



# The Water Monitor

Summer 2008  
Volume 1, Issue 2



Texas Commission on Environmental Quality—Water Quality Monitoring and Assessment Section

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"Water is the best of all things."

Pindar (c. 522 BC - c. 438 BC), Olympian Odes

## Welcome to The Water Monitor

Welcome to second issue of *The Water Monitor*, a newsletter focusing on issues related to monitoring and protecting surface water quality. Each quarter this newsletter will bring updates on the activities within three of the TCEQ's water quality programs: Surface Water Quality Monitoring, Texas Clean Rivers, and Nonpoint Source. This newsletter will be reporting on statewide activities and work being done through these programs as well as other field happenings and water-related topics.

### DSHS Issues Fish Consumption Advisory for Galveston Bay

by the DSHS Seafood and Aquatic Life Group

The Texas Department of State Health Services (DSHS) has issued an advisory warning people to limit their consumption of spotted seatrout and catfish from Galveston Bay. The advisory, which includes Chocolate Bay, East Bay, West Bay, Trinity Bay and contiguous waters, was issued after a two-year study showed elevated levels of dioxins and polychlorinated biphenyls, or PCBs, in the two fish. Other fish species such as red drum, black drum and flounder were sampled and an advisory was not necessary.

Adults are advised to limit consumption of the two fish to no more than one 8-ounce meal a month. Women who are nursing, pregnant or may become pregnant, and children should not eat any catfish or spotted seatrout from these waters.

PCBs are industrial chemicals once used as coolants and lubricants in electrical transformers and capacitors.

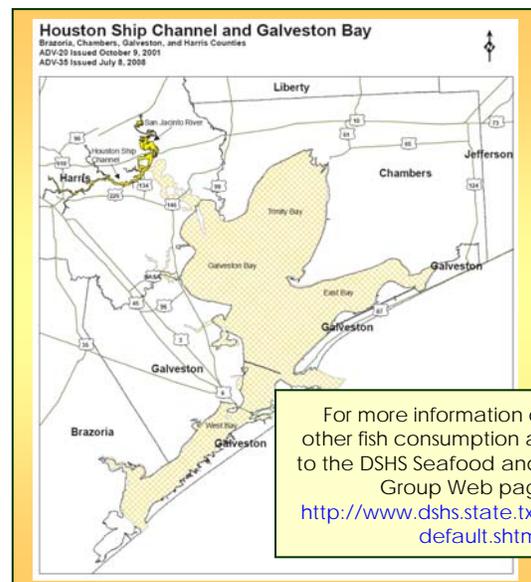
The EPA banned PCBs in 1979, and older items containing them have to be replaced. PCBs degrade slowly in the

environment. Dioxins are formed as unintentional by-products of many industrial and chemical production processes and incomplete combustion.

Long term consumption of PCBs may cause cancer, reproductive, immune system, developmental, and liver problems. Dioxins can cause skin rashes, liver damage, weight loss, reproductive damage and may increase the risk of cancer.

Spotted seatrout, also known as speckled trout, is a favorite among recreational anglers in coastal waters. The DSHS advisory does not prohibit catching or possessing either fish species.

The contaminants do not pose a threat to other recreational uses of the bay such as swimming or other contact recreational activities.



For more information on this and other fish consumption advisories, go to the DSHS Seafood and Aquatic Life Group Web page at <http://www.dshs.state.tx.us/seafood/default.shtm>

## Nonpoint Source Pollution Management is Celebrated at the 2008 Texas Environmental Excellence Awards



Rocky Freund, Deputy Executive Director and Sky Jones-Lewey, Resource Protection and Education Director accepting the award for the Nueces River Authority.



The NRA Watershed Model

Learn more about the Texas Environmental Excellence Awards at [www.teea.org](http://www.teea.org) or watch a video of Nueces River Authority's award-winning watershed model at [www.teea.org/win08\\_edu.htm](http://www.teea.org/win08_edu.htm).

The TCEQ annually presents the Texas Environmental Excellence Awards to environmental projects across the state that demonstrate excellence in resource conservation, waste reduction and pollution prevention. The award-winning programs of the 2008 ceremony aptly reflect the goals of the TCEQ: to protect our state's human and natural resources and ensure clean air, clean water, and safe management of waste. The awards celebrate the bold efforts of citizens, communities, businesses, and organizations that preserve and protect the Texas environment. Under the Waste Reduction Policy Act of 1991, the TCEQ initiated the Texas Environmental Excellence Awards in 1993. Presented every spring, the awards are given in 10 diverse categories across the public and private sectors.

### The Nueces River Authority wins the Education Category in 2008: Helping Students Understand Water's Future

The Nueces River is the lifeblood of a region, and that awareness led the Nueces River Authority to mount an ambitious effort to preserve and protect the headwaters of the Frio, Sabinas, Leona, Nueces and West Nueces rivers in South Texas. With a Clean Water Act §319(h) grant from the Texas State Soil and Water Conservation Board, the

Authority implemented an innovative education project aimed at improving and protecting water quality in the five Nueces Basin headwater watersheds.

The campaign's centerpiece is a 24-square foot scaled relief model of the Nueces River Basin, which educators take to 5<sup>th</sup> and 6<sup>th</sup> grade classrooms in a five-county area each year. Using food coloring to illustrate pollutants and spray bottles to make rain, students witness how tainted runoff makes its way downstream. This hands-on approach enables students to run their fingers over the terrain and trace the connections between creeks, rivers and bays.

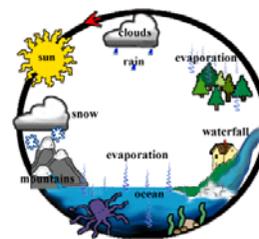
The watershed model demonstration is followed by a unique educational campaign, called *Up 2 U*, which asks students to consider how their personal choices impact water quality. The Nueces River Authority reinforces its *Up 2 U* message through bookmarks, billboards and bilingual posters. In addition, 64 local river-related businesses hand out mesh litterbags for visitors to use while enjoying the river and riding its current on inner tubes. The campaign is underwritten in part by contributions from local businesses, private groups, and governmental organizations that have a direct interest in water quality.

Since its inception in 2005, the Nueces Basin Headwater Stewardship Project has invested approximately \$300,000 in pollution-

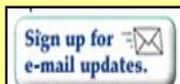
prevention education strategies, touching more than 5,000 young lives. The project's success has led two other river authorities in Texas to adopt the program and create their own models. Through this creative educational effort, youngsters of a new generation will learn responsibility and become empowered to make choices that have a positive effect on the world around them.

### Upper Colorado River Authority's North Concho Best Management Practices qualifies as a finalist in the Government Category

In the Spring 2008 issue of *The Water Monitor*, The Rio Concho "Downtown" NPS Project described an innovative best management practice (BMP) funded by Clean Water Act §319(h) grants through the TCEQ. In 2008, the project was one of the finalists in the Government Category at the Texas Environmental Excellence Awards.



