

Headwaters

Fall 2014

Prepared in cooperation with The Texas Commission on Environmental Quality and The United States Environmental Protection Agency

Hello Texas Stream Team!

Texas Stream Team is a joint collaboration between The Meadows Center for Water and the Environment at Texas State University, the Texas Commission on Environmental Quality, and the US Environmental Protection Agency. Texas Stream Team's primary source of funding is from what is known as a "319 Grant". The name of the grant comes from the fact that the money is appropriated by Congress to the Environmental Protection Agency under the authorization of §319(h) in the Clean Water Act. The money in this grant is used for the management of nonpoint source pollution in the nation's waters. TCEQ manages the Section 319 program for urban sources of nonpoint source pollution in Texas, whereas the Texas State Soil and Water Conservation Board administers the program for agricultural and silvicultural nonpoint source pollution.

Texas Stream Team usually receives 319 Grant funding on a two year basis. We are happy to announce that Texas Stream Team has been approved for another two year grant from TCEQ's Nonpoint Source Management Program. The funding cycle began September 1st, at the start of the 2015 Fiscal Year, and runs through August, 2016, the end of the 2016 Fiscal Year. The money from this funding will be used to work with our partners around the state, support our citizen scientists' efforts to collect water quality data, and participate in the development of Water Quality Management Plans. For more information about TCEQ's Nonpoint Source Management Program, visit their website at: <http://www.tceq.state.tx.us/waterquality/nonpoint-source/mgmt-plan/index.html>.

Texas Stream Team's Annual Statewide Partner Meeting

Texas Stream Team held its Annual Statewide Partner Meeting at The Meadows Center for Water and the Environment in San Marcos in August. Texas Stream Team depends heavily on its partners, which include river authorities, city governments, universities, and non-profits to support Stream Team citizen scientists around the state. Texas Stream Team relies on its partner organizations across the state to support local Stream Teams by purchasing monitoring equipment and supplies, creating monitoring plans, and organizing trainings. The Annual Meeting gives the partners a chance to connect with Stream Team staff at the Meadows Center, as well as network among themselves to see how different organizations use Texas Stream Team to accomplish their goals of improving water quality.

Mike Bira with the US Environmental Protection Agency gave a presentation at the meeting on the importance of citizen science in collecting data and educating the public. Faith Hambleton, the Texas Stream Team Project Manager at the Texas Commission on Environmental Quality also gave a talk on TCEQ's Nonpoint Source Management Program. The Meadows Center gave an update on Texas Stream Team, the San Marcos Watershed Initiative. Partners from Aquatic Alliance, Houston Galveston Area Council, Galveston Bay Foundation, The Cypress Creek Project, and Texas Water Resource Institute gave talks on how their organizations use Texas Stream Team to achieve their goals.

The meeting concluded with the group taking a famous Glass Bottom Boat Tour on Spring Lake at The Meadows Center.

Texas Stream Team would like to thank all of the partners who were able to make it to the meeting, and all of the hard work they do, to make the program a success. We look forward to continuing to work with you.



Texas Stream Team Staff and Partners met at The Meadows Center for Water and the Environment in August for the Annual Statewide Partner Meeting. Photo by Anna Huff.

Partners that attended the 2014 Annual Statewide Partner Meeting were:

- U.S. Environmental Protection Agency Region VI
- Texas Commission on Environmental Quality
- Houston-Galveston Area Council
- Galveston Bay Foundation
- Caldwell County Soil and Water Conservation District (Representing the Plum Creek Partnership)
- Guadalupe Blanco River Authority
- City of Waco
- Lower Colorado River Authority
- Lower Neches Valley Authority
- Coastal Bend Bays Foundation
- The Cypress Creek Project
- Baylor University's Center for Reservoir and Aquatic Systems Research
- The San Marcos River Foundation
- Texas A&M University's Texas Water Resource Institute
- Aquatic Alliance (Representing the City of Dallas)

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The following article has been submitted to Texas Parks and Wildlife for their bi-annual newsletter "Texas Watersheds". The newsletter is expected to be released this fall.

