

# State Listed Threatened Mussels and Zebra Mussels: What You Need to Know



Texas Association of Environmental Professionals  
May Luncheon  
Houston, Texas  
May 21, 2015

**ZARA**  
ENVIRONMENTAL LLC

# GENERAL OUTLINE

## Native Mussels

- Lifecycle and habitat
- Current State Regulations & Requirements
- Compliance Process & Schedule
- Range of Case Studies



## Zebra Mussels

- Texas Distribution
- Engineering implications
- Federal Listing Implications



# WHY DO WE CARE ABOUT NATIVE MUSSELS?

## Important Role in the Aquatic Ecosystem

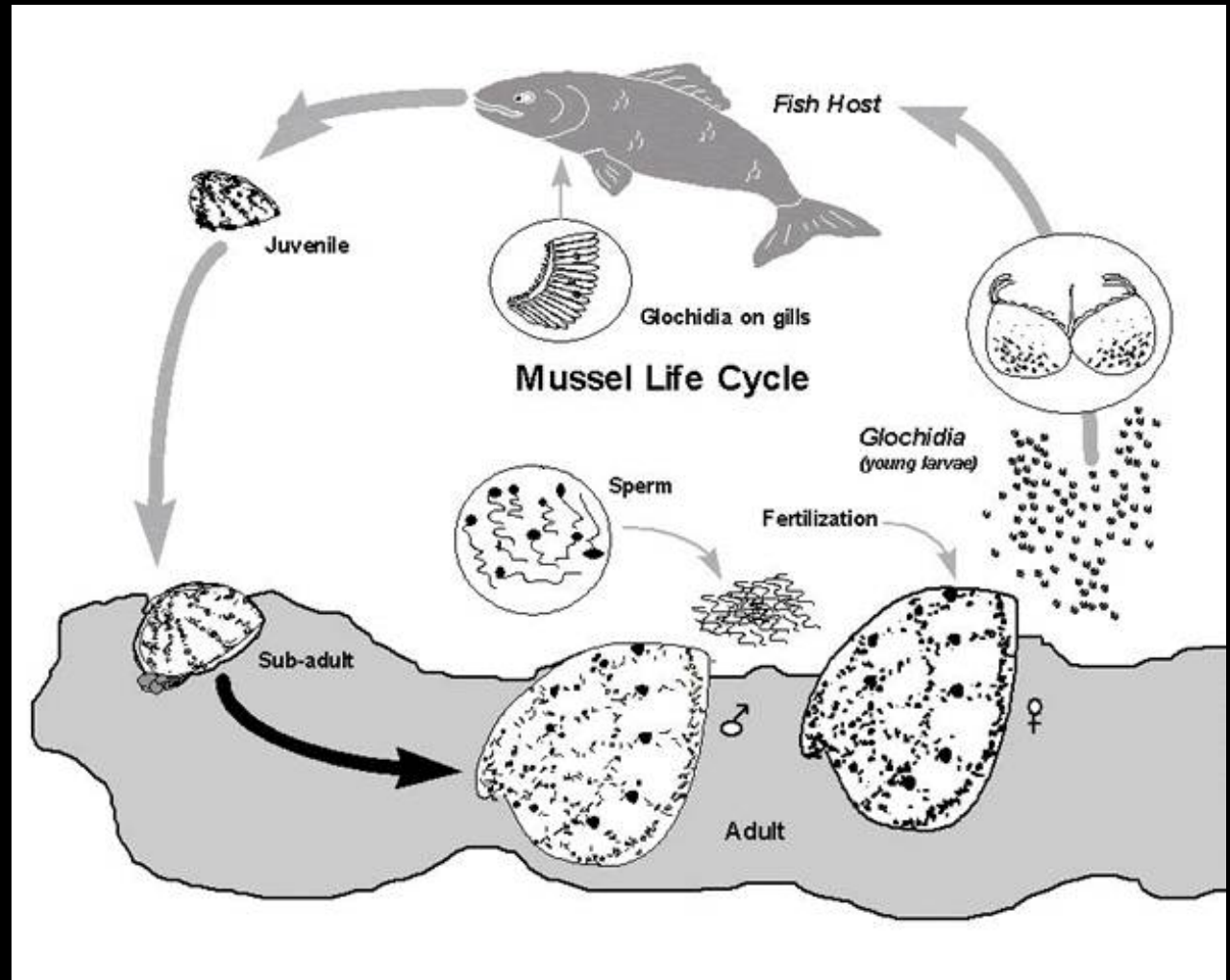
- Ecosystem engineers
- Monitors of aquatic health
- Natural filter feeders
- Valuable food source for wildlife
- Stabilize bottom
- Minimize scouring
- Biodiversity





# LIFE HISTORY

- Adults buried in suitable substrate
- Free swimming sperm pulled in by female to fertilize
- Larvae (glochidia) released to find fish host
- Glochidia develop as parasites (on fins and gills)
- Juveniles drop and will grow in suitable substrate



# LIFE HISTORY

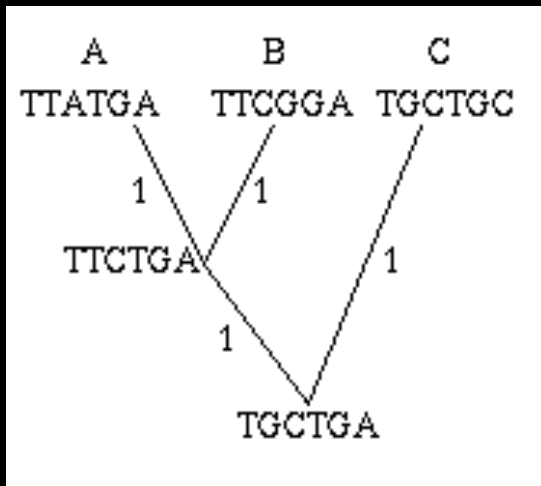
- Mantle flap lures
- Glochidia in the middle
- Deflatable



# LIFE HISTORY

## Host Fish

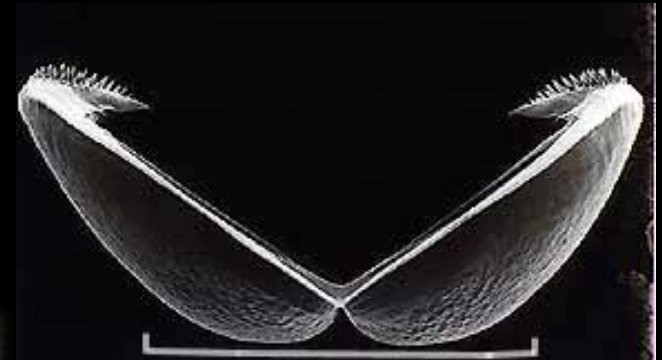
- Very little is known about host fish specificity or tolerances
- Most mussels can only parasitize certain fish species; therefore, if the fish is threatened so is the mussel
- Research: field DNA and lab infection



# LIFE HISTORY

## Glochidia

- Exceedingly little is known about the larval, or glochidia, stage of Texas species.
- We don't know what many of them look like, or what strategies they use to find fish (e.g. lures)





