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Introduction

In 1917, the voters of Texas, recognizing the necessity of developing and conserving the State’s water resources and inspired by devastating floods of 1913 and 1914, passed a Constitutional amendment allowing the Legislature to create special purpose political subdivisions of the State to serve regional areas, generally coincidental with river basins and to be generally known as river authorities. The San Antonio River Authority (SARA), created in 1937, is one of many such active river authorities in the State of Texas. SARA’s jurisdiction covers all of Bexar, Wilson, Karnes and Goliad Counties.

In 1991, the Texas Legislature passed the Texas Clean Rivers Act [Senate Bill 818]. The Act was intended to move Texas towards comprehensive water resources planning and management to ensure the integrity of the State’s surface water supply over the long term. The Clean Rivers Act requires an ongoing assessment of water quality issues and management strategies statewide. The Act established the Texas Clean Rivers Program (CRP) under the Texas Water Commission, now the Texas Commission on Environmental Quality (TCEQ). The program is funded by fees assessed on wastewater discharge permittees and water rights holders as well as through TCEQ’s own state appropriations.
The San Antonio River Basin

The San Antonio River Basin (Basin) is one of 23 major basins in Texas and is located in South Central Texas. The Basin contains over 8,800 miles of streams and drains over 4,194 square miles. Although SARA’s political jurisdiction includes Bexar, Wilson, Karnes and Goliad Counties, the Basin includes parts of Atascosa, Bandera, Comal, Dewitt, Guadalupe, Kendall, Kerr, Medina, Refugio and Victoria Counties. There are six major perennial streams in the San Antonio River Basin: San Antonio River, Cibolo Creek, Leon Creek, Medina River, Medio Creek and Salado Creek.

The San Antonio River is the Basin’s major river, flowing 240 miles from its headwaters in San Antonio, Bexar County, to its confluence with the Guadalupe River in Refugio County. Approximately 11 miles downriver of the confluence, the Guadalupe drains into the San Antonio Bay and the Gulf of Mexico.

The upper part of the San Antonio River Basin begins in the northeast corner of Bandera County. This portion of the Basin is dominated by the Edwards Plateau ecoregion (Texas Hill Country) characteristics and is mostly rural with light ranch and recreational use. Changes in land use, due to development and suburbanization, are major factors affecting water quality in this area. Many of the streams within this portion of the Basin are intermittent and the riparian vegetation is relatively undisturbed by development.
The central part of the Basin in Bexar County includes the heavily urbanized San Antonio metropolitan area. This area is densely populated and covered by residential, commercial and industrial activities. This part of the Basin is located in the Texas Blackland Prairie and is dominated by deep clay soils, which are gently sloping. Although many of the streams within the City of San Antonio are channelized and have limited riparian vegetation, a comprehensive multi-year project has been completed to restore and enhance 13 miles of the San Antonio River, from Hildebrand Avenue south to Loop 410 South. Restoration efforts associated with San Antonio River Improvement Project are expected to help oxygenate the water, improve water quality, reduce sediment in the water, and restore the structural diversity of the river.
The lower part of the Basin in Wilson and Karnes Counties is mostly rural and flows southeastward through the Gulf Coastal Plains of the Central Plains Province ecoregion.

Although the land use in this area is primarily range, crop and pastureland, increased development associated with the oil and gas productions continues to increase.

The lower Basin is rural and sparsely populated. Land uses are predominantly agricultural and ranching. Streams and creeks in this area are lined with dense riparian vegetation. In this portion of the Basin, the San Antonio River channel becomes more entrenched with steep, muddy banks, and the river is generally deeper. The majority of the lower Basin is in the East Central Texas Plains ecoregion also known as the South Texas Brush Country. The southernmost end of the Basin is in the Western Gulf Coastal Plains ecoregion.
The San Antonio River Basin is a dynamic ecosystem. The rivers, creeks, and streams have varying water characteristics, land uses, geology, and ecoregions. Developing a comprehensive Coordinated Monitoring Schedule (CMS) that supports the various basin and statewide objectives requires intensive planning and coordination.

Each spring, monitoring agencies within the San Antonio River Basin participate in a Coordinated Monitoring Meeting (CMM). The CMM is a working meeting that addresses: stakeholder concerns, comments, new and existing cooperative efforts, and emerging priorities of the Basin. During the meeting, the upcoming annual CMS is reviewed and evaluated, segment by segment, station by station. This process ensures that Basin monitoring remain effective, viable, and prevent duplication, while maximizing the monitoring resources of the Basin. The CMS identifies sampling locations, associated maps, frequency of collections, parameters to be analyzed, as well as any relevant comments for sampling.

As a follow-up to the CMM, a “Summary of Changes” is produced. The summary reflects several things: what decisions were made, why a site was dropped or added, why the frequency was altered, why a parameter was dropped or added, why a monitoring need was unable to be addressed, and any future monitoring recommendations.

Participants in the CMS process continue to communicate schedule changes until the schedule is finalized. Once the CMS is finalized, the information is incorporated into a TCEQ approved Quality Assurance Project Plan. Past and current CMS are located at https://cms.lcra.org/.

In 2013, water quality monitoring was conducted at 78 stations throughout the San Antonio River Basin.
SAN ANTONIO RIVER BASIN 2013 CLEAN RIVERS PROGRAM MONITORING

Legend
Monitoring Stations
- CRP
- CRP Systematic
- CRP-SARA SM
- CRP-BA
- SARA SM
- GBRA
- TCEQ
- Wastewater Outfalls
- Rivers and Creeks

Subwatersheds
- Cibolo
- Leon
- Lower San Antonio
- Medina
- Medio
- Salado
- Upper San Antonio

Disclaimer:
The GIS material included with this transmittal is made available as a public service. The maps and/or data are to be used for reference and/or informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. The data herein shall be used and relied upon only at the user's sole risk, and the user agrees to indemnify and hold harmless the City of San Antonio Civil Authority and/or its employees from any claims, liabilities, losses, or damages arising out of the use of this data.
Water Quality Monitoring Programs

The biennial Texas Integrated Report for Clean Water Act, sections 305(b) and 303(d) (IR), are the primary source of information used to guide the CRP monitoring programs in the San Antonio River Basin. Information in the documents describes the status of the State waterbodies, as required by the Federal Clean Water Act. In the development of the IR, the TCEQ assesses available data and summarizes water quality improvement, concerns for public health, fitness for use by aquatic species, specific pollutants and their possible sources, and areas where additional data could be needed. The 2012 IR is available on the TCEQ's Surface Water Quality Monitoring website located at http://www.tceq.texas.gov/waterquality/assessment/waterquality/assessment/12twqi/twqi12. The TCEQ is currently working on the draft 2014 IR. When available, information in the draft IR may also be utilized to adjust current and future monitoring activities.

The CRP and its SARA funded companion monitoring program, SARA Stream Monitoring, together with the TCEQ, Bandera County River Authority and Groundwater District and GBRA collect water quality data at 78 sampling stations throughout the San Antonio River Basin. In order to balance the needs of multiple programs of the State, monitoring activities in the San Antonio River Basin are divided into routine and systematic monitoring efforts.

Routine monitoring is conducted to document long-term water quality conditions and characteristics over a variety of seasonal and flow conditions at fixed stations throughout the Basin. The routine monitoring network collects physicochemical, biological, and hydrological data at varying frequencies throughout the year. In addition to classified perennial waterbodies, smaller unclassified waterbodies are also monitored to evaluate and define water quality and to respond to perceived risk for pollution.

Systematic watershed monitoring is similar to routine monitoring but with a shorter duration (1 to 2 years) and is designed to screen waters that are not routinely monitored. This type of monitoring can follow either a rotating-watershed approach or an intensive watershed evaluation to check the status of water bodies (improvements or concerns).

Guadalupe bass, *Micropterus treculii* and Mexican tetra, *Astyanax mexicanus*
Monitoring activities include field measurements, bacteria, 24-hour measurements and conventional chemical parameters. Field measurements include dissolved oxygen (DO), water temperature, pH and specific conductance. DO is crucial for the survival of water organisms. As the amount of dissolved oxygen drops below normal levels in waterbodies, the water quality is adversely affected. Water temperature affects the ability of water to hold oxygen. As the temperature rises, the amount of dissolved oxygen in the water decreases. In extreme cases, this can lead to fish kills. pH is a measure of how acidic or basic the water is. Shifts in pH can affect other aspects of water chemistry by increasing the solubility of various pollutants which in turn can be more easily absorbed by aquatic organisms. Most organisms have a preferred pH range of 6 to 9. Conductivity is a measure of the ability of water to pass an electrical current and is also affected by temperature; the cooler the water, the lower the conductivity. Water conductivity is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge).

Escherichia coli (E. coli) bacteria monitoring of the Basins surface waters is important to ensure they are safe for swimming or other water sports that involve direct contact with the water, especially with the possibility of ingesting it. Although E. coli bacteria are not typically pathogenic in and of themselves, elevated E. coli concentrations are an indicator of recent fecal matter contamination. Although it is possible to swim in water that does not meet this standard without becoming ill, the probability of illness is higher.
Each waterbody in the San Antonio River Basin is assigned an aquatic life use (ALU). Support of the ALU is based on several components including assessment of 24-hour dissolved oxygen, flow, and indices for habitat, benthic macroinvertebrate and fish community. The five ALU categories are: exceptional, high, intermediate, limited, or minimal aquatic life use.

