Update on Texas Instream Flow Program

Texas Instream Flow Program

As the worldwide water community strives to strike a balance between the environmental and human needs for water resources, the field of instream flow science has taken center stage. Over the past few decades, the science of instream flow has played a major part in helping scientists, policy makers, and the public determine how flow regimes influence the structure of aquatic and riparian ecosystems. In Texas, the advent of statewide water resources planning has prompted water policy planners to pursue ways to manage water resources that sufficiently ensure public health, safety, and welfare, further economic development, and protect agricultural and natural resources of the entire state. In order to accomplish this, the Texas Legislature amended the Texas Water Code in 2001 to include the collection of instream flow data and to conduct instream flow studies, known as the Texas Instream Flow Program (IFP).

The Texas IFP is executed through an inter-agency agreement between the Texas Parks & Wildlife Department (TPWD), Texas Commission on Environmental Quality (TCEQ) and the Texas Water Development Board (TWDB); its goal is to determine the appropriate methodologies for flow conditions in the state's rivers and streams necessary to support a sound ecological environment. Together, the agencies developed two documents that describe the Texas IFP: the *Programmatic Work Plan* (2002) and the *Technical Overview* (2003). The *Programmatic Work Plan* identifies six priority studies, outlines the role of the state agencies, and presents the scope of the studies. The *Technical Overview* provides a technical discussion of instream flow methods. These documents served as the basis of the National Academy of Sciences (NAS) review of Texas IFP. One of the major challenges the IFP presents for the state, as addressed by the NAS review, is developing an instream flow program that provides for statewide consistency but is tailored for specific and diverse river basins. This dichotomy poses an interesting challenge for the state and will require Texas to employ inter- and multi-disciplinary expertise. The Texas IFP will have an influential impact on the future of Texas' natural heritage by providing accurate and useful data and tools for water planning, water rights permitting and the conservation of fish and wildlife.

San Antonio River Instream Flow Study

One of the priority studies identified by the *Programmatic Work Plan* (based on potential water development projects, water rights, permitting issues, and other factors) was the San Antonio River (lower subbasin). The geographic scope of the San Antonio River Instream Flow Study (IFS) begins just below the city of San Antonio and ends at the confluence of the San Antonio and Guadalupe rivers. In 2004, the San Antonio River Authority (SARA) began collaborating with TPWD, TCEQ, and TWDB to commence the study and design elements for the San Antonio IFS, the reconnaissance phase of the study. The reconnaissance phase of the study was two-fold: to develop a compilation of existing historical information on the Lower San Antonio River and to develop an outreach program that would help study partners identify the role of stakeholders in the study and design elements. The entire study, which will take approximately four years to complete (contingent upon state appropriations to the three state agencies), will provide an understanding of the flow regime that is necessary to support a sound ecological environment and assist regional water planners in balancing the water needs of environmental and human users.

Photo from: SARA

SARA completed the reconnaissance phase of the Study in 2005, collecting and analyzing data from existing reports produced by regional, state, and federal agencies, as well as various university studies. Historical information on the hydrology, biology, physical habitat, physical processes, and water quality of the lower San Antonio River was then compiled into a searchable GIS database.

This spring, SARA will begin biological collections along specific segments of the lower San Antonio River. The reconnaissance phase of the study revealed gaps in the data available for the lower portion of the San Antonio River, where the water is deeper. To address these gaps, SARA will be focusing its biological collections in the deeper portions of the lower San Antonio River to develop a more suitable instream flow methodology for the San Antonio River Basin. Understanding the instream flow regime of the entire river is the goal of this study and evaluating the biology of the river at varying depths will help to identify appropriate flow regimes that not only conserve fish and wildlife resources but provide sustainable water resources for the whole community.

If you are interested in learning more about the San Antonio River Instream Flow Study contact Mike Gonzales, Environmental Services Manager, San Antonio River Authority at (210) 302-3633. For additional information about the Texas Instream Flow Program visit http://www.twdb.state.tx.us/instreamflows/ or contact Texas Water Development Board [Barney Austin or Jordan Furnans at (512) 936-0823], Texas Commission on Environmental Quality [Chris Loft at (512) 239-4715], or Texas Parks & Wildlife Department [Kevin Mayes at (512) 754-6844].

Article contributed to *TRA Stream Lines* by Ylda Pineyro at SARA Intergovernmental Relations. ypineyro@sara-tx.org

A Listserv Primer

The Riparian Listserv is a service of the University of Texas, created to encourage the exchange of information on riparian issues among the citizens of Texas. You do not need to be a member of TRA to subscribe. Notices about recent riparian research, conferences, training, and activities are posted daily. The listserv also provides a forum for finding, sharing, and discussing riparian-related information and issues. TRA member business is generally conducted through a membership email list and snail mail.

