

# **5-YEAR REVIEW**

## **Ash Meadows speckled dace (*Rhinichthys osculus nevadensis*)**



Ash Meadows speckled dace / credit: Joseph Tomelleri

**July 2021**

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**Ash Meadows speckled dace (*Rhinichthys osculus nevadensis*)**

**GENERAL INFORMATION:**

**Species:** *Rhinichthys osculus nevadensis*

**Listing History**

**FR Notice:** 48 FR 608

**Date of Emergency Listing Rule:** January 5, 1983

**FR Notice:** 48 FR 40178

**Date of Final Listing Rule:** September 2, 1983

**Classification:** Endangered

**BACKGROUND:**

**Most recent status review:** None. The initiation for a 5-Year Review occurred on March 25, 2009, but was not completed (74 FR 12878).

**FR Notice citation announcing this status review:**

84 FR 36116. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 58 Species in California, Nevada, and the Klamath Basin of Oregon. July 26, 2019.

**ASSESSMENT:**

**Information acquired since the last status review:**

This 5-year review was conducted by the U.S. Fish and Wildlife Service (Service), Southern Nevada Fish and Wildlife Office. Data for this review was solicited from interested parties through a Federal Register notice announcing this review on July 26, 2019. We also contacted State and local agencies, partners, stakeholders, 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.

The Ash Meadows speckled dace (*Rhinichthys osculus nevadensis*) is a small-bodied fish (Cypriniformes: Leuciscidae) endemic to the Ash Meadows National Wildlife Refuge (hereafter, "Refuge") in the Amargosa Valley, Nye County, Nevada (but see below that closely related forms exist). The original listing for this subspecies follows a temporary emergency listing eight months prior (48 FR 608), due to the restricted distribution, and imminent changes to the landscape from sources such as housing subdivisions, clearing of land for road construction and agricultural purposes, pumping of ground water, and diversion of surface flows that threaten the integrity of the species' habitat and therefore their survival (48 FR 40178).

Rationale for listing the Ash Meadows speckled dace includes the following factors: Factor A—the reduction and manipulation of stream habitat from reduced groundwater within the Ash Meadows basin aquifer; Factor B—Overutilization/collection (not applicable); Factor C—Predation and disease by introduced fish and crayfish; Factor D—No existing regulatory

mechanism to protect the habitat; Factor E—Other natural or manmade factors, including the extremely small range and specialized habitat.

At the time of listing, little was known about specific life-history characteristics of the Ash Meadows subspecies. However, all members of the *Rhinichthys osculus* species complex are omnivorous stream minnows distributed widely throughout the western United States, albeit characterized by significant variation in morphology. More recently, basic life-history of this species at numerous locations outside of Ash Meadows is reviewed in Minckley and Marsh (2009), and the threats specifically associated with this subspecies are similar to those for other subspecies, and identical with those of the co-occurring Ash Meadows Amargosa pupfish (*Cyprinodon nevadensis mionectes*) on the Refuge (Service 1990).

The Ash Meadows speckled dace occurred in three springs when listed (Big, Jackrabbit, and Bradford springs; 48 FR 40178), and subsequently also reported in Tubbs Spring on the Refuge in the 1990 Recovery Plan for the Threatened and Endangered Species of Ash Meadows (Service 1990). As all spring habitats occur on the Refuge, further degradation of habitat from human development is unlikely, but the impacts of invasive fishes and crayfish, and the future threat of reduced spring discharge remain as primary threats for this subspecies.