# MUSSEL VIDEOS

NC STATE UNIVERSITY

COLLEGE OF VETERINARY MEDICINE

## Mantle Display of the Wavy-rayed Lampmussel

*(Lampsilis fasciola)*

Little Tennessee River  
Swain County, NC



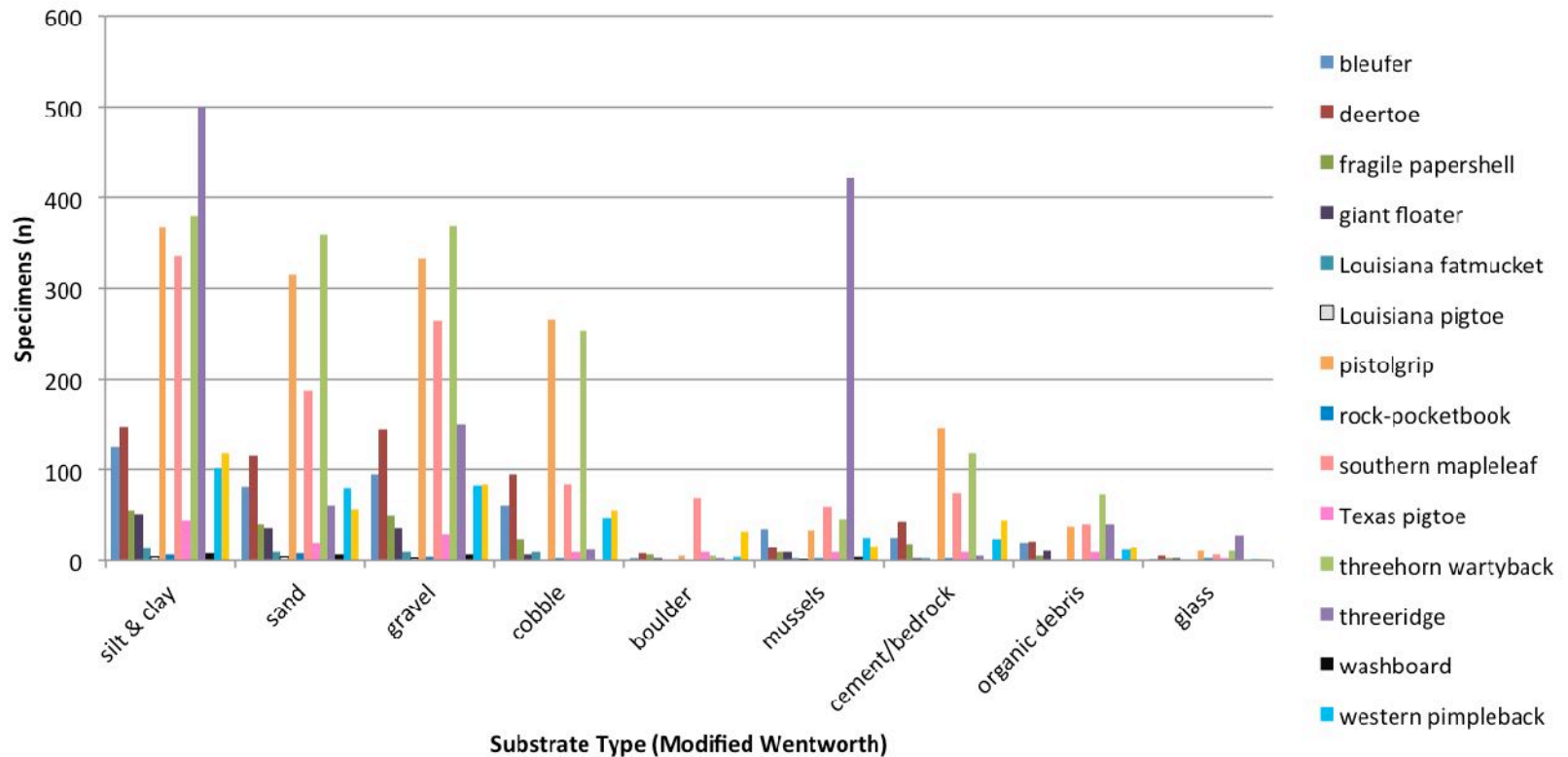


# MUSSEL VIDEOS

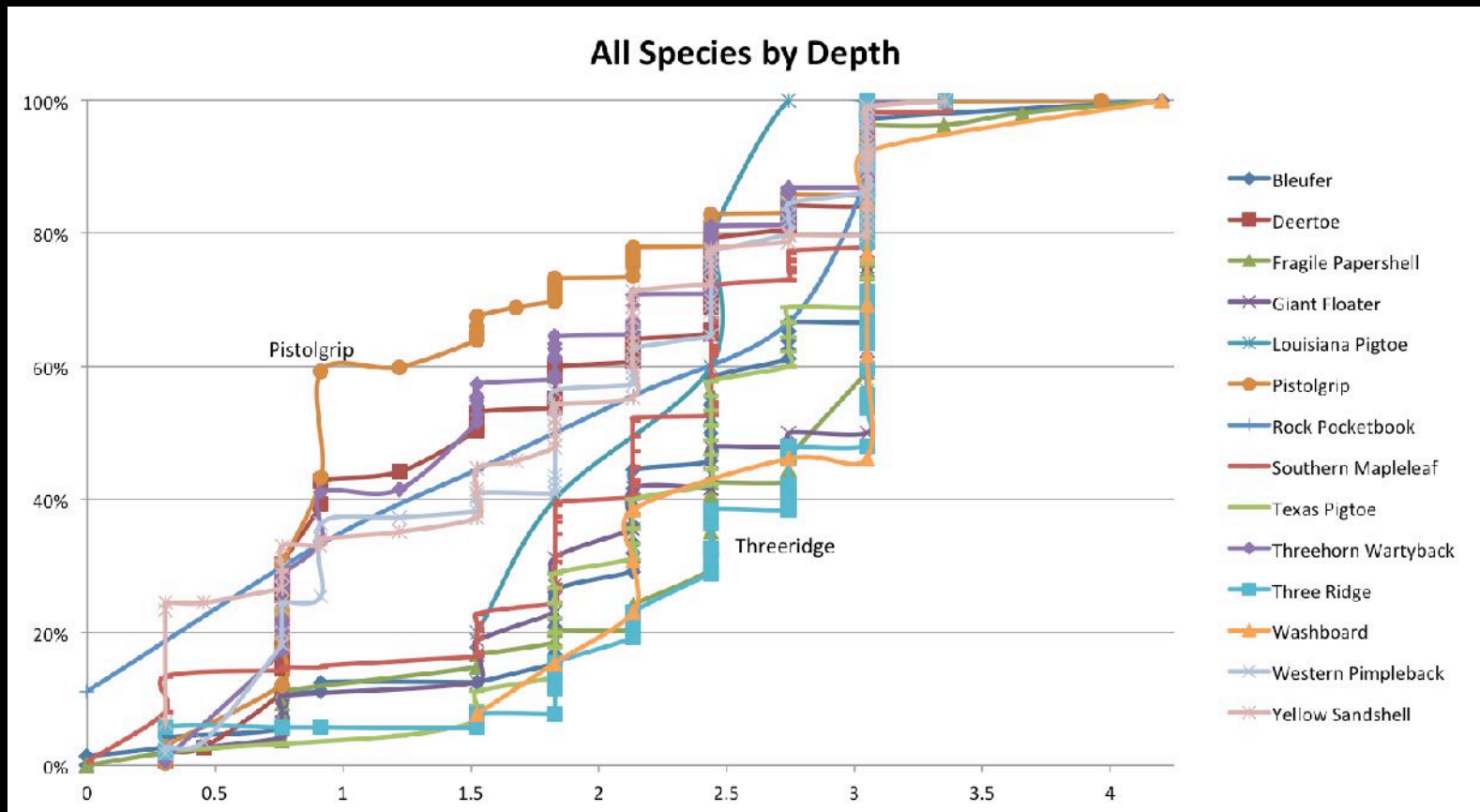


# HABITAT

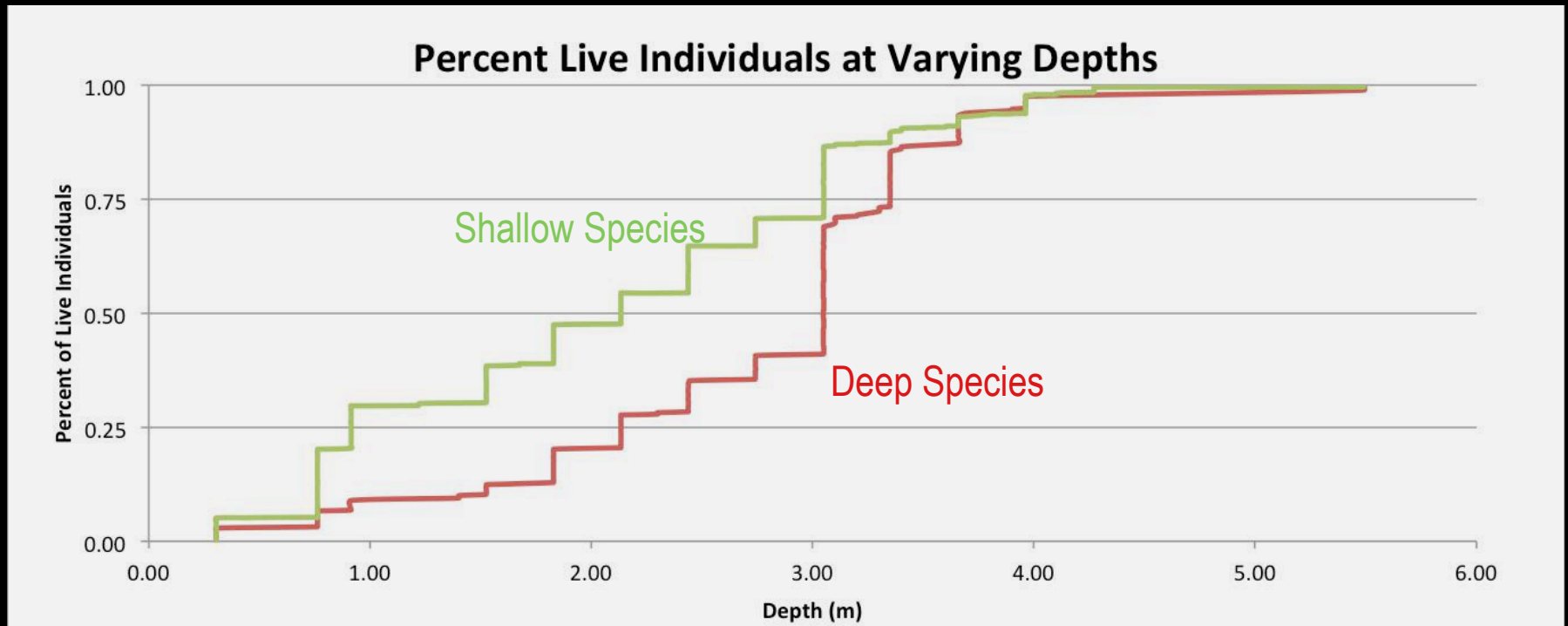
Substrate by Species



# HABITAT



# HABITAT





# STATE REGULATIONS & REQUIREMENTS



**STATE STATUS: 15 species listed as Threatened by TPWD on January 17, 2010**

## Protection of State-Listed