

Interim Core Map Documentation for Warm Springs Pupfish

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Interim core map developed by the Center for Biological Diversity (CBD)¹

Documentation supplemented by EPA's Office of Pesticide Programs

Species Summary

Warm Springs pupfish (*Cyprinodon nevadensis pectoralis*; Entity ID #231) is an endangered fish endemic to the Ash Meadows National Wildlife Refuge in Nye County, Nevada. There is no designated critical habitat for this species. The species has a restricted distribution and is found in six, low-flow springs within the Ash Meadows National Wildlife Refuge. It resides in shallow pools and streams arising from the springs. The Warm Springs pupfish is a generalist omnivore eating periphyton, algae, invertebrates, detritus, and diatoms. The species spawns throughout the year with a peak in the spring. Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the Warm Springs pupfish is based on species range, the entirety of which is within the Ash Meadows National Wildlife Refuge. The species range is refined and represents areas important for this species' conservation. There are only six known populations of this species, and they are all located within the range. There is no designated critical habitat. **Figure 1** depicts the interim core map for Warm Springs pupfish. The core map represents approximately 3,810 acres, most of which is within Ash Meadows National Wildlife Refuge.

All Warm Spring pupfish habitats are isolated from other aquatic environments and none of the springs it occupies discharges more than 1.17 gallons/sec. The Warm Springs pupfish still occurs in the same springs as originally listed (North Indian, South Indian, North Scruggs, South Scruggs, Marsh, and School springs). Landcover categories within the core map area are included in **Table 1**. Landcover is predominantly shrub, barren land, and herbaceous wetland, which are generally consistent with the habitat of this species.

The core map developed for the Warm Springs pupfish is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Warm Springs pupfish. 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 expert feedback from FWS. This interim core map has a "none" best professional classification because it consists of the species' range without additions or subtractions. The interim core map contains all six known populations of this

¹ CBD sent EPA the core map for this species before EPA released its mapping process document and example documentation. EPA supplemented the documentation and supporting analysis for consistency with EPA's most recent documentation examples made available after CBD developed this core map.

