

**Scientific Name:** *Cyprinodon pecosensis*

**Common Name:** Pecos pupfish

**BISON No.:** 010355

**Legal Status:**

- |                                       |                              |                              |
|---------------------------------------|------------------------------|------------------------------|
| ➤ Arizona, Species of Special Concern | ➤ ESA, Proposed Threatened   | ➤ New Mexico-WCA, Threatened |
| ➤ ESA, Endangered                     | ➤ ESA, Threatened            | ➤ USFS-Region 3, Sensitive   |
| ➤ ESA, Proposed Endangered            | ➤ New Mexico-WCA, Endangered | ➤ None                       |

**Distribution:**

- |   |                           |
|---|---------------------------|
| ➤ Endemic to Arizona                      | ➤ Southern Limit of Range |
| ➤ Endemic to Arizona and New Mexico       | ➤ Western Limit of Range  |
| ➤ Endemic to New Mexico                   | ➤ Eastern Limit of Range  |
| ➤ Not Restricted to Arizona or New Mexico | ➤ Very Local              |
| ➤ Northern Limit of Range                 |                           |

**Major River Drainages:**

- |                        |                             |
|------------------------|-----------------------------|
| ➤ Dry Cimmaron River   | ➤ Rio Yaqui Basin           |
| ➤ Canadian River       | ➤ Wilcox Playa              |
| ➤ Southern High Plains | ➤ Rio Magdalena Basin       |
| ➤ Pecos River          | ➤ Rio Sonoita Basin         |
| ➤ Estancia Basin       | ➤ Little Colorado River     |
| ➤ Tularosa Basin       | ➤ Mainstream Colorado River |
| ➤ Salt Basin           | ➤ Virgin River Basin        |
| ➤ Rio Grande           | ➤ Hualapai Lake             |
| ➤ Rio Mimbres          | ➤ Bill Williams Basin       |
| ➤ Zuni River           |                             |
| ➤ Gila River           |                             |

**Status/Trends/Threats (narrative):**

Federal: Conservation agreement exists. State NM: Threatened.

The Pecos pupfish was listed as threatened by NM in 1988. The Pecos pupfish has been eliminated from the Pecos River in TX (**Echelle and Conner 1989**) and in the Pecos River, NM upstream to Loving Crossing (Wilde and Echelle 1992). The Pecos pupfish occurs primarily and most commonly in three disjunct areas within its range: sinkholes, isolated oxbow lakes, and artificial impoundments on Bitter Lake National Wildlife Refuge, sinkholes on Bottomless Lakes State Park, and Salt Creek, TX (**Hoagstrom and Brooks 1995**). The Pecos pupfish occurs irregularly in the Pecos River upstream of Artesia, NM and has been eliminated from the Pecos River in Texas (Hoagstrom and Brooks 1995).

In Texas, the Pecos pupfish is known to hybridize with sheephead minnows (*Cyprinodon variegatus*). New Mexico populations of Pecos pupfish may also be jeopardized from hybridization

with *C. variegatus* (Sublette et. al. 1990). The introduction of nonnative sheephead minnow between 1980 and 1984 to the Pecos River in Texas was responsible for the elimination of the Pecos pupfish from the Pecos River downstream from Loving, NM (**Echelle and Conner 1989**).

### **Distribution (narrative):**

Historically the Pecos pupfish is found in the Pecos River system from the mouth of Independence Creek, TX to Roswell, New Mexico (Lee et. al. 1981, Propst 1999, Fishbase 2002). The Pecos pupfish is found in the Pecos River drainage south from Bitter Lake National Wildlife Refuge and Bottomless Lake State Park near Roswell to the Texas border (Sublette et. al. 1990). The largest extant populations of the Pecos pupfish in New Mexico occur in gypsum sinkholes, isolated oxbow lakes, and artificial impoundments on Bitter Lake National Wildlife Refuge (**Brooks and Wood 1988**).

### **Key Distribution/Abundance/Management Areas:**

<p><b>Panel key distribution/abundance/management areas:</b></p>
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### **Breeding (narrative):**

Male Pecos pupfish establish territories over substrates with substantial topographic complexities that are favored for oviposition sites by females (**Kodric-Brown 1977, 1978, 1983**). All reproduction takes place on territories, and since oviposition substrates are limiting, a large proportion of males do not breed. Breeding activities are affected by temperature (Kodric-Brown 1977). Peak spawning of the Pecos pupfish occurs from May through June (Sublette et. al. 1990). The male establishes a breeding territory over a substrate such as rocky outcrops, mats of submerged vegetation, or scattered rocks and silt, with females preferring rock outcrops for spawning (**Kodric-Brown 1983**). Kodric-Brown (1988) reported that manipulations of the physical dimensions of the habitat, availability of oviposition substrate, and population density indicate that male Pecos pupfish respond facultatively to changes in their social and ecological environment. Changes in the physical dimensions of the habitat have the most pronounced effect on the structure of the Pecos pupfish breeding system. The Pecos pupfish displays two distinct breeding behaviors both in the lab and field; dominance hierarchy at low density (3 males/ m<sup>2</sup>) to territoriality at high density (12 males/ m<sup>2</sup>) (Kodric-Brown 1988). Dominance hierarchies usually occur in restricted but productive habitats, such as small springs and pools, where the physical dimensions of the environment severely limit both absolute population size and available breeding habitat (Kodric-Brown 1988). Kodric-Brown (1988) reported that territorial breeding systems were not observed in the field in the smaller springs, presumably because these ecosystems could not support large populations of Pecos pupfish.