Species in Texas

- State law prohibits take (incidental or otherwise) of state-listed species (*Chapters 67-68 TPW Code; Section 68.015 TPW Code; and Section 65.171 of TAC*)
- State-listed species may only be handled by persons possessing a Scientific Collecting Permit or Letter of Authorization issued to relocate a species.

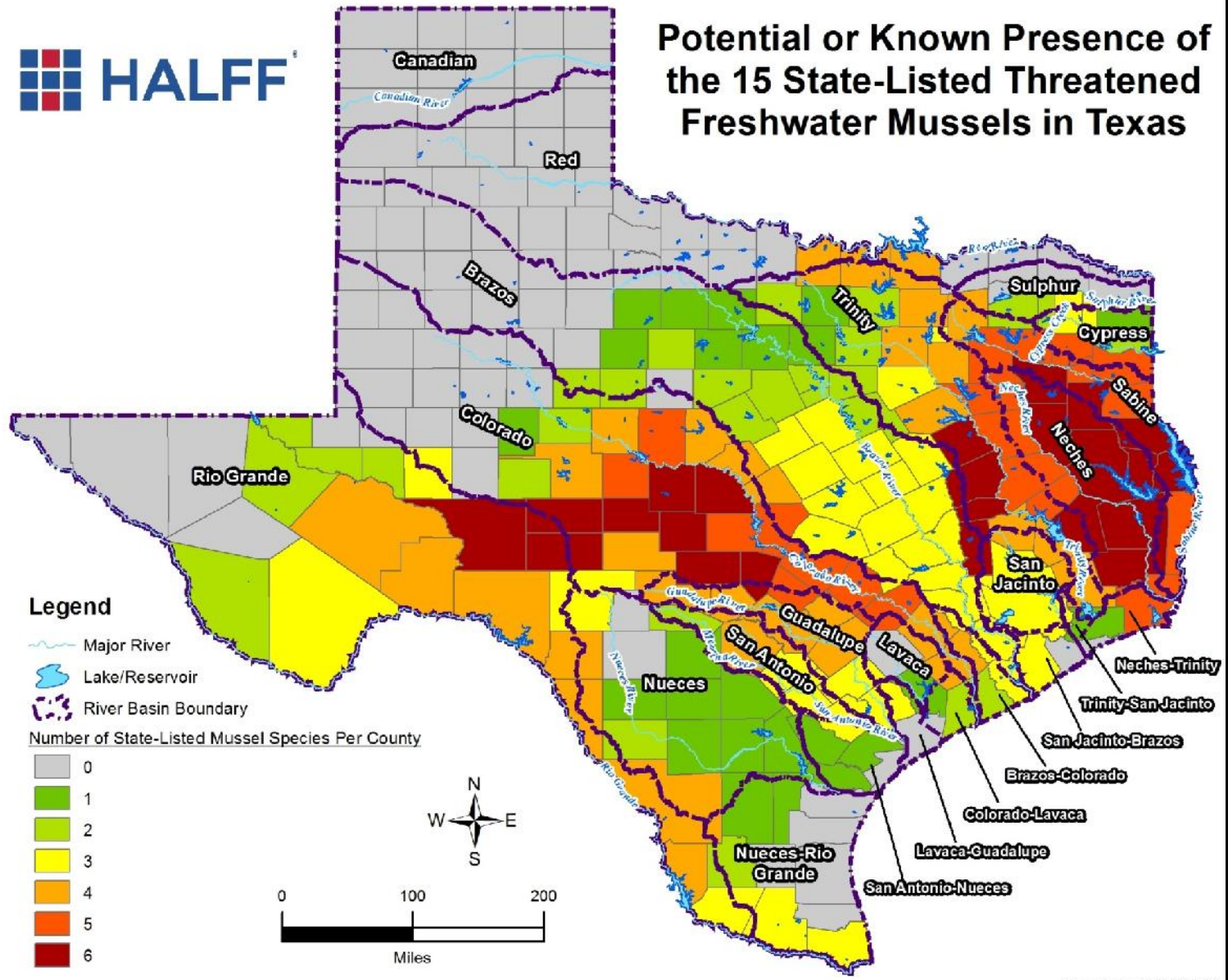
## Penalties:

- Up to a Class A Misdemeanor & 1 year in jail; and
- Fines & Restitution values per individual, vary by species (TPWD developing mussel values)