Upper San Marcos River Protection Efforts

**By Mary Van Zant and Travis Tidwell
The Meadows Center for Water and the Environment**

The Upper San Marcos River

The Upper San Marcos River watershed is located in Hays County, TX and includes the San Marcos River and its major tributaries: Sink Creek, Sessom Creek, Purgatory Creek, and Willow Springs Creek. Artesian spring water from the Edwards Aquifer emerges into Spring Lake through hundreds of spring openings, creating one of the most productive spring-fed systems in Texas, and forming the headwaters of the Upper San Marcos River. The upper portion of the river flows through part of Texas State University and a number of public parks, managed by the City of San Marcos, before passing under Interstate Highway 35. It then meanders by a fish hatchery, a wastewater treatment plant, and several tracts of private land in a largely undeveloped area before combining with the Blanco River.

The Watershed is mostly limited to Hays County, with small portions of the west-south-west portion of the Purgatory creek subwatershed crossing into Comal County. A small northern section of the Sink Creek subwatershed is located within the boundary of the City of Wimberley. The majority of the watershed is rural and over the Edwards Plateau. The main stem of the river, however, is in the urban center of the City of San Marcos, on the Gulf Coastal Plain. The springs flow out of the Balcones Fault Line, which separates the Edwards Plateau and the Gulf Coastal Plain. The upper San Marcos River watershed's approximate 60,585 square acres.

The Lake and River are home to several endangered species, including the Texas Blind Salamander, Fountain Darter, San Marcos Salamander, San Marcos Gambusia and Texas Wild Rice. Locals began to celebrate the unique Texas Wild Rice, found only in the first 3 miles of the river, with the annual Texas Wild Rice Festival. Due to the river's high biodiversity and presence of a number of endemic and endangered species, the USFWS have designated the San Marcos Springs and Spring Lake as critical habitat. The Guadalupe roundnose minnow (*Dionda nigrotaeniata*) and the bigclaw river shrimp (*Macrobrachium carcinus*) also occur in the headwaters and have been identified by the Texas Comprehensive Wildlife Conservation Strategy as species of "high priority" for conservation.



The Falls at Rio Vista on the San Marcos River.

From archeological studies of the area, there is evidence that it has been continually inhabited for over 11,000 years. Based on its rich cultural record, Spring Lake and the San Marcos River continue to hold a great deal of significance to contemporary populations. This includes not only modern-day San Marcos residents, but also descendent Native American communities, some of whom consider the springs to be sacred. In the 20th Century, Spring Lake was home to a theme park known as Aquarena Springs, with an underwater submarine mermaid show, a swimming pig named Ralph, and glass bottom boats. Texas State University purchased the theme park in 1991, and has retained the glass bottom boats as an educational nature tourism attraction which continues to operate on Spring Lake. Today, the river is known for its high clarity and relatively constant flow rates and temperatures. It is a very popular location for water recreation activities including: swimming, tubing, boating, canoeing, kayaking, golfing, snorkeling, SCUBA diving, and fishing. The river attracts hundreds of thousands of visitors annually, generating substantial revenues from tourism and recreation.

Threats to the River

According to U.S. Census data, the population of San Marcos increased by 29% and the population of Hays County grew by a remarkable 61% between 2000 and 2010. Both San Marcos and Hays County grew at a faster rate than state (21%) or national averages (9.7%). Projected growth rates indicate that the population near the San Marcos River will continue to grow at a rapid rate over the next 20 years. The population of the entire Edwards Aquifer region is expected to increase by 63%,

to nearly 1.3 million people over the next 50 years. Given these population growth projections, the land use demands within the upper San Marcos River will be much more significant and the demand for Edwards Aquifer water resources also will be exceptionally high.

