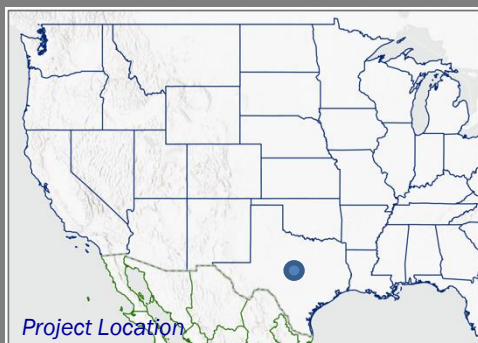Texas Fatmucket Mussels

ACTIONABLE SCIENCE

Climate Modeling and Partnerships for Freshwater Mussel Conservation in Central Texas

Freshwater mussels are crucial for riverine ecosystems, but are facing population declines due to various threats, including climate change. In central Texas, there are several partnerships and mechanisms that provide support for freshwater mussel conservation. Candidate Conservation Agreements with Assurances (CCAAs) support voluntary conservation efforts for Texas hornshell (*Popenaias popeii*), Texas fawnsfoot (*Truncilla macrodon*), and Balcones spike (*Fusconaia iheringi*). Additional research efforts in Texas included Texas A&M's researchers partnering with the U.S. Fish and Wildlife Service (USFWS) and The Nature Conservancy, to utilize high resolution, downscaled climate projections to track impacts on the Texas fatmucket (*Lampsilis bracteata*) and their habitats and inform future conservation actions.

Project Location

KEY ISSUES ADDRESSED

Riverine systems, such as the San Saba and Llano Rivers in central Texas, are anticipating shifts in streamflow and temperature resulting from climate change. The subsequent impact on Texas fatmucket populations was unknown, as these species exhibit ecosystem sensitivity due to limited mobility and adaptation capacities. Shifts in temperature and water quantity can alter female brooding windows and increase days when streamflow falls below levels needed to support the needs of mussels. Collaborative conservation efforts are needed to support opportunities for voluntary conservation actions that may preclude the need for listing.

PROJECT GOALS

- Determine the projected changes in streamflow and stream temperature by using downscaled climate projections
- Evaluate the potential implications of climate change for the Texas fatmucket
- Support partner's development of CCAAs to implement voluntary conservation actions for at-risk mussel species and their habitats by water users and managers

Mussels from the Colorado River

PROPAGATION SUCCESS

The major recovery plans for mussel conservation include propagation and release of the species. Researchers successfully reproduced the Texas fatmucket in hatcheries as well as determined suitable areas for reintroduction.

LESSONS LEARNED

Effective communication in partnerships is vital for large-scale conservation. Stakeholders have diverse backgrounds, so proactive communication is necessary to avoid knowledge and logistical barriers. Mutual comprehension among partners on interdisciplinary projects ensures the creation of agreement that fully encapsulates the issues impacting the species and ecosystems.

The Texas fatmucket research is just one example of how to utilize climate projections at a finer scale to determine how mussel species are, and will continue to be, impacted by climate change. Although researchers focused on a single species for the impact analysis, the results were fine-tuned to be applicable in the central Texas region. Similar analysis can be completed for other regional freshwater mussels, contributing to greater freshwater mussel conservation in the region.

PROJECT HIGHLIGHTS

CCAAs in Action: The Texas hornshell, Balcones spike, and Texas fawnsfoot, Texas fatmucket, and Texas pimpleback have active CCAAs in Texas. These agreements cover a time-period in which research, monitoring, education, and outreach will be implemented by involved parties on non-federal lands. By implementing proactive conservation measures, partners receive assurances that no additional conservation measures will be imposed if the species is listed under the ESA.

Projected Impacts of Climate Change: Researchers used six USGS streamflow gauges and three Texas A&M-managed stream temperature stations to collect streamflow and temperatures. Researchers determined central Texas will likely experience an air temperature increase between 1°C to 4°C before 2099, with an anticipated 50 to 100mm reduction in annual precipitation averages across both rivers.

Climate Modeling at Management-Appropriate Scales: Climate data is often collected and analyzed on a global scale, but researchers used statistical analysis to downscale projections for local management decisions. Analysis suggests the Texas fatmucket could face intolerable streamflow rates and temperatures. Using this knowledge, landowners can implement conservation measures to address these changes.

NEXT STEPS

- Utilize the data collected and projections to inform a new CCAA to support increased collaboration among water users and managers to conserve additional freshwater mussel species native to Texas.
- Complete other research currently under-way for conservation of at-risk freshwater mussels and stream research.
- Continue to use climate projections at a finer scale to analyze the impacts of climate change on mussel populations.

Collaborators

- See online for full list of collaborators

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Photos courtesy of USFWS
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Texas Pimpleback Mussels