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

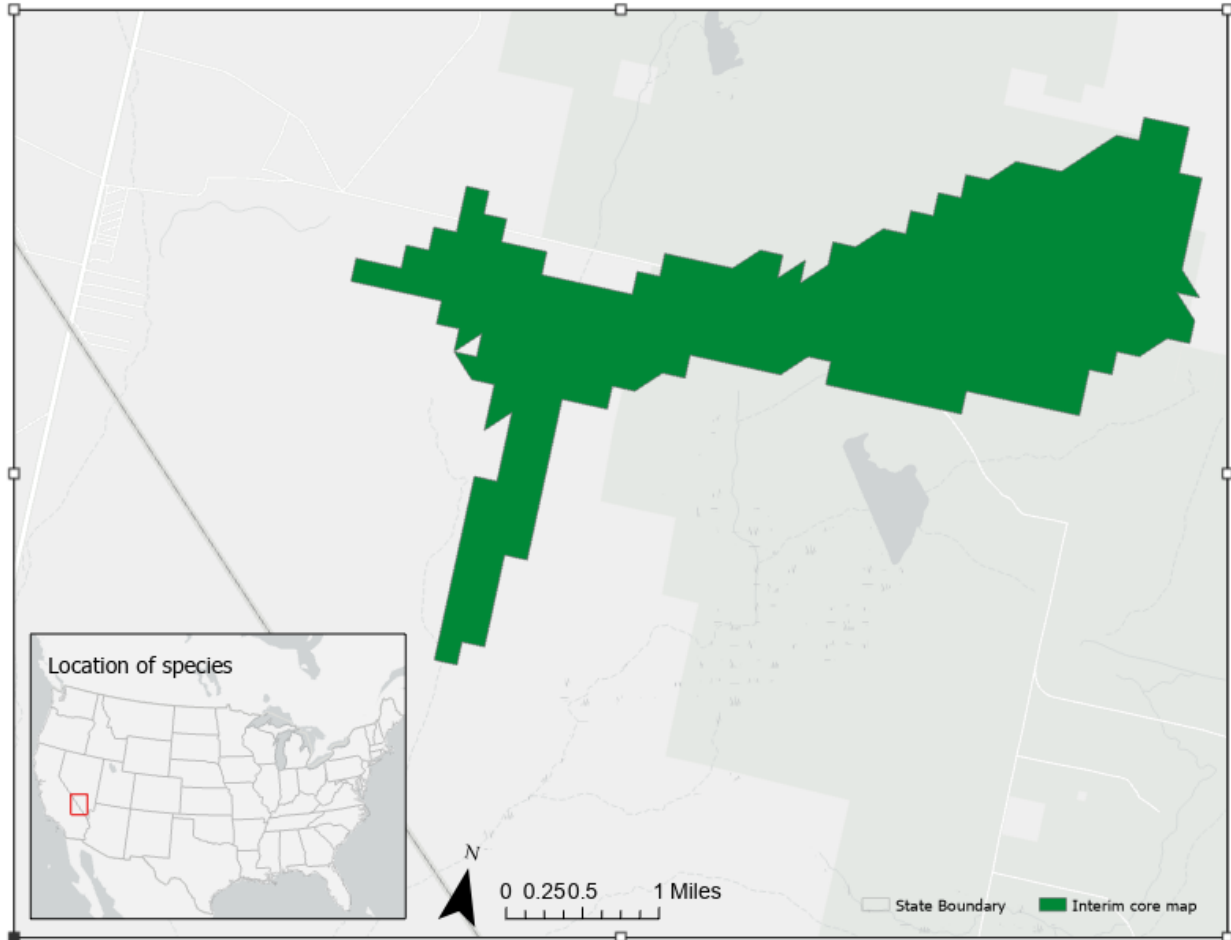


Figure 1. Interim core map for Warm Springs pupfish. Total acreage of the interim core map is approximately 3,810 acres.

Table 1. Percentage of Interim Core Map Represented by NLCD 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%	0%
	Evergreen Forest (42)	0%	
	Mixed Forest (43)	0%	
Agriculture	Pasture/Hay (81)	0%	0%
	Cultivated Crops (82)	0%	
Mosquito adulticide, residential	Open space, developed (21)	0.1%	0.1%
	Developed, Low intensity (22)	0.1%	
	Developed, Medium intensity (23)	0%	
	Developed, High intensity (24)	0%	
Invasive species control	Woody Wetlands (90)	6.4%	99.9%
	Emergent Herbaceous Wetlands (95)	3.1%	
	Open water (11)	0%	
	Grassland/herbaceous (71)	0.6%	
	Scrub/shrub (52)	53.0%	
	Barren land (rock/sand/clay; 31)	36.9%	
Total Acres	Interim Core Map Acres	3,810	

Evaluation of Known Location Information

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

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

EPA evaluated these four sets of data to inform or support the core map. FWS provided the most refined descriptions of the occurrence information and confirmed that all known locations of extant populations are located within the range. iNaturalist had five research grade observations. Given the resolution of the data, the observations were consistent with the species range. GBIF's occurrence data had three observations that had not been accounted for in iNaturalist, but all three observations were within the species' range. NatureServe included no occurrence locations. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

The developer compiled available information for the Warm Springs pupfish from FWS, as well as observation information available from various publicly available sources (including iNaturalist, GBIF, and NatureServe). The information compiled for the Warm Springs pupfish is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- The species range is refined, surrounding the springs where the species is known to occur.
- There are 6 known populations in FWS documentation, all of which are within the species' range;
- Occurrence data from other sources are generally consistent with the species range location.

EPA used the compiled information to identify the core map type. EPA compared known location data to the range and found that these known locations are consistent with the species range. Based on the narrow range that includes all occurrence data identified by FWS, EPA selected the range to use as the species core map. EPA used the ECOS species range for Warm Springs pupfish.

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

Alternative approaches and data were not considered in the development of this interim core map.