# STATE REGULATIONS & REQUIREMENTS

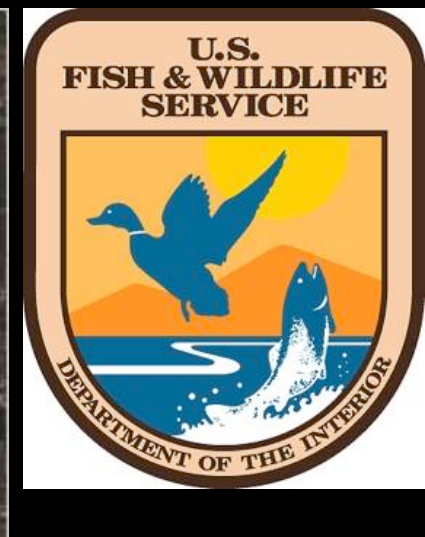
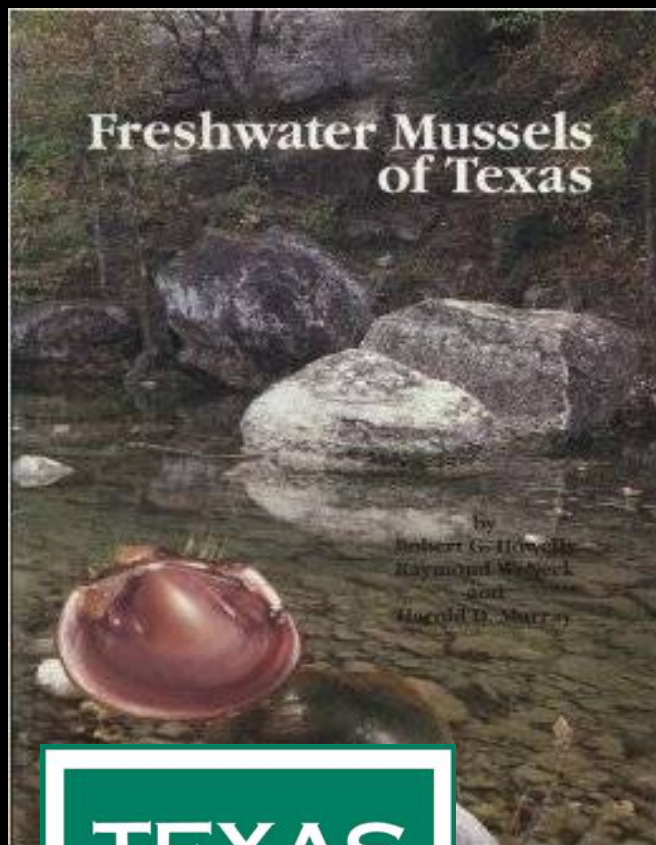


## Potential or Known Presence of the 15 State-Listed Threatened Freshwater Mussels in Texas



Map Date: 02/11/2014

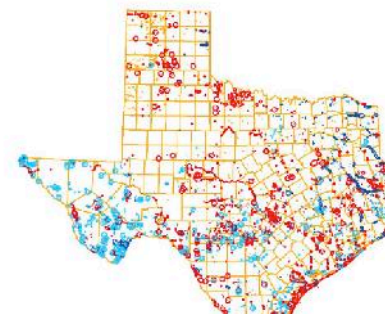
# RESOURCES



## Texas Natural Diversity Database (TXNDD)

The Mission of the Texas Natural Diversity Database is to manage and disseminate scientific information on rare species, native plant communities, and animal aggregations for defensible, effective conservation action. The TXNDD and the expertise of its staff facilitate conservation planning, natural resources management, and the design and implementation of ecologically sound development projects.

- [Learn About the TXNDD](#)
- [Tracked Species List for Plants](#) | PDF
- [Tracked Species List for Animals](#) | PDF
- [Submit Data](#)
- [Request Data](#)
- [TXNDD Report](#)



## Freshwater Unionids of Texas Distribution Chart

Family: Unionidae		1. Canadian River	2. Wichita River	3. Red River	4. Sulphur River	5. Big Cypress Bayou	6. Sabine River	7. Angelina River	8. Neches River	9. Trinity River	10. San Jacinto River	11. Brazos River	12. Little Brazos River	13. Navasota River	14. Colorado River	15. Concho River	16. San Saba River	17. Llano River	18. Pedernales River	19. San Marcos River	20. Guadalupe River	21. San Antonio River	22. Frio River	23. Nueces River	24. Rio Grande River	25. Devils River	26. Pecos River	27. Lavaca River
ma plicata (three-ridge)			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	X	X	O	X				
onta suborbiculata (flat floater)				*		*	*	*	*	*	*	*																
ens confragosus (rock pocketbook) <sup>6</sup>			X	X	X	X	X	X	X	X	X	X	X	X	X					X	X							
nsia wheeleri (Ouachita rock-pocketbook) <sup>1(TCAP-SGCN)</sup>			X																									
anaia tampicoensis (Tampico pearlymussel)			I						I			X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X
io dilatata (spike)																				O								
onaia askewi (Texas pigtoe) <sup>2,3,8 (TCAP-SGCN)</sup>					X	X	X	O	X	X	X	X																
onaia flava (Wabash pigtoe) <sup>6</sup>			X	X	X	O	X	X	X	X	X																	
onaia lananensis (triangle pigtoe) <sup>2,8 (TCAP-SGCN)</sup>									X	X	X																	
ula rotundata (round pearlshell)						X		X	X	X	X	X									O	X						
nula rotundata (round pearlshell) <sup>2,7,8 (TCAP-SGCN)</sup>												O		X	X	X	O	O	X	X	X							





# TYPES OF PROJECTS THAT MAY REQUIRE MUSSEL SURVEYS

- Placement of fill in channel or reservoir
- Dredging
- Changes to banks
- Dewatering/cofferdamming
- River channel modifications
- Projects requiring CWA Section 404 permits
- Any project that impacts the bottom of a channel or reservoir





# PROJECT PLANNING AND PROCESS

**Habitat Assessment  
(1-2 weeks)**

**Assess Specific Project Needs &  
Determine Best Survey  
Methodology (2-4 weeks)**

**“Demonstrate Absence”  
Methodology Selected (625 m<sup>2</sup>)**

**Presence/Absence  
Surveys (April-Oct)  
(1-8 weeks)**

**No State-listed  
Species Found;  
Report Findings  
(2 weeks)**

**Begin  
Construction**

**“Assume Presence”  
Methodology Selected  
(100% of impact area +  
sedimentation)**

**Prepare Aquatic  
Resource Relocation  
Plan (2-4 weeks)**

**Obtain TPWD  
Approval on Plan  
(1-4 weeks)**

**Conduct Survey & Relocation Activities (April-Oct)  
(4-8 weeks, depending on project size)**

**Begin  
Construction**

**More Surveys During Dewatering  
(if Determined Necessary)**

**Report Detailed  
Findings (> 4weeks)**

**Take Away Message:  
Plan Project Early to Avoid Delays  
Suggest ≥4 mths before construction**



# STATE SURVEY PROTOCOLS COMING SOON

- Define exactly **HOW** to Survey (i.e., when to use SCUBA)
- **HOW MUCH** to survey
- **WHERE** to survey (upstream vs. downstream limits)
- **WHEN** can survey, likely April - October



# CASE STUDIES

- **Site habitat assessment**
- **“Typical” presence/absence survey**
- **Relocation, PIT tagging and monitoring on Trinity River in Dallas, Texas**
- **Dewatering and relocation on Trinity River in Dallas, Texas**

# SITE HABITAT ASSESSMENT

- Least intensive
- Inexpensive/fast
- No SCUBA
- Desktop component
- Visual inspection in field
- Tactile/visual survey if shallow





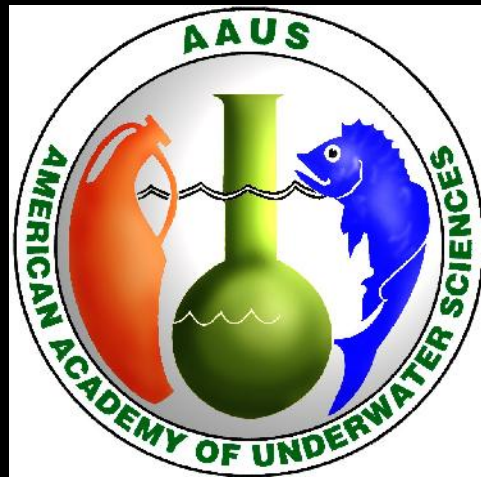
# PRESENCE/ABSENCE SURVEY

- SCUBA or visual/tactile wading surveys
- Twenty five, 25 m<sup>2</sup> randomly placed survey plots (625 m<sup>2</sup> total)
- Combined presence/absence and relocation protocol
- Smaller survey area possible