To sign-up for automatic notification of new issues of the "The Water Monitor" newsletter go to [www.tceq.state.tx.us](http://www.tceq.state.tx.us), click on the "sign up for e-mail updates" icon and follow the instructions.





Effects of the *Aphanizomenon* bloom on Twin Buttes Reservoir.



**What is Geosmin?** *Geosmin* literally translates to "earth smell". It is an **organic compound** with a distinct earthy flavor and aroma and is responsible for the earthy taste of **beets**. The human **nose** is extremely sensitive to *geosmin*, able to detect it at concentrations down to 5 ppt.

*Geosmin* is produced by several classes of **microbes** [including **cyanobacteria**, **actinobacteria**, and **streptomyces**] and is released when these microbes die. Communities whose **water** supply depends on surface water can periodically experience episodes of unpleasant tasting water when a sharp drop in the population of these bacteria releases *geosmin* into the local water supply. Under **acidic** conditions, *geosmin* decomposes into odorless substances.



**NEW**—U.S. Geological Survey Fact Sheet 2008–3009  
**Monitoring Indicators of Harmful Cyanobacteria in Texas**  
By Richard L. Kiesling, Robin H. Gary, and Marcus O. Gary  
<http://pubs.usgs.gov/fs/2008/3009/>

## Twin Buttes Reservoir Cyanobacteria Bloom

by Stephen Twidwell, TPWD San Marcos

On May 1, Boyd Guthrie from the TCEQ Region 8 Office was first to notice an unusual algal bloom in Twin Buttes Reservoir near San Angelo. What made the bloom appear so unusual was the brilliant green color; it looked like someone had poured green paint into the water. Near shore by the dam, the alga was so dense that it formed a surface floating scum resembling a thick paste.

The following day, Chuck Brown from the Upper Colorado River Authority (UCRA) was on the reservoir conducting routine water quality monitoring. Field measurements made in the middle of the bloom indicated the bloom had little influence on water quality as dissolved oxygen concentrations and pH levels remained normal in profile. Further, the bloom did not appear to be producing toxins. In the bloom area, fish were observed swimming and local residents were fishing. Steve Twidwell, TPWD, took a sample for algal identification to the University of Texas Phycology Lab. Dr. Jerry Brand identified the bloom as *Aphanizomenon* sp.

*Aphanizomenon*, with *Anabaena* and *Microcystis*, is one of three cyanobacteria genera (formerly called "blue-green algae") that account for the vast majority of blooms. *Aphanizomenon* is notorious for producing a variety of cyanotoxins: dermatotoxins that affect the skin; neurotoxins that affect the nervous system; and hepatotoxins that affect the liver. These toxins can make people, their pets, and other animals sick. In addition to the cyanotoxins it can produce, *Aphanizomenon* is also known to produce **geosmin**, making the water taste and smell bad.

Throughout the middle of May, the *Aphanizomenon* bloom seemed to pulse on a daily basis, from declining densities and appearing evenly dispersed in the water column, to

escalating densities and localized patchiness. Toward the end of May, with the prevailing winds picking up from the South, the bloom became concentrated in several coves near the dam on the north side of the reservoir. The character of the bloom changed dramatically at this point. Dissolved oxygen in the cove areas declined to less than 1 mg/L, suggesting that the bloom was beginning to die and bacterial decay was consuming the oxygen. Dead shad, catfish, and carp were found in the cove areas. There was also an indication that cyanotoxins were being released, as field investigators from the TCEQ, UCRA, and TPWD observing the bloom began experiencing scratchy and sore throats and asthma like symptoms due to exposure.

Meridith Byrd, TPWD's Harmful Algal Bloom Coordinator, began working with the Department of State Health Services (DSHS) to get a public health advisory issued. On Friday, May 23, in advance of Memorial Day weekend, the DSHS issued a public health advisory warning local citizens of the algal bloom on Twin Buttes Reservoir.

There are several questions regarding the bloom that remain unanswered. First, what caused the bloom in the first place? Cyanobacteria blooms can occur at any time, but typically develop in late summer or early fall when water temperatures are elevated. Heavy rains in the San Angelo area in April may have washed excessive nutrients into the reservoir. Inflowing water also raised the water level in Twin Buttes Reservoir several feet, thus inundating many acres covered by vegetation. The nutrient data indicates that the water at the time of the cyanobacteria bloom peak was deprived of nitrogen (NO<sub>2</sub>-N + NO<sub>3</sub>-N and NH<sub>3</sub>-N, less than

detection) while phosphorus was in abundance (TP, 0.35 mg/L). This scenario gives the cyanobacteria a competitive advantage, since they are able to fix gaseous nitrogen from the atmosphere into a useable nutrient form to continue growing and reproducing, while other algal forms are essentially limited by the lack of nitrogen in the water. According to researchers at USGS, a cyanobacteria bloom occurring this early in the season is likely to linger through the summer months.

The *Aphanizomenon* bloom is also puzzling due to episodic production of cyanotoxins. The literature indicates that not all cyanobacteria blooms are toxic. Even blooms produced by a known toxin producer like *Aphanizomenon* may not produce toxins or produce them at undetectable levels. Since cyanobacteria toxins can be lethal in relatively small amounts, caution should always be taken when a bloom occurs. Scientists do not know what triggers toxin production by cyanobacteria, but the probability that an individual bloom containing *Aphanizomenon*, *Anabaena*, or *Microcystis* will produce toxins is as high as 75%. Many times toxins may not be produced during the peak of the bloom by cyanobacteria, but they may be released when the cells die and their contents are released to the water. TPWD has sent a sample to the USGS Lawrence, Kansas Research Laboratory to see if toxins are being produced by the bloom. Results from that laboratory analysis are pending. As of July 7, the bloom appeared to be disappearing.

For additional information contact,

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TPWD Harmful Algal Bloom  
Coordinator  
[Meridith.Byrd@tpwd.state.tx.us](mailto:Meridith.Byrd@tpwd.state.tx.us)



*"The life of every river sings its own song, but in most the song is long marred by the discords of misuse"*

-Aldo Leopold (1886-1948), Sand County Almanac



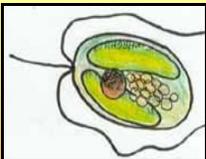
Photo by LCRA



TEXAS CHAPTER AMERICAN FISHERIES SOCIETY  
**Fisheries & Harmful Algae:  
 Can They Co-Exist?**  
 TEXAS PARKS & WILDLIFE DEPARTMENT

For information on Harmful Algal Blooms in Texas, visit the TPWD website at [www.tpwd.state.tx.us/hab](http://www.tpwd.state.tx.us/hab)

The site contains updates on current **Red Tide** and **Golden Alga** blooms, ongoing research and other related information.