**Habitat (narrative):**

The Pecos pupfish is found in a variety of habitats from saline springs to gypsum sinkholes to desert streams with highly fluctuating conditions, and along the Pecos River, the Pecos pupfish is most often found in backwater and side pools that lack sunfish or other predators (Sublette et. al. 1990). The Pecos pupfish occurs in saline springs, gypsum sinkholes, and desert streams. Sometimes the Pecos pupfish is collected in low salinity waters, but most typical in highly saline (3,000 to 50,000 mg/L) habitats that support relatively few species (**Echelle and Echelle 1978**).

**Key Habitat Components:** warm water habitats, with silt bottoms

**Breeding Season:**

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

**Panel breeding season comments:**

**Aquatic Habitats:**

**Large Scale:**

- Rivers
- Streams
- Springs
- Spring runs
- Lakes
- Ponds
- Sinkholes
- Cienegas
- Unknown
- Variable

**Small Scale:**

- Runs
- Riffles
- Pools
- Open Water
- Shorelines

**Panel comments on aquatic habitats:**

### Important Habitat Features (Water characteristics):

#### Current

- Fast (> 75 cm/sec)
- Intermediate (10-75 cm/sec)
- Slow (< 10 cm/sec)
- None
- Unknown
- Variable

#### Gradient

- High gradient (>1%)
- Intermediate Gradient (0.25-1%)
- Low Gradient (<0.25%)
- None
- Unknown
- Variable

#### Water Depth

- Very Deep (> 1 m)
- Deep (0.25-1 m)
- Intermediate (0.1-0.25 m)
- Shallow (< 0.1 m)
- Unknown
- Variable

**Panel comments on water characteristics:**

### Important Habitat Features (Water Chemistry)

#### Temperature (general)

- Cold Water (4-15°C)
- Cool Water (10-21°C)
- Warm Water (15-27°C)
- Unknown
- Variable

#### Turbidity

- High
- Intermediate
- Low
- Unknown
- Variable

#### Conductivity

- Very High (> 2000  $\mu\text{S}/\text{cm}$ )
- High (750-2000  $\mu\text{S}/\text{cm}$ )
- Intermediate (250-750  $\mu\text{S}/\text{cm}$ )
- Low (< 250  $\mu\text{S}/\text{cm}$ )
- Unknown
- Variable

**Panel comments on water chemistry:**

### Important Habitat Features (Structural elements):

#### Substrate

- Bedrock
- Silt/Clay
- Detritus
- Sand
- Gravel
- Cobble
- Boulders
- Unknown
- Variable

#### Cover

- Rocks, boulders
- Undercut banks
- Woody debris
- Aquatic vegetation
- Rootwads
- Not important
- Overhanging vegetation
- Unknown
- Variable

**Panel comments on structural elements:**

**Diet (narrative):**

The Pecos pupfish is omnivorous, feeding primarily on diatom-detritus mixture; however, other important dietary items included macrophytes, sand, and seeds (Davis 1981). The presence of sand in 50% of the fishes examined indicated the importance of bottom foraging as a feeding mechanism (Davis 1981). Animal items were more voluminous in fish with gut lengths < 50 mm, and declined in importance in larger fish (Davis 1981). Davis (1981) reported that filamentous algae and macrophytes increased in importance as fish grew in relation to an increasing gut length. Davis (1981) stated that Pecos pupfish have a high degree of dietary adaptability, which allows the Pecos pupfish to subsist on whatever foods exist, even though the available items may be less preferred and marginally nutritious.

**Diet category (list):**

- Planktivore
- Herbivore
- Insectivore
- Piscivore (Fish)
- Omnivore
- Detritivore

**Grazing Effects (narrative):**

Grazing potentially has little to no effect on the Pecos pupfish due to its habitation of saline springs and streams, and steep-sided sinkholes.

<b>Panel limiting habitat component relative to grazing and comments:</b>
<p><b>Panel assessment:</b> Is this species a priority for selecting a grazing strategy?</p> <p style="padding-left: 40px;">Throughout the species' distribution in New Mexico and Arizona</p> <p style="padding-left: 80px;">YES NO UNKNOWN</p> <p style="padding-left: 40px;">In key management area(s)</p> <p style="padding-left: 80px;">YES NO UNKNOWN</p>

## Principle Mechanisms Through Which Grazing Impacts This Species (list):

**\*\*May be Revised\*\***

- Alteration of bank structures
- Alteration of substrate
- Alteration of water regimes
- Altered stream channel characteristics
- Altered aquatic vegetation composition
- Altered bank vegetation structure
- Change in food availability
- Change in water temperature
- Change in water quality
- Habitat fragmentation
- Increased turbidity
- Other biotic factors
- Parasites or pathogens
- Population genetic structure loss
- Range improvements
- Trampling, scratching
- Unknown

**Panel causal mechanisms comments:**

### Authors

- **Draft:** Rinne, J.N. and Magaña, H.A.
- **GP 2001:**
- **GP 2002:**
- **Revision:**

### Bibliography:

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- Kodric-Brown, A. 1988. Effect of population density, size of habitat and oviposition substrate on the breeding system of pupfish (*Cyprinodon pecosensis*). *Ethology* 77: 28-43.
- Lee, D. S., Gilbert C. R., Hocutt C. H., Jenkins R. E., Callister D. E., and Stauffer J. R. 1981. *Atlas of North American Freshwater Fishes: North Carolina, North Carolina State Museum of Natural History, 1981, c1980.*
- Propst, D. L. 1999. Threatened and endangered fishes of New Mexico. New Mexico Game and Fish Tech Report 1. 84 pp.
- Sublette, J. E., M. D. Hatch, and M. Sublette. 1990. *The Fishes of New Mexico.* The University of New Mexico Press. Albuquerque, NM. 393 pp.