Aquatic life uses are protected by an average DO criterion (measured over 24-hours) and absolute minimum criterion. Evaluation of fish, benthic and habitat quality is critical to any assessment of ecological integrity. Biological characteristics are monitored throughout the San Antonio River Basin and are assessed against the criterion as stated in the Texas Surface Water Quality Standards (TSWQS) for that waterbody. The ALU is not supported when these criteria are not attained. The TSWQS are developed by the TCEQ to maintain the quality of surface waters in Texas so that it supports public health and enjoyment and protects aquatic life, consistent with the sustainable economic development of the state.
Conventional chemical parameters include total Kjeldahl nitrogen (TKN), nitrate, nitrite, ammonia, total phosphorous, chlorophyll-a, sulfate, chloride and total suspended solid. The analysis of nutrients in water samples is needed to help characterize the ambient levels and to determine whether the waterbody exhibits a potential for generating excessive plant growth which, in turn, can lead to eutrophication and problems with dissolved oxygen. This data also support TCEQ's efforts to develop numeric nutrient criteria for the State's surface waters. Some key nutrient parameters are: total nitrogen, total Kjeldahl nitrogen, nitrite, nitrate, ammonia-nitrogen, and total phosphorus. In addition, chlorophyll-a is analyzed to determine the level of algal phyto-pigments as an indicator of algal biomass in the water column and is very important in assessing the health of the waterbodies throughout the San Antonio River Basin. Chloride, sulfate and total suspended solids are analyzed to determine sediment loading and document amounts and dispersion of pollutants. The complete list of SARA 2014 CRP monitoring parameters can be view at http://www.sara-tx.org/major_initiatives/water_monitoring/clean_rivers_program/2014_parameters.php
Assessment of the Basin

The TCEQ publishes the TSWQS for each river basin in Texas. The water data collected as part of the San Antonio River Basin Clean Rivers Program assists the TCEQ in determining the extent to which the Basin waters meet the objectives of the Clean Water Act (CWA). Waters not meeting the TSWQS are identified in the IR. The 2012 IR was approved for submission by the TCEQ on February 13, 2013. It was submitted to the Environmental Protection Agency on February 21, 2013 and approved May 9, 2013.

A waterbody is listed as “impaired” if the data shows the standards are not being met. A “concern” may be also identified for near non-attainment of the standards, or if screening levels indicate marginal water quality for a given parameter exists. TCEQ has developed the Guidance for Assessing and Reporting Surface Water Quality in Texas (Guidance) which contains steps to be taken when assessing waterbodies which are not impaired but where data indicates potential water quality “concerns”. The most current Guidance can be viewed on the TCEQ’s web site located at http://www.tceq.texas.gov/waterquality/clean-rivers/guidance/index.html.

Every five years, SARA publishes a summary report as part of the CRP. The SARA 2013 Basin Summary Report contains a comprehensive review of water quality, programs and activities in the basin. This report is available on SARA’s web site located at http://www.sara-tx.org/public_resources/library/documents/water_quality_monitoring/2013BSR-web.pdf.
The TCEQ 2012 IR identifies the San Antonio River Basin as having 13 classified segments, 20 non-classified stream segments and four reservoirs. For 2013, CRP partners collected water quality samples at 78 surface water quality monitoring stations throughout the San Antonio River Basin.

The most substantial water quality issues in the Basin include E. coli, depressed dissolved oxygen, Polychlorinated biphenyls (PCBs) in edible tissue and fish and macrobenthic community impairments, several concerns have also been identified. An “impairment” exists if a waterbody does not support its designated uses. If the waterbody is close to violating the water quality standard or screening level, the waterbody is identified as having a concern. A summary of the impairments and concerns throughout the Basin are identified in the summary table below.

### San Antonio River Basin Water Quality Impairment and Concern 2012 Texas Integrated Report

<table>
<thead>
<tr>
<th>Segment</th>
<th>Name</th>
<th>Impairment or Concern</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>Lower San Antonio River</td>
<td>Impairment / Concern</td>
<td>E. coli, Fish Community / Nitrate, Total Phosphorus, Ortho-Phosphorus, habitat, Chlorophyll-a</td>
</tr>
<tr>
<td>1901A</td>
<td>Escondido Creek</td>
<td>Concern</td>
<td>E. coli</td>
</tr>
<tr>
<td>1901B</td>
<td>Cabeza Creek</td>
<td>Concern</td>
<td>E. coli</td>
</tr>
<tr>
<td>1901C</td>
<td>Hord Creek</td>
<td>No impairments or concerns</td>
<td></td>
</tr>
<tr>
<td>1902</td>
<td>Lower Cibolo Creek</td>
<td>Impairment / Concern</td>
<td>E. coli, Fish Community / Nitrate, Ortho-Phosphorus, Total Phosphorus</td>
</tr>
<tr>
<td>1902A</td>
<td>Martinez Creek</td>
<td>Concern</td>
<td>Depressed Oxygen, E. coli, Nitrate, Total Phosphorus</td>
</tr>
<tr>
<td>1902B</td>
<td>Salatrillo Creek</td>
<td>Concern</td>
<td>Nitrate, Ortho-Phosphorus, Total Phosphorus</td>
</tr>
<tr>
<td>1903</td>
<td>Medina River Below Medina Diversion Lake</td>
<td>Impairment / Concern</td>
<td>E. coli / Ammonia, Nitrate, Ortho-Phosphorus, Total Phosphorus,</td>
</tr>
<tr>
<td>1904</td>
<td>Medina Lake</td>
<td>No impairments or concerns</td>
<td></td>
</tr>
<tr>
<td>1905</td>
<td>Medina River Above Medina Lake</td>
<td>Impairment / Concern</td>
<td>Fish Community / Habitat</td>
</tr>
<tr>
<td>1905A</td>
<td>N. Prong Medina River</td>
<td>Concern</td>
<td>Habitat</td>
</tr>
<tr>
<td>1906</td>
<td>Lower Leon Creek</td>
<td>Impairment / Concern</td>
<td>PCBs in edible tissue-Restricted and No Fish Consumption, Depressed Oxygen / Cadmium and Silver in Sediment, Fish Community, Chlorophyll-a</td>
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<tr>
<td>1906A</td>
<td>Helotes Creek</td>
<td>No impairments or concerns</td>
<td></td>
</tr>
<tr>
<td>1907</td>
<td>Upper Leon Creek</td>
<td>No impairments or concerns</td>
<td></td>
</tr>
<tr>
<td>1908</td>
<td>Upper Cibolo Creek</td>
<td>Impairment / Concern</td>
<td>Chloride, E. coli / Ortho-Phosphorus, Total Phosphorus, Habitat</td>
</tr>
<tr>
<td>1909</td>
<td>Medina Diversion Lake</td>
<td>No impairments or concerns</td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td>Salado Creek</td>
<td>Impairment / Concern</td>
<td>E. coli, Fish and Macrobenthic Community, Depressed Oxygen / Nitrate, Chlorophyll-a</td>
</tr>
<tr>
<td>1910A</td>
<td>Walzem Creek</td>
<td>Impairment</td>
<td>E. coli</td>
</tr>
<tr>
<td>1910B</td>
<td>Rosillo Creek</td>
<td>No impairments or concerns</td>
<td></td>
</tr>
<tr>
<td>1910C</td>
<td>Salado Creek Tributary</td>
<td>Concern</td>
<td>E. coli</td>
</tr>
<tr>
<td>1910D</td>
<td>Menger Creek</td>
<td>Impairment</td>
<td>Depressed Oxygen, E. coli</td>
</tr>
<tr>
<td>1910E</td>
<td>Beitel Creek</td>
<td>Concern</td>
<td>Depressed Oxygen, E. coli</td>
</tr>
<tr>
<td>1911</td>
<td>Upper San Antonio River</td>
<td>Impairment / Concern</td>
<td>E. coli, Fish Community / Nitrate, Ortho-Phosphorus, Total Phosphorus, Habitat</td>
</tr>
<tr>
<td>1911B</td>
<td>Apache Creek</td>
<td>Impairment / Concern</td>
<td>E. coli / Depressed Oxygen</td>
</tr>
<tr>
<td>1911C</td>
<td>Alazan Creek</td>
<td>Impairment / Concern</td>
<td>E. coli / Ammonia, Chlorophyll-a</td>
</tr>
<tr>
<td>1911D</td>
<td>San Pedro Creek</td>
<td>Impairment / Concern</td>
<td>E. coli / Depressed Oxygen, Nitrate</td>
</tr>
<tr>
<td>1911E</td>
<td>Six Mile Creek</td>
<td>Impairment</td>
<td>E. coli</td>
</tr>
<tr>
<td>1911F</td>
<td>Calaveras Reservoir</td>
<td>No impairments or concerns</td>
<td></td>
</tr>
<tr>
<td>1911G</td>
<td>Braunig Reservoir</td>
<td>No impairments or concerns</td>
<td></td>
</tr>
<tr>
<td>1911H</td>
<td>Picosa Creek</td>
<td>Impairment</td>
<td>Depressed Oxygen</td>
</tr>
<tr>
<td>1912</td>
<td>Medio Creek</td>
<td>Concern</td>
<td>Nitrate, Ortho-Phosphorus, Total Phosphorus</td>
</tr>
<tr>
<td>1912A</td>
<td>Upper Medio Creek</td>
<td>Concern</td>
<td>Nitrate, Ortho-Phosphorus, Total Phosphorus</td>
</tr>
<tr>
<td>1913</td>
<td>Mid Cibolo Creek</td>
<td>Impairment / Concern</td>
<td>Depressed Oxygen / Ammonia, Nitrate, Ortho-Phosphorus, Total Phosphorus</td>
</tr>
</tbody>
</table>
Projects in the San Antonio River Basin

The San Antonio River Authority, TCEQ and CRP partners are passionately committed to the preservation, protection, and sustainability of waterbodies in the San Antonio River Basin. Water quality issues in the Basin are complex in nature, have a substantial cost to address them, and often require years of support from stakeholders, programs, and funding sources. As a result, successfully addressing pollution sources to achieve water quality standards must be approached in holistic watershed manner. Watershed planning, projects, programs and efforts in the Basin are strategically focused on fully assessing the causes and sources of the impairments and concerns, then prioritizing restoration and protection efforts to address the issues. The following San Antonio Basin projects and efforts allow for an integrated evaluation of physical, chemical, and biological characteristics of aquatic systems in relation to human health concerns, ecological protection and conditions, stream standards and designated uses.

