

**Little Colorado Spinedace**  
*(Lepidomeda vittata)*

**5-Year Status Review:  
Summary and Evaluation**



*Photo by S. Hedwall, U.S. Fish and Wildlife Service*

**U.S. Fish and Wildlife Service  
Arizona Ecological Services Office  
Flagstaff, Arizona**

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## 5-YEAR REVIEW

### *Little Colorado Spinedace (Lepidomeda vittata)*

#### 1.0 GENERAL INFORMATION

##### 1.1 Listing History

**Species:** species, Little Colorado Spinedace (*Lepidomeda vittata*)

**Date listed:** October 16, 1987

**FR citation(s):** 52 FR 35034

**Classification:** Threatened

**Critical habitat/4(d) rule/Experimental population designation/Similarity of appearance listing:** In the final rule listing for the Little Colorado spinedace (hereafter, spinedace), the U.S. Fish and Wildlife Service (Service) designated critical habitat for the species and provided a 4(d) rule to allow take for direct taking of the spinedace through the requirement of state collecting permits.

##### 1.2 Methodology used to complete the review:

The Service most recently evaluated the biology and status of the spinedace as part of a status review conducted on July 3, 2018. We examined whether new information was available and whether that new information would alter or affect analyses and conclusions made in the previous status review. We solicited data for this current review from interested parties through a Federal Register notice announcing the review on January 11, 2023. We also contacted state agencies, federal agencies, tribes, and species experts to request any data or information we should consider in our review. Additionally, we conducted a literature search and a review of information in our files.

##### 1.3 FR Notice citation announcing the species is under active review:

88 FR 1602, “Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 31 Species in the Southwest,” January 11, 2023.

#### 2.0 REVIEW ANALYSIS

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of “endangered species” or “threatened species.” The Act defines an “endangered species” as a species that is “in danger of extinction throughout all or a significant portion of its range,” and a “threatened species” as a species that is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” The Act requires that we determine whether a species meets the definition of “endangered species” or “threatened species” due to any of the five factors described below.

Section 4(a) of the Act describes five factors that may lead to endangered or threatened status for a species. These include: A) the present or threatened destruction, modification, or curtailment of its habitat or range; B) overutilization for commercial, recreational, scientific, or educational purposes; C) disease or predation; D) the inadequacy of existing regulatory mechanisms; or E) other natural or manmade factors affecting its continued existence.

The identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an “endangered species” or a “threatened species.” In assessing whether a species meets either definition, we must evaluate all identified threats by considering the expected response of the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species—such as any existing regulatory mechanisms or conservation efforts. The Service recommends whether the species meets the definition of an “endangered species” or a “threatened species” only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

## **2.1 Distinct Population Segment (DPS) policy (1996):**

The DPS Policy does not apply to the spinedace.

## **2.2 Updated Information and Current Species Status**

### **2.2.1 Biology and Habitat:**

The spinedace still occupies the streams it is known from historically (Chevelon Creek, East Clear Creek, and the Little Colorado River, including Nutrioso and Rudd creeks), except for Silver Creek where surveys have not located spinedace in over 20 years. Populations are small and the true population size for any occupied stream is unknown due to yearly fluctuations in their numbers and the difficulty in locating fish. Spinedace have disappeared from sampling sites for several years but have reappeared later. The ephemeral nature of their occurrences makes management of the species difficult because we cannot measure population responses to changes within the watershed with certainty.

The spinedace consists of four genetically distinct populations (Tibbets *et al.* 2001; Grover *et al.* 2019) within the East Clear Creek, Upper Little Colorado River Watershed (upstream of Lyman Reservoir), Chevelon Creek, and Silver Creek watersheds, which we provide current information on below.

*East Clear Creek Watershed:* The East Clear Creek population of spinedace has 10 locations with self-sustaining populations encompassing over 35 kilometers (km) (21.7 miles [mi]) of stream habitat (Hedden *et al.* 2023). The Arizona Game and Fish

Department (AZGFD) with the Service and other partners conducts monitoring and translocation efforts annually to monitor population stability, supplement populations, and reestablish lost populations (AZGFD 2021a, 2021b, 2022a, 2022b, 2022c, 2022d, 2022e, 2022f, 2022g, 2022h, 2022i, 2022j, 2022k).