Appendix 1. Information Compiled for Species

1. Recent FWS Documents

- [1990 Recovery Plan for the Endangered and Threatened Species of Ash Meadows, Nevada](#)
- [2021 Warm Springs pupfish 5-year review](#)
- [2020 Final Biological Opinion 08ENVS00-2020-E-00089](#)

2. Background information on Species

- **Status:** Federally listed as endangered in 1970
- **Taxonomy:** Fish
- **Resiliency**

“Abundance of this species is highly variable, fluctuating dramatically over the course of the year (Service 1980, 1990), and is reflected in periodic surveys by Ash Meadows National Wildlife Refuge staff. Total catch per spring can range from 1 or 2 individuals in School or Indian springs to several hundred in the Scruggs springs (Ash Meadows National Wildlife Refuge fish monitoring data 2012-2017). Both species biology and the modification of fish sampling protocols over time presents difficulty in estimating abundance.” (5-year review 2021, 3)

See Known Locations section of this document for population counts.
- **Redundancy**

“Today, the Warm Springs pupfish still occurs in the same historically described springs when originally listed (North Indian, South Indian, North Scruggs, South Scruggs, Marsh, and School springs).” (5-year review 2021, 3)
- **Representation**

“The Warm Springs pupfish is an endemic species restricted to six springs and their outflows in a 0.77 mi² (2 km²) area within the Warm Springs Complex in Ash Meadows NWR. All of these springs are small (discharge less than 1.7 gallons (6.4 liters) per second), and some have no source pool.” (Biological Opinion 2020, 163)
- **Habitat Description**

“This pupfish was described in 1948, and it occupies six small springs within an area encompassing less than 0.77 square mile situated approximately 0.62 mile west of Devil’s Hole. All of its habitats are isolated from other aquatic environments and none of the springs it occupies discharges more than 1.17 gallons/sec. The discharge from these springs’ surfaces into small spring holes then flows less than 1.25 miles before disappearing into the soil.” (Recovery Plan 1990, 16)

“Most of the spring systems within the Mojave Desert are alkaline, and pupfish are susceptible to low pHs. Pupfish in general have a very wide tolerance to salinity, and pupfish from within the Colorado River and Death Valley system have been maintained and reproduced in water ranging from distilled water to a salinity 2.5 times saltier than seawater. This is due to their unique ability to rapidly adjust serum osmotic concentration of ions, preventing water loss.” (Biological Opinion 2020, 163)
- **Relevant Life History Information:**

“Pupfish are relatively short-lived species, with a life span estimated to be 2 to 4 years. Soltz and Naiman (1978) provide a summary of life history and growth traits of pupfish, including *C. nevadensis*. Longevity is relative to water temperature and is a function of metabolism. Typically, pupfish living in the warm waters reach maturity at 2 to 4 months, and then live 6 to 9 months as an adult. In colder waters, such as spring outflow tailwaters or marshes, pupfish may go dormant during winter, ultimately extending their lives to approximately 3 years.” (Biological Opinion 2020, 163)

“All pupfish have similar diets, essentially being omnivores and detritivores. The primary food for the pupfish is periphyton and algae, but they also consume invertebrates, detritus, and diatoms.” (Biological Opinion 2020, 163)

“Like other members of *Cyprinodon nevadensis*, the Warm Springs pupfish spawn throughout the year with a peak in the spring. Local environmental conditions also influence fecundity, life history, and mortality, subsequently the population fluctuates throughout the course of a year. The number of individuals in the population likely peaks in fall but dies back in the winter.” (Biological Opinion 2020, 164)

- **Ecology**

“Physiology of the fish allows for a wide range of suitable habitats, and fish may occur in nearly all habitats present within the Warm Springs; however, some fish may be limited by upper thermal constraints, especially during spawning. This discourages use of extreme upper portions of the springs, especially during times with high air temperatures and increased solar inputs. Gravel substrate is critical for establishment of endemic invertebrates, which form an important forage resource for the pupfish.” (Biological Opinion 2020, 163-164)