# SCUBA SURVEY METHODOLOGY

- SCUBA safety:  
positive pressure  
full face masks  
& drysuits
- SCUBA divers  
conduct tactile  
searches
- Visual ID by a  
TPWD-permitted  
biologist
- Transport live  
mussels in coolers  
to the pre-selected  
relocation site





# RELOCATION MONITORING: CA CROSSING BRIDGE



# RELOCATION MONITORING: MARKING AND MEASURING





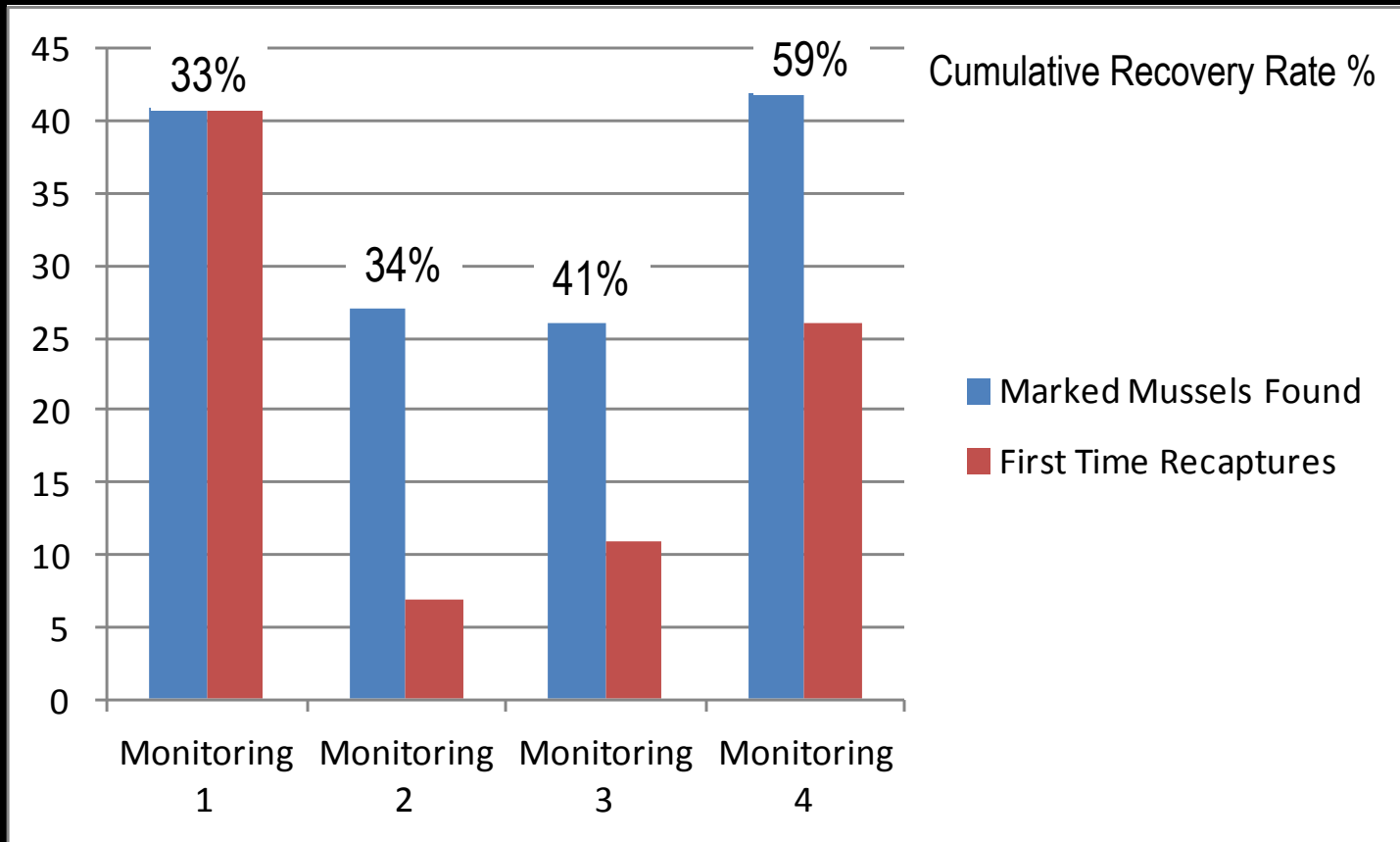
# RELOCATION MONITORING: RELOCATION SITE