Upper San Antonio River Watershed Protection Plan (WPP) Update

In 2000, the upper eight miles of the Upper San Antonio River along with Salado Creek were identified as impaired for contact recreation due to elevation bacteria. Walzem Creek was added to the listing in 2002. These waterbodies were included in the three Total Maximum Daily Loads (TMDL) efforts to address the elevated levels in Upper San Antonio River Watershed. The TCEQ adopted these TMDLs on July 25, 2007; the EPA approved them on September 25, 2007.
In 2004, the Bexar Regional Watershed Management Partnership (BRWM) initiated a WPP for the upper eight miles of the San Antonio River. This project complemented the TMDL activities by establishing a framework for local implementation planning to address stormwater and nonpoint source contributions in the urbanized portion of the watershed.

In 2006, with extensive stakeholder input from the BRWM, the San Antonio River Authority prepared a draft WPP. The final watershed protection plan was published in December 2006.

In an effort to continue to enhance the urban reaches of the Upper San Antonio River and improve and protect water quality, SARA’s proposal to update and revise the 2006 Upper San Antonio River WPP was accepted by the TCEQ in October 2011. The goal of this project is to update the Upper San Antonio River WPP to reflect progress made and to provide significantly more detailed proposals for implementation of Best Management Practices (BMPs) to reduce non-point source pollution of bacteria and nutrients to achieve the necessary reductions in loads in the project area.

SARA and local partners are currently working to develop a suite of BMPs recommended for implementation in the WPP area. Recommendation will include an inventory of suitable locations for BMP implementation, and storm event water quality monitoring to evaluate potential bacteria load reductions at priority candidate sites and verify the scale of implementation required to meet water quality standards.

**Upper San Antonio River WPP Zoo Best Management Practices**

The 2006 Upper San Antonio River WPP and 2007 TMDL identified the San Antonio Zoo, located in Brackenridge Park, as one of the more significant point sources for bacteria loading into the Upper San Antonio River. Modeling during the TMDL processes indicated that treatment of the San Antonio Zoo’s discharge would bring most of the Upper San Antonio River into compliance with surface water quality standards, except under periods of prolonged wet weather when bacteria loads were more influenced by urban runoff (Miertschen, et al, 2006). The majority of stakeholders were sure they did not want chlorine disinfection, but what disinfection method(s) would be most cost effective and environmental friendly? Besides disinfection, what other effective Best Management Practices (BMP) could be implemented to decrease bacteria loading to the Upper San Antonio River?
Under dry weather conditions, the zoo discharges about 1,700 gallons per minute or about 2.5 million gallons of water per day to the San Antonio River. Recognizing the need for a BMP to address the issue of animal wastes, a project was initiated to reroute the zoo animal husbandry waste streams to a new 6-foot diameter wet well which would then be drained into the SAWS sanitary sewer main. The large size of the wet well was installed to accommodate the hippo holding tank, which is emptied daily. Historically, the wastewater flow would be released from Zoo into the storm drains which would ultimately flow into San Antonio River. Relocation and modification of the hippo enclosure and rerouting of waste stream was completed in 2004.

To help address the high levels of bacteria in the San Antonio River above Loop 410, Klotz Associates assisted the City of San Antonio with planning, design, and construction of an ultraviolet (UV) water treatment plant to disinfect zoo discharge into the San Antonio River. The ultraviolet disinfection process is housed in a water treatment plant adjacent to the zoo outfall. The peak plant capacity will be 3.88 mgd (for “dry weather” flows) with stormwater being by-passed around the plant. Design was completed in 2011; construction is expected to be finished in early 2014.

SARA will conduct pre and post bacteria water quality monitoring at thirty five monitoring sites upstream and downstream of the UV facility discharge point. Pre-monitoring, sampling just prior to the facility becoming operational, will set a base-line by which to measure bacteria changes after the UV facility becomes operational. Once the facility becomes operational, bacteria monitoring will be conducted twice daily for one week at each of the monitoring sites.

Data collected during this intensive monitoring effort will be used to generate maps showing pre-disinfection bacteria levels and post-disinfection levels by site. The data will be compared to the model results developed during the development of the Upper San Antonio River Total Maximum Daily Load. The intensive monitoring may also identify areas where sources other than the Zoo discharge are contributing to the elevated bacteria levels in the Upper San Antonio River.

**Upper San Antonio TMDL I-Plan**

With EPA approval of the Upper San Antonio River, Salado Creek and Walzem Creek TMDLs, on September 25, 2007, these waterbodies became part of the State’s Water Quality Management Plan. A requirement of the TMDL is the development of an Implementation Plan (IP) to address the bacteria impairment. In moving forward, the TCEQ TMDL Program has contracted with Texas A&M AgriLife Research to facilitate the IP process for the Upper San Antonio TMDLs. This process was initiated early in early 2013.
The most significant difference between Texas and many other states is in the local stakeholder development of the IP rather than by the state or Environmental Protection Agency. The stakeholders in TMDL watersheds are given the responsibility to develop a plan to improve water quality. Stakeholder groups consist of members, who represent interests in the watershed, including: private citizens, municipalities, counties, environmental interest groups, agricultural interests, and State and federal agencies. The IP development involves public meetings to discuss the process and formation of committees (Coordination Committee and technical workgroups). The groups will have the responsibility to determine the voluntary activities stakeholders will conduct to address specific sources or general actions needed to reduce bacteria loads. These activities require numerous meetings to work through all of the issues and represent a high level of commitment from the stakeholders. The committee will also develop the draft IP which includes implementation activities over the next few years. After TCEQ approval of the IP, stakeholders will meet periodically to measure their progress and determine whether the plan needs to be revised (adaptive management). Success depends on everyone doing their part.

The result of this process is an IP that has the support of the stakeholders in the watershed and an agreement to sustain the effort through time with the goal of reduce bacteria concentrations, and ultimately to reach the contact recreation standard. This process fosters stewardship of the waterbody at the local level which provides the true reasonable assurance that water quality will be improved. Additional information can be obtained from the TCEQ’s website located at http://www.tceq.texas.gov/waterquality/tmdl/34-uppersanantoniobac.html.

**Lower Leon Creek Use-Attainability Analysis (UAA)**

In 1999, the Lower Leon Creek, Segment 1906, was identified as impaired based on depressed levels dissolved oxygen (DO). As a result of the listing, the TCEQ Total Maximum Daily Load (TMDL) team initiated a sampling project in 2008 to evaluate the low DO concentrations in Lower Leon Creek. The 24-hour DO data collected as part of the TMDL indicated that a site-specific standards change may be appropriate. Monitoring data indicates the creek meets neither the 24-hour DO average criterion (5.0 mg/L) nor minimum criterion (3.0 mg/L) that are presumed for perennial streams. Data generated for the UAA will be provided to the TCEQ to determine if a TSWQS adjustment is merited.
A sub-element under the Lower Leon Creek UAA is to collect 24-hour DO and flow data to either confirm or remove Menger Creek (Salado Creek Watershed) and Picosa Creek (Upper SAR Watershed) from the TCEQ 303(d) List. Both Menger Creek and Picosa Creek are currently identified as impaired and not supporting the high aquatic life use designation based on depressed levels of instantaneous DO concentrations (grab samples).

The objective of the project is to conduct 24-hour DO, routine chemistry and biological monitoring (fish, benthic and habitat) throughout the segment. The TCEQ will evaluate the data and assign the appropriate aquatic life use and DO criterion for Lower Leon Creek. To assess attainment with surface water standards for dissolved oxygen criteria, the study will also collect 24-hour DO and flow data on Menger and Picosa Creeks. The project will begin early 2014.
In 2009, the City of Boerne was awarded a Clean Water Act Section 319(h) grant by the TCEQ to develop the Upper Cibolo Creek Watershed Protection Plan (UCC WPP) to address bacteria impairments in the watershed. The UCC WPP was approved by the EPA in September 2013. The UCC WPP report can be viewed at the City of Boerne’s website located at http://www.ci.boerne.tx.us/.

Utilizing the watershed approach, stakeholders were able to identify several potential bacteria and nutrient pollution sources in the watershed, including: agricultural land management practices, On-Site Sewage Facilities (OSSFs), populations and impacts of feral hogs, spatial distribution of axis deer, pet waste, cliff swallow nesting sites, and seasonal and spatial variations in waterfowl abundance. As sources were identified it became evident that they could be grouped into 3 broad categories: Wildlife, Agriculture and Urban/Residential.

Using modeling information, stakeholders were able to identify Best Management Practices (BMP) and assess their potential impact on water quality in the watershed. Two key BMPs quickly became apparent as most effective, cliff swallow nest deterrents under IH-10 bridges and urban waterfowl management at River Road Park in Boerne. However, stakeholders wished to address all pollution sources identified within the watershed and endorsed the simultaneous implementation of recommended BMPs according to the UCC WPP implementation schedule.

