

# SOUTH CENTRAL CLIMATE ADAPTATION SCIENCE CENTER

## CLIMATE IMPACTS AND ADAPTATION MEASURES FOR SPECIES

### Arkansas River Shiner *Notropis girardi*



The Arkansas River Shiner (ARS) is a small minnow species that existed abundantly throughout the rivers and streams in the Arkansas River Basin (ARB). The total number of ARS has drastically declined since it was first recorded in 1926. The ARS was listed as a threatened species in 1998 by the U.S. Fish and Wildlife Service (FWS). ARS populations are threatened by severe drought and rapidly increasing water temperatures due to a warming climate. Climate adaptation measures are vital to the preservation of the ARS and other species in the South Central Climate Adaptation Science Center (CASC) region.

Image: [Daniel Fenner/USFWS](#)

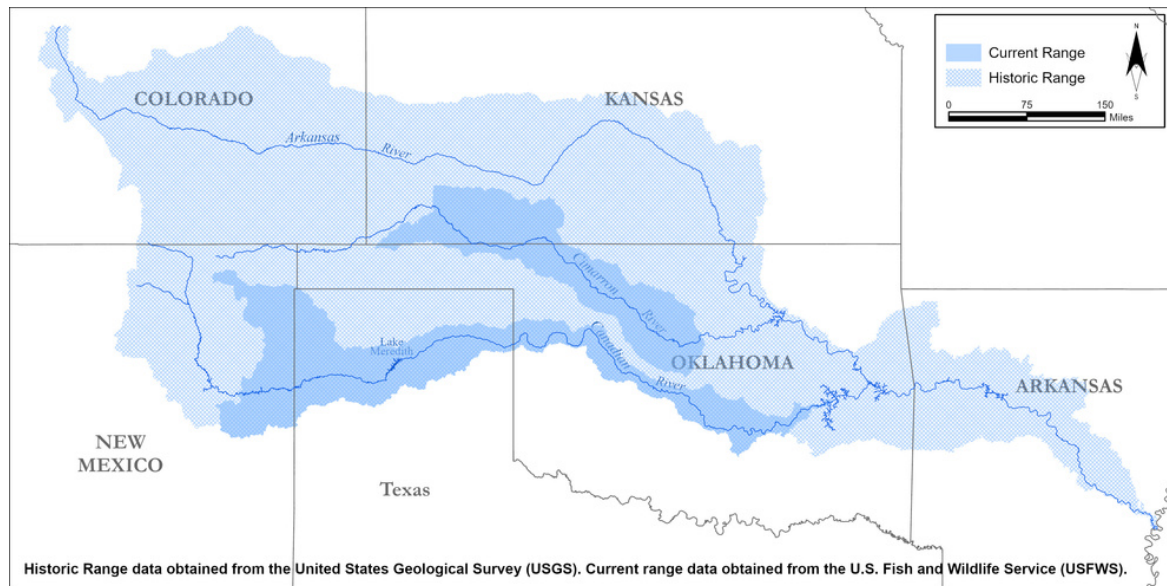
**Presence in the South Central CASC region:** Historically, the ARS was commonly found throughout the ARB in Arkansas, Oklahoma, Texas, and New Mexico (light blue shading below). As of 1998, the ARS was only found in 20 percent of its historical range (dark blue shading) in fragmented populations along 250 to 500 miles of the Cimarron and South Canadian Rivers of New Mexico, Texas, and Oklahoma. There is also a reintroduced population in the Pecos River in New Mexico.

#### **Habitat requirements:**

The general habitats of the ARS are the main channels of wide, shallow, sandy-bottomed rivers and streams of the Basin. The ARS requires adequate rainfall during the rainy season for successful reproduction.

#### **Reproduction:**

The ARS spawns several times between May and July when there are heavy rains and high river flow. Females produce roughly 100 to 300 eggs each spawning period, and high water levels carry the eggs downstream, where they hatch 24 to 48 hours after being laid. Further, as an open-water (pelagic) spawning species, the ARS requires long-distance, deep-water flows for their semi-buoyant eggs to develop and hatch while floating in the water column. Both eggs and larvae need to be able to drift to avoid damage from larger particulate matter and predation. As a result, ARS reproduction requires roughly 130 miles or more of unfragmented river and unaltered stream flow.