### Mark Your Calendars - International Golden Algal Symposium Announced

The Texas Chapter of the American Fisheries Society (TCAFS) and Texas Parks and Wildlife Department (TPWD) are hosting a 4-day conference which will include an International Golden Alga Symposium and the TCAFS Annual meeting.

The combined meeting will convene **January 27- 31, 2009 in Fort Worth, Texas** at the Radisson-Fort Worth Fossil Creek Hotel.

The TCAFS and TPWD cordially invite all American Fisheries Society members, water quality professionals, harmful algae experts, academics, governmental agency staff, river authorities, and other stakeholders to attend this combined conference of the annual TCAFS meeting and Golden Alga International Symposium.

The TPWD Golden Alga Task Force has invited international,

national, and Texas researchers to present their most recent findings in control, bloom dynamics, toxicity, management, and genetics of golden alga. The keynote speaker will be Dr. Don Anderson from the Woods Hole Oceanographic Institute.

Confirmed international and national speakers include:

- Dr. Edna Graneli (Sweden)
- Dr. Wenche Eikrem (Norway)
- Dr. Linda Medlin (Germany)
- Dr. John LaClaire (UT-Austin)
- Dr. Jim Grover (UT-Austin)
- Dr. Dan Roelke (Texas A&M)
- Dr. Kevin Schug (UT-Austin)
- Dr. Bryan Brooks (Baylor University, Texas)
- Dr. John Rogers (Clemson University)
- Dr. Johannes Hagstrom (UT, Marine Science Institute)

TPWD golden alga researchers will also present topics on the Texas experience, including statewide distribution and genetics, and recent developments for control in small impoundments.

The meeting will include a special contributed session for inland and coastal harmful

algal bloom topics (red tide, blue-green algae) as well as a general fisheries and poster session.

The meeting will also feature the lively annual raffle and banquet, student awards, Texas fisheries workers awards, student/mentor luncheon, and student social. Conference registration includes admittance to exhibits, breaks, Tuesday afternoon mixer, Wednesday lunch, Thursday dinner and banquet, and Friday afternoon social.

Information will be posted on the TCAFS website. For updates, visit [www.sdafs.org/tcafs/](http://www.sdafs.org/tcafs/)

or contact

Brian VanZee at [brian.vanzee@tpwd.state.tx.us](mailto:brian.vanzee@tpwd.state.tx.us)



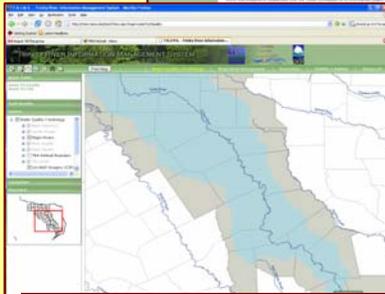
### Access Texas SWQM Data Online

The **Surface Water Quality Web Reporting Tool** will allow you to select TCEQ water quality monitoring stations to view and optionally download sample data. This data comes from the TCEQ's new Surface Water Quality Monitoring Information System (SWQMIS).  
[www8.tceq.state.tx.us/SwqmisWeb/public/index.faces](http://www8.tceq.state.tx.us/SwqmisWeb/public/index.faces)

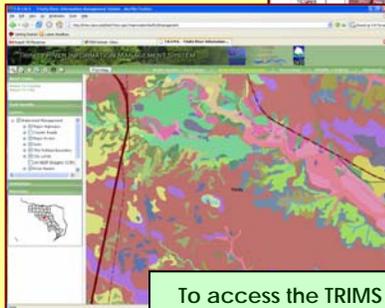
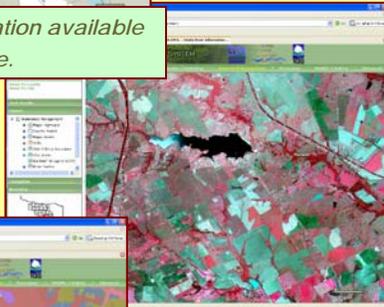


## Trinity River Information Management System (TRIMS)

by Web Mangham, Trinity River Authority



Examples of information available on the TRIMS website.



To access the TRIMS website go to, <http://trims.tamu.edu>

With over 5.5 million residents, the Trinity is the most populated river basin in Texas. From her headwaters north of the Dallas-Fort Worth metroplex to her outlet into Galveston Bay, the 512 mile river and its 1,983 miles of major tributaries drain 18,000 mi<sup>2</sup> of Texas. In addition, the Trinity River basin supplies drinking water to over half of Texas' population. In September 2006, Governor Rick Perry announced the Trinity River Basin Environmental Restoration Initiative (TRBERI) as part of a comprehensive effort to improve the quality of life, economic sustainability and ecological integrity of areas associated with the Trinity River basin through a coalition of local communities, NGO's and stewards of private and public lands.

TRIMS—Trinity River Information Management System— was the first project developed under the TRBERI. Funded by the Trinity River Authority (TRA) through TCEQ's CRP, TRIMS was developed by the Texas A&M Institute of Renewable Natural Resources with design input from TRA. Based on ESRI's ArcServer technology, this browser-based internet mapping system is designed to address the need for local stakeholders to easily access and use geospatial data for making land use decisions in the Trinity River Basin.

Accessed through an internet browser, TRIMS provides the general public with an outreach and planning tool without the need for expensive,

sophisticated Geographic Information System programs. In addition, the extensive metadata available from the website can assist GIS users in locating actual datasets. Along with over 30 other data layers, TRIMS provides access to recent high-resolution aerial images, the original Texas Land Survey, 2000 Census Block Data, live USGS gage data, and digital elevation data for the entire Trinity Basin. This tool provides data access and baseline support for projects designed to address water quality, hydrology, floodplain management, wetland restoration, bottomland hardwood establishment, and wildlife habitat management.

In addition to the TRIMS mapping system, the website contains geospatial links, a user guide, and links designed to teach children about the environment and generate an interest in Geography. Tools that anyone with an internet connection can access include:

- Measure area
- Stack data layers together
- Information button that drills through active layers allowing users access to databases
- View recent aerial photos
- Produce printable maps
- Access specific tasks and query options.

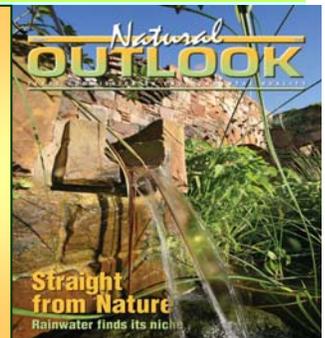
## Water Topics Featured in TCEQ's "Natural Outlook"

Several water topics are highlighted in the summer 2008 edition of TCEQ's *Natural Outlook*:

- **Water Wizards:** Advances in monitoring provide a more comprehensive picture of water quality. CWQMN highlights.
- **Multiple Strategies at Play:** Cleanup projects underway in

- the North Bosque River.
- **Need Water? Look to the Sky:** An article on the capture, storage, and use of rainwater.
- **Comeback on the Coast:** Restoration of the Bahia Grande wetlands near Brownsville.