In 2013, the City of Boerne pro-actively developed and implemented a long-term waterfowl management plan and successfully captured and relocated 106 individual birds and initiated an egg oiling program at River Road Park and along the extended creek-side trail system. To assist with the implementation of BMPs throughout the watershed; local, state and federal technical and financial resources were identified to support individuals or organizations with their efforts. The City of Boerne hired a full time Resource Conservation Coordinator who will be the primary point of contact and liaison for any entity seeking technical or financial assistance to implement strategies as outlined in the UCC WPP. The coordinator will also work to sustain the UCC Watershed Partnership, initiate implementation efforts, pursue funding sources and technical resources; oversee water quality monitoring efforts to evaluate the effectiveness of BMPs and conduct outreach and education programs throughout the watershed.
United States Geological Survey Projects

The United States Geological Survey (USGS), in cooperation with the San Antonio River Authority, conducts various water quality and sediment investigative and characterizations studies aimed at the preservation, protection, and sustainability of the San Antonio River Basin. These studies are innovative, adaptive, and strategically focus on identifying and understanding the potential effects of various chemical compounds on the ecological health of the Basin. Once the projects are completed, the results will be published in U.S. Geological Survey (USGS) reports located at USGS website located at http://pubs.er.usgs.gov/.

USGS Emerging Contaminants Project

The USGS Emerging Contaminants Project evaluated detections, concentrations, and distributional patterns of selected compounds of emerging concerns from water quality samples collected throughout the San Antonio River Basin. The USGS Detections, Concentrations, and Distributional Patterns of Compounds of Emerging Concern in the San Antonio River Basin, Texas, 2011–12 report is located at the USGS website at http://pubs.er.usgs.gov/publication/sir20135200.

The report summarizes the number of detections, concentrations, and distributional patterns of wastewater compounds, pharmaceuticals, steroidal hormones, and sterols analyzed in samples collected from 20 sampling sites throughout the San Antonio River Basin, during 2011–12. Report results are presented for 54 wastewater compounds, 13 pharmaceuticals, 17 steroidal hormones, and 4 sterols. The report presents data for the number of detections and concentrations of individual compounds from all samples collectively and for the number of detections and concentrations of individual compounds and compound classes for each of the three sampling events throughout the study area. The report also describes basin-wide distributional patterns of detections and concentrations of all compounds to provide insight into the potential sources and transport of compounds from streams in the San Antonio River Basin.
USGS Hydraulic Fracturing Project

The process of hydraulic fracturing has contributed to the recent surge in oil and gas production across the State of Texas and has elicited a multitude of concerns about the potential risks to human and environmental health (U.S. Environmental Protection Agency, 2011). The USGS Hydraulic Fracturing Project was initiated to refine an appropriate suite of stream water-quality measurements for detecting and monitoring hydraulic fracturing fluid and produced water-derived contaminants in the Lower San Antonio River Watershed. To accomplish this goal, this project will:

• Review available data on hydraulic fracturing fluids and existing data from monitoring sites and previous studies within the watershed to develop and refine a priority list of analytical schedules;
• Collect and analyze surface water and sediment samples for compounds known to be associated with hydraulic fracturing fluids and produced waters resulting from oil and gas production activities. This study will provide a much needed baseline data for a broad spectrum of contaminants that are associated with hydraulic fracturing and petroleum production in general, in the lower San Antonio River watershed.

USGS Leon Creek Sediment Analysis Project

The Texas Department of Health has issued a fish consumption advisory stating the consumption of fish from Leon Creek may pose a threat to human health due to polychlorinated biphenyls (PCBs). This advisory extends from Old U.S. Highway 90 bridge downstream to the Loop 410 bridge in South Bexar County. Previous sediment sampling confirms the presence of trace elements, pesticides and PCBs in Lower Leon Creek at and below the former Kelly Air Force Base (AFB). Unfortunately it is unclear if the contaminants originate from the AFB or from the watershed upstream of the AFB. The USGS Leon Creek Sediment Analysis project will conduct both streambed and suspended sediment sampling and analysis for contaminants with special focus on PCBs to determine sources.
USGS Westside Creek Sediment Study Project

The Westside Creeks are a cluster of tributaries to the San Antonio River that flow through some of San Antonio’s oldest Westside neighborhoods. These communities have a rich historical and cultural background. In 1954, channel modifications to portions of Alazan, Apache, Martinez, and San Pedro Creeks resulted in urban creeks lacking natural ecosystems and did not encourage recreational use by the surrounding community. SARA’s goal is to return these creeks to a more natural state while employing modern and attractive flood control structures. However, the current sediment and water quality conditions are relatively unknown. Prior to initiating restoration efforts, it is important to initially assess the creeks for ecosystem health and recreational use, which are the primary goals of restoration. The USGS characterization of the Westside Creeks will provide baseline data about current creek conditions and assist resource managers in evaluating concerns about disturbing the streambed sediment during proposed restoration activities. The project will consist of collecting sediment and water quality samples before and after storm events. Sediment samples will be analyzed for trace metals and organic contaminants such as pesticides, polychlorinated biphenyls (PCBs), flame retardants, and polycyclic aromatic hydrocarbons (PAHs). Whole-water samples will be analyzed for fish toxicity, which is an indicator of ecological health.
San Antonio River Authority Watershed Master Plans

The San Antonio River Authority (SARA) defines watershed management as a holistic approach to managing land use changes through scientifically-based master planning techniques which promote land management that respects the natural flow of water on the land and maintains natural processes in altered landscapes.

SARA utilizes a watershed management approach to create holistic watershed master plans for sub-watersheds within the San Antonio River Basin. These master plans address flooding, water quality, stream restoration, low impact development, nature-based park planning, conservation easements, stream mitigation banking and geographic information system mapping. SARA’s watershed management approach is an ongoing cycle of steps that include:

- **Planning:** Determine the watershed unit and issues to be studied and identify the stakeholders and resource personnel;
- **Data Collection:** Collect routine water quality and quantity data at specific locations;
- **Assessment and Targeting:** Compare current water quality to state and federal standards or establish desired future conditions;
- **Strategy Development:** Develop goals and strategies to maintain or achieve water quality standards and meet future demands; and
- **Implementation:** Implement goals and strategies through public policy, best management practices (BMPs) and education.

The watershed master plans take existing knowledge and utilize new computer modeling and decision matrices to develop infrastructure and BMP recommendations. SARA has been very active as the technical planning lead by making significant investments in collecting and maintaining watershed data and developing complex analytical tools and models to make scientifically sound watershed management recommendations. SARA will ensure watershed master plans and models remain updated to reflect continual changes in land uses as well as to capture improvements in available data. Emphasis will be placed on sustainable, non-structural solutions such as green infrastructure, low impact development programs and stormwater BMPs. SARA will also place emphasis on protecting and restoring instream and riparian habitat through measures such as conservation easements and development of parks and open spaces. Through its intergovernmental and community relationships, SARA uses these watershed master plan recommendations to educate the public and influence decision makers regarding land use changes, investment in capital projects and modifications to development regulations within the Basin.

SARA is working with city and county officials, community leaders, stakeholders, and other governmental agencies to develop high-level, long-range master plans for all watersheds in the San Antonio River Basin. The master plans identified below will address current and potential water quality and flooding issues in a “holistic” or integrated manner.
Cibolo Creek Holistic Watershed Master Plan

The Cibolo Creek Holistic Watershed Master Plan project was initiated in July 2013. The Watershed Master Plan will focus on flood issues, stream restoration, water quality modeling, water quality best management practices, (GIS)/mapping/remote sensing, low impact development, MS4 permitting, conservation easements, mitigation banking, and nature-based park planning. The activities of this project include identification of major flooding reaches and potential flood control (e.g. natural water way conveyance, regional stormwater detention facilities, and storm sewer improvements). The project will also identify opportunities for non-structural flood control strategies such as property buyouts, riparian buffers, land use and development recommendations, and low impact development. The project is expected to be completed in 2019.

Medina River Watershed Master Plan

This project will develop a comprehensive watershed master plan for the Medina River Watershed, including portions of Medio Creek. The Watershed Master Plan will identify major flooding reaches and look at potential mitigation solutions such as detention, channelization, and low impact development, and determine preliminary locations for regional stormwater facilities and outline a plan of implementation. The Watershed Master Plan will be conducted in three phases. Phases I and II included data collection, condition assessment and conceptual level solutions, modeling and integration of solutions with stakeholders. This project is currently entering into Phase III. This phase consists of data collection/analysis, review of water quality/pollutant sources, WQ Model Development and calibration, hydrologic & hydraulic analysis, water quality modeling, Stormwater/MS4, review of best management practices opportunities, implementation planning, and a final Phase III report.
Upper San Antonio River Watershed Master Plan

The objective of this project is the development of a comprehensive watershed master plan for the Upper San Antonio River Watershed in Bexar County. Given the watershed’s high density of development, the initial phases of the project have focused on evaluating flooding conditions and proposing feasible mitigation solutions. For the 2014 fiscal year, funding will support incorporation of sustainability, natural channel design and water quality components. The project was initiated in 2009 and is expected to be completed in 2014.

Wilson, Karnes, Goliad Watershed Master Plan

The River Authority is working to develop a holistic watershed master plan. The master plan will focus on flood issues, stream restoration, stream mitigation banking, GIS mapping, low impact development, conservation easements, nature base park planning, and water quality concerns. SARA would like to develop dynamic master plans that have long term impacts and provide multiple alternatives to implement projects in phases. Counties and municipalities will have the option to move forward with projects as their budgets allow or as funding becomes available.

SARA has coordinated with community members to select and prioritize project problematic flooding areas in Karnes and Goliad Counties. Potential stream restoration sites have also been identified in both counties. As part of the master plan, Karnes County has identified two park areas that can be developed into linear parkways and incorporate low impact development BMPs including natural channel design. In 2013, SARA worked to incorporate Wilson County into the holistic watershed master plan and will be assessing water quality, damage centers and potential stream restoration projects.

The downstream counties are also experiencing a population and development boom resulting from increased oil and gas production. SARA wants to ensure the counties and small municipalities are prepared with the low impact development tools they need to assist in maintaining a healthy watershed.