- **Relevant Pesticide Use Sites**

No available information on pesticide use sites is included in FWS documents

- **Threats**

“The concerns expressed previously for groundwater extraction have heightened in recent years, with new understanding of the level of connectivity of the aquifer feeding springs of Ash Meadows. The hydrogeology of the region has received even more attention given the ongoing demands for water in the desert (i.e., pumping) and the likely reduced springflow as a consequence of climate change.... The Ash Meadows discharge area occurs at the terminus of a hydrologically significant feature referred to as the “megachannel”.... Therefore, pumping from carbonate rock in the megachannel can significantly impact water levels and spring discharges in the Ash Meadows discharge area.” (5-year review 2021, 3)

“The primary threats to the species are its small population size, vulnerability to habitat alteration, and the presence and introduction of predatory or competing nonnative species such as mosquito fish (*Gambusia affinis*), crayfish, and bullfrogs (*Lithobates catesbeiana*). Crayfish appear to currently occur only in the South Scruggs system, but due to the proximity of all of the springs in the Warm Springs Complex, the chance of the other systems being invaded or re-invaded is extremely high. Aquifer depletion and global warming have recently been suggested as causes for declining amount of habitat. Genetic bottlenecks and recent

isolation of populations due to shrinking habitat are also threats that are currently being investigated.” (Biological Opinion 2020, 164)

- **Reclassification Criteria**

From the 1990 Recovery Plan p 34-35, “All of the following eight conditions must be met within essential habitat for a period of 5 years before downlisting of Devil’s Hole pupfish, Warm Springs pupfish, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, Ash Meadows naucorid, and Ash Meadows niterwort to a threatened status may be considered:

1. All non-native animals and plant species must be eradicated from essential habitat. These non-native species currently include sailfin mollies, mosquitofish, largemouth bass, black bullheads, bullfrogs, crayfish, turban snails, wild horses, salt cedar and Russian olive.
2. Secure and protect the Ash Meadows aquifer so that all spring flows return to historic discharge rates, and the water level in Devil’s Hole is maintained at a minimum level of 1.4 feet below the copper washer. Spring discharge rates will be determined by Task number 211.
3. Re-establish water to historic springbrook channels which are free of barriers that eliminate genetic exchange between populations by preventing movement of native fishes throughout their historic range.
4. The essential habitat must be secure from detrimental human disturbances including mining, off-road vehicles, and introduction of non-native species.
5. All listed fish species are present in all the springs that they have occupied historically as identified in Appendix A, Table XIII.
6. Amargosa niterwort is present in all localities that it has occupied historically as identified in Appendix A, Table XV. 35
7. Establish and protect refugia populations of Devil’s Hole pupfish at Hoover Dam and Amargosa Pupfish Station.
8. Maintain a population of not less than 300 Devil’s Hole pupfish individuals during the winter and 700 during late summer and early autumn.”

- **Delisting Criteria**

From the 1990 Recovery Plan p 36, “Delisting of the remaining 11 species (Warm Springs pupfish, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, Ash Meadows naucorid, Ash Meadows niterwort, Ash Meadows blazing star, Ash Meadows milkvetch, Ash Meadows sunray, spring-loving centaury, Ash Meadows gumplant, and Ash Meadows ivesia) will be considered when the following criteria are met for a five year period:

1. Criteria shown above for downlisting from endangered to threatened.
2. Secure, protect, and maintain in natural vegetation, corridors and adjacent buffer areas for gene flow and dispersal of listed plant species within the essential habitat.
3. Native plant communities and aquatic communities have been reestablished to historic structure and composition within all essential habitat.
4. Each individual spring or stream population of Warm Springs pupfish, Ash Meadows Amargosa pupfish, and Ash Meadows speckled dace have sex ratios and juvenile-to-adult ratios that support self-sustaining populations as determined by Task 626.
5. The listed Ash Meadows naucorid, the two candidate aquatic insects, and 13 candidate snails are present in all the locales that they have historically occupied as identified in Appendix A, Table XIII.

6. All of the listed plant species and the four candidate plant species are present in all the sites that they have historically occupied as identified in Appendix A, Table XV and within each critical habitat unit, the listed plant has a frequency value equal to or greater than the frequency value determined by Task number 644 needed as an indicator of a self-sustaining plant population.”

