Interim Core Map Documentation for the Dixie Valley Toad

Version 1
Review Completed: April 2026
Core Map Developer: U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs (map and documentation was in part created by Center for Biological Diversity)

Species Summary

The Dixie Valley toad (*Anaxyrus williamsi*, Entity ID 11468) is an endangered toad. The U.S. Fish and Wildlife Service (FWS) has not designated a final critical habitat for the Dixie Valley toad but did propose a critical habitat in 2024. This species is endemic to Dixie Meadows area of Churchill County, Nevada. The species is aquatic and prefers warm water for much of its life history needs. Additional information on the species is provided in **Appendix 1**.

Description of Core Map

The core map for the Dixie Valley toad is based on biological information. The outer extent of this core map is defined using a refined map from FWS's Species Status Assessment (SSA) (2023). The map developer georeferenced figure 2.2 from FWS's SSA (2023) to create the core map and included a 1000-ft buffer. EPA removed the buffer for core map purposes because any necessary buffering will occur during Pesticide Use Limitation Area (PULA) development.

Figure 1 depicts the resulting interim core map for the Dixie Valley toad. The size of this core map is approximately 403 acres. Landcover categories within the core map area are included in **Table 1**. Landcover is predominantly emergent herbaceous wetlands and scrub/shrub.

The core map developed for the Dixie Valley toad is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Dixie Valley toad. This core map incorporates information developed by 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 a "limited" (2) best professional judgment classification to describe major uncertainties/limitations. The map is based on refined areas described by FWS that are based on biological needs and known location of the species.