SARA would like to be proactive in obtaining conservation easements and evaluate any potential areas of stream restoration to eliminate any future land degradation sites.

Multiple 2014 stakeholder meetings will be held in Wilson, Karnes and Goliad Counties to develop partnerships and confirm we address the issues the community has as a priority. As this master plan moves forward, information will be posted on SARA’s website located at http://www.sara-tx.org/. The River Authority looks forward to developing a tool the communities can utilize and ensure we maintain a healthy watershed. The master plan is expected to be completed in 2015.
Leon Creek Holistic Watershed Master Plan

The objective of this project is the development of a Holistic Watershed Master Plan for the Leon Creek Watershed. Phase I identified 14 new Regional Storm Water Facilities Capital Improvement Projects and was completed in December 2008. Phase II efforts were completed in April 2010 and identified new Natural Water Way Conveyance Projects including stream erosion analyses and channel improvement projects. Phase III will focus on water quality and the development of watershed management guidelines to improving water quality, identify appropriate low impact development (LID) techniques, identifying stream restoration and mitigation banking opportunities, and investigating sustainable solutions to keep the watershed physically, chemically and biologically healthy. Additionally, River Health Index criteria and goals will be major considerations for the project. A final report incorporating all three phases is expected sometime in 2014.

Salado Creek Watershed Master Plan

The objective of this project is to develop a comprehensive watershed master plan for the entire Salado Creek Watershed in Bexar County tailored to the unique characteristics and issues in the watershed. Given the presence of 13 dams in the upper Salado Creek watershed, the analyses performed and the conceptual projects recommended as a result of this study include additional alternatives that may not have been considered in previous master plans. Such options include the possibility of channel modifications seeking both to increase conveyance and provided opportunities for environmental restoration. In 2014, the project will include components such as improving water quality in the creeks and rivers, appropriate low impact development techniques, and other sustainable solutions to keep the watershed physically, chemically and biologically healthy. The project is slated for completion in 2017.
Red Shiner, *Cyprinella lutrensis*
Highlighted Efforts Around the San Antonio River Basin

SARA and our partners continue to pioneer innovative and sustainable solutions that enrich the lives of the people and communities throughout the San Antonio River Basin. Environmental programs, project and efforts utilize sound scientific and engineering principles and practices are designed to identify and communicate water quality concerns in the Basin.

Instream Flow Study of the Lower San Antonio River and Lower Cibolo Creek

The San Antonio River Authority is working with our partners: Texas Parks and Wildlife, Texas Water Development Board and the Texas Commission on Environmental Quality, to develop flow recommendations to support a sound ecological environment in the Lower San Antonio River and Lower Cibolo Creek. The legislature tasked the partners with conducting scientific and engineering studies, looking at biological communities (both instream and riparian), water quality, geomorphology, hydrology, hydraulics and their interactions to recommend subsistence, base, high flow and overbank flows. Along with the flow recommendations, the timing of the flows is critical for the aquatic and riparian communities. Over the last year, SARA’s Environmental Sciences Department has been active in:

- mussel surveys to determine which mussels species are present in the study area, along with the habitats that these mussels are found,
- fish sampling to determine how different species and different aged fish of the same species utilize their habitat under different flow conditions and seasons,
- riparian studies to determine how overbanking events affect the riparian zone, including sediment deposition and erosion, plant communities along with growth and recruitment. Staff is also investigating the interaction between stream flow and shallow groundwater resources at the two riparian study sites.

Once these studies are complete, the partners will conduct data integration workshops to generate flow recommendations. A draft report will then be written and the stakeholders asked to comment and make recommendations. The final report must be completed by December 31, 2016. Additional information can be found at www.twdb.texas.gov/surfacewater/flows/instream.

Golden Orb, Quadrula aurea
Rock pocketbook, Arcidens confragosus

Riparian studies at SARA’s County Park, Wilson County
Lower San Antonio River Bacterial Source Tracking

In 2000, approximately 120 miles of the Lower San Antonio River (LSAR) were listed as impaired on the TCEQ 303(d) List of Impaired Water Bodies due to elevated levels of bacteria. In response to the listing, the TCEQ initiated a LSAR Total Maximum Daily Load (TMDL) to determine the pollutant reductions necessary to restore water quality in the river. The Lower San Antonio River TMDL identified and utilized bacterial source tracking (BST) as a possible method to determine the sources of Escherichia coli (E. coli) in environmental samples.

BST methods utilize the genetic composition of E. coli found in water and compares that genetic makeup to E. coli samples taken from known sources such as feral hogs, coyotes, cattle, humans, birds and other warm-blooded organisms found in the Basin. The Lower San Antonio River TMDL report can be viewed at the TCEQ website located at http://www.tceq.texas.gov/waterquality/tmdl/34-lowersanantoniobac.html/#tmdls. In the development of the LSAR TMDL, BST was utilized to better define sources of bacteria.

While the initial 2008 BST study provided some insight into the origins of bacterial loading, there were several questions regarding the reliability of the analytical methods. Since the original study, the science behind BST methodologies continues to evolve. Technological advancements allow for a more definitive evaluation of bacterial sources of contamination, modeling and determining which best management practices would be most cost effective and beneficial. The current BST sampling effort was initiated in August 2013 and is expected to continue for several years.
Long-Term Automated Stormwater Monitoring

Streams within the San Antonio River Basin are influenced by the quality of water that flows into them during storm events. Stormwater runoff is generated when rain flows over land or impervious surfaces (paved streets, parking lots, and building rooftops) and does not have sufficient time to percolate into the ground. As the runoff flows over the land or impervious surfaces it accumulates debris, chemicals, sediment and other pollutants that adversely affect water quality.

SARA is challenged with the task of defining stream water quality within the San Antonio River Basin during and following storm events. To accomplish this, SARA is incorporating the latest innovative procedures to collect water quality data by implementing permanent long-term automated sampling stations. Automated sampling instruments collect water quality samples throughout the duration of a storm event, make the collection effort more economically feasible, and allow for the collection of water quality samples without endangering field personnel during hazardous conditions. In 2013, SARA began construction on one permanent long-term automated stream monitoring station located at the San Antonio River at Mitchell Street, with plans on constructing four additional stations by the end of 2015 fiscal year. The purpose of these monitoring stations is to collect long-term water quality data under stormwater runoff conditions to help characterize water quality influences on the stream from non-point sources within the watershed.
Low Impact Development

In addition to permanent long-term automated stormwater monitoring stations, SARA is also promoting low impact development (LID) throughout the Basin to protect the quality and function of the aquatic environment. LID is a group of sustainable land planning and engineering design techniques for minimizing the impact of urban development and human use on the environment. To advance this goal, SARA has created various tools to assist the community with site design and resource management decisions.

In partnership with the Bexar Regional Watershed Management, SARA has developed a manual outlining standard practices for design of LID best management practices (BMPs). The manual provides technical guidance on LID BMP design, operation and maintenance, and monitoring for policy makers, designers and regulators. Multiple training sessions have been developed by SARA to facilitate use of the San Antonio River Basin Low Impact Development and Technical Guidance Manual (LID Manual). Stormwater BMP design training was provided for the community with a target audience of engineers, architects, and landscape architects. In addition, an education series has been produced to collaborate with government partners to address promotion, operation, and maintenance of LID BMPs. The LID Manual can be found on SARA’s website located at http://www.sara-tx.org/lid_services/documents/Full%20LID%20Manual.pdf

These BMPs are site-specific and perform differently depending on climate, soil type, and other physical characteristics. Therefore, in parallel efforts, SARA is collaborating with its public partners to characterize the pre-construction stormwater quality flowing off various projects which are planned to incorporate LID BMPs. Once the BMPs are installed, continued stormwater monitoring will provide data which, when compared to the pre-construction data, will indicate how well the BMPs perform locally and under varying physical conditions. In addition, SARA is monitoring the present water quality character of selected SARA facilities. This will provide the baseline to quantify BMP performance and SARA’s own stormwater footprint prior to installation of planned BMPs.

Stormwater runoff monitoring at SARA’s Guenther Building:

Top, left: Automated stormwater sampler; Top, right: Sample conduit in the stormwater drain; Above: Sampler housing unit
SARA’s Environmental Center Building demonstration rain garden

SARA is currently implementing a series of homeowner demonstration rain gardens at its Environmental Center Building. This will provide education opportunities for homeowners while at the same time providing stormwater management at SARA facilities. Rain gardens reduce runoff by allowing stormwater to soak into the ground rather than flowing into storm drains and surface water which can adversely affect water quality, diminish groundwater, cause erosion and increase flooding. Construction of the rain garden is expected to be completed in 2014.
Environmental Investigations and Fish Kills

SARA established an Environmental Investigations Team (Team) to help protect the basin from activities that pollute, damage, and degrade its natural resources. The Team was given the task to proactively locate illegal activities through the use of methods such as, helicopter fly-overs, vehicular patrol, canoe reconnaissance, and camera surveillance. Once an illegal activity is found, the Team will assess impact to public health and safety, the environment, and identify the responsible party(s).

Often, abuses of a stream are done out of unawareness. Educating polluters on how streams and aquatic communities function can be a successful approach to end further destruction. If warranted, the Team will collaborate with regulatory agencies in the local, state, or federal level to help remedy the problem. The Team’s investigations include, but are not limited to:

- complaints and concerns of citizens
- emergency spills, permit violations, and illegal dumping
- stream and riparian habitat destruction
- floodplain and encroachment violations

If a citizen sees an illegal or hazardous activity, they must first contact a local law enforcement officer who will make sure that the appropriate agencies are notified. If SARA is first notified then the Investigations Team will work with enforcement agencies and keep the caller informed.