Despite the successful establishment of additional populations in the East Clear Creek watershed, spinedace will need ongoing conservation activities to continue to improve their status in the watershed. For example, in 2020 one translocated population (Turkey Creek) and one relict population (Leonard Canyon - Dines Tank) were extirpated due to severe drought; translocation efforts have been ongoing to reestablish these populations (AZGFD 2021a, 2022j). Additionally, from 2021-2022, nonnative green sunfish (*Lepomis cyanellus*) from C.C. Cragin Reservoir invaded three spinedace populations (Kehl Canyon, Miller Canyon, and Bear Canyon). AZGFD conducted removal efforts in all three populations and were able to remove green sunfish (Hedden and Rinker 2022). However, C.C. Cragin Reservoir is extremely full following a very wet and snowy winter this past spring and it is likely that green sunfish will reinvade these upstream areas in 2023. Because of delayed access to these areas due to snow, AZGFD and the Service have yet to conduct surveys in these areas this year.

There are several tributary streams that contain suitable habitat for spinedace, but many of these streams shrink to isolated pools during the summer months. Additionally, many of these streams that are suitable for spinedace within this watershed have already had spinedace translocated into them. A continuing threat to spinedace within this watershed is the invasion of green sunfish out of C.C. Cragin Reservoir (Hedden *et al.* 2022; Hedden *et al.* 2023).

*Upper Little Colorado River Watershed (upstream of Lyman Reservoir):* The Upper Little Colorado River population of spinedace is the next most robust population and consists of four subpopulations: the Little Colorado River mainstem population, the lower and upper Rudd Creek populations, and the Nutrioso Creek population.

The Little Colorado River mainstem population of spinedace occurs at low densities but the fish is commonly present in pools sampled (Hedden *et al.* 2022, AZGFD 2022d, Blasius 2023). The lower Rudd Creek population is very isolated and recent surveys only captured a few individuals from isolated pools (Hedden *et al.* 2022). AZGFD, the Service and U.S. Forest Service (USFS) established the upper Rudd Creek population in 2021 with ongoing monitoring and translocation events occurring (Hedden *et al.* 2022; AZGFD 2021b, 2022i). The Nutrioso Creek population contains high abundances of adults (2.03 fish/min electrofishing) across a broad area (7 km [4.3 mi]), with juveniles also being present but less abundant (0.49 fish/min electrofishing). Habitat in Nutrioso Creek often becomes reduced to isolated pools during the summer months (Hedden *et al.* 2022; AZGFD 2022d, 2022h).

The Little Colorado River mainstem has suitable habitat for spinedace and currently has a low abundance of nonnative fish (Hedden *et al.* 2022). AZGFD is implementing habitat improvement projects for the benefit of spinedace at both Wenima Wildlife Area

and Becker Lake. In Nutrioso Creek, Little Colorado spinedace do not occur within designated critical habitat, which is downstream of Nelson Reservoir; where Little Colorado spinedace occur in Nutrioso Creek (upstream of Nelson Reservoir) consists of fine (silt) substrates and small isolated pools during the summer months. These habitats are void of nonnative predatory fish species (Hedden *et al.* 2022). In Rudd Creek, the upper portions contain suitable habitat, and we expect that recent translocations of Little Colorado spinedace into this reach will establish a population. In the lower portions of Rudd Creek, pools are deep, isolated and contain finer (silt) substrates (Hedden *et al.* 2022). Habitat improvement projects at Sipe Wildlife Area are ongoing to improve instream habitat for spinedace in these lower reaches of Rudd Creek. Additionally, pond renovations and the development of a management plan are ongoing to create refuge habitat and potentially a rearing population of spinedace for future translocations at AZGFD's White Mountains Grasslands Wildlife Area (Hedden and Lough 2022).