Along with impacts from population growth, the region has been affected by drought conditions in recent years. The years 2009 and 2011 had below average rainfall, with 2011 being one of the driest years on record. The drought of 2011 dried up intermittent creeks, rivers, and drastically diminished reservoirs, effects of which are still present. The City of San Marcos has remained under water use restrictions nearly continuously since 2011. Flows have been variable, often below average and low flow conditions have degraded water quality conditions.

The endangered species in the lake and river are sensitive to variances in water quality and rely on suitable flows for survival, including constant cool temperatures made possible through springflows into the upper reaches of the system. Other threats to these species include habitat destruction from development (sedimentation and pollution from construction, reduced riparian areas and increased river traffic), invasive species that alter the ecosystem, and water pollution.

Water Quality in the River

The Texas Commission on Environmental Quality (TCEQ) has set the standard Total Dissolved Solids (TDS) concentration for the upper San Marcos River as 400 mg/L. In 2010, the upper San Marcos River Segment 1814 was listed as impaired for TDS and added to the state's 303(d) List (the list of water bodies which do not meet a specific water quality parameter's standard for the water body's designated use). Citizen Scientists have been collecting water quality samples for the upper San Marcos River under an approved TCEQ Quality Assurance Project Plan since 1995 as part of the Texas Stream Team. A recent analysis of TDS concentrations on the upper San Marcos examined 1,683 specific conductivity measurements by Texas Stream Team Citizen Scientists from 1995 to 2013. A mean TDS value of 399 mg/L was calculated, and showed no significant increase or decrease in concentrations over time. Texas Stream Team's data is not intended for official assessment purposes, but the analysis does support that notion the TDS concentrations of the upper San Marcos River are hovering at, or above, the state's designated standard and that these concentrations have remained steady for some time. Furthermore, the San Marcos system has shown an inverse relationship between peak discharge from rain events and TDS which indicates that the rainfall runoff is low in TDS and dilutes that which may come from the spring water.

Watershed Protection Plan

The San Marcos Watershed Initiative (SMWI) began when local stakeholders partnered with The Meadows Center for Water and the Environment to better understand water quality in Spring Lake and Sink Creek. With guidance from the Texas Commission on Environmental Quality (TCEQ), the Meadows Center and a stakeholder committee is utilizing the results of the Spring Lake Study to develop a Watershed Protection Plan (WPP) for the upper San Marcos River. Goals of the WPP are to investigate causes of the Total Dissolved Solids impairment and identify any other nonpoint source pollution concerns in the watershed. The vision of the San Marcos Watershed Initiative is “a

healthy watershed that supports a clean, clear, and flowing San Marcos River for the future as it was in the past.”

Stakeholders involved in developing the WPP include diverse representatives of the community. Stakeholder interests include: agriculture, archaeology, culture, development, local business, coupled with representatives from the city, county, university, local non-governmental organizations, river authority, and experts in water quality, water conservation, education and outreach and other relevant topics.

There are several parallel efforts focusing on other aspects of the river that are being combined with WPP efforts. As the City of San Marcos approaches a population of 50,000 both the City and Texas State University are required to develop a Multiple Separate Storm Sewer System (MS4) program to manage stormwater. The City is also coordinating its current water quality protection plan activities with the WPP. Efforts to protect the endangered species include the Edwards Aquifer Habitat Conservation Plan (HCP), which requires various conservation, restoration and protection measures such as invasive species removal, riparian protection, recreation entry points, sediment management, and educational outreach.

This effort presents the opportunity to explore ways to manage impacts to surface water resources through a voluntary, stakeholder-driven WPP for the upper San Marcos River watershed. The WPP will address the listed impairment (5c) for TDS, and will serve as a proactive mechanism to address *E. coli*, nutrients, sediment, pollutants identified by stakeholders, and impacts of future population growth. This project began in the winter of 2012-13. A Watershed Characterization has been compiled and pollution causes and sources have been identified. The next task in the project timeline is to identify best management practices to address existing and expected future nonpoint source pollutants. A comprehensive WPP will be completed and submitted to TCEQ and the US Environmental Protection Agency in October, 2015.