Fish kills frequently occur in our basin to which the Team will often find itself as a first responder. Fish kills can result from natural or man-made events. The leading cause of fish kills is low dissolved oxygen (DO). Low DO oxygen can be the result of events such as algal blooms or sewage spills. Upon the discovery of a fish kill, the Team will notify Texas Parks and Wildlife Kills and Spills Team (TPWD-KAST) and the TCEQ. The dead fish are then removed from the impacted area and categorized by species and length. The data is recorded and reported to TPWD-KAST and TCEQ. TPWD-KAST will investigate to determine the responsible party and will establish restitutions based on fish species and size. TCEQ will also establish fines if necessary. All three agencies will then determine the best way to remediate a stream after a spill, leaving the least amount of disturbance. SARA staff will monitor the clean-up process and continue to monitor during recovery.

In 2013, the SARA Environmental Investigation Team participated in:

- 32 Pollution Complaints
- 6 Sewage Spills
- 6 Fish Kills
- 6 Illegal Dumping Events
- 1 Fish Relocation Event

Illegal dump site on the San Antonio River, Bexar County

Fish kill on Salado Creek
San Antonio River Basin Plan for Nature-Based Park Resources

In 2006 SARA adopted the San Antonio River Basin Plan for Nature-Based Park Resources (the “Plan”). One of the many major elements of the Plan is to increase the public awareness of the San Antonio River Basin and its recreational opportunities. During public meetings that were held during the 2013 Plan Update, partners and stakeholders have indicated the need for more paddling trails and public access to waterbodies and natural areas in the Basin.

The successful Goliad Paddling Trail, the recently opened section of the Mission Reach, and the access points SARA has already constructed on the Upper San Antonio River serve as models for future development throughout the Basin. In those areas where paddling trails and nature areas have been successfully implemented, continuous discussion with landowners to answer and address concerns has been critical.

Since 2006, the Plan and its current updated form are used as a guide for the development of park, open space and natural resources by SARA, cities and communities within the district and by the four counties. Over the last six years, SARA has purchased several properties that provide additional destinations for implementation of the Plan.

The first to be acquired was the Helton San Antonio River Nature Park, which is located at the confluence of the San Antonio River and Calaveras Creek.

The Helton-San Antonio River Nature Park is a 98-acre park, owned and operated by the San Antonio River Authority. Located just outside of Floresville, near the community of Calaveras, the park features a large pecan grove, picnic areas, restroom facilities, and river access for canoes and kayaks. Helton Nature Park is the end point of the 12-mile long Saspamco Paddling Trail. SARA staff hosted several Second Saturday’s events at the park, in 2013. The family-friendly activities give visitors an opportunity to explore nature; learning about birds, animals and plants.
The second and third properties are located at the intersection of Loop 1604 and the San Antonio River, and at CR 125 and the San Antonio River. These sites provide river access for canoes and kayaks, have visitor parking, and restroom facilities.

Keeping the momentum going, SARA is currently in the master planning phase to develop the property formerly known as the Catfish Farm into a park. This property which borders the Medina River has been a catalyst for change of the groundwater management of the Edwards Aquifer through court battles and public outcry during the mid-1990’s.

Current public feedback indicates a desire for nature trails, youth sports fields, community gardens, wildflower gardens, picnic areas, river access sites for fishing and paddling, pavilions, restrooms, and other park amenities. In addition Southwest Independent School District has expressed interest in partnering with the River Authority to offer field trips and other outdoor learning opportunities to the Catfish Farm. The master plan should be complete in the spring of 2014, and implementation soon to follow. One of the highlights of this park property will be the access to the Medina River. The section of the Medina River south of the Catfish Farm is one of the most pristine waterways in the entire San Antonio River Basin, and there are publicly accessible park resources downstream that could be partnered with to develop a paddling trail. This trail would be the first along the Medina River to submit an application for Texas Inland Paddling Trail designation.
The San Antonio River Foundation (SARF) is collaborating with SARA to complete Confluence Park. The park will be a hands-on science and technology learning center located at the convergence of the San Antonio River and the San Pedro Creek. The name “Confluence” represents not just the meeting of the river and the creek, but also merging:

- education and recreation
- art and science
- nature and technology
- past and future

The park will offer indoor and outdoor space to educate students and adults about water, ecology, and the river basin. The design plans for Confluence Park include a site-wide water catchment system, irrigation channels which distribute water throughout the park to be reused for irrigation. There will also be groundwater collection elements such as pervious parking lot pavement and a solar-powered water circulation system. SARF has embarked on a financial campaign to complete the project. Confluence Park will provide SARA with a unique opportunity to combine classroom and field trip offerings in one location. Conceptual Confluence Park pictures courtesy of the San Antonio River Foundation.

Jackson Nature Park is a 50-acre park in Stockdale, owned by Wilson County, and managed by the San Antonio River Authority. Visitors have a variety of activities to enjoy at the park including: hiking, nature study, or bird watching along with several picnic areas. In 2014, SARA staff will be hosting a series of guided nature walks which offer recreation and education.
Branch River Park is a 4.2-acre park that links Goliad's historic courthouse square to the San Antonio River. The park is near the Angel of Goliad Hike & Bike Trail and the Ferry Street River Access Site. Aside from a walking trail, the park features a pavilion, picnic tables, benches, and public restroom facilities.
SARA Wastewater Nutrient Study

Wastewater effluent and stormwater runoff can be two major sources of nutrients in the receiving waterbodies. Excessive nutrient concentrations can stimulate aquatic plant growth and negatively affect the overall health of the creeks or impoundments in the system. But at the same time, a limited supply of nutrients can reduce productivity in resources further downstream. A balanced management approach to nutrients is essential.

SARA currently has four operational wastewater treatment plants (WWTPs), namely Upper Martinez, Martinez 2, Martinez 3 and Salatrillo with a total wastewater flow of less than 10 million gallons per day that discharge into the Martinez and Salatrillo Creeks (referred to as Creeks) in the Martinez Creek Watershed.

It is anticipated that an additional WWTP will be in operation in the future. Wastewater effluent discharged from these plants form the base flows in major portions of the creeks, and are effectively the only contributors to the streams during dry weather conditions. The Martinez Creek Watershed is approximately 88 square miles in area and comprises mostly residential, industrial and agricultural land uses. With discussions of limits on the various nutrient constituents in the wastewater effluent, there is a need for analysis of the issue.

The goals of this project are to study the levels and effects of nutrients in major creeks of the Martinez Creek Watershed, understand the dynamics of effluent nutrient concentrations in the receiving creeks downstream of the WWTPs, evaluate the different contributors of nutrients in the watershed, and prioritize management strategies for preserving and/or improving the health of the Creeks and impoundments.

The first phase of the project, which started in July 2012, focused on developing dynamic water quality models using Hydrologic Simulation Program–Fortran (HSPF) to simulate existing land use conditions with self-reporting effluent data as well as with fully build out conditions over a 5-year period. This study helped to quantify sources of nutrient loadings into the Martinez Creek due to both point and non-point sources with different development scenarios.

The second phase of the study is now focusing to assess, study and make recommendations related to potential biological nutrient removal (BNR) for the WWTPs. The study will provide recommendations for the incorporation of BNR into the SARA operated WWTPs in anticipation of the upcoming new regulations. The technologies being evaluated include extended aeration/oxidation ditch type biological processes and also chemical precipitation processes for meeting the future discharge permits for nutrients. Process selection criteria will also consider cost-effectiveness and operations and maintenance friendliness of plant improvements related to BNR treatment. Mathematical treatment modeling are being used to assess the various treatment alternatives and their projected results using historical plant data and current sampling to provide benchmark plant condition information and model calibration. It is anticipated that this study will be completed by June 2014.
The Cibolo Preserve: Upper Cibolo Creek Watershed — SARA Basin
By: Ryan Bass, Resource Conservation Coordinator — City of Boerne

The Cibolo Preserve (Preserve) is a nonprofit foundation dedicated to the management of native vegetation and the preservation of unique geologic and hydrologic features within the Upper Cibolo Creek Watershed. Located in south central Kendall County adjacent to the Cibolo Nature Center in Boerne, the 521 acre Preserve contains 1.5 miles of Upper Cibolo Creek (UCC) and plays a key role in local environmental monitoring efforts to better understand water quality and quantity issues.

Established in 2008 by San Antonio philanthropist Bill Lende, the Preserve has become a unique outdoor laboratory used to conduct scientific research and promote environmental education programs. Notably, the University of Texas at San Antonio (UTSA), the Cibolo Nature Center and the Texas Parks and Wildlife Department conduct research within the Preserve. Current research focuses on surface water/groundwater interactions, seasonal waterfowl diversity, Great Blue Heron rookery monitoring, water quality analysis, post oak tree reproduction and archeology. Water quality monitoring is also conducted at the Preserve as part of the 2013 CRP monitoring efforts in the Upper Cibolo Creek Watershed.
One of the more unique and yet least understood features of the Preserve is the number, location and extent of groundwater recharge features found along this relatively short reach of the Cibolo. Oftentimes during normal flow conditions the entire volume of streamflow within UCC makes its way underground through fractures in the streambed leaving the Cibolo dry a short distance downstream of the Preserve. Researchers at UTSA’s department of Geological Sciences Center for Water Research are working to describe, simulate and document groundwater recharge rates throughout this reach of UCC.

During drought conditions streamflow through the Cibolo Preserve and the Cibolo Nature Center are maintained by effluent discharges from the two City of Boerne wastewater treatment facilities. This supplemental baseflow plays a key role in supporting downstream riparian habitat and aquatic life, including a population of Guadalupe bass that is thought to be greater than 90% genetically pure. With environmental foresight, the City of Boerne in 2010 guaranteed a minimum flow of 410,000 gallons of water per day in Cibolo Creek where it enters the Cibolo Preserve, downstream from Boerne City Park. As municipal water conservation strategies focus on ways to increase the availability and distribution of reuse water, which in turn reduces waste water discharge volumes, agreements such as this are important in order to maintain healthy aquatic systems during low flow conditions.