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## Richland Chambers Constructed Wetlands

by Art Crowe, TCEQ, Region 5-Tyler

In honor of World Wetlands Day, TCEQ employees from Tyler, DFW, and Waco regional offices, along with the Northeast Texas Municipal Water District, the City of Waco, and Baylor University met at the Richland-Chambers constructed wetlands. This constructed wetland is a joint project between the Tarrant Regional Water District and Texas Parks and Wildlife Department (TPWD).

Effluent dominated water from the Trinity River south of Corsicana is passed through 250 acres of wetlands where much of the sediment and nutrients are removed. Testing has shown the following improvements in Trinity River water on the downstream end of the wetland: 96% reduction in

TSS, 61% reductions in total nitrogen, and a 39% reduction in total phosphorus. In the mean time, ideal wildlife habitat is created for all types of waterfowl including ducks, wading birds, and top predators like osprey and eagles.

The first phase of the field scale project is scheduled to come on line in 2008. When completed, 15 MGD of water will be pumped from the wetlands to Richland Chambers Reservoir. Construction is currently underway for an additional 200-acre wetland cell. When fully complete the constructed wetlands will encompass roughly 1,000 acres and supply 150 MGD of treated water to Richland Chambers Reservoir. There is

currently a 96-inch water supply pipe from the reservoir to the City of Fort Worth. When operational, water will have traveled approximately 200 miles round trip from Dallas back to Fort Worth. This project has the triple benefit of water reuse, nutrient reduction, and the creation of waterfowl habitat.



**“This project has the triple benefit of water reuse, nutrient reduction, and the creation of waterfowl habitat.”**



Staff viewing the outlet from the Richland Chambers constructed wetland.



Trinity River water inlet to the constructed wetlands.

## The EPA's National Rivers and Streams Assessment

The EPA's national monitoring studies are designed to report on the condition of the nation's lakes, streams, rivers, wetlands, and coastal waters. In 2008, TCEQ staff will participate in the National Rivers and Streams Assessment (NRSA). The EPA assigned Texas 32 NRSA sites to complete over a two year period.

The goal of the NRSA is to address two key questions on a national level:

1. What percent of the nation's rivers and streams are in good, fair, or poor condition for the key indicators of trophic state, ecological health, and recreation?

2. What is the relative importance of key stressors such as nutrients and pathogens?

3. What are the trends in stream conditions since the 2004 Wadeable Streams Assessment?

The survey will measure a wide variety of variables intended to characterize the chemical, physical, and biological condition of the Nation's flowing waters. These include water chemistry, nutrients, chlorophyll a, sediment enzymes, enterococci, fish tissue, physical habitat characteristics, and biological assessments including phytoplankton, periphyton, benthic macroinvertebrates, and fish communities.

In April 2008, TCEQ and TPWD staff attended a three-day training seminar in southeastern Oklahoma. Field work is set to begin at the first 16 sites this summer.

Staff from the TPWD River Studies team led by Roy Kleinsasser and staff from TCEQ SWQM Program in Austin and field staff from Houston, Tyler, San Antonio, DFW, and Waco will be participating this summer.



For more information, contact:

Bill Harrison  
SWQM Program  
NRSA Project Lead  
[bharriso@tceq.state.tx.us](mailto:bharriso@tceq.state.tx.us)



Study participants learning to use survey equipment to measure bed slope and reviewing fish collection protocols.



EPA National Rivers and Streams Assessment  
[www.epa.gov/owow/riverssurvey/](http://www.epa.gov/owow/riverssurvey/)

What is an invasive species?

To find out more about the "Invasive Species in Texas" go to [www.ucsus.org/invasive\\_species/state-invasion-portfolios.html](http://www.ucsus.org/invasive_species/state-invasion-portfolios.html)



Top: Water hyacinth;  
Bottom: Hydrilla



## Invasive Species in Texas

What is an invasive species? An "invasive species" is defined as a species that is non-native (or alien) to a given ecosystem and whose introduction causes or is likely to cause economic or environmental harm or harm to human health ([Executive Order 13112](#)).

Invasive species are also referred to as exotic, alien, or non-indigenous species. The problem with these names is that they only refer to the non-native part of the

definition above. Many exotic or alien species do not cause harm to our economy, our environment, or our health. In fact, the vast majority of "introduced" species do not survive and only a few become "invasive" or harmful.

An invasive species grows, reproduces and spreads rapidly, establishes over large areas, and persists. Species that become invasive succeed due to favorable environmental conditions

and lack of natural predators, competitors and diseases that normally regulate their populations.

There are six species of most concern in Texas:

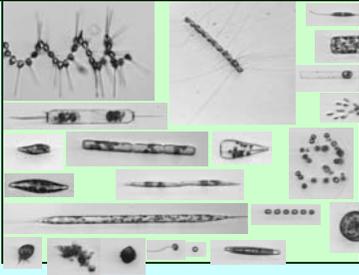
- **Aquatic Plants**  
Hydrilla, giant salvinia, water hyacinth
- **Riparian Plants**  
Salt cedar, Giant reed
- **Animals**  
Armored catfish

Source: TexasInvasives.org

*"This successful event response has demonstrated that continuous and automated methods for monitoring coastal waters can provide real-time detection and early warning of harmful algal bloom events."*



Top: IFCB in the field at Port Aransas  
Bottom: Images generated by the IFCB



## New Technology-Imaging Flow Cytobot

by Christine Kolbe

*Dinophysis acuminata* is a dinoflagellate that produces okadaic acid, the toxin responsible for diarrhetic shellfish poisoning (DSP). Toxic blooms of *D. acuminata* are a serious problem in Europe. The US has been relatively unaffected by toxic *Dinophysis* blooms, until recently. In early February 2008, a *Dinophysis* bloom was forming near Port Aransas. Without early detection this bloom could have had serious consequences along the Texas coast. A potential health crisis was averted due to technology developed at the Woods Hole Oceanographic Institution and the work being done by Dr. Lisa Campbell at Texas A&M University.

"Early warning of this first toxic *Dynophysis* bloom was provided by a new automated particle imaging system. Imaging FlowCytobot (IFCB) combines video and flow cytometric technology to capture images for phytoplankton identification and to measure chlorophyll fluorescence associated with each image. From the high resolution images, organisms ranging from 10 to

~100µm can be identified, often to genus or even species." In September 2007, the IFCB was installed in Port Aransas at the University of Texas-Marine Sciences Institute pier as part of a project to monitor *Karenia brevis*, another toxic dinoflagellate that blooms in the Gulf of Mexico.