*Chevelon Creek Watershed:* The Chevelon Creek population of spinedace has a high potential for extirpation due to a restricted distribution and ongoing invasion of nonnative predatory fish species. Currently the only known extant population occurs in lower Chevelon Creek (Hedden *et al.* 2022, AZGFD 2022e). Translocation efforts from this lower portion of Chevelon Creek into West Chevelon Creek are ongoing (AZGFD 2022g, 2022k) to minimize the potential loss of this population. Population densities are declining at the lower Chevelon Creek site, with densities being negatively correlated with the increase in green sunfish and black bullhead (*Ameiurus melas*) at this site (Hedden *et al.* 2022, AZGFD 2022e).

Several streams in Chevelon Creek are perennial but many of these contain populations of nonnative predatory fish species (*e.g.*, green sunfish, brown trout [*Salmo trutta*], and black bullhead). Recently, there is an increase in nonnative predatory fish species in habitat currently occupied by Little Colorado spinedace. But several tributary streams exist that may be suitable for future translocations (Hedden *et al.* 2022).

*Silver Creek Watershed:* The last records of spinedace in Silver Creek were in the late 1990s (Lopez *et al.* 1999). Contemporary sampling supports the assumption that this population was extirpated sometime in the early to mid-2000s (Weiss 2007; Grover *et al.* 2019; Hedden *et al.* 2022).

Habitat conditions are poor within Silver Creek, with high amounts of turbidity and fine (silt) sediments at many locations. There may be available habitat in the upper Silver Creek Watershed, but AZGFD and the Service need to assess habitat suitability (Hedden *et al.* 2022).

### **2.2.2 Threats Analysis (threats, conservation measures, and regulatory mechanisms):**

Current or potential future threats to spinedace include habitat alteration and destruction due to high intensity, landscape scale wildfire, increased groundwater pumping, and long-term drought (Factors A and E), and competition and predation with nonnative

species (Factors C and E). The USFS is implementing thinning and prescribed burning within spinedace watersheds to reduce the threat from high intensity landscape-scale wildfires. Thinning and prescribed burning will also improve water infiltration and increase base flows to occupied, potential, and critical habitat within the project area. Improving water retention in these drainages is vital to maintaining spinedace habitat in a warming and drying climate. AZGFD is implementing habitat improvement projects at their wildlife areas to improve local conditions in streams and provide refugia habitat for spinedace (e.g., implementation of habitat improvements at Becker Lake, White Mountains Grasslands, Sipe, and Wenima Wildlife Areas). Predation from nonnative fish species continues to be a substantial challenge to spinedace recovery (Blinn *et al.* 1993, Rinne 1995), but ongoing nonnative fish removal projects have proven to be successful at protecting existing spinedace populations (Hedden and Rinker 2022).

### **2.3 Synthesis:**

The spinedace is a fish with a limited, highly fragmented distribution and relatively low numbers, making it highly vulnerable to stressors, particularly drought, ground-water and surface water withdrawals, high-intensity landscape scale wildfires, and predation and competition with nonnative warm water fishes. Uncertainties and data gaps that may impede recovery progress include climate change and the effects of extended drought and increased groundwater pumping for human water consumption to the persistence of spinedace habitat; the lack of knowledge regarding genetic diversity; and our ability to develop techniques to assist with the control of invasive non-native fishes and other aquatic organisms. The number of areas within the East Clear Creek watershed where spinedace are persisting has increased over the last several years (USFWS 2018). In addition, occupied sites in the Little Colorado River (upstream of Lyman Reservoir), West Chevelon Creek, Nutrioso Creek, and Rudd Creek continue to support spinedace; although we have long-term concerns regarding habitat in Chevelon Creek. Efforts by AZGFD, the Service, USFS, and Bureau of Land Management have resulted in an increased number of habitats, albeit small areas, which spinedace occupy.

After reviewing the best available scientific information, we conclude that the Little Colorado spinedace remains a threatened species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act and analysis of the status of the species in our 2018 5-year review (USFWS 2018) remains an accurate reflection of the species status. Habitat alteration via anthropogenic disturbances (habitat destruction, habitat fragmentation, and climate change induced drought) and nonnative fish (illegal fish stockings and escapement from impoundments) are a substantial stressor to spinedace recovery, but ongoing conservation actions are increasing the resiliency, redundancy, and representation of spinedace populations and improving habitat conditions (Hedden *et al.* 2023).