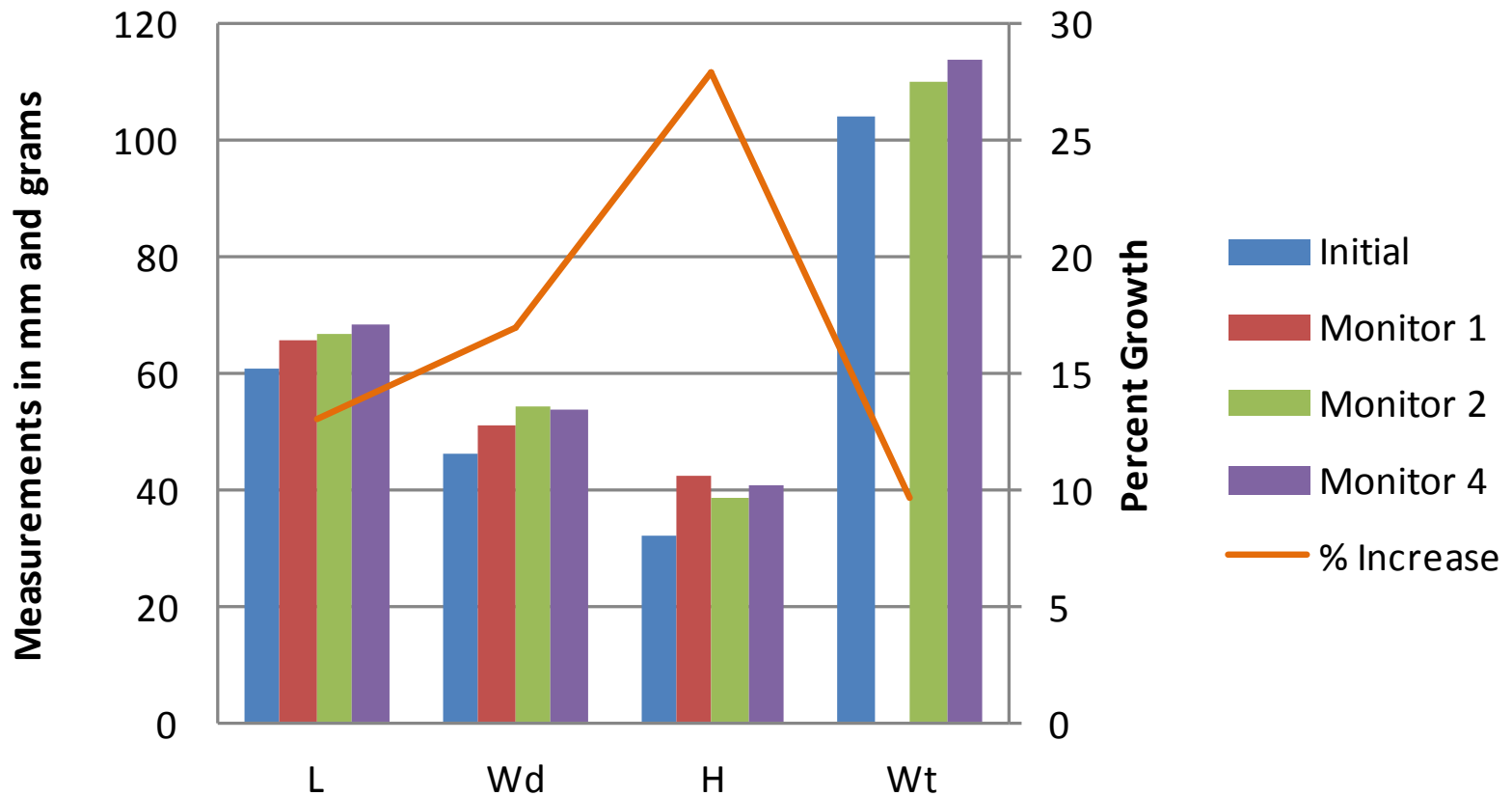
# RELOCATION SITE



# RELOCATION MONITORING: RECOVERY

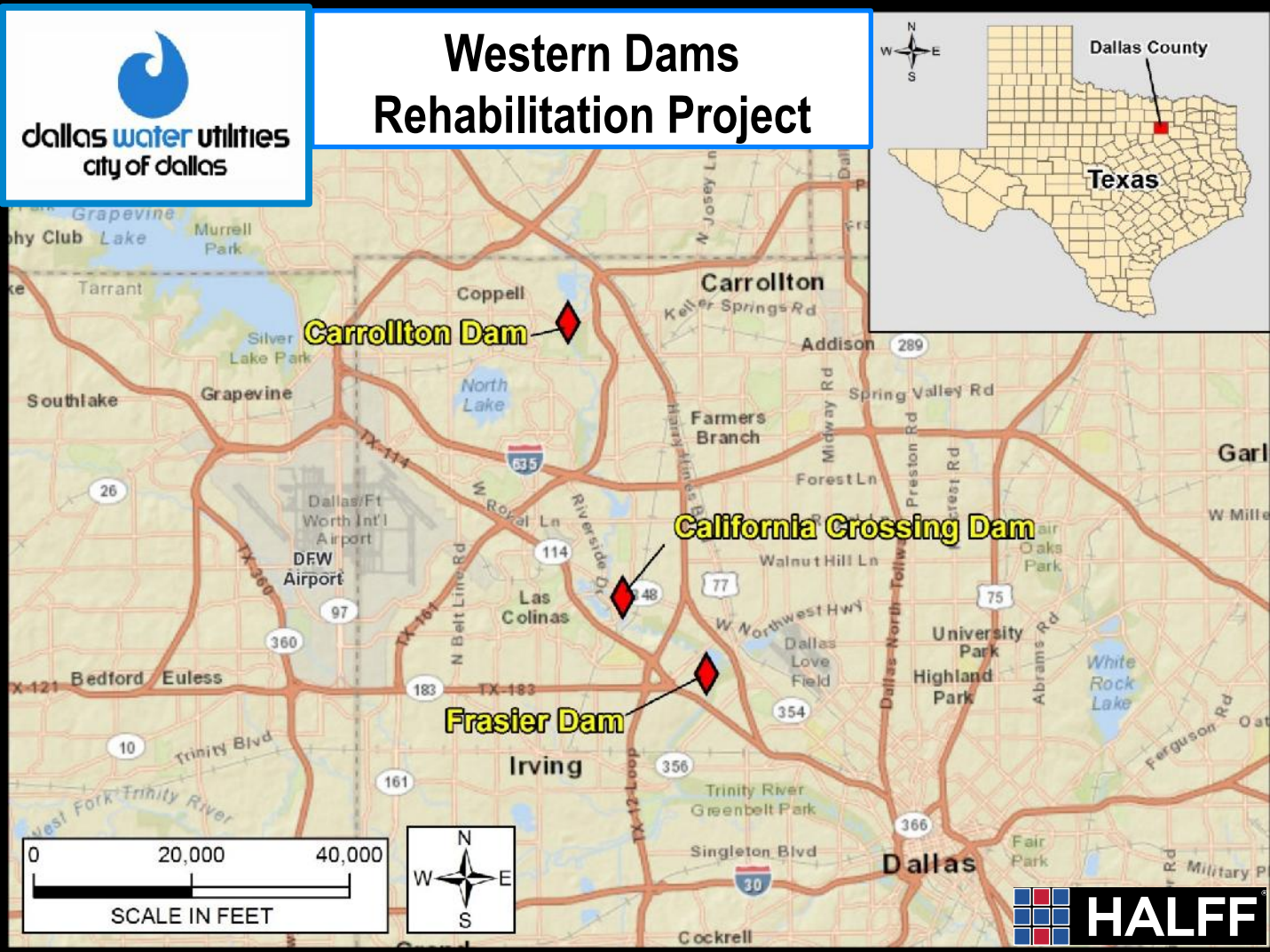


# RELOCATION MONITORING: GROWTH





# DEWATERING AND RELOCATION: WESTERN DAMS



# DEWATERING AND RELOCATION: WESTERN DAMS

## California Crossing Dam Construction Began in October 2013



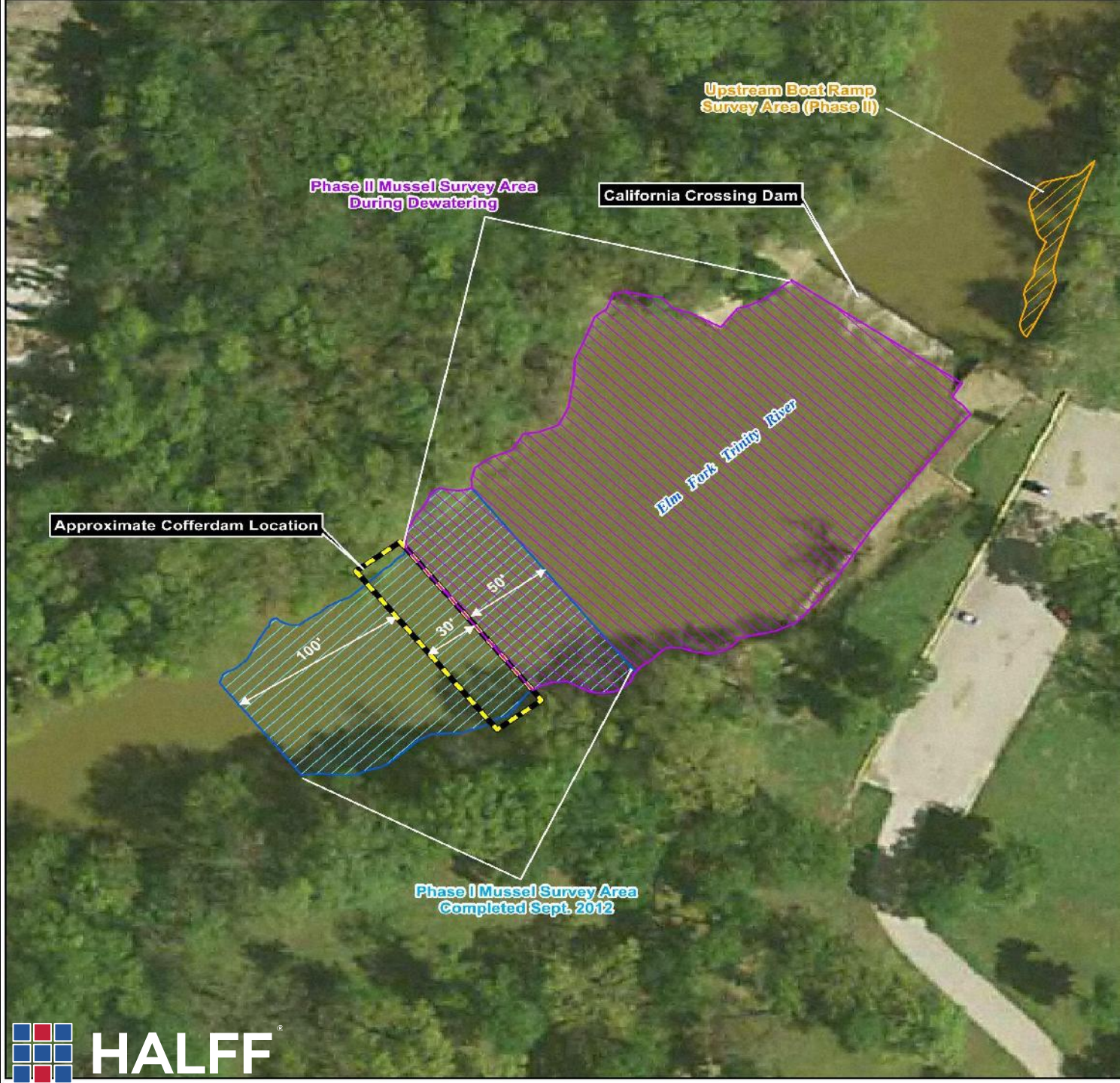
**HALFF**<sup>®</sup>



**dallas water utilities**  
city of dallas

**ZARA**  
ENVIRONMENTAL LLC









© 2013 Google



# CALIFORNIA CROSSING DAM DEWATERING



 HALFF