- **Recovery Actions**

From the 1990 Recovery Plan Executive Summary:

“Secure habitat and water sources for the Ash Meadows ecosystem.

Conduct research on the biology of the species.

Conduct management activities within essential habitat.

Re-establish populations/monitor new & existing populations.

Determine/verify recovery objectives.”

3. Description of Species Range

“Today, the Warm Springs pupfish still occurs in the same historically described springs when originally listed (North Indian, South Indian, North Scruggs, South Scruggs, Marsh, and School springs).” (5-year review 2021, 3)

Figure A1-1 depicts the FWS range map of the Warm Springs pupfish. This range was last updated 11/09/2021 and has an area of approximately 3,810 acres.

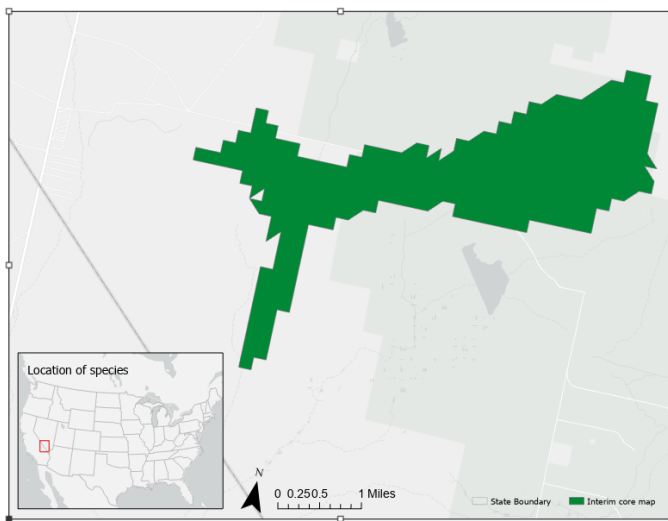


Figure A1-1. Map of Warm Springs pupfish range.

4. Critical Habitat

There is no designated critical habitat for this species.

5. Known Locations

- Occurrences Described in FWS Documents

“Today, the Warm Springs pupfish still occurs in the same historically described springs when originally listed (North Indian, South Indian, North Scruggs, South Scruggs, Marsh, and School springs).” (5-year review 2021, 3)

- Occurrences Described in iNaturalist:
 - https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=209194
 - iNaturalist includes five observations consistent with the range when location obscuring is accounted for.
 - Figure A1-2 depicts the locations of these observations.



Figure A1-2. Occurrences available in iNaturalist.

- Occurrences Described in GBIF:
 - https://www.gbif.org/occurrence/search?has_coordinate=true&has_geospatial_issue=false&taxon_key=6165253
 - All but 3 observations listed are also included in iNaturalist.
 - Figure A1-3 depicts the locations of these observations.

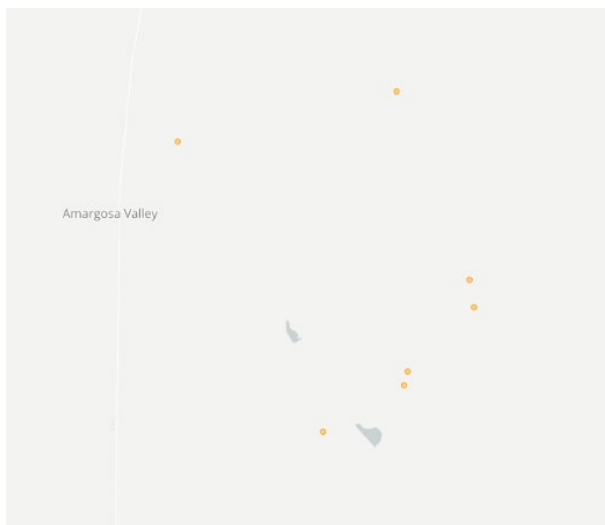


Figure A1-3. Occurrences available in GBIF.

- Occurrences Described in NatureServe: <https://explorer.natureserve.org/pro/Welcome>
 - NatureServe had no documented observations.