

# MUSSELS MATTER

## *Research team increasing knowledge of mussels*

Though zebra mussels in Texas give mussels a bad name, other freshwater mussels are welcomed and needed in Texas waters.

Invasive zebra mussels, first confirmed in Texas in 2009, are causing major economic and environmental damages to Texas reservoirs. But unionid mussels, a family of freshwater mussels, are important indicators of water quality and stream health and play an important role in freshwater ecosystems, according to Dr. Charles Randklev, research scientist for the Texas A&M Institute of Renewable Natural Resources (IRNR).

Because mussels are sensitive to changes in the environment, Randklev said, declining populations of mussels can mean that a stream's health is deteriorating. "In Texas, many streams and rivers

are unable to support mussel populations at levels that existed in the past because of changes to the mussels' habitats and declining water quality," he said.

Randklev said that when these mussels start declining, it also affects freshwater ecosystems. Freshwater mussels mediate the transfer of nutrients between the water column and stream bottom, increase habitat diversity, and are a food source for some fishes, mammals and birds. "So when mussels start declining in a river or stream, it's going to impact other species that depend on them, whether it be for food or for habitat," he said.

Of the 52 mussel species known to occur in Texas, 15 were listed as state-threatened in 2009 because of declines in their distribution and abundance.

The Texas A&M Institute of Renewable Natural Resources mussel research team conducts surveys of unionid mussels, such as those pictured, in several Texas rivers. Photo courtesy of IRNR.

A state-threatened designation means that a species may become endangered in the state in the near future. Twelve of the 15 are being considered for federal protection under the Endangered Species Act (ESA).

“Unionid mussels are considered one of the most endangered groups of animals alive today,” said Dr. Roel Lopez, IRNR director. “A listing under the ESA could potentially impact many aspects of the Texas economy related to water resources or environmental flows.

“Their long-term conservation requires understanding the mussels’ distribution, life history and ecology, but unfortunately little is known about them,” Lopez added.

### Launching a new program

To remedy the lack of information about unionid mussels, IRNR launched a mussel research program in 2010.

“More fundamental knowledge of unionid mussels will allow resource managers to more effectively conserve populations of both rare and common mussel species,” Lopez said.

Though the team lacked knowledge of rare mussels’ current distributions and abundance, it had “a good idea of where these mussel species occurred historically,” said Randklev, lead researcher for the mussel program.

The new program created a database of all mussel specimens collected in museums in Texas and other parts of the country in the last 150 years, said Julie Groce, IRNR senior research associate. From the database, the team produced a digitized map of where the mussels occurred historically.

“The map was used as a starting point to direct our future efforts,” Groce said.

In the short time of the team’s existence, different agencies have contracted with it for different purposes. The team currently consists of Randklev; Groce; Mark Cordova, research assistant; and Eric Tsakiris, graduate research assistant.

In 2010, the research team began conducting surveys of mussels in East and Central Texas river systems for the Texas Department of Transportation (TxDOT). TxDOT needs to know more about the current distribution, basic biology and habitat requirements of the 15 state-listed species, Groce said.

“Now that certain species are state-listed, TxDOT needs to take these species into consideration when it does any bridge or road construction or maintenance that might affect these species and their habitats,” she said.

If any state-listed species live within planned construction or maintenance areas, the department must come up with a plan to avoid, minimize or compensate for any loss of the species or its habitat, she explained.

In addition to surveying mussel populations for TxDOT, the team has also developed preliminary distribution models for several state-listed mussel species. “Species distribution modeling allows us to predict where a certain species could occur in a given waterway and can provide a helpful starting point for conservation and management,” Groce said.

“We successfully developed a species distribution model for the state-threatened smooth pimpleback for the Leon River, a tributary of the Brazos River,” Randklev said. At the same time, researchers from the University of Texas at Tyler developed a model for the Texas pigtoe, which is also a state-threatened species.

### An unexpected discovery

In the summer of 2011, while conducting studies in the San Saba River in Central Texas, the team made an unexpected discovery. It found the remains of a freshwater mussel species thought to be extinct: the false spike mussel or *Quadrula mitchelli*.