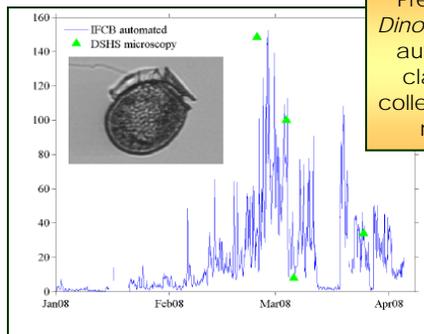
After noticing an increasing number of *Dinophysis* cells, Dr. Campbell alerted the Texas Department of State Health Services (DSHS) who then conducted manual sampling to confirm the species, toxicity, and abundance. By March 2008, the DSHS confirmed the accumulation of DSP toxins in shellfish samples. The result was a closure of shellfish harvesting in Aransas, Corpus Christi, and Copano Bays and a product recall. Timing of the closure and recall of locally harvested oysters was

fortunate. This allowed organizers of "Oysterfest"—an annual event that typically attracts more than 30,000 people to Fulton, Texas—to purchase oysters elsewhere.

"This successful event response has demonstrated continuous and automated methods for monitoring coastal waters can provide real-time detection and early warning of harmful algal bloom events."

For the complete article "First Toxic *Dinophysis* Bloom Observed in the Gulf of Mexico, USA" in *Harmful Algae News* go to, [http://www.ioc.unesco.org/hab/HAN36\\_comp.pdf](http://www.ioc.unesco.org/hab/HAN36_comp.pdf)

For details on the state response to the bloom go to the DSHS Seafood Safety Web site and select "Red Tide." <http://www.dshs.state.tx.us/seafood/>



Preliminary time series of *Dinophysis* abundance from automated analysis and classification of images collected by IFCB and DSHS microscope counts.

Graphics from Dr. Lisa Campbell, Texas A&M University

## *E. coli* Holding Time Update

In 2007, an *E. coli* "Holding Time Study" was done in an effort to comply with new requirements from the Texas Legislature. These new requirements make it mandatory for surface water bacteria samples to be analyzed in a NELAC accredited lab. Since the few accredited Texas labs are geographically dispersed it has become necessary to consider the option of shipping long distances, in order to meet holding time requirements of bacteria samples. Though the holding

time for bacteria samples is 8 hours, this study shows that *E. coli* samples can be held for up to 48 hours when the samples are held at 4 °C and not allowed to freeze.

As of June, 2008, EPA Region-6 has conditionally approved SWQM method changes based on these findings. Additional sampling is scheduled for 2008 to provide further confirmation that *E. coli* results do not change significantly over time.

The approved holding times do not apply to those water



A cluster of *E. coli* magnified x10,000



bodies where *Enterococcus* is monitored routinely. A separate holding time study is currently being formulated to address the possibility of extending the holding time for these samples when necessary.

For additional information contact, Steven Earnest SWQM Program [searnest@tceq.state.tx.us](mailto:searnest@tceq.state.tx.us)

## Words for the Quarter

Have you ever stayed awake at night wondering about the word *SAPROPEL*?

**Sapropel**—An unconsolidated ooze consisting mainly of putrefied plant remains found in anaerobic areas at the bottom of swamps, lakes, and shallow seas.

Can't talk about sapropel without giving homage to the organisms that have to eat the stuff...

**Saprotroph**—An organism, especially fungus or bacteria, that eats sapropel.



## The 22<sup>nd</sup> Annual SWQM Workshop

The twenty-second annual SWQM Workshop will be held **October 20-23, 2008** at the *Mayan Ranch Conference Center* in Bandera, Texas.

The workshop will begin on Monday, the 20th at 1:00 PM with a half-day session for TCEQ SWQM Program staff only. The regular session—open to all—

begins on the 21<sup>st</sup>. The workshop will end after lunch on Thursday the 23<sup>rd</sup>.

The SWQM Program welcomes any ideas for workshop topics. We also welcome any offers to present findings of recent studies, new technologies, interesting aspects of monitoring in your region, or any related monitoring topics.



For additional workshop information, to suggest a topic, or to make a presentation, please contact Anne Rogers, at [anrogers@tceq.state.tx.us](mailto:anrogers@tceq.state.tx.us); 512-239-4597.

## Critter of the Quarter—Bowfin

**Bowfins** are an order (Amiiformes) of primitive **ray-finned fish**. Only one species, the bowfin *Amia calva*, family Amiidae, exists today, although additional species in six families are known from **Jurassic**, **Cretaceous**, and **Eocene fossils**. These included the huge **Leedsichthys**, the biggest fish that ever existed. The bowfin and the **gar** are two freshwater fish that exist today almost unchanged from prehistoric times.

The most distinctive characteristic of the bowfin is its very long **dorsal fin** running from mid-back to the base of the tail. Other noticeable features are the black "eye spot"

usually found high on the caudal peduncle, and the presence of a gular plate. The gular plate is a bony plate located on the exterior of the lower jaw, between the two sides of the lower jaw bone.

When the oxygen level is low, the bowfin can rise to the surface and gulp air into its **swim bladder**, which is lined with blood vessels and can serve as a **lung**.

Bowfin are indiscriminate and voracious predators, known to eat a variety of prey from insects and crawfish to fish and frogs. Compared to many other species of their size, they have a tremendous

appetite. Bowfins should be handled carefully. They are an ill-tempered, pugnacious fish, and consider themselves a match for anything—including humans. They have a mouthful of very sharp teeth. Just ask Bill Harrison.



With the exception of the Appalachian Mountains, the bowfin is native to eastern **North America**, ranging from extreme southeastern Canada to the Gulf Coast. In Texas this species is found in the Red, San Jacinto, and Sabine River systems, as well as the downstream reaches of the Brazos and Colorado Rivers.

Source: Wikipedia and TPWD



Bowfin — *Amia calva*

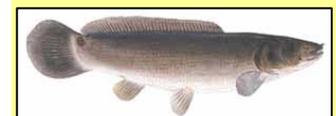


Illustration © TPWD

## Upcoming Events

### Watershed Protection Plan Meetings

*Arroyo Colorado*—  
Aug 21  
[www.arroyocolorado.org](http://www.arroyocolorado.org)

*Bastrop Bayou*  
Last Tues & Thurs of each month  
[om.chawla@h-gac.com](mailto:om.chawla@h-gac.com)

*Brady Creek* —1 meeting prior to Aug 31  
[www.ucratx.org/](http://www.ucratx.org/)

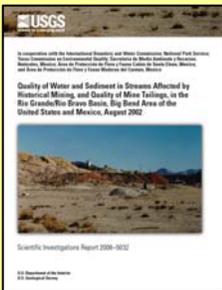
*Buck Creek* —Aug 28  
<http://twri.tamu.edu/buckcreek/>

*Caddo Lake* —  
Sept 16 - Stakeholder Meeting  
[www.netmwd.com](http://www.netmwd.com)

*Cedar Creek* — Aug 28  
[wfrossard@trwd.com](mailto:wfrossard@trwd.com)

*Dickinson Bayou* —  
Aug 14 & 28  
[www.dickinsonbayou.org](http://www.dickinsonbayou.org)

*Plum Creek* — Aug 14, Nov 13, Feb 12  
<http://pcwp.tamu.edu/>



#### NEW Publication:

*Quality of Water and Sediment in Streams Affected by Historical Mining, and Quality of Mine Tailings, in the Rio Grande/Rio Bravo Basin, Big Bend Area of the United States and Mexico, August 2002*

A USGS, TCEQ, and IBWC cooperative study.