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

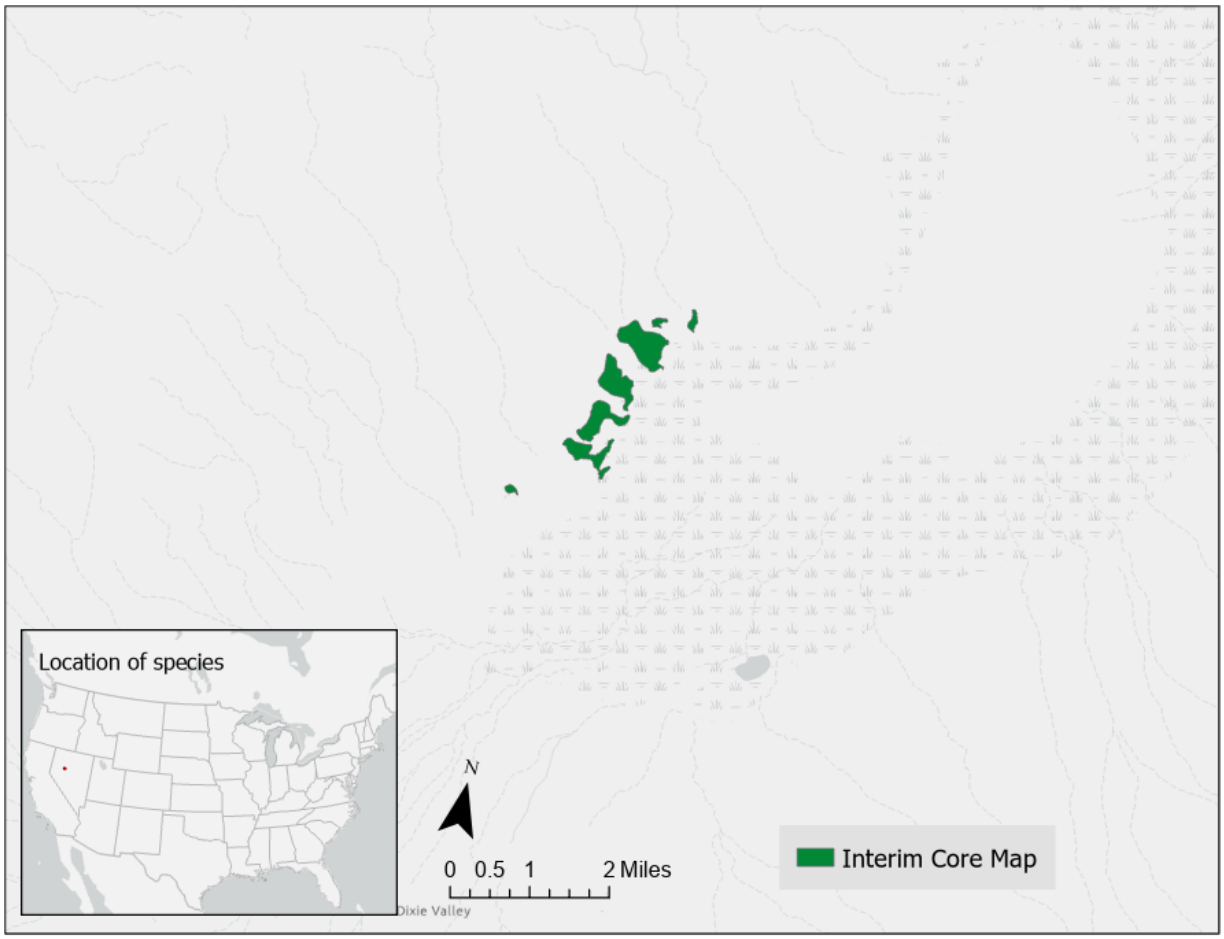

Figure 1. Interim core map for the Dixie Valley toad.

Table 1. Percentage of Interim Core Map Represented by National Land Cover Database (NLCD)[8] 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)	1%
Agriculture	Cultivated Crops (82)	0%
Mosquito adulticide, residential	Developed Open Space (21)	1%
Mosquito adulticide, residential	Developed Low Intensity (22)	2%
Mosquito adulticide, residential	Developed Medium Intensity (23)	0%
Mosquito adulticide, residential	Developed High Intensity (24)	0%
Invasive species control	Woody Wetlands (90)	1%
Invasive species control	Emergent Herbaceous Wetlands (95)	74%
Invasive species control	Open Water (11)	0%

Example pesticide use sites/types	NLCD Class/Value	% Area
Invasive species control	Grassland/Herbaceous (71)	0%
Invasive species control	Shrub/Scrub (52)	20%
Invasive species control	Barren Land (31)	1%
Total Acres	Interim Core Map Acres	~ **403**

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
- Occurrence locations in the Global Biodiversity Information Facility (GBIF)

The developers evaluated the FWS set of data before selecting the type of and developing the core map. EPA reviewed occurrence sets of data from iNaturalist, NatureServe, and GBIF for comparison purposes. FWS appeared to have the finest resolution of the location information, providing a map that depicted the refined range within the Dixie Meadows area of Churchill County, Nevada (**Figure A1-1 in Appendix 1**). Occurrences in iNaturalist, GBIF, and NatureServe did not support expanding the core map outside of this refined range. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

The developers compiled available information for the Dixie Valley toad from FWS, and EPA checked observation information available from various publicly available sources to ensure it did not include additional location data that should be included in the core map (including iNaturalist, NatureServe, and GBIF). The information compiled for the Dixie Valley toad is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- The species is found in springs, spring provinces (a series of springs clustered in a single area connected by a common groundwater source), and associated wetlands in Dixie Meadows, Churchill County, Nevada.
- There is a proposed critical habitat for the species from FWS.

The developer used the compiled information to identify the core map type including species range and known location information. The species is found in springs, spring provinces (a series of springs clustered in a single area connected by a common groundwater source), and associated wetlands in Dixie Meadows, Churchill County, Nevada. Therefore, the developers based the core map on the refined mapping identified by FWS in the SSA (2023).

The developer used the best available data sources to generate the core map. Data sources are discussed in the process document. For this core map, the developer used the refined mapping for the Dixie Valley toad georeferenced from the SSA (2023). **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

The FWS's range for the Dixie Valley toad (see figure A1-1 below) is contains unoccupied areas. FWS does not have a final critical habitat designated for the Dixie Valley toad and only has a proposed critical habitat (see figure A1-2 below) at the time of the creation of this core map.

Appendix 1. Information Compiled for the Dixie Valley toad

1. **Recent FWS documents/links and other data sources**
   - Proposed Critical Habitat (2024) (https://www.govinfo.gov/content/pkg/FR-2024-05-30/pdf/2024-11847.pdf#page=1)
   - Species Status Assessment (SSA) (2023) (https://iris.fws.gov/APPS/ServCat/DownloadFile/251623)
   - Recovery Outline (2023) (https://ecos.fws.gov/docs/recovery_plan/Recovery%20Outline%20for%20Dixie%20ValleyToad.pdf)
   - Species Status Assessment (SSA) (2022) (https://ecos.fws.gov/ServCat/DownloadFile/231607)

2. **Background information**
   - **Status**: Federally listed as endangered in 2022

   - **Resiliency, redundancy, and representation** (the 3Rs) **(from 20023 Recovery Outline)**

     "Resiliency: High occupancy rate observed from 2018 through 2022 and evidence of reproduction observed in the period 2009 through 2022 indicate that the Dixie Valley toad is currently maintaining resilience to the historical and current environmental stochasticity present at Dixie Meadows."