- Relocated 8,632 mussels; 21 total species
- Relocated 175 Tx Pigtoe, 62 La Pigtoe, 8 “probable” Tx Heelsplitter
- Dewatering for mussel relocation is very rare

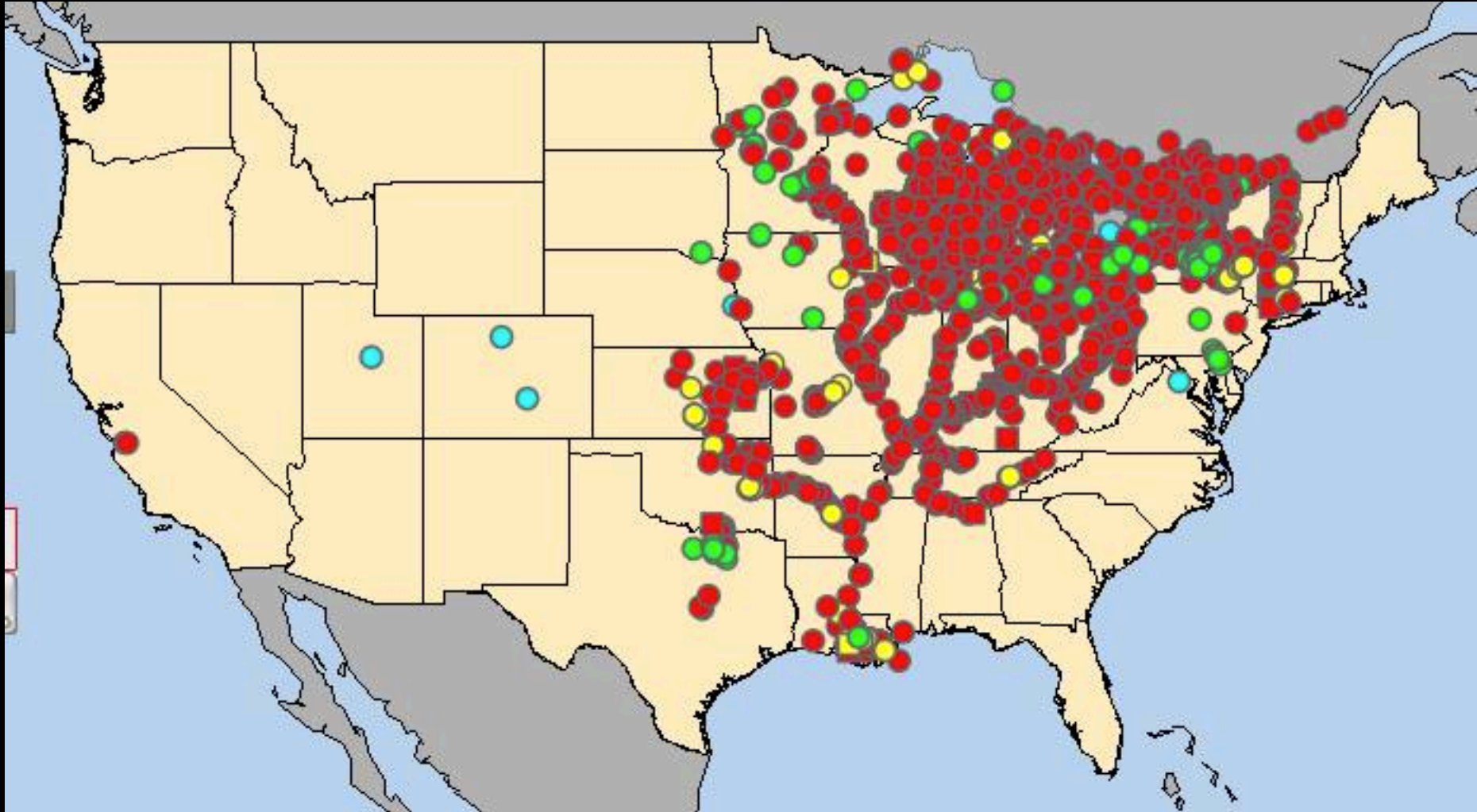


# ZEBRA MUSSEL VS. NATIVE MUSSELS





# ZEBRA MUSSELS IN THE UNITED STATES



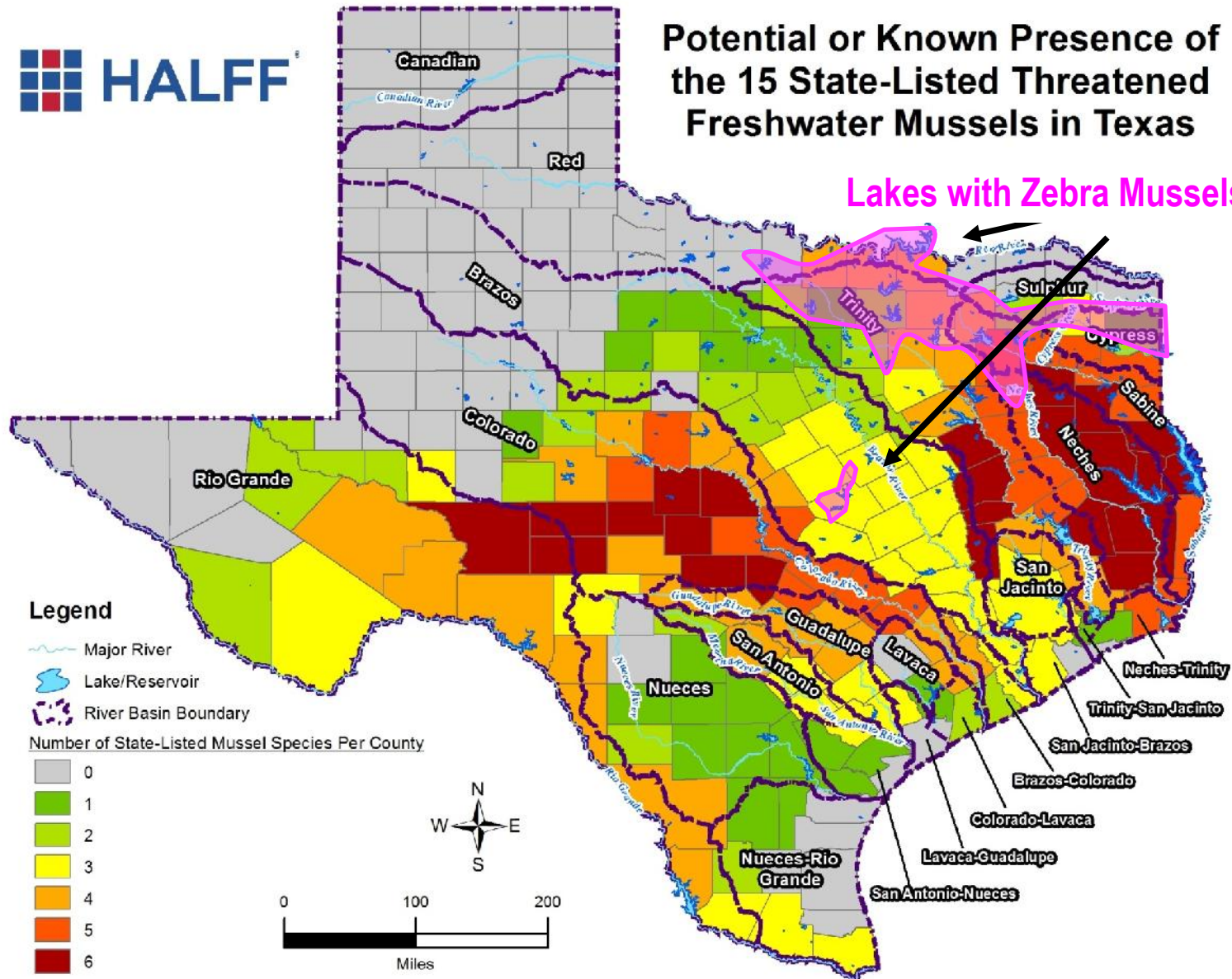
[http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/maps/current\\_zm\\_quag\\_map.jpg](http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/maps/current_zm_quag_map.jpg)