Texas Stream Team on the San Marcos River

Data collection is a vital component to any successful Watershed Protection Plan in order to establish baseline conditions, predict future changes via modeling, and to measure the impacts of the efforts taken to protect the watershed. The San Marcos Watershed Initiative relies on Texas Stream Team for a good portion of its water quality data.

Texas Stream Team is a collaboration of the Environmental Protection Agency, the Texas Commission on Environmental Quality, and The Meadows Center for Water and the Environment at Texas State committed to water stewardship. Trained volunteers conduct water quality monitoring at assigned sites on their local lakes, rivers, streams, and estuaries across the state. The information collected by citizen scientists is submitted to a database containing 23 year worth of data on hundreds of sampling sites maintained by The Meadows Center for Water.

The Stream Team group responsible for water quality monitoring on the San Marcos River is “The San Marcos River Rangers” who have been monitoring the San Marcos River on 19 sites since 1995.

Rachel Sanborn, the leader of the River Rangers, has been involved with Texas Stream Team for almost 20 years.

“I think volunteering in this capacity strengthens the idea of local responsibility for local resources,” said Rachel, when discussing the benefits of joining Texas Stream Team. “Rather than relying on outside forces such as TCEQ to note and find problems, this is a much more proactive type of involvement. I stress that data collection is our best defense against the inevitable development by clearly demonstrating what the water quality has been, and what standard must be maintained.”

Texas Stream Team relies on its partner organizations across the state to support local Stream Teams by purchasing monitoring equipment and supplies, creating monitoring plans, and organizing trainings. The San Marcos River Rangers are supported by The San Marcos River Foundation, a non-profit organization dedicated to protecting the flow, purity, and natural beauty of the San Marcos River.

“The Stream Team’s volunteers are the perfect way to collect data. All of the volunteers let us know when they see anything unusual that needs to be checked out while they are out doing their water testing. The long term records of any changes in water quality will be useful for generations to come,” said Dianne Wassenich, the Executive Director of SMRF.

Many of the San Marcos River Rangers are Texas State University Students who volunteer with Texas Stream Team to gain experience and technical skills. Texas Stream Team supports the goals of many students who pursue a career in water resource management or environmental science. Some of these students move on to start their own Stream Teams after graduation and others continue to collect data on the San Marcos long after they have graduated. Whatever the case, the data collected by these Texas Stream Team Citizen Scientists will help to ensure that the San Marcos River stays just as beautiful for future Texans.

Citizen Scientist Spotlight: Jenna Walker



Jenna Walker first became involved with Texas Stream Team in spring of 2011, while enrolled as a Geology graduate student at Texas State University. She learned about the program through the Environmental Conservation Organization and was interested in getting more involved with the protection of Texas Rivers. She was eager to learn more about water quality monitoring and to get hands on training in the field. She was first assigned a site at Spring Lake on the San Marcos River, the location of Meadows Center. Jenna loved having an excuse to make a monthly visit to the gorgeous spot every month and would even bird watch or go for a swim while sampling.

Jenna believes her experience monitoring early on helped her to secure her current position as the City of Waco Watershed Administrator, where she works to improve the water quality in the Bosque Watershed. Jenna manages a team of Stream Team Volunteers spanning from Stephenville to Waco and additionally carries out other responsibilities related to education and outreach. In her time not spent monitoring, she and her husband, Shane, are beekeepers who love to travel and explore the outdoors.

Jenna's is a 7th generation Texan that originates from the Hill Country; this is where her enthusiasm for water quality monitoring stems from. Growing up, her most found childhood memories include exploring the rivers, lakes and swimming holes of Central Texas with her family. This instilled the belief that protecting Texas Rivers is not only vital for Texans' current and future drinking water needs but also to sustain our state's cultural heritage and natural habitat.