     "Redundancy: low redundancy to withstand catastrophic events to the single population."

     "Representation: low representation due to the limited range and lack of dispersal opportunities."

     - **Habitat (From SSA 2023)**
       - "…springs, spring provinces (a series of springs clustered in a single area connected by a common groundwater source), and associated wetlands in Dixie Meadows, Churchill County, Nevada."

     - **Pollinator/reproduction**
       - Not applicable

     - **Taxonomy**
       - Toad
       - FWS Category (from SSA 2023):
         - "Goebel et al. (2009, entire)[1] described the *Anaxyrus* (*Bufo*) *boreas* species complex found in western North America as consisting of four different species: (1) The widely distributed western toad (*A. boreas*) and three localized species, (2) Yosemite toad (*A. canorus*), (3) Amargosa toad (*A. nelsoni*), and (4) Black toad (*A. exsul*); however, the authors reported that

[1] Goebel, A.M., T.A. Ranker, P.S. Corn, and R.G. Olmstead. 2009. Mitochondrial DNA evolution in the *Anaxyrus boreas* species group. Molecular Phylogenetics and Evolution 50:209–225.

this species complex is poorly understood and may contain other isolated cryptic species. Dixie Valley toads (*A. williamsi*) were recently described as a new species by Gordon et al. (2017, entire)[2] as part of the *A. boreas* species complex. In short, Gordon et al. (2017, entire)[2] concluded that Dixie Valley toads are a unique species within the *A. boreas* species complex due to morphological differences, genetic information, and its isolated distribution."

- "In addition to Dixie Valley toads, Gordon et al. (2020, entire)[3] described two other endemic cryptic species of toads that belong to this species complex: (1) Hot Creek toad (*A. monfontanus*), and (2) Railroad Valley toad (*A. nevadensis*). The three newly described toad species have been accepted as valid by the two leading authoritative websites: (1) AmphibiaWeb (http://amphibiaweb.org), and (2) Amphibian Species of the World (Frost 2021, entire; http://research.amnh.org/vz/herpetology/amphibia/). All North American toads were removed from the genus *Bufo* and given the genus *Anaxyrus* by Frost et al. (2006, pp. 66–70, 222, 363)[4] because they do not form a monophyletic group and this change in genus has been accepted by the Society for the Study of Amphibians and Reptiles, the accepted authority on amphibian and reptile taxonomy (Table 3.1; Crother et al. 2017, pp. 6–10[5])."

- **Relevant Pesticide Use Sites**
  - No information found.

- **Recovery Criteria/Objectives (from 2023 Recovery Outline)**
  - "More specific recovery objectives, delisting criteria, and actions will be developed during the formal recovery planning process as additional data become available for analysis."

- **Recovery Actions (from 20023 Recovery Outline)**
  - Interim Recovery Strategy:
    - Continue to fill knowledge gaps
    - Protect the existing population and currently occupied habitat
    - Maintain existing habitat conditions
    - Ameliorate primary threats

[2] Gordon, M.R., E.T. Simandle, and C.R. Tracy. 2017. A diamond in the rough desert shrublands of the Great Basin in the western United States: a new cryptic toad species (Amphibia: Bufonidae: Bufo (Anaxyrus)) discovered in northern Nevada. Zootaxa 4290:123–139.
[3] Gordon, M.R., E.T. Simandle, F.C. Sandmeier, and C.R. Tracy. 2020. Two new cryptic endemic toads of *Bufo* discovered in central Nevada, western United States (Amphibia: Bufonidae: *Bufo* [*Anaxyrus*]). Copeia 108:166–183.
[4] No reference provided in References Cited section of FWS's SSA (2023)
[5] Crother, B.I. Editor. 2017. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. Eigth Edition. Society for the Study of Amphibians and Reptiles Herpetological Circular 43:1–102.

3. **Description of Species Range**
    - Figure A1-1 depicts the FWS range. The range was last updated on 04/27/2022. Total acreage of range is around 3,196,041 acres.