This single individual was the first hard evidence of the false spike in 30 years, Randklev said. The only other recent evidence was in 2000 when two specimens were collected in the San Marcos River. The IRNR team, as well as other scientists, has since found live false spike mussels in other Central Texas rivers. ⇨

## Impacts of the mussel program

- Served as statewide project lead in freshwater mussel ecological work in Texas, particularly in Central Texas
- Rediscovered a mussel species thought to have been extinct: *Quadrula mitchelli* (false spike)
- Identified and confirmed a new host fish for *Lampsilis bracteata* (Texas fatmucket), a mussel species that is a candidate for protection under the ESA
- Successfully developed occupancy models for *Quadrula houstonensis* (smooth pimpleback), a mussel species that is a candidate for protection under the ESA
- Implemented a pilot Freshwater Mussel ID Workshop that trains participants in mussel ecology and identification



## Relocating mussels as a potential drought strategy

Along with conducting surveys and developing models, the team has also done preliminary research showing that relocating mussels could be an effective strategy for saving populations affected by drought or bridge construction.

Randklev said the pilot study on drought relocation was conducted in response to a contingency plan developed during the 2011 drought by Texas Parks and Wildlife Department (TPWD) and U.S. Fish and Wildlife Service. The contingency plan aimed to alleviate droughts' potential impacts on mussels.

"The 2011 drought caused record-low flow levels in Texas streams, and many previously perennial streams went dry or became intermittent," he said. "A lot of mussels were stranded out of the water."

At the time, Randklev said, the team was studying the feasibility of temporarily relocating mussels to other locations while TxDOT works on bridges in areas with mussel populations, so they merged the two projects together.

Tsakiris and Randklev relocated three mussel species in the lower San Saba River to a site upstream with similar species and habitat. To date, all of the mussels recovered from the new site have survived and grown, Tsakiris said. "Short-term relocation is successful," he said, "but long-term, we still don't know." He will continue monitoring the mussels for two years as part of his dissertation research in Texas A&M University's Department of Wildlife and Fisheries Sciences.

Although the early results of this research are promising, the study was limited in scope, Randklev said. It needs to be replicated with different species and in different rivers in Texas to evaluate whether relocation is truly an effective management tool for other species and situations.

Tsakiris' future research will look at various life history traits such as reproduction cycles of these mussels in the San Saba. "If or when these species get listed, it is really important to have an understanding of how they reproduce and how their reproductive timing is associated with water temperatures and flow," Randklev said. "That will help to more effectively manage these populations."

## Continuing the work

The team is now conducting projects in the lower Brazos River, the lower Sabine River, the middle Brazos River and the lower Guadalupe River.

Randklev said the team is doing surveys in the Brazos River near Houston and in Allen's Creek,

a tributary of the Brazos, to examine riverwide patterns of mussel distribution and abundance for the Texas Water Development Board.


For TPWD, surveys in the lower Sabine will provide information about the distribution of mussels downstream from the Toledo Bend Reservoir, Randklev said. "This information could then be used later by TPWD and the Sabine River Authority to better manage mussel populations in this river," he said.

In another project for TPWD, the mussel team is surveying certain sites where TPWD is conducting instream flow analyses as part of the Texas Instream Flow Program. The program was created in 2001 by the Texas Legislature to determine the amount of water required to maintain a healthy river or sound ecological environment. Part of the mandate included scientific studies on how water flow affects aquatic life and habitat.

At three instream flow study sites on the middle portion of the Brazos River, the team is "examining the distribution and abundance of unionid mussels and collecting information on mussel-habitat associations," Randklev said. "This information will help inform instream flow recommendations by TPWD for this portion of the Brazos River."

The team will also gather more data on the false spike, the species the researchers discovered in 2011, on the lower Guadalupe River. "Understanding the distribution and abundance of this mussel is really important for the U.S. Fish and Wildlife Service when it is evaluating the species for listing," Randklev said.

Because the institute's scientists are experts on a variety of ecological and conservation questions related to unionid mussels, other agencies look to them for support, Lopez said. "In fact, the U.S. Fish and Wildlife Service will likely use information generated by the team to determine whether listing under the ESA is warranted for petitioned Texas mussel species," he said.

"Applied studies such as those conducted under this program could potentially shape conservation and management practices for rare and common mussel species throughout the state," he said. "That is saying a lot for such a young program." 

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