## **3.0 RESULTS**

### **3.1 Recommended Classification:**

No change is needed.

### **3.2 New Recovery Priority Number:**

No change recommended.

### **Brief Rationale:**

Not applicable.

### **3.3 Listing and Reclassification Priority Number:**

The current listing and reclassification priority number for the Little Colorado spinedace is a 2 (high degree of threat/high recovery potential). No change recommended.

## **4.0 RECOMMENDATIONS FOR FUTURE ACTIONS**

We will work with our partners to implement the following recommended actions during the next five-year review period:

- Work with Federal and non-Federal entities to protect environmental (instream) flows in future water development plans within the historical range of the spinedace. Continued efforts to work with the Coconino Plateau Water Advisory Council and the Bureau of Reclamation regarding future water use on the Coconino Plateau may assist with this effort. In addition, the Service should actively work with non-Federal water users to determine if Habitat Conservation Plans, Safe Harbor Agreements, or other cooperative conservation efforts may be options for maintaining instream flow.
- Continue to work with the USFS to implement forest and watershed management plans that reduce the risk of high intensity, landscape level fire that could result in long-term detrimental effects to spinedace habitat.
- Work with AZGFD to implement the Watershed Management Plans for the Little Colorado River Watershed, which contains the entire range of the spinedace, to prioritize and implement actions to improve spinedace habitat.
- Assist with AZGFD's continued monitoring and mechanical removals, particularly within the East Clear Creek Watershed, until there are solutions to stop the source population of green sunfish from being able to colonize stream habitats in the watershed.
- Continue to implement and support the East Clear Creek Watershed Recovery Strategy for the Little Colorado Spinedace and other Riparian Species (USFS 1999). The actions implemented to date, particularly the supplemental stocking of spinedace and improved livestock management, are assisting with sustaining spinedace within the East Clear Creek Watershed.
- Continue to work with state and Federal partners to initiate a program of aggressive development of novel technologies to assist with the control of invasive non-native

fishes and other aquatic organisms. The spinedace is one of many species currently threatened with extinction due to our inability to control non-native and invasive species, such as crayfish (*Orconectes virilis*) and green sunfish.

- Work with landowners, Federal agencies (such as the Natural Resource Conservation Service), and state agencies (such as AZGFD and Arizona Department of Water Quality) to conduct a habitat assessment in the upper watershed of Silver Creek.

## 5.0 REFERENCES

- Arizona Game and Fish Department (AZGFD). 2021a. Dines Tank Translocation Report 09.15.2021. Arizona Game and Fish Department Report, Phoenix, AZ. 2 pp.
- \_\_\_\_\_. 2021b. Rudd Creek Translocation Report 10.13.2021. Arizona Game and Fish Department Report, Phoenix, AZ. 2 pp.
- \_\_\_\_\_. 2022a. Bear Canyon Trip Report 05.12.2022. Arizona Game and Fish Department Report, Phoenix, AZ. 4 pp.
- \_\_\_\_\_. 2022b. Miller Canyon Trip Report 05.24.2022. Arizona Game and Fish Department Report, Phoenix, AZ. 3 pp.
- \_\_\_\_\_. 2022c. Yeager Canyon Trip Report 05.25.2022. Arizona Game and Fish Department Report, Phoenix, AZ. 2 pp.
- \_\_\_\_\_. 2022d. Upper Little Colorado River Trip Report 06.07.2022. Arizona Game and Fish Department Report, Phoenix, AZ. 1 pp.
- \_\_\_\_\_. 2022e. Chevelon Creek and Willow Creek Trip Report 06.13.2022. Arizona Game and Fish Department Report, Phoenix, AZ. 4 pp.
- \_\_\_\_\_. 2022f. West Leonard Canyon Trip Report 07.01.2022. Arizona Game and Fish Department Report, Phoenix, AZ. 4 pp.
- \_\_\_\_\_. 2022g. West Chevelon Creek Translocation Report 07.05.2022. Arizona Game and Fish Department Report, Phoenix, AZ. 4 pp.
- \_\_\_\_\_. 2022h. Nutrioso Creek Trip Report 07.20.2022. Arizona Game and Fish Department Report, Phoenix, AZ. 1 pp.
- \_\_\_\_\_. 2022i. Rudd Creek Translocation Report 07.26.2022. Arizona Game and Fish Department Report, Phoenix, AZ. 2 pp.
- \_\_\_\_\_. 2022j. Turkey Creek Translocation Report 10.04.2022. Arizona Game and Fish Department Report, Phoenix, AZ. 2 pp.
- \_\_\_\_\_. 2022k. West Chevelon Creek Translocation Report 10.25.2022. Arizona Game and