<http://pubs.usgs.gov/sir/2008/5032/>

## Interested in Learning More About Water Quality Standards?



In the field of water quality monitoring much of our work is driven by water quality standards.

Are you interested in knowing a little more about water quality standards? Don't have the time or funds to travel? EPA has just the thing for you...

An online course that introduces six key concepts related to water quality standards.

Each of the six modules of the online course is designed to be completed in about 15 minutes.

The modules present text-based information pages that include user interaction, links to further information and resources, and brief video clips that expand on important points.

To access the training modules go to, [www.epa.gov/waterscience/standards/academy/keyconcepts/index.htm](http://www.epa.gov/waterscience/standards/academy/keyconcepts/index.htm)

[ts/index.htm](http://www.epa.gov/waterscience/standards/about/index.html)

For an even quicker overview of water quality standards go to, [www.epa.gov/waterscience/standards/about/index.html](http://www.epa.gov/waterscience/standards/about/index.html)

To access the *Texas Surface Water Quality Standards* go to, [www.tceq.state.tx.us/nav/eq/eq\\_swqs.html](http://www.tceq.state.tx.us/nav/eq/eq_swqs.html)

## Interesting Web Sites

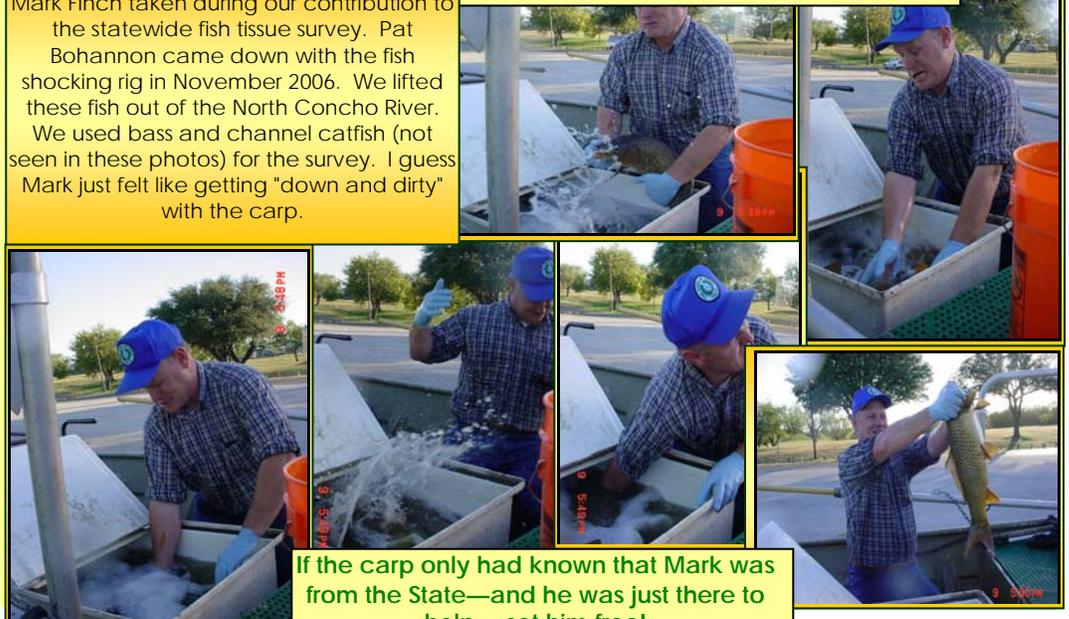
- Texas Invasive Species: [www.TexasInvasives.org](http://www.TexasInvasives.org)
- USGS Invasive Species Program: <http://biology.usgs.gov/invasive/>
- Center for Aquatic and Invasive Species: <http://plants.ifas.ufl.edu>
- Center for Watershed Protection: [www.cwp.org/](http://www.cwp.org/)
- General Information on Toxic and Harmful Algal Blooms: <http://bigelow.org/hab/index.html>
- Invasive Species of the Eastern US: <http://www.invasive.org/eastern/>
- Guide to Invasive Plants of the Galveston Bay Area: [www.galvbayinvasives.org/](http://www.galvbayinvasives.org/)
- Union of Concerned Scientists: [www.ucsusa.org/invasive\\_species/](http://www.ucsusa.org/invasive_species/)
- USDA National Invasive Species Info Center, Aquatic Species: [www.invasivespeciesinfo.gov/aquatics/main.shtml](http://www.invasivespeciesinfo.gov/aquatics/main.shtml)
- Aquatic Vegetation Management in Texas, A Guidance Document: [www.tpwd.state.tx.us/publications/pwdpubs/media/pwd\\_pl\\_t3200\\_1066\\_1.pdf](http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_pl_t3200_1066_1.pdf)



## The Leaky Wader by Boyd Guthrie TCEQ, R-8, San Angelo

This is a rather humorous series of photos of Mark Finch taken during our contribution to the statewide fish tissue survey. Pat Bohannon came down with the fish shocking rig in November 2006. We lifted these fish out of the North Concho River. We used bass and channel catfish (not seen in these photos) for the survey. I guess Mark just felt like getting "down and dirty" with the carp.

### "Primal Instinct and Raw Determination"



If the carp only had known that Mark was from the State—and he was just there to help— set him free!

*Call for Papers and Posters*

The Galveston Bay Estuary Program is pleased to announce that the *Ninth Biennial State of the Bay Symposium* will be held January 12-14, 2009 in Galveston, Texas.

The theme of this year's symposium is *"What is Needed to Sustain Our Estuary?"*

- Habitat Protection*
- Species Protection*
- Freshwater Inflow and Bay Circulation*
- Spills and Dumping*
- Shoreline Management*
- Public Health Protection*
- Water and Sediment Quality*
- Non-Point Sources of Pollution*
- Point Sources of Pollution*
- Public Participation and Education*
- Economic Valuation and Impact of Estuarine Resources*
- Monitoring and Research*

Abstracts are due no later than September 8, 2008.

Further information about the symposium will be placed on the Estuary Program website at [www.gbep.state.tx.us](http://www.gbep.state.tx.us) as it becomes available.

For more information on submitting an abstract contact

Scott A. Jones  
Galveston Bay Estuary Program  
[sjones@tceq.state.tx.us](mailto:sjones@tceq.state.tx.us)  
(281) 486-1245

## NELAC Accreditation Update

by Jennifer Delk

Starting on July 1, 2008, analytical data submitted to TCEQ that is related to assessing or characterizing an environmental process or condition must be generated by a National Environmental Lab Accreditation Conference (NELAC) accredited lab.