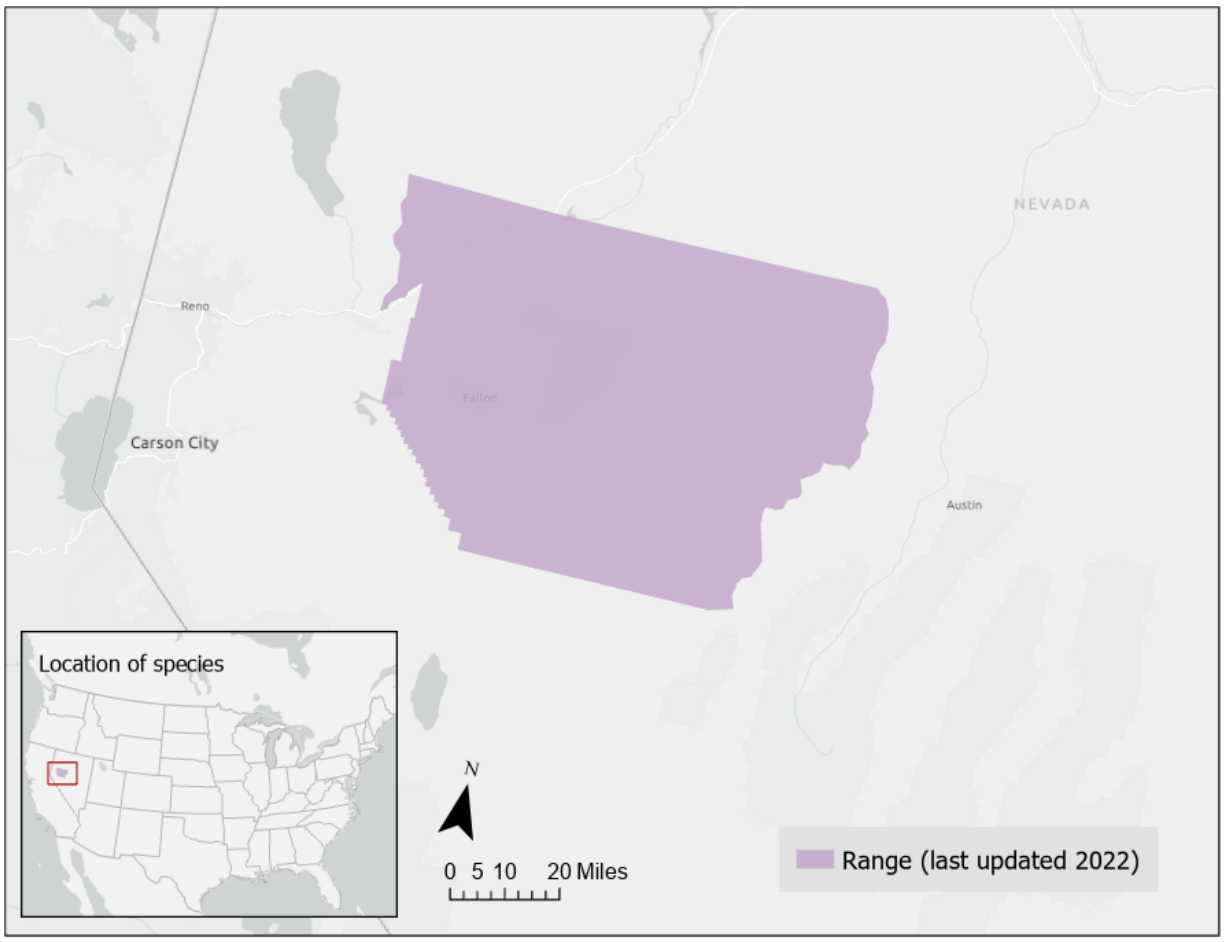

Figure A1-1. FWS range for the Dixie Valley toad. The total acreage of the range is around 3,196,041 acres.

4. **Critical Habitat**
    - Figure A1-2 depicts the FWS proposed critical habitat. The total acreage of the proposed critical habitat is approximately 930 acres (2024 Proposed Critical Habitat).