The Preserve is home to several distinguishing landmarks including Herff Falls, an exposed Lower Cretaceous reef formed approximately 110 million years ago. The Upper Cibolo flows across the fossilized reef where over time erosion cut through the formation and created the falls. The Preserve also contains the entrance to Cibolo Island Cave, a groundwater recharge feature located in UCCs flood plain. The cave is a direct vertical conduit to a shallow aquifer only 19 meters below the surface where groundwater flows in the opposite direction of Cibolo Creek.

The Cibolo Preserve is structured as a 501(c)(3) charitable foundation and is governed by a Board of Trustees. The Preserve, operated as a natural habitat laboratory, is not open for public access. With a commitment to stewardship, the Preserve will continue its mission of protecting land, water and wildlife along this unique reach of Upper Cibolo Creek.
Non-Native Species

Living organisms have been moving from one place to another since the beginning of time. In the natural order of things, this movement occurs relatively slow and allows for the adaptation to changes in habitat and species interactions until a natural balance is achieved. Organisms that occur naturally over time in a given region or habitat are referred to as native species. Non-native species do not originate in the area in which they are found. Normally, the vast majority of non-native species transported, either intentionally or accidentally, do not survive. However, when a non-native species not only survive, but out compete and threaten the survival of native species, they are referred to as aggressive non-native species.

Some examples of Texas non-native species included:

- **Trees and Plants**: Chinese tallow tree, Privet, Cat’s-claw vine and Giant reed
- **Aquatic Plant**: Giant Salvinia and Hydrilla
- **Animals**: Feral Pig and Nutria
- **Fish**: Armored Catfishes and Tilapia
- **Mussels**: Asian clam and Zebra Mussel

In their natural habitat, these species develop stable populations and are kept in check by predators, parasites, diseases and competitors that exist in their habitats. When transported out of their natural environment, non-native species can become ingrained and take over landscapes, displace native species, reduce biological diversity, and cause an immense amount of agricultural, ecological, and economic damage.

There are many different ways through which non-native species are introduced into the environment. Some species have been deliberately introduced for purposes of economic benefit, biological-control, food, or when unwanted aquariums fish, snakes and lizards get too large for their owners to care for. Receiving exotic plants and seeds from nurseries, via mail order shopping, is one of the newest ways for possible intentional introductions.
Many species are accidentally introduced into the environment. Unintentional introductions include species that are hidden (in wood packing materials, vegetation and produces), hitchhiking (on other species, boats and boat trailers), and many other pathways. The best action against non-native species is prevention. For a complete list of aggressive and non-native species, preventive measures and contact information visit the Texas Parks and Wildlife Department website at http://www.tpwd.state.tx.us/huntwild/wild/species/exotic/ and the Texas Invasive website at http://www.texasinvasives.org/.

Blue Tilapia, *Oreochromis aureus*
Public Involvement

In support of SARA and Clean Rivers Programs, SARA is involved in developing, enhancing and implementing comprehensive communication, educational and public involvement programs throughout the San Antonio River Basin. These efforts are aimed at increasing knowledge and awareness of the rivers, creeks and streams while enhancing stewardship for the resources within the Basin.

San Antonio River Watershed Environmental Advisory Committee (EAC)

San Antonio River Authority is involved in several environmental studies and projects that include a public outreach component. In 2005, the SARA Board of Directors approved the creation of an Environmental Advisory Committee (EAC). The committee serves as an umbrella group that reviews and provides input on environmental studies and programs at SARA. The EAC also acts as SARA’s Clean Rivers Program (CRP) Steering Committee, providing guidance and feedback on SARA’s annual monitoring schedule and Basin Highlight Reports. The CRP EAC Steering Committee meeting is normally held in August and is open to the public. To provide adequate notice of upcoming Steering Committee meetings, SARA posts public meeting notices at the Bexar, Wilson, Karnes and Goliad Counties City Halls well in advance of the meetings. The advisory committee may comprise up to 25 members, each representing a specific stakeholder group. The committee has two co-chairs: one representing Bexar County and the other representing a southern basin county. Additional information can be found at http://www.sara-tx.org/major_initiatives/water_monitoring/clean_rivers_program/index.php.

River Reach Quarterly Newsletter

The River Reach quarterly newsletter provides water quality information to the general public. Created in 2003, the newsletter features community events pertaining to water quality. The events are hosted, and sometimes, sponsored by SARA. The River Reach is distributed through the United States Postal Service and by email to our stakeholders throughout South Central Texas—including SARA’s jurisdiction of Bexar, Wilson, Karnes and Goliad counties. SARA staff also hand out copies of the newsletter during school functions, community events and public meetings. Our mailing list database contains more than 10,000 contacts and we continue to see growth in River Reach membership, as stakeholders gain knowledge about what we are doing.
Be Watershed Wise

SARA promotes stewardship and sustainability of the San Antonio River and encourages those who live, work or travel through the San Antonio River Watershed to become more environmental aware, or “Be Watershed Wise.” SARA continues to promote this environmental awareness initiative through a variety of messages, including but not limited to:

- Watershed education
- Sustainable land-use practices
- Prevention of illegal dumping
- Recycling
- Reduction in the use of plastic bags
- Proper disposal of pet waste
- Proper lawn and vehicle maintenance

“Be Watershed Wise” is a pro-active, public initiative designed to help improve water quality by raising awareness and providing public education related to the various facets of watershed sustainability and water quality issues.

Low Impact Development (LID) Competition

SARA, in partnership with the San Antonio Land/Water Sustainability Forum, held the city’s first-ever Low Impact Development (LID) Design Competition. With continued population growth, SARA is working diligently to highlight the benefits of LID and push for more sustainable land development in the communities we serve. A total of 32 companies participated in the four months of LID competition. Teams submitted their design for three actual properties within the San Antonio areas: Hemisfair (Urban Redevelopment), the Port of San Antonio (Multi-Family Mixed-Use) and Evers Road in Leon Valley (Green Roadway).

Get Outdoors! Event

Get Outdoors! is a free, family-friendly event hosted by SARA and the National Park Service (NPS). Held annually at Mission San José, the event is designed to encourage people in the community to get involved in outdoor recreation, learn more about our environment and promote a healthy lifestyle. More than 60 community organizations and local businesses have participated by setting up booths for hands-on activities for children and adults that include health screenings, exercise and sports demonstrations.

Mission Reach Presentation and Field Trip

SARA partnered with the San Antonio Missions National Historical Park to host a series of field trips at the Mission San Juan Capistrano for high school students. The educational field trips have been funded through the National Park Foundation “America’s Best Idea” grant. Students learned about the historical use of the San Antonio River, the culture that settlement on the river propagated, human-impact on the riparian ecosystem and students toured the Mission Reach Ecosystem Restoration Project along the San Antonio River.
Watershed Model

As a part of our Be Watershed Wise initiative, SARA uses a watershed model to teach the public about non-point source pollution. Using a 4 x 2 foot, three dimensional replica of the San Antonio River Watershed, we teach participants first what a watershed is, and second how land use far away from the river can impact the quality of water in the river. The watershed model presentation is empowering to participants who discover how each of us can have a more positive impact on the San Antonio River Watershed by helping to prevent the spread of pollutants.

Erosion Presentations

It is difficult to comprehend the concept of erosion without first understanding the watershed.

We offer children and adults a hands-on learning opportunity that includes using the above mentioned three dimensional replica of the San Antonio River Watershed. Our SARA education staff explains the vast watershed and how eroded soil can become sedimentation in waterways which could be problematic for aquatic life or hinder water flow.

Project WET Workshops

SARA is also involved in the nationally renowned, Water Education for Teachers, a curriculum also known as Project WET. During workshops, teachers received instruction and resource material with engaging, relevant and hands-on lessons about water to take back to the classroom to educate students in grades K-12. Teachers also receive Continuing Education credits which can be used to gain Texas Educator Certification.

Household Hazardous Waste Collection Events

SARA works in conjunction with local governments and other organizations to organize household hazardous waste collection events in the southern basin counties to ensure that hazardous waste, used tires, e-waste and unused pharmaceuticals do not end up in creeks and rivers. In 2013, SARA hosted four collection events. Vendors at these events collected thousands of pounds of waste, tires and unwanted pharmaceuticals from residents representing several hundred households in Wilson, Karnes and Goliad counties.
Illegal Dumping Training Workshops

SARA is involved with the Bexar Regional Watershed Management Illegal Dumping Task Force. SARA sponsors and hosts free annual training seminars for elected and appointed officials, law and code enforcement officers, environmental investigators and administrative staff from governmental organizations in Bexar County as well as from the southern basin counties. SARA hosted the fourth such annual training seminar in October 2013. The Edwards Aquifer Authority co-sponsored and the Alamo Area Council of Governments provided illegal dumping enforcement handbooks from the Texas Illegal Dumping Resource Center. These annual training seminars have become an invaluable tool to help local agencies identify and mitigate illegal dumping and even prevent dumping before it happens. The seminars held in SARA’s training facility, Martinez II Wastewater Treatment Plant Administration Building, create a great opportunity for communication and coordination between different government agencies.

Second Saturdays at Helton Nature Park

We continue to see interest in the Second Saturdays at Helton Nature Park. This has been a family-friendly series of outdoor activities where people have had an opportunity to explore Helton Nature Park. Visitors learn about the environment and expand their knowledge of the San Antonio River Watershed. Second Saturdays is free to the public. Some events have been geared toward children, while others, like bird hikes, have drawn more adults.