The Clean Rivers Program (CRP) informed participating laboratories that their NELAC applications had to be submitted by August 31, 2007. This was done for two reasons, (1) to coincide with the initiation of the start date of the new QAPPs, and (2) to ensure that labs would

receive their accreditations by the June 30, 2008 deadline.

For the last four years, the CRP has been preparing for NELAC. The NELAC accreditation process was both labor and resource intensive. Labs devoted a substantial amount of time and money to updating SOPs, running performance test samples, filling out applications, preparing for audits, and responding to comments.

CRP staff would like to thank our partner laboratories for all of their hard work. We are proud to announce that they

have all turned their NELAC applications in on time and have received full or interim accreditation status by the June 30th deadline.

The TCEQ Houston Lab also received NELAC accreditation on May 22, 2008.

***Congratulations to all CRP partners and the Houston Lab!***

For a list of NELAC accredited labs go to,

[www.tceq.state.tx.us/compliance/compliance\\_support/qa/env\\_lab\\_accreditation.html](http://www.tceq.state.tx.us/compliance/compliance_support/qa/env_lab_accreditation.html)

## Water Quality Makes a Big Splash at the 2008 TCEQ Environmental Trade Fair and Conference

by Jill Csekitz

More than 4,100 people attended the 2008 TCEQ Environmental Trade Fair and Conference, an environmental forum held at the Austin Convention Center from April 29 to May 1. Visitors to the event were treated to a picturesque waterfall and pool exhibit, showcasing surface water quality monitoring efforts in Texas. The exhibit included native Texas materials, including granite boulders from the hill country, native herbaceous plants and Texas oaks. A continuous water quality monitoring

station was installed alongside the pool, collecting measurements visitors could observe in real-time using laptops at the exhibit. Members of the Clean Rivers Program, Data Management, NPS Water Pollution Management, and Surface Water Quality Monitoring Teams staffed the exhibit and distributed outreach materials from each program.

The surface water quality monitoring booth was one of the most popular among the 363 exhibit booths and agency displays, drawing attention from local media outlets as well as conference visitors. News 8 Austin interviewed Jill Csekitz for an early morning story featuring the trade fair and continuous water quality monitoring. High profile booth visitors included each of the Commissioners, as well as former Executive Director Glen Shankle.



Staff from Data Management (Nancy Ragland), CRP (Patricia Wise), NPS (Anju Chalise), and SWQM (Michele Blair) working at the water booth.



SWQM exhibit at the TCEQ's Environmental Trade Fair.

## CWQM Updates

### New Stations

Three new continuous monitoring stations were installed in June and July. In June, a station was installed on Pine Island Bayou (C749) in the Neches River Basin. In July, two stations were installed on the Devils River (C763) and Independence Creek (C766) in the Rio Grande Basin. These sites are being operated by the LNVA, and TCEQ Laredo, and Midland regional staff, respectively.

### Problem Solving

Since the installation of two sites on the Wichita River in

December 2008, Dan Warren (TCEQ Region 3-Abilene) has been plagued with a build-up of fine sediment on the Greenspan multiprobe. To solve the problem, Lynn Robbins (Ambient Monitoring Section) designed a system to blow the sediment off the sensors. Using a solar powered 12-volt air compressor controlled by the Zeno data logger, the system blasts air across the sensors for 5-6 seconds each hour after the water quality measurements are made. After the installation the site went from no data to reporting at 100%.



Typical conditions at the Wichita River CWQM site (top) and sediment build-up on the sonde (below)



### Texas Surface Water Quality Viewer

Look up uses, standards, and information on water-quality assessment for bodies of surface water in Texas. Search using a Texas map, by the name of a water body, or by its segment number. Go to,

<http://gis3.tceq.state.tx.us/website/Seamants/>



## Cibolo Creek—A Success Story by Michele Blair, TCEQ SWQM

Most of us in the business of water quality have this job because we care very much for the environment around us. When we see something unique we want to help it stay that way.

It started with a waste-load evaluation. The City of Boerne wastewater treatment plant (WWTP) needed a permit amendment to accommodate future growth.

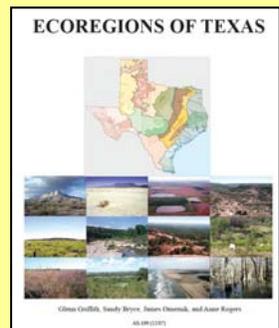
During a trip to select monitoring sites for a wasteload evaluation (WLE) TCEQ staff found a gem. Actually we found several.

Upper Cibolo Creek (Segment 1908-San Antonio River Basin) is a beautiful hill country stream lined with Cypress trees and springs. The area of focus was a short stretch of the creek that started just above the WWTP at

at the SE edge of Boerne and meandered through public, the Cibolo Nature Center (CNC), and private lands.

Our sampling took us through the Nature Center and as far as we could safely go until the creek plunges into a deep canyon and recharges the Trinity aquifer just downstream of this canyon marked by 100

*(continued on page 12)*



## Freshwater Mussel (*Not Muscle*) Training

by Art Crowe, TCEQ, Region 5 Tyler

Freshwater mussels are an important and fascinating component of the freshwater ecosystem. The USA has more freshwater mussel species (~300) than any other similar sized area in the world. Unfortunately, 70 species are federally listed as threatened or endangered and 35 species are extinct. There are over 50 species found in Texas.

TCEQ currently does not have a program to monitor mussel populations, or utilize them as part of a water quality assessment, or in the development of water quality standards. In an attempt to raise mussel awareness and to see if they might fit into future

assessment plans, a training conducted by Dr. Neil Ford at the University of Texas at Tyler this July.

He is a world-renowned herpetologist who has recently developed an interest in freshwater mussels. According to Dr. Ford, mussels make great subjects for his students. They are easier to catch than water moccasins. Currently there is more grant money available as well.

The second day of training was in the field. The first stop was at the Old Sabine Bottoms (OSB). The 6000-acre wildlife management area supports

some of the best bottomland hardwood forest left in Texas. It is located north of Tyler between the current and an old channel of the Sabine. Dr. Ford and his graduate students have been studying the area for a number of years and have a several publications—including Texas J. of SCI. 58(3): 243-254. The morning was spent at the OSB doing timed surveys of transects, counting and identifying species, and looking for marked mussels.

The afternoon was spent on the main channel of the Sabine River near SH14.

*(continued on page 13)*

**NEW Publication**  
**Ecoregions of Texas**  
 (TCEQ AS-199)  
 Companion Book to the  
*Ecoregions of Texas* map/poster  
 produced by the EPA.