# ZEBRA MUSSELS IN TEXAS



## Potential or Known Presence of the 15 State-Listed Threatened Freshwater Mussels in Texas

Lakes with Zebra Mussels or DNA





# IMPACTS OF ZEBRA MUSSELS ON TEXAS NATIVE MUSSELS

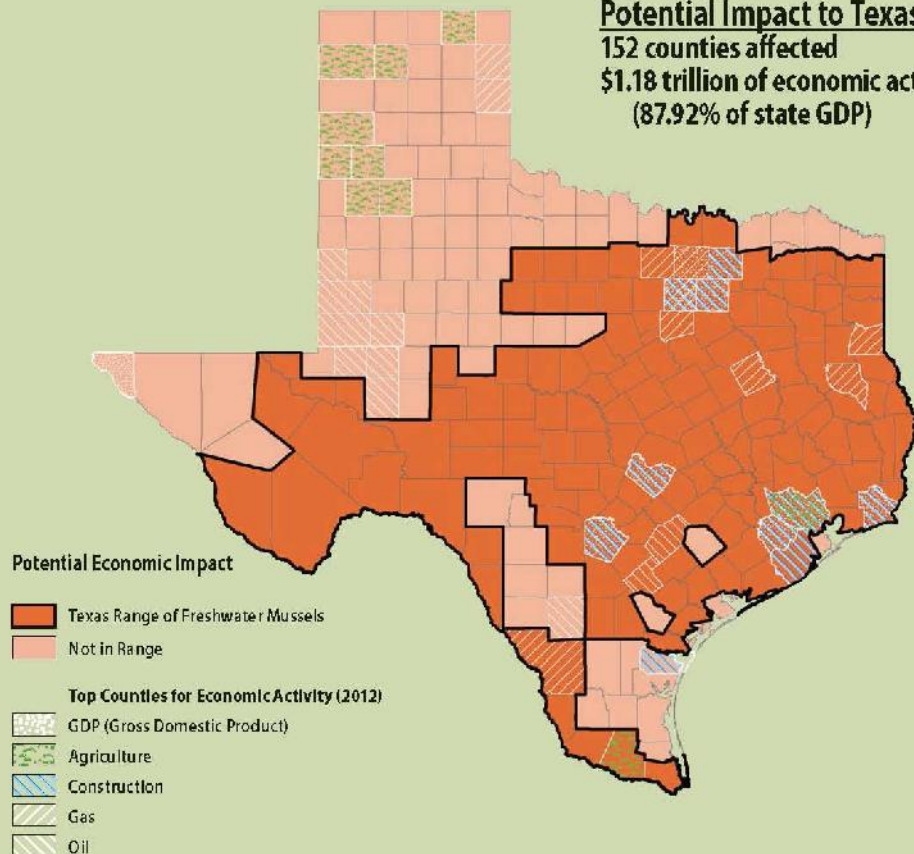
- Federal listing implications
- 12 of the 15 State listed threatened species
- 12-Month findings (potential for listing) anticipated in FY 2017





## Freshwater Mussels

**Potential Impact to Texas**  
152 counties affected  
\$1.18 trillion of economic activity  
(87.92% of state GDP)



Potential range of species for research with overlay of top counties for economic activity in the state (2012 GDP, Agriculture Production, Construction, Gas and Oil).

Freshwater Mussels include: False Spike, Golden Orb, Louisiana Pigtoe, Mexican Fawnsfoot, Salina Mucket, Smooth Pimpleback, Texas Fatmucket, Texas Fawnshoof, Texas Heelsplitter, Texas Hornshell, Texas Pimpleback, Triangle Pigtoe

Sources: Texas Comptroller of Public Accounts, FWS, Railroad Commission of Texas, Texas Agriculture Extension Service, Texas Parks and Wildlife Department, and other related sources



Photo: R.G. Howell/istockphoto  
Prepared for:  
Zara Environmental

- Funding Mussel Studies in Texas
- Possible Federal Listing Implications after FY 2017
- Potential Economic & Schedule Impacts
- TWCA Committee

# ZEBRA MUSSELS: CITY OF DENTON

- Lake Ray Roberts infested July 2012
- City of Denton water intake structure
- By Summer 2014, 80% covered in zebra mussels
- Projects anticipated to cost >\$3 million
- Increase in water prices to customers anticipated

CBSDFW Buy Tickets Your Home More ▼ FOLLOW US f t y LOG IN

## Zebra Mussels Move Into Denton Water System

July 31, 2014 9:54 PM

Share 91 Tweet 6 Share 8 View Comments



10:10 72°  
100% 2013 09:11  
#CBSDFW

**Related Tags:** clog, denton, Infestation, lake ray roberts, wastewater treatment plant, water department, Zebra mussel, Zebra Mussels

**DENTON COUNTY (CBSDFW.COM)** – They are a species about the size of a dime, but the damage they are causing will cost one city millions. Zebra mussels have moved from Lake Ray Roberts into the water system in Denton.

The infestation is something like a clogged pipe problem. Each mussel that moves into the main water line threatens to clog things up. Even though there is currently only a thin layer of zebra



# ZEBRA MUSSELS: ENGINEERING SOLUTIONS



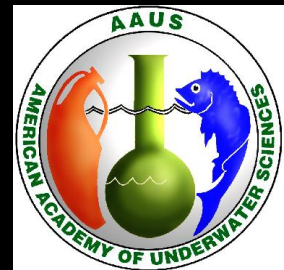
- Risk assessment to water bodies and system-wide infrastructure, before and after infestation
- Development of prevention and mitigation strategies
- Engineering design for new projects and retrofit for existing infrastructure
- Assistance with project prioritization and CIP budgeting (program management-type planning)

# ACKNOWLEDGEMENTS

- **Halff Associates**— project partner for survey & reporting



- **TxDOT**- Client for California Crossing Bridge Project, Dr. Stirling Robertson, Robert Hall, Jay McCurley, Leslie Mirise (TxDOT) for relocation plan, relocation site coordination, field and other assistance.
- **DWU Staff**- Client for California Crossing Dam
- **TPWD Kills and Spills Team**- Relocation Plan development/approval & assistance with relocations.
- **Dr. Neil Ford (UT Tyler)** for assistance with fieldwork and rare species identification.
- **Bob Howells** for assistance with rare species identification.
- **Dr. Robert McMahon (UT Arlington), Brian Van Zee (TPWD),**
- **and Chris Churchill (USGS).**



# QUESTIONS?

## Contact Information:

Brian Cowan

[brian@zaraenvironmental.com](mailto:brian@zaraenvironmental.com)

(512) 632-8409