The specific concern for groundwater extraction has heightened in recent years with new levels of understanding regarding 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 USGS report of Halford and Jackson (2020) represents the most recent literature available that expands on the basic notion of nearby pumping affecting Ash Meadows. The Ash Meadows discharge area occurs at the terminus of a hydrologically significant feature referred to as the “megachannel” (Winograd and Pearson 1976). The megachannel is a 80 km (50 mi) long by 40 km (25 mi) wide area of fractured carbonate rock that has estimated transmissivities spanning from 20,000 to 2,000,000 ft<sup>2</sup>/d (Halford and Jackson 2020). High estimated transmissivities and confined aquifer conditions cause groundwater pumping signals to propagate large distances 24–32 km (15–20 mi) in short timespans (less than 2 yrs) within the megachannel. Therefore, pumping from carbonate rock in the megachannel can significantly impact water levels and spring discharges in the Ash Meadows discharge area. Halford and Jackson (2020) specifically determined that groundwater pumping from within the central Amargosa Desert, at Indian Springs, and at the Nevada National Security Site can capture discharge from springs within the Ash Meadows discharge area. Further discussions between the FWS and the USGS are planned for 2021 that include conducting aquifer tests to estimate the level of drawdown of the aquifer and the effects on the springs.

Within the last five years, the Nevada State Engineer (NSE) further recognized the potential for groundwater reduction to threaten the habitat at Devils Hole (a nearby spring habitat within the Refuge boundaries). The NSE signed Order 1197A (January 12<sup>th</sup>, 2018), *Curtailment of New Appropriations of Groundwater within the Amargosa Valley Hydrographic Basin 230*, that prohibits new applications for water or water diversions within 25 miles of Devils Hole. Order 1197A supersedes 1197, which imposed similar regulations at 10 miles from Devils Hole.

The last status review of the Ash Meadows speckled dace is noted in the 1990 Recovery Plan that covers all Ash Meadows listed species (Service 1990). The plan identified five main objectives for the Refuge: 1) Secure habitat and water sources for the Ash Meadows ecosystem, 2) Conduct research on the biology of the species, 3) Conduct management activities within essential habitat, 4) Reestablish populations and monitor new and existing populations, and 5) Determine and verify recovery objectives. All of these objectives have been addressed to some degree with varying success. For example, the specific concerns to secure the water source represents a major success, as noted above by the new research that details the groundwater flowpaths that feed the Ash Meadows springs, and the heightened consideration by the NSE to implement Orders 1197 and 1997A. Corollary with water-related objectives are the annual monitoring of water flow at select springs by Service hydrologists and USGS stream gaging. However, on-the-ground objectives such as conducting management activities that directly benefit the Ash Meadows speckled dace have only been partially effective. Significant habitat renovation among historic habitats for Ash Meadows speckled dace has been completed at Crystal, Fairbanks, Jackrabbit, Kings Pool and Point of Rocks, Longstreet, and Rodgers springs across the Refuge (Ash Meadows Natural Resource Management Plan [AM NRMP] *in review*). While all of these habitats received physical improvements (e.g., barrier removal, channel restoration, native plant revegetation, etc.), only Fairbanks and Jackrabbit springs additionally received treatment for aquatic invasive species (AM NRMP *in review*). As both additional habitat improvements and removal of aquatic invasive species are still needed, the status of Ash Meadows speckled dace has not substantially improved overall. Unlike some of the smaller springs more amenable to desiccation or chemical treatment (e.g., habitats of the Warms Springs pupfish (*Cyprinodon nevadensis pectoralis*), many of the Ash Meadows speckled dace habitats are logistically more difficult to remove aquatic invasives; most habitats still support aquatic invasive species. The Service has ongoing plans to continue to remove nonnative fishes across the Refuge in suitable habitats as funding and staffing allows (Desert NWR Complex Comprehensive Conservation Plan [DNWR CCCP] 2009).

The 1990 recovery plan documented this subspecies to occur in four springs (Bradford, Big, Jackrabbit, and Tubbs), and identified seven other historic springs (Fairbanks, Rodgers, Kings Pool, Point of Rocks, Forest, Longstreet, and Crystal springs) where the species should be repatriated (Service 1990). Today, nonnative predatory fishes (western mosquitofish, *Gambusia affinis*) and crayfish (red swamp crayfish, *Procambarus clarkii*) remain on the Refuge, and in habitats co-occurring with the Ash Meadows speckled dace (Service 2020, *unpubl.*). Despite attempted mitigation of aquatic invasive species and improvements to habitats, the subspecies regularly occurs (over the last decade) at only three springs on the Refuge (Bradford, Big, and Jackrabbit springs), and only sporadically and in small numbers at several other springs (e.g., Rodgers, Tubbs, Longstreet, etc.). The species-wide distribution of Ash Meadows speckled dace remains extremely limited today.