Available online at  
[http://www.tceq.state.tx.us/assets/public/comm\\_exec/pubs/as/199.pdf](http://www.tceq.state.tx.us/assets/public/comm_exec/pubs/as/199.pdf)

For a hard copy contact Anne Rogers at  
[anrogers@tceq.state.tx.us](mailto:anrogers@tceq.state.tx.us)

or TCEQ Publications at  
[http://www.tceq.state.tx.us/comm\\_exec/forms\\_pubs/search\\_pubs.html](http://www.tceq.state.tx.us/comm_exec/forms_pubs/search_pubs.html)

**Upper Cibolo Creek—A Success Story**

*(continued from page 11)*



Upper Cibolo Creek upstream of Herff Falls.



To learn more about the Cibolo Nature Center go to <http://www.cibolo.org/>

foot walls. The top of this canyon is called Herff Falls and is comprised of a fossilized reef of cretaceous univalve clams and star corals. What is unique about this reef is the surface location. These are generally buried deep below the earth's surface. The area downstream of the WWTP is an area rich in diverse and complex habitats. There were long open runs, deep shaded pools, riffles, springs, you name it. It was clear, after seeing this for ourselves, this place was special.

The next thing we noticed was a huge clearing adjacent to the fossil beds. KB Homes was building 600, high density, single family homes, right on the edge of the creek! Like any SWQM type, alarm bells went off. What can we do to protect the creek in light of the pressures sure to come with increased building and density in the area?

Back in the office, we asked for permission to start aquatic life monitoring (ALM) in order to get



Bill Linde at the bottom of the canyon downstream of Herff Falls.

**"Unless someone like you cares a whole awful lot,  
Nothing is going to get better. It's not."**

— Dr. Seuss, from *The Lorax*



some baseline conditions before all of the new construction really began. We got the okay and were off and running. We completed the first monitoring event (August 1-2, 2006), including benthics, fish, habitat, and typical field measurements. There were so many fish and so much diversity in this creek, it was becoming clearer that we may be seeing not only high but exceptional aquatic life use, in an effluent dominated creek!

A year and many floods later, we completed the 2nd ALM monitoring event in June 2008 with the same results. Though the final counts are not in, there is no doubt, Cibolo Creek is an exceptional water body well worth every protection we can afford it.

We also completed the WLE in mid-August 2006. As suspected, the water quality data was indicative of effluent with no nutrient limits. Phosphorus was relatively high (3.5 mg/L), compared to natural systems. The impact of the phosphorus was evident. Filamentous algae were abundant and the locals recounted the increased blooms over the past 20 years. However, what was also evident was an abundance of aquatic life. And this was in a stream that was effluent dominated and in drought! Using both the WLE and ALM data we were able to get a total phosphorus permit limit set at 0.5 mg/L for the new WWTP.

Through all of the monitoring, we have been fortunate enough to forge great relationships with the local folks. We have regularly met with the CNC staff in order to exchange data and ideas and provide literature for their local efforts such as xerascaping, fertilizing, water conservation, and general environmental education. We have all had the great fortune to become friends with Bill Linde, the owner of the area downstream of the

CNC which includes Herff Falls. He has provided us unlimited access and great companionship along the way. Bill is committed to the land and creek and taken every step possible to restoring the hill country habitat on his ranch. He has hosted two meetings on his breezy veranda where we, CNC staff, TPWD, City Council, and WWTP staff have all shared thoughts on how best to protect Cibolo Creek. During one of our meetings, we suggested they apply for a \$250,000 grant to create a Watershed Protection Plan. The City of Boerne and the CNC have written and submitted their proposal together and all indications are that they will be funded this year.

For us, this project has been a real reward! We have been able to connect with a group of people who are doing amazing things to protect a very unique environmental resource. We all connected at the right time.

Since the start of this project, Bill Linde, in partnership with the CNC, has recently converted all of his lands, with the exception of the old ranch house, to a trust. The land is to be preserved for research purposes and the CNC as stewards are charged with continuing Bill's legacy of restoration. It certainly was an honor and a pleasure to work with all of these dedicated people.



Upper Cibolo Creek at the top of Herff Falls.

**Freshwater Mussel (*Not Muscle*) Training** (continued from page 11)

We kayaked or canoed downstream about a quarter of a mile to a riffle area. At this site, we broke into three groups and did a density survey using a technique called systematic sampling with multiple random starts. The following morning we gathered back at UT-Tyler and entered the data into an Excel spreadsheet and did a Single Factor Analysis-ANOVA to determine if there were differences between groups—there wasn't.

Freshwater mussels are fascinating. Most have a complex reproductive cycle that involves a parasitic stage on fish. Some have developed fish-like lures to attract the correct host species. Many are quite beautiful on the inside with colors ranging from rose to purple. Just the common names make you want to learn more—Louisiana fatmucket, Texas pigtoe, Tampico pearlymussel, rock-pocketbook, bluefer, and Rio Grande monkeyface are some examples.

But the real importance of freshwater mussels in Texas may lie in their sensitivity to certain pollutants, such as ammonia, copper and certain fungicides. The October 2007 issue of the journal *Environmental Toxicology and Chemistry* has a special section on the pollutant sensitivity of freshwater mussels. Mussels appear to be more sensitive to ammonia than other animals that are used to develop water quality criteria and standards.

Where to go from here? One idea is to do a "Special Study" of mussel populations at the least-impacted reference sites throughout Texas. This would be an interesting addition to the diurnal DO survey that was recently completed at these sites. It would also be an opportunity to learn the different species that should be found in your region or river basin.

Here's a link to the series title *Contaminant Sensitivity of Freshwater Mussels*:  
[www.setacjournals.org/perlserv/?request=get-toc&issn=1552-8618&volume=26&issue=10](http://www.setacjournals.org/perlserv/?request=get-toc&issn=1552-8618&volume=26&issue=10)



Freshwater mussels collected from the Sabine River at SH 14



Washboard

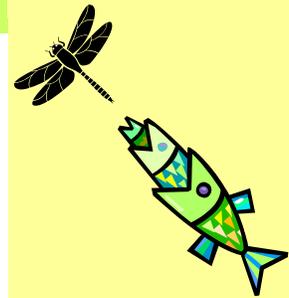
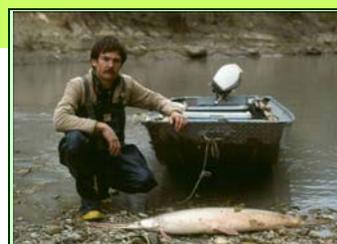


Shawna Simpson (TCEQ SWQM Team) and Boyd Guthrie (TCEQ Region 8 San Angelo) getting into their work collecting mussels.

**Changing Times**

Last but definitely not least—after many years of dedication to TCEQ's SWQM Program and recently to the Water Monitoring and Assessment Section, Patrick Roques is ready to say good-

bye. As of August 1<sup>st</sup> Patrick will begin to enjoy a much deserved rest and start enjoying all those things he's been missing riding herd on a very lively bunch. His absence will be felt for a long time.



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THE TEXAS  
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 PROGRAM