Historic Range data obtained from the United States Geological Survey (USGS). Current range data obtained from the U.S. Fish and Wildlife Service (USFWS).

**Cultural relevance in the region:** There is no publicly recorded information regarding the cultural significance of the ARS to Tribes in the south central U.S. However, the ARS may still be culturally significant to Tribes. The lack of public information could result from a loss of knowledges over time, a lack of capacity to gather information, minimal or no Tribal or other funding dedicated to this species, or the sacred keeping of sensitive knowledges by Tribes. Tribal-led research regarding the ARS and its benefits to Tribes and the environment is needed. As an example of the cultural significance of a different minnow, the Clear Lake Hitch (CLH), or “chi” (pronounced “Chai”) in the Pomo language, is a symbol of prosperity, abundance, and security to the Big Valley Band of Pomo Indians in California. For 400 generations, the CLH has been important to the survival of Clear Lake’s ecosystems, nourished the Tribe, and served as prey for other fish that the Tribe relies on for food. It is also a relative to the Tribe as a messenger from the creator. The California Department of Fish and Wildlife urges the U.S. FWS to list the CLH under the Endangered Species Act.

# Arkansas River Shiner

## Climate Sensitivities of the Arkansas River Shiner

**Temperature:** Air temperatures in the Great Plains, from Canada to Mexico, have increased an average of 1.4°F (0.8°C) since the 1970s and are projected to increase by between 1.8 to 13.5°F (1 to 7.5°C) by the end of the century. Water temperatures in the Arkansas River Basin (ARB) are affected by increasing air temperatures and can cause elevated evaporation rates. An increase in both air and water temperatures, along with higher evaporation rates, can lead to heavier rainfall events and associated altered stream flows, and increased suspended solids (muddy water) from soil erosion.

**Drought:** The Arkansas River Shiner (ARS) requires natural stream flow patterns in shallow waters. Drought conditions between heavy rainfall events threaten not only ideal habitat conditions but can also impact the occurrence and success of (ARS) spawning events.



Image: Daniel Fenner/USFWS

**Interactions of stressors:** ARS populations can be stressed by the mistaken use of the species as bait and from predation by other species. Organic water pollution (e.g. fertilizer runoff, etc.) and reduced dissolved oxygen levels are stressors that may lead to increased disease incidence. Although disease is found in ARS populations, the exact cause is unknown. Most stressors tend to impact isolated areas along the South Canadian River of eastern Texas and Oklahoma.

## Adaptive Capacity of the Arkansas River Shiner

**Genetic diversity:** The current adaptive capacity of the ARS depends on its genetic diversity to enable adaptation to environmental change. The drastic decrease in total ARS population size has impacted the genetic and ecological diversity of this species throughout the ARB. The most genetically diverse ARS populations no longer exist. However, there are a few areas of the ARB where ARS populations do support more genetic diversity. These sites include areas up and downstream of Lake Meredith on the South Canadian River and an introduced population in the Pecos River in New Mexico.

Image: Daniel Fenner/USFWS

## Example Climate Adaptation Actions for the Arkansas River Shiner

### Site-Specific Actions

- Create emergency response plans with specifications to provide environmental flows that maintain a wet, in-stream habitat for temporary, refuge populations during dry and low-flow conditions.
- Develop breeding and husbandry protocols for captive ARS populations. Emphasize enhancing genetic diversity for future repatriation efforts into the wild.
- Reintroduce the ARS in areas that have maintained and are projected to maintain average stream flow conditions appropriate for the ARS. These include sites on the Cimarron and Arkansas Rivers.
- Encourage genetic diversity and habitat connectivity by removing aquatic barriers where possible and modifying reservoir management, as feasible, to facilitate ARS spawning events and enhance habitat quality and connectivity.

### Supporting Actions

- Empower the study and application of Indigenous and traditional knowledge toward the conservation of this species.
- Stop using minnows as bait for fishing. This action decreases the chances of mistakenly using the ARS as bait.
- Study the ARS's dispersal abilities and the relationship between river discharge and ARS reproductive success.
- Discourage or carefully evaluate new water resource infrastructure that may reduce stream flow in ARS habitats.

*Asa Samuels prepared a literature review and the text for this fact sheet. Version 1 March 2024*