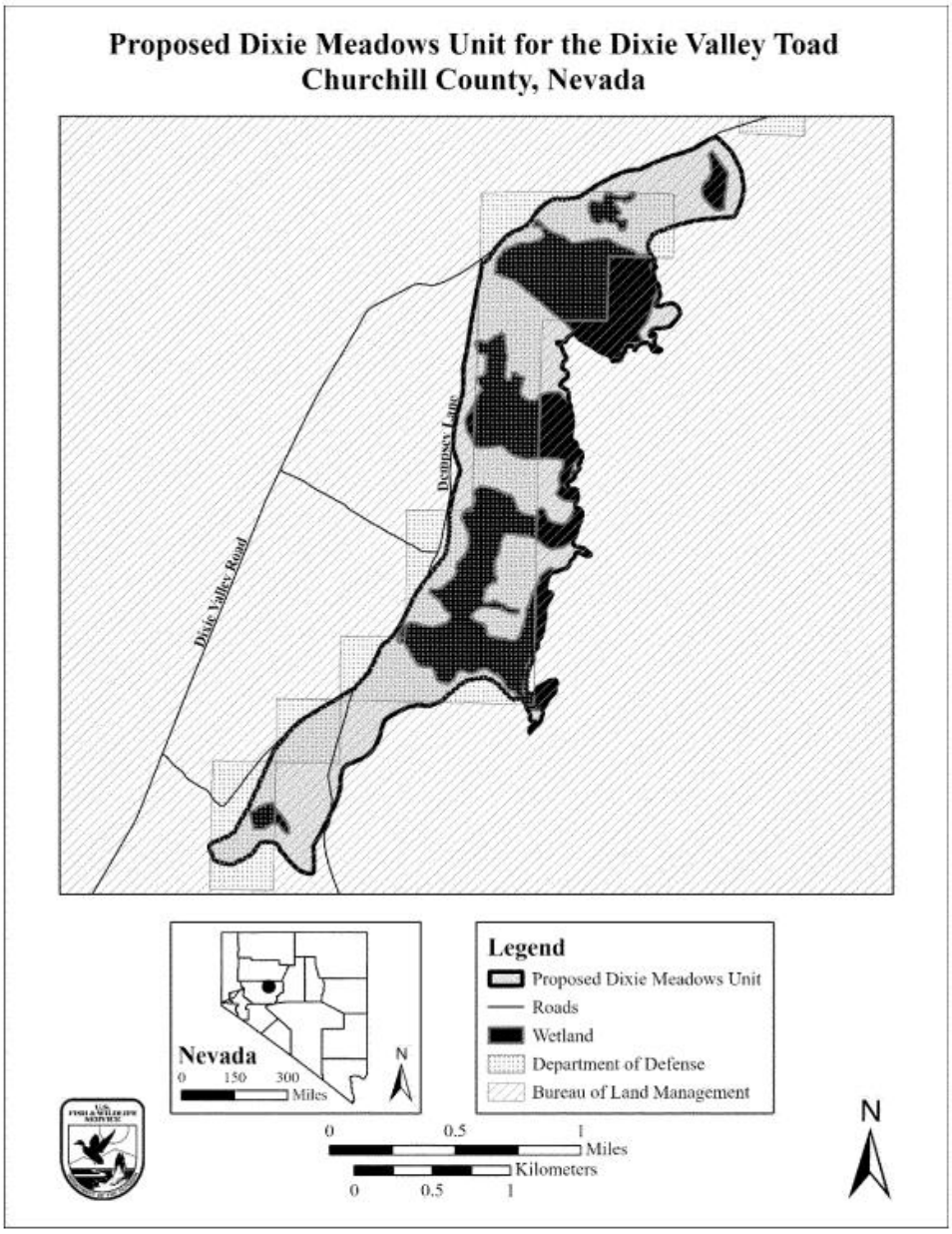

Figure A1-2. Proposed a critical habitat for the Dixie Valley toad. The total acreage of the proposed critical habitat is approximately 950 acres.

5. **Known Locations**
    - Known Locations Described in FWS SSA (2023)
        - Figure A1-3 depicts the entire refined range of the Dixie Valley toad in Dixie Meadows, Churchill County, Nevada from FWS's SSA (2023). Dixie Valley toads are reliant on springs, and thus the known spring locations in wetland complexes are also depicted.

