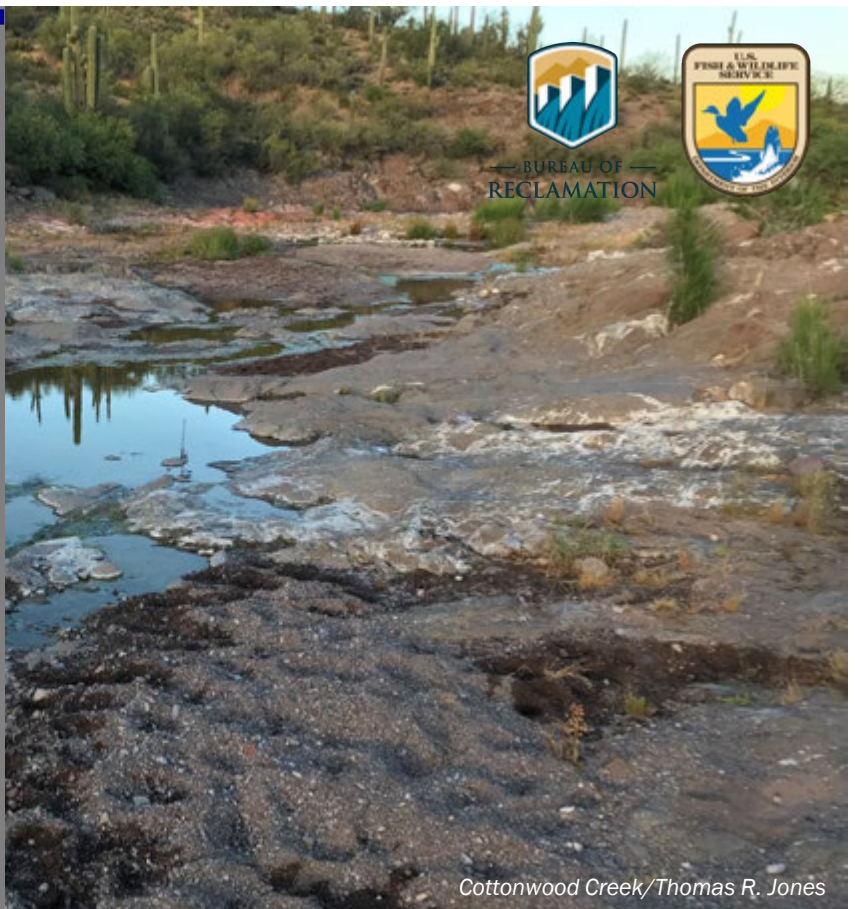


RESTORATION

Opportunistic Crayfish Eradication Benefits Local Sonora Mud Turtle Population



Virile crayfish (*Orconectes virilis*) are freshwater crustaceans that have a wide native range across eastern North America but are now found in many locations outside their native range. Virile crayfish have become invasive throughout much of Arizona's aquatic systems, causing the decline of native species through predation and resource competition. One aquatic system threatened by virile crayfish was Cottonwood Creek in central Arizona. This small Sonoran Desert stream has also suffered from drought and native species declines, including its Sonora mud turtle (*Kinosternon sonoriense*) population. In 1996, biologists began a 10-year population biology research project on the Sonora mud turtle at this site.



KEY ISSUES ADDRESSED

During their study at Cottonwood Creek, researchers observed negative impacts of crayfish on the native Sonora mud turtle population, including signs of predation on hatchlings. Researchers witnessed an adult crayfish repeatedly pushing a young mud turtle and found dead hatchlings with missing limbs and crushing and puncture injuries consistent with crayfish attacks. Researchers observed that crayfish prey on hatchlings and suspected that declines in mud turtles elsewhere were a result of crayfish predation. As part of their overall research on this aquatic community, biologists and students immediately began opportunistically removing crayfish from the creek and ramped up eradication efforts in 1999.

PROJECT GOALS

- Examine the impact of introduced crayfish on the Sonora mud turtle population
- Eradicate virile crayfish from Cottonwood Creek to conserve native aquatic species
- Demonstrate possible eradication methods for management of crayfish within similar environments

MUDBUG ROUNDUP

The successful eradication of crayfish in Cottonwood Creek required a combination of methods: dip nets in shallow pools and hand capture under rocks and in bedrock crevices.



Cottonwood Creek/Thomas R. Jones

PROJECT HIGHLIGHTS

Opportunistic Efforts: Biologists removed crayfish throughout the study site whenever possible, but from 1999 through 2000 engaged in an aggressive effort to eradicate the crayfish completely.

Successful Crayfish Eradication: Crayfish failed to permanently recolonize the creek for at least four years following eradication. Since the conclusion of the research study, researchers have only found a few crayfish within the lowermost portion of the study area, but the crayfish have failed to establish a permanent population or spread to the upper parts of the watershed. The site has remained crayfish-free as of 2020.

Immediate Mud Turtle Response: Researchers never recaptured hatchling mud turtles when crayfish were abundant. After crayfish numbers declined, researchers frequently recaptured hatchlings, including eight hatchlings that were first captured during intensive crayfish removal. Among 29 hatchlings that were captured after crayfish eradication, fourteen were recaptured one or more times, demonstrating that crayfish removal resulted in an immediate increase in mud turtle survivorship.

References

- Hensley et al. (2010). Demography, Terrestrial Behavior, and Growth of Sonora Mud Turtles (*Kinosternon sonoriense*) in an Extreme Habitat. *Herpetological Monographs* 24(1): 174-193.

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LESSONS LEARNED

The increase in Sonora mud turtle hatchlings recaptured immediately following crayfish eradication is strong evidence for increased survivorship.

Researchers did not keep detailed records of the crayfish numbers removed because it was largely an opportunistic effort that involved many individuals working independently. The small size of the stream allowed for researchers to successfully use dip nets and hand-capture to remove crayfish. However, attempts to trap crayfish in minnow traps baited with liver were only marginally useful. The usefulness of these methods may differ in other environments.

When working with invasive species in any environment, researchers emphasized that eradication efforts must be aggressive and persistent. Knowing the species' natural history is also vital to successful control. For example, removing adults prior to reproduction was far easier than removing juveniles later. Effective management of a low-density mud turtle population like this one requires an understanding of the relationships between habitat use, demographics, and invasive predators.

NEXT STEPS

- Continue crayfish removal whenever observed in Cottonwood Creek
- Apply these crayfish eradication methods to environments with similar landscape and small stream characteristics
- Communicate that crayfish control can be successful with sustained effort

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Virile Crayfish from Cottonwood Creek/Frank R. Hensley