Eagle Ford Shale Handbook

SARA published the second edition of the Best Practices Handbook to Assist Communities in the Eagle Ford Shale in April of 2013. The second edition seeks to bring together best practices of communities that have previously experienced oil and gas exploration into one handbook, so other Eagle Ford Shale communities experiencing similar issues can draw on these best practices and strategies. SARA supports the continued economic growth brought by the Eagle Ford Shale, yet we recognize that sustainable practices can balance cost without compromising the health of the rivers and creeks within the San Antonio River Watershed. The handbook focuses on practices that preserve and enhance water quality, land use practices that preserve natural watershed functions to manage the quantity and quality of stormwater runoff, road infrastructure, floodplain land use and development issues that frequently accompany rapid growth associated with successful oil and gas exploration. SARA worked with representatives of the Railroad Commission (RRC), South Texas Energy & Economic Roundtable (STEER), Texas Commission on Environmental Quality (TCEQ) and the Texas Department of Transportation (TxDOT) to update regulatory agency and industry information and provide new resource materials that were released since the publishing of the first edition. As with the first edition, SARA distributed the second edition of the handbook to local elected leaders and city and county staff throughout Wilson, Karnes and Goliad counties.
Screenings of the SARA produced documentary

In April 2013, SARA released a documentary about the San Antonio River. The 70-minute movie, “Sustaining and Enriching Life in South Texas: The Story of the San Antonio River,” was developed and produced by SARA along with Thompson Marketing and Ten-Eighty Productions. This film covers the history and environmental issues associated with the San Antonio River. SARA invited citizens in the community to view the film, free of charge, at the City Base Cinema from April 6-11. Public viewings were also held throughout the year in La Vernia and Floresville (Wilson County), Kenedy (Karnes County), Goliad (Goliad County) cities and at several locations in Bexar County. In addition, SARA held a special showing on KLRN-TV, in December 2013, when the PBS station hosted its annual fundraising event. Viewers were able to see the natural beauty of river and learn about the challenges facing the watershed and how SARA and others are working to ensure the river’s future sustainability.

Roots in the River

SARA, in cooperation with the Witte Museum, has provided a series of field trips for students in grades 4 through 6 at the Witte Museum. Using TEKS-based hands-on activities, students explore the river environment and learn how human contact affects the conservation, preservation and restoration of the San Antonio River Watershed. The field trip experience has incorporated content on the historical use of the San Antonio River’s riparian zone, natural resources, settlement and human impact on the River. SARA’s ecosystem restoration projects are also used as education tools. Program and transportation fee reimbursement is made available through SARA.

Basura Bash

In partnership with the San Antonio River Foundation, the Basura Bash Planning Organization hosted the 19th annual event, in 2013. For many years, SARA has actively participated in the Basura Bash. Several companies and sponsors have helped with the success of this event. Each year, thousands of volunteers help remove tons of trash and collect mounds of recyclable material from the banks of the San Antonio River and its tributaries. SARA has offered educational outreach and training to many community groups, within the San Antonio River Watershed, that have shown a desire to create similar clean-up and recycling events.

Wilson, Karnes and Goliad Regional Watershed Summits

On April 25 and November 19, 2013, SARA hosted the Wilson, Karnes and Goliad Regional Watershed Summit. This is an on-going series of events aimed at fostering dialogue about local and regional watershed issues within the communities of Wilson, Karnes and Goliad counties. These events were well attended by elected officials and key staff from all three counties and included presentations from SARA staff and other invited government agencies. Through these summits, SARA seeks to explore further collaboration with the communities of Wilson, Karnes and Goliad and raise awareness of the benefits of a healthy watershed. The community leaders involved in this summit series also offered SARA staff various agenda topic suggestions to meet their needs. SARA will continue to promote these beneficial summits and believes fostering dialogue on locally identified issues can pioneer innovative solutions that sustain and enrich the lives of all who live, work and play within the San Antonio River Watershed.
Mission Reach Grand Opening

Bexar County, City of San Antonio, SARA, San Antonio River Foundation, San Antonio River Oversight Committee and the United States Army Corps of Engineers were partners in the Mission Reach Ecosystem Restoration and Recreation Project. In October 2013, these partners celebrated the Grand Opening Ceremony for Mission Reach along the river near Padre Park. The celebration marked the completion of the project which transformed an eight mile stretch of the San Antonio River into a quality riparian woodland ecosystem. The community was invited to attend the event and explore the Mission Reach section of the River Walk. Thousands of adults and children enjoyed hiking, biking, canoeing or participating in several activities that were planned along the river and at the newly renovated Mission Park Pavilions.

River Walk Watershed Alliance

Since 2008, SARA has been working with the Paseo del Rio Association, Downtown Alliance/Centro San Antonio, Downtown Residents Association, Bexar County, City of San Antonio and San Antonio Water System to reduce human impact on water quality in the River Walk Watershed, particularly in the sub-watershed which drains to the downtown section of the San Antonio River Walk. Originally started with Environmental Protection Agency (EPA) funds awarded through Texas Commission on Environmental Quality (TCEQ), these seven entities formed the River Walk Watershed Alliance (RWWA) to reduce bacteria levels which were significantly exceeding state standards. The RWWA both gathered data from and provided information to River Walk employees, residents and visitors about their daily routines within the watershed. Through data gathered, the RWWA determined that bacteria loading was linked to human behaviors such as: sidewalk and patio café cleaning procedures that sent runoff straight to the river; human feeding of wildlife, which resulted in greater numbers but less diversity of wildlife and the bacteria they generate; and improper trash management. With continued input, the RWWA developed a series of Best Management Practices (BMP) educational pieces tailored to each audience and to various job functions within the heavily urbanized, tourist-driven watershed. By late 2010, bacterial levels in the watershed had dropped by 48 percent. Although the original EPA grant ended in August 2010, SARA has continued to fund the RWWA in order to promote its BMP messages through social media, community events, River Walk businesses and advertisements targeted to River Walk Watershed audiences.
Olmos Basin Alliance

This project uses the Environmental Protection Agency’s (EPA) Getting in Step watershed outreach method to guide the Olmos Basin Alliance (OBA) in reducing human-made trash. The project identifies target audiences (polluters) within the project area, their reasons for polluting, the barriers to behavior change, how they receive information and the types of information they respond well to. Based thereon, the project helps remove barriers as appropriate and develops and distributes Best Management Practices (BMP) messages to stop the pollution.

Accomplishments of the OBA in 2013 include: produced monthly e-newsletters for subscribers and school science teachers in the area; promoted and assisted with Olmos Basin cleanup events; worked with the City of San Antonio and City of Alamo Heights in promoting the use of inlet covers to capture trash during rain events; ran the OBA 30-second public services announcements (PSAs), which were created in 2012, at the Quarry Theaters over the Christmas-New Year’s holidays (2012/2013); placed the OBA 30-second PSAs on the SARA, Basura Bash and SA Audubon websites; were recognized by the EPA for OBA’s “Cup” and “Bag” PSAs through EPA’s inclusion of the materials in their Non-point Source Outreach Toolbox for use by all public entities throughout the U.S.

Water: A Living Lesson Educators’ Conference

This conference, where we teach the educators, was developed in partnership with the San Antonio Water System, the Edwards Aquifer Authority and the University of Texas at San Antonio. The conference celebrates its 10th anniversary in 2014. The event has drawn more than 2,000 participants from South Central Texas. Participants attend workshops, field trips, booth exhibits and brainstorming sessions with other educators and topic experts. The annual event is designed to provide educators a wealth of resources, information and hands-on activities to address water-related topics in their classrooms. During the conferences, SARA staff facilitates several workshops focused on water quality and watershed management issues.

Huiscache daisy, Amblyolepis setigera and Texas bluebonnet Lupinus texensis
SARA Sponsored and Attended Events

The list below only reflects sponsored and/or attend events and does not include the in-class or field trip experiences given directly by SARA’s education staff.

February 2013
23 Earthwise Living
23 Basura Bash

March 2013
2 Get Outdoors!
3 Spring Bloom

April 2013
5 Fresh Air Friday
6 Learning Is Fun At Confluence Park
20 Earth Day San Antonio

May 2013
11 Household Hazardous Waste Collection, Karnes County
18 Household Hazardous Waste Collection, Wilson County

September 2013
7 Hardberger Park Urban Ecology Grand Opening
20 Lonesome Dove Festival
21 Leon Springs Family Green Festival
25 Crestview Science In the Park

October 2013
5 Mission Reach Grand Opening
19 Tour de Goliad
19 Mitchell Lake Wildlife Festival

November 2013
9 Goliad Rio Rio
9 Household Hazardous Waste Collection, Wilson County
21 Ags In the Park
23 Household Hazardous Waste Collection, Goliad County

December 2013
5 KLRN Pledge Drive


San Antonio River Authority Core Values

Stewardship

We are passionately committed to the preservation, protection, and sustainability of the San Antonio River Watershed.

We are committed to making the river safe, healthy, and enjoyable.

We, working with our partners, pioneer innovative solutions that sustain and enrich the lives of the people in and the economies of the communities we serve.

We are quick to respond, open to new ways of doing things, and dedicated to delivering valued public service.

We will not grow complacent, compromise our values, or lose sight of our purpose and vision.

Excellence

We are committed to innovative, collaborative, adaptive, and strategic actions that proactively address watershed issues and priorities.

We expect the best from ourselves, learn from our experiences, and continuously strive to advance our knowledge, skills and capabilities.

We do not make excuses or avoid responsibility for our actions.

Integrity

We are accountable to the Board of Directors, citizens and stakeholders of the communities we serve, and to our partners, and entrusted to efficiently use limited public resources.

We are honest and reliable in our dealings with others.

We base our decisions on prudent financial management and sound scientific/engineering principles and practices.

We do not misrepresent facts, research, our capabilities or expertise. Excellence