To subscribe to the Riparian Listserv, send an email to: listproc@lists.cc.utexas.edu. Leave the subject line blank. In the body of the email, type: SUBSCRIBE RIPARIAN your first name your last name (for example: SUBSCRIBE RIPARIAN JOHN DOE). Soon afterwards, you should receive an email response confirming your request and providing general listserv info.

To receive listserv postings in a daily digest instead of receiving individual emails for each posting, send an email to the address above, leaving the subject line blank. In the body of the email, type: set RIPARIAN mail digest.

To remove yourself from the Riparian listserv, follow the instructions for subscribing, except in the body of the email, type: UNSUBSCRIBE RIPARIAN. Again, a confirmation email will be sent when your request has been processed.

To post messages to the listserv, direct your email to riparian@lists.cc.utexas.edu.

Please remember: When using the listserv, please be courteous to other users by not pushing the "Reply" button after viewing a message unless you want your reply sent to everyone that subscribes to the service.

That's about it! We suggest saving this primer for future reference. If you have questions, or encounter problems using the Riparian listserv, email Kevin at Kevin.anderson@ci.austin.tx.us.

Newsletter Basics

It's difficult to believe, but we're already into our fourth year of producing *TRA Stream Lines*. It is our hope that this newsletter will serve as a means of orienting new members and updating existing members to the developments and activities within our organization. I am sure that *Stream Lines* will evolve with the TRA, and I welcome your comments and suggestions for improvement, topics, and features (as long as you're nice). I also hope that you will contribute ideas, articles, and calendar entries for future issues.

We plan to publish this newsletter biannually, in the winter and the summer; the deadlines for submittals will be December 1st and June 1st, respectively. I encourage you to submit articles on topics you find interesting, but please be sure to make your submittals ahead of the deadline so that the newsletter can be printed on schedule. I will always edit articles for clarity and space constraints. Please send submittals (text as .doc files and images as .jpg files) and comments to Emily Schieffer at 512-451-5240 or eschieffer@lggroupinc.com. Thanks!

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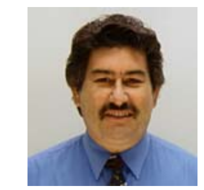

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Riparian Buffer Strips, continued from page 3…

fiber products via the aboveground biomass. The also shade streams and provide large woody debris for habitat and channel control[26]. Rapidly growing trees with large canopies and high transpiration rates are well suited as biological pumps for pesticides in the groundwater[15]. Including shrubs in a buffer system adds biodiversity and understory wildlife habitat[17,26,30]. The root systems also provide an excellent trap for flood water debris[26]. Grasses provide bank stability, trap sediment from surface runoff, provide significant organic C to the soil, improve soil structure and provide wildlife habitat[20,24,26]. A benefit of the grass component in buffer strips is the ability of grass to increase the hydraulic roughness because of greater stem density, subsequently decreasing flow velocity and sediment carrying capacity[25].

Once planted, maintaining the effectiveness of riparian buffers requires management plans. Regularly scheduled maintenance should begin immediately after the buffer has been planted[27,30]. Intensity of buffer maintenance depends on the planned function of a system, with some systems requiring more care than others. For example, high diversity, low biomass buffers may require continuing management and are difficult to create[32] while forested buffers may only require harvesting every few years. Maintenance of grassy riparian vegetation usually requires active management like mowing, burning, herbicide treatments, and grazing. Otherwise, successional processes will tend to ultimately favor woody vegetation[20]. In buffers with zones of trees, periodic tree harvesting is necessary to keep forests highly productive where nutrient uptake is high[18] because uptake of N and P by young trees is significantly higher than in older forests[22].

Riparian buffers, if implemented and maintained properly, can serve many different functions including, but not limited to, 1) maintaining biodiversity, 2) reducing nonpoint source pollution, 3) stabilizing streambanks. Effective function will depend on several factors including location, size, species composition, and maintenance.

Texas Riparian Association
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For more information, contact Kevin Anderson at 512-972-1960 or kevin.anderson@ci.austin.tx.us
Or check us out on the web at www.texasriparian.org

Membership Update. The Texas Riparian Association is an all-volunteer, nonprofit organization dedicated to encouraging healthy riparian systems in Texas. The TRA's efforts in education, research and healthy watershed management are possible largely through the funds provided by members like you. Please consider joining us or renewing your membership today. Thank you for your support!

Yes, I want to become a member of the Texas Riparian Association and help to encourage healthy riparian systems within Texas!

