is unclear if these observations are in the core map area or not.

While the occurrence data are likely masked, the Five-Year Review supports expanding the core map beyond the designated critical habitat to capture the seventh extant population in Green Valley, Utah.

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

This core map was created based on biological information, including occupied location and critical habitat. EPA used the FWS critical habitat as the starting point for developing this core map. The known location from the 2021 FWS Five-Year Review that occurred outside of the critical habitat was manually added to the core map.

1. **Dataset References and Software**

- FWS Critical Habitat Shapefile –last updated 12/27/2006
- Software used: ArcGIS Pro 3.3
- FWS Known Occurrences (2021 Five-Year Review)

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 critical habitat established by FWS in 2006. Upon review of the 2021 FWS Five-Year Plan, it was noted that there was one additional Holmgren milk-vetch extant population outside of the critical habitat, but still within the species range.
- This core map contains the area of the established critical habitat in addition to the known occurrences. EPA used the information in the Five-Year Plan to approximate the location of the seventh extant population and created a polygon in the approximate location of the outside known occurrence using the "draw polygon" tool.