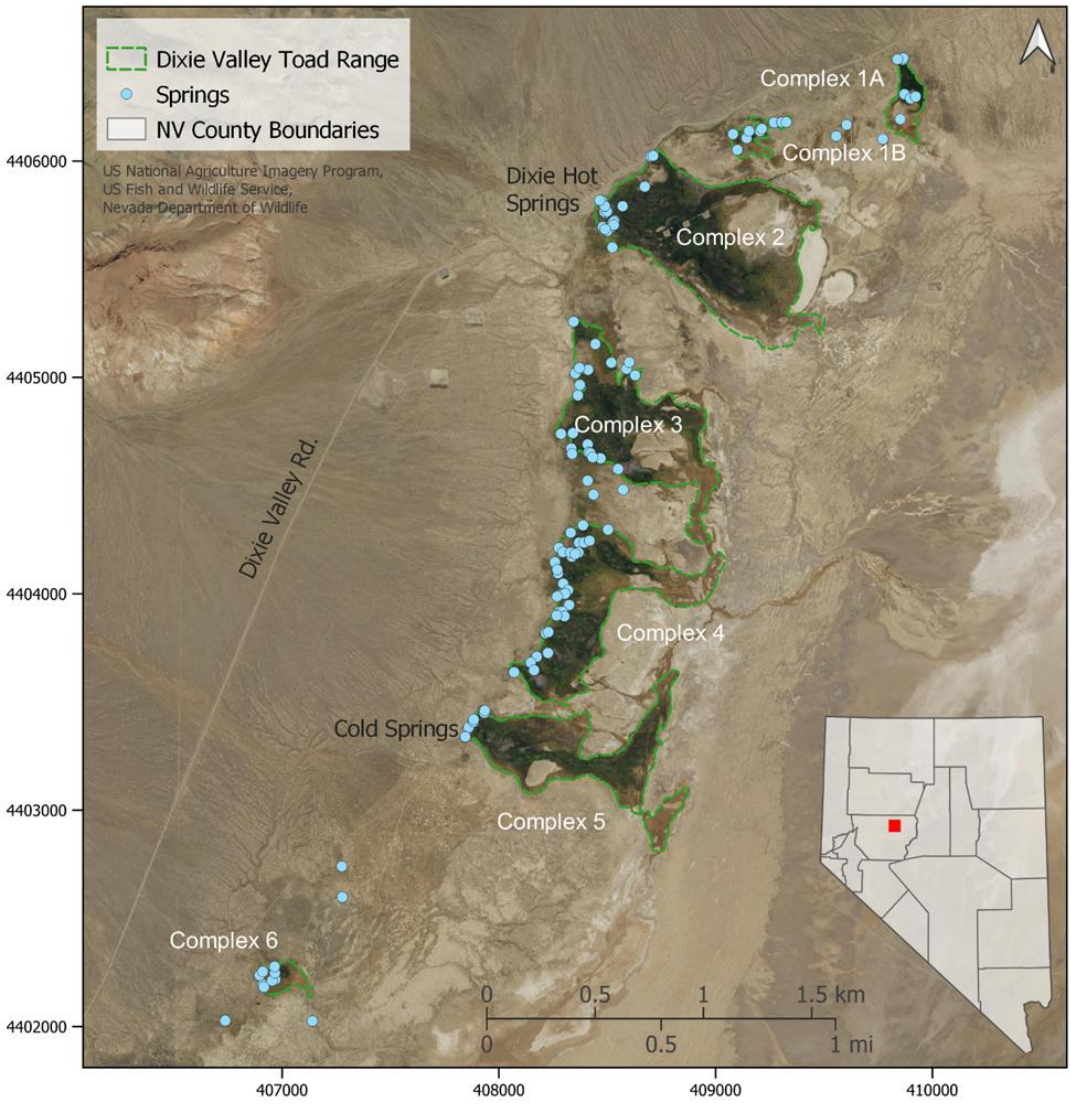

Figure A1-3. Known location information from FWS. The figure is "Figure 2.2" from most recent FWS SSA (2023).

- **Occurrences Included in Public Databases**
  EPA queried iNaturalist, GBIF, and NatureServe. Occurrences in NatureServe were also consistent with other occurrence data (linked here). Collectively, the occurrence data are consistent with the three watersheds used to identify the core map.

  iNaturalist (available here) had 14 research grade observations for this species, all of which fall within the range of the species (Dixie Meadows, Churchill County, Nevada).

  GBIF (available here) included eight occurrences and human observations (from 2005-2025). All these observations are also included in iNaturalist.

  Occurrences in NatureServe were consistent with other occurrence data (linked here).

  Collectively, the occurrence data are consistent with the FWS range.

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

This core map was created based on biological information, using a refined range map from FWS's SSA (2023). The developers georeferenced figure 2.2 from the SSA (2023) to create the core map.

1. **Dataset References and Software**
   Software used: ArcGIS Pro 3.2 and ArcGIS Online Map Viewer

1. **Datasets Used in Core Map Development**
   All datasets used in core map development are described in EPA's process document.

3. **Core Map Development**

- The developers started with figure 2.2 for FWS's SSA (2023) and georeferenced the figure to create a refined range core map. This included a 1000 ft buffer, which EPA removed because it was not representative of where the species exists.
- The core map is contained in the shape files "inputLayers.dbf", "inputLayers.shp", and "inputLayers.shx