Abundance of this species is highly variable across the spring locations, and fluctuates over time in conjunction with flowing water connectivity in response to precipitation and nonnative fishes. Recent estimates of population size are difficult to compare, especially in light of changing habitat conditions during stream restoration that is ongoing on the Refuge (see examples in AM NRMP *in review*; and DNWR CCCP 2009), and the varied protocols used to sample fish over time. Still, total capture estimates from 2012–2019 range from several individuals (1-10 fish) at all sites to several hundred fish at Bradford Springs (Service, *unpubl.*). At present, the Refuge is

unable to survey annually due to staffing, which oftentimes results in surveys that only occur every 2-3 years, a frequency difficult to determine trends in population size. Overall, Ash Meadows speckled dace is generally uncommon compared to the co-occurring Ash Meadows Amargosa pupfish.

Most recently, advances in molecular systematics (e.g., full genome sequencing) has spurred renewed interest in the complex taxonomy of the Ash Meadows speckled dace subspecies, and its historically connected relatives in the Amargosa River, Nevada and Owen's Valley, California. The speckled dace species complex, in general, is likely the most variable species in the western United States, most of which have not been formally described, and is widely distributed across many geographically disconnected areas. Recent studies using new genomic approaches have elucidated cryptic diversity and clarified evolutionary relationships, but have not resulted in formal taxonomic revisions of *Rhinichthys osculus*. The lack of discrete morphological characters among geographically separated forms in this species complex (Smith et al. 2017) has contributed to confusion, and led previous investigators to sustain support for a single species of *Rhinichthys osculus* (Hubbs et al. 1974).

Of specific taxonomic interest here are the five isolated forms occurring in the Death Valley region (Long Valley, Owens Valley, Oasis Valley, Amargosa Canyon and Ash Meadows). At present only the Ash Meadows speckled dace is a formally described subspecies (*R. o. nevadensis*), and is afforded protection under the Endangered Species Act. Studies over years have variously considered the Amargosa Canyon and Owens Valley forms to be separate undescribed subspecies (Deacon and Williams 1984), or a single variable subspecies, excepting Long Valley (Sada et al. 1995). The most recent phylogenomic analysis supported the monophyletic structure of these five forms, and the clear distinctiveness among most populations (Mussmann et al. 2020). Additionally, this work also revealed that hybridization may be responsible for the patterns of genetic variation in the Amargosa Canyon population between the Ash Meadows and Oasis Valley forms. Overall, this paper (Mussmann et al. 2020) clarifies many of the evolutionary patterns proposed over the last 25 years (e.g., Sada et al. 1995, Oakey et al. 2004), and prompts both future taxonomists to revise species names and managers to afford regulatory protections in accordance with distinct lineages and evolutionary groups for conservation.

The Service in 2020 received a petition by the Center for Biological Diversity (CBD, June 8, 2020), whereby CBD requested that forms of the Amargosa Canyon and Owens Valley be considered the same subspecies as the Ash Meadows speckled dace (*R. o. nevadensis*), and afforded the protected status under the Act (i.e., endangered). The petition also requested that the Long Valley form be recognized as a distinct subspecies, and also listed as endangered. Alternatively, the petition also requested that the Amargosa Canyon, Owens, and Long Valley populations of speckled dace each be listed as endangered Distinct Population Segments (DPSs).