- Fish Department Report, Phoenix, AZ. 1 pp.
- Blinn, D.W., Runck, C., Clark, D.A. and Rinne, J.N. 1993. Effects of rainbow trout predation on Little Colorado spinedace. *Transactions of the American Fisheries Society* 122:139-143.
- Blasius, H.B. 2023. Email correspondence from H. Blasius (Fisheries Biologist, Bureau of Land Management). February 21, 2023; 1112 hours.
- Grover, M.C., M.A. Rinker, A.J. Larson, and M.A. Lopez. 2019. Little Colorado Spinedace Monitoring and Management Activities during 2018. Arizona Game and Fish Department Report, Phoenix, AZ.
- Hedden, S.C., M.A. Rinker, S.J. Hedwall. 2023. Translocation prevents the extirpation of a threatened minnow during ongoing drought and species invasions [Unpublished Manuscript].
- Hedden, S., and L. Lough. 2022. Grasslands Wildlife Area Native Fish Management Plan 2022. Arizona Game and Fish Department Report, Phoenix, AZ. 17 pp.
- Hedden, S., M. Rinker, K. Smith, and L. Lough. 2022. Upper Little Colorado River Native Fish Monitoring and Management Activities in 2021. Arizona Game and Fish Department Report, Phoenix, AZ.
- Hedden, S. and M. Rinker. 2022. Green sunfish removals from east clear creek drainage tributaries to CC Cragin Reservoir. Arizona Game and Fish Department Report, Phoenix, AZ. 15 pp.
- Lopez, M. A., R. J. Dreyer, and G. R. Gonzales. 1999. Silver Creek fish management report. Fisheries Technical Report 99-02. Statewide Fisheries Investigations, Federal Aid Project F-7-M-41. Arizona Game and Fish Department, Phoenix Arizona.
- Rinne, J.N. 1995. Interaction of Predation and Hydrology on Native Southwestern Fishes: Little Colorado Spinedace in Nutrioso Creek, Arizona. *Arizona-Nevada Academy of Science*.
- Tibbets, C.A., Weibel, A.C., and Dowling, T.E. 2001. Population genetics of *Lepidomeda vittata*, the Little Colorado River spinedace. *Copeia*, 2001(3):813-819.
- U.S. Department of Agriculture, Forest Service (USFS). 1999. East Clear Creek Watershed Recovery Strategy for the Little Colorado Spinedace and Other Riparian Species. Unpublished Report by a Multi-agency Task Group. 62 pp.
- U.S. Fish and Wildlife Service (USFWS). 2018. 5-Year Review: Summary and Evaluation. Little Colorado spinedace (*Lepidomeda vittata*). U.S. Fish and Wildlife Service. Arizona Ecological Services Field Office. Phoenix, Arizona. 14 pp.

Weiss, D.W. 2007. Silver Creek Survey March and October 2007. Arizona Game and Fish Department, Region I Native Fish Program.

U.S. FISH AND WILDLIFE SERVICE

**5-YEAR REVIEW of Little Colorado Spinedace**

**Current Classification:** Threatened

**Recommendation resulting from the 5-Year Review:**

No change needed.

**Appropriate Listing/Reclassification Priority Number, if applicable:** Not applicable.

**FIELD OFFICE APPROVAL:**

**Lead Field Supervisor, Fish and Wildlife Service, Arizona Ecological Services Office**

Approve \_\_\_\_\_