The following article was submitted by Texas Stream Team Citizen Scientists, Melissa Lam. Melissa wrote this article for her high school's newsletter. If you have a story you would like to share about your experience as a Texas Stream Team Citizen Scientist, please email us at txstreamteam@txstate.edu.



Melissa Lam and her family monitoring their site in Sugar Land. Photo courtesy of Keep Sugar Land Beautiful

Grow up as a TST Citizen Scientist

By: Melissa Lam

If you happen to drive by the bridge over in old town Sugar Land on a random Sunday morning and spot a group of three people kneeling on a pink flowered picnic blanket at the reed-lined bank of the stream with a bunch of bottles and colored liquids, don't assume they are suspicious or up to no good. It's my mom, my brother, and I, taking the monthly stream water quality test for our home city of Sugar Land.

We've been part of the Texas Stream Team for 5 years, ever since I was in eighth grade. Even though it has already been 5 years, I am just as dedicated to Stream Team as I was when I first started. I admit, there are some days when I absolutely refuse to wake up early and bitterly complain

about the Texas weather and mosquitos (they are nasty!), but by the time we arrive at our assigned water testing site, everything will be alright. The scenery is different every time, and it's interesting—sometimes the grass is cut, new wildflowers and weeds have bloomed; wildlife appears from time to time—fish, turtles, birds, crickets and dragonflies—and we occasionally even meet new people, fishing or offering their dog a nice dip in the cool water. One time we had a very cute dog who kept circling around us, trying to get us to play with him; the other time we saw the stream completely covered by water lettuce and water hyacinth that we hardly found any open water to collect the water sample.

Participating in the Stream Team effort ultimately gives me a sense of pride. It's like hitting two birds with one stone--I get to help my community and help myself at the same time. Helping my community is obvious: Sugar Land uses surface water for its municipal water supply system and maintaining stream water quality impacts its citizen's everyday life. Water monitoring is therefore very important. Though it may sound weird to say that it helps me too, it is actually very real, in many aspects. For example, water testing has given me a leg-up in chemistry. I learned how alkaline potassium iodine (KI) reacts with manganous sulfate ($MnSO_4$) in a double reaction in which K_2SO_4 precipitates, forming that yellowish color in the bottle. It has also helped me in scientific lab procedure in general, which I will continue to use throughout high school and eventually college. I say I don't do it for the hours, but Stream Team gives me countless, dependable monthly volunteer hours to earn the community service medal from my high school.

In the past 5 years, we've outlasted 3 Sugar Land Water Facility Department supervisors and a few Texas Stream Team Volunteer Coordinators. Although it is sad to watch them move on to different jobs, it personally brings me a sense of self-accomplishment when I realize that my family and I can dutifully continue to contribute to this great effort to serve our community.

So, what's not to love about doing this job? The schedule is lax, the people are brilliant, and the experience is rewarding. In fact, I'm just about to head over to my site right now!

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Aquatic Plant Series: Texas Wild Rice (*Zizania texana*)

By: Christina Duron – Texas Stream Team Intern

Habitat and Range: Texas Wild Rice is endemic to Texas. Its natural growth is restricted to one and a half miles of the headwaters of San Marcos River located in Hays County, Texas. (Handbook of Texas)

Description: Texas Wild Rice is a coarse perennial forage plant that attaches itself firmly to the gravelly streambed by short spongy roots that serve as a study anchor. These entangled roots produced into a plant clone. The base of this clone can range from a few square centimeters to as big as a square meter. New plants are produced at the end of the short coarse runners. Flowering heads are normally developed in the spring and fall. The plant grows completely submerged in .3 to 2 meters of clear constant temperature water. The flowering head rises .3 to .6 of a meter above the current. (Handbook of Texas)



Importance: This rare and endangered plant is protected by federal regulations. In conservation of Texas Wild Rice we can insure that the San Marcos River is kept in prime condition.