Clearly, the Death Valley group of speckled dace require taxonomic reconsideration in accordance with the evolutionary patterns described by recent analyses. Aspects of the CBD petition followed the taxonomic revisions supported in an unpublished report to the Service written by Baumsteiger and Moyle (2018), that specifically posits that 1) the Ash Meadows, Amargosa Valley, and Owens Valley groups should be regarded as a single subspecies (*R. o. nevadensis*), and that 2) structure within this subspecies also supports designation of DPS units

in each basin. However, it is important to note that the designation of any DPS is a policy determination relative to conservation status under the Endangered Species Act, and not merely based on a finding that a particular population segment is genetically separate from other segments. These relationships and taxonomy, along with recommendations for legal protections have also been suggested previously by Moyle (2012) in *Fish Species of Special Concern in California*, a recurring status report to the California Department of Fish and Wildlife. However, the suggested taxonomy is not yet formally revised, and the degree to which these geographically isolated forms represent new species or subspecies relative to the entire *Rhinichthys osculus* complex has not reached consensus in the peer-reviewed literature. The Baumsteiger and Moyle (2018) report does however, note that these findings will be submitted for publication in the future. Still, the first step before consideration of any conservation and regulatory protections for such potential taxonomic entities requires formal taxonomic revisions, such as those proposed by the 2018 report, to be validated in the scientific community. With regard to taxonomy of this group, the most recent published paper on the systematics and conservation by Musmann et al. (2020) also notes the genetic distinction among Death Valley group lineages, but highlights that until formal taxonomic revisions are published, that the Owens Valley, Amargosa Canyon, Oasis Valley, and Long Valley remain as evolutionary significant units of the *Rhinichthys osculus* complex, and sustain the described subspecies *R. o. nevadensis* for the Ash Meadows form. This is especially important where complex evolutionary patterns exist, and taxonomic decisions are difficult and vary across investigators. Depending on the outcome of future taxonomic research on the Owens/Ash Meadows/Amargosa group (and the species complex overall), the Service may need to consider evaluation of the status of these forms. For example, should the Ash Meadows speckled dace (*R. o. nevadensis*) be formally expanded taxonomically to include the Owens and Amargosa forms, the Service would subsequently need to re-evaluate its current listing status.

### **Conclusion:**

After reviewing the best available scientific information, we conclude that Ash Meadows speckled dace (*R. o. nevadensis*) remains an endangered 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 listing determination (48 FR 40178) remain an accurate reflection of the species current status.

### **RECOMMENDATIONS FOR FUTURE ACTIONS:** *(optional, but may be helpful to identify priorities for management actions and information needs for next 5-year review)*

1. Monitor compliance with Nevada Revised Statute Order 1197A (January 12, 2018), Curtailment of New Appropriations of Groundwater within the Amargosa Valley Hydrographic Basin 230, that prohibits new applications for water or water diversions within 25 miles of Devils Hole (and by proximity Ash Meadows NWR). Water levels in Devils Hole are affected by pumping centers in the Amargosa Desert and the Ash Meadows groundwater basins (Halford and Jackson 2020).
2. Collaborate with the Ash Meadows NWR to implement the *Desert National Wildlife Refuge Complex – Ash Meadows, Desert, Moapa Valley, and Pahrangat National Wildlife Refuges Final Comprehensive Conservation Plan and Environmental Impact*

*Statement, Volume I – August 2009* (Service 2009) and also the *Draft Ash Meadows Natural Resource Management Plan* in review (Service, *in review*); and

3. Support Ash Meadows speckled dace research at the Refuge and monitor the population as identified in the *Recovery Plan for the Endangered and Threatened Species of Ash Meadows* (Service 1990); and
4. Monitor the future activity of mineral rights in the Ash Meadows area. The BLM ACEC surrounding the refuge is withdrawn from mining and entry until 2029 (PLO# 7737, signed November 2<sup>nd</sup>, 2009), but requires renewal every 20 years. Mining can still occur on private inholdings within the refuge, but no active mining permits exist at this time.
5. Monitor the peer-reviewed literature of upcoming changes regarding the taxonomic uncertainties in the Death Valley forms of speckled dace, specifically the Ash Meadows speckled dace.

**Lead Field Supervisor, Fish and Wildlife Service**

Approved \_\_\_\_\_ Date \_\_\_\_\_

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