Name____________________ Affiliation (if any)____________________

Address____

____

Phone (work/home)____________________ Phone (cell/pager)____________________

Email____

Please check one of the following annual membership categories:

☐ Member	$20	☐ Business Member	$50
☐ Student Member	$10	☐ Sponsoring Member	$150
☐ Government or Non-profit Member	$35	☐ Life Member	$300
		☐ Sustaining Member (add to cost of any other membership category)	$20

I would like to serve on a committee! My first choice is:
- ☐ Administration (finances, incorporation, by-laws, membership)
- ☐ Program (agendas and logistics for conferences, workshops, seminars, meeting planning)
- ☐ Outreach (educational materials- except programs- including newsletter, website, brochures)
- ☐ Research & Demonstration (library, database, demonstration projects)

Please make checks payable to the Texas Riparian Association and mail with this form to: TRA c/o Center for Environmental Research, 2210 S. FM 973, Austin, Texas 78725-7103

For more information on membership, contact Kevin at kevin.anderson@ci.austin.tx.us

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The Struggles of the Pecos River

The Pecos River basin is the largest that flows into the Rio Grande River in Texas. As such, its historic, biologic, and hydrologic importance to the future of the lower Rio Grande basin is huge. The flows of the once great Pecos River have dwindled to a mere trickle due to many causes; some are natural, but many are not. If the health of the entire Rio Grande basin below the Pecos is to be improved and maintained, then both the water quality and quantity of Pecos flows should be drastically improved.

These days, the Pecos is a greatly depleted western river arising from snows in the Sangre de Cristos Mountains of northern New Mexico, and flowing hundreds of winding miles through hot, dry, semi-desert landscapes in New Mexico and Texas before emptying into the Rio Grande near Langtry, Texas. Before any "excess" flows are diverted, the basic health and integrity of the Pecos River system needs to be repaired and restored.

A Pecos basin watershed plan is the goal of a multi-agency team put together by Dr. Charles Hart, Range Specialist at the Ft. Stockton Extension Center. Will Hatler is Project Coordinator and other team members represent the International Boundary & Water Commission, Texas Agricultural Experiment Station, Texas Water Resources Institute and others from the Ft. Stockton Extension Center. An EPA 319 grant administered by the Texas Soil & Water Conservation Board provides funding for the three-year project.

Prior to developing a plan for the Pecos River basin and riparian restoration, an inventory and plan of the entire watershed must be developed with community input and support. Goals will be set and, if the plan is implemented, projects will be developed which will achieve those goals in an economically feasible manner.

It is believed that over the past century the water quality of the Pecos has deteriorated and its stream flows have decreased. This has caused a drastic change in the aquatic community of the Pecos River, according to fishery biologists and local users. No longer does it have a healthy, diverse community of aquatic plants, invertebrates, microorganisms, fish, amphibians, and waterfowl.

Photo 1 (above). The Pecos River and its salt cedar community during a wet year.

Photo 2 (below). Aerial spraying of salt cedar along the Pecos River.

Photos from Mike Mecke.

The aquatic diversity of the river has been negatively affected by a combination of factors over a long period of time, including changes in river hydrology, destruction of the riparian plant community, oil and gas activities, irrigation demands, short- and long-term droughts, and damming of the river. The rangeland watershed has deteriorated due to livestock management and drought. These factors, both natural and man-made, aided saltcedar, an introduced plant/pest that has invaded riparian zones within the watershed. The invasive plant is now found across the basin, hundreds of miles from the river on dry arroyos and in highway ditches. Saltcedar has not only reduced river flows and shallow groundwater due to its high water use, but also concentrated salt in the soil and river banks, which then dissolves into the river itself. Charlie Hart is helping to lead another successful multi-agency project that has sprayed thousands of acres of saltcedar along the Pecos River during the past few years. The downward trend of the Pecos River has hurt the Rio Grande River, which has many problems of its own, including saltcedar invasions, degrading water quality, and low flows. As an international river, the Rio Grande is relied upon by both Mexico and the U.S. for drinking water, irrigation and industry. As the Pecos is the major Texas tributary supplying water to the Rio Grande, developing a good watershed plan for the Pecos River basin is a first step in improving the Rio Grande, an historic and important river. Check the Pecos Team's website for information and updates: http://pecosbasin.tamu.edu/

Article contributed to *TRA Stream Lines* by Mike Mecke, Water Programs Specialist, Fort Stockton Extension Center, 432/336-8585

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Benefits, Creation, and Maintenance of Riparian Buffer Strips in Agricultural Areas: A Review

Riparian buffers are an important option to consider for controlling loss of sediments and nutrients from fields to receiving bodies of water. When placed between agricultural lands and waterways, riparian buffers can have important impacts on water quality, quantity, stream bank health, and local biota including fish, birds, insects, amphibians, reptiles, and small mammals[29]. Gilliam called buffers "the most important factor influencing non-point source pollutants entering surface water[10]." Many researchers agree that riparian buffers are a viable option for reducing sediment runoff from fields and removing nutrients and pollutants from surface and groundwater[8,19,25,27,28,29,30]. Buffers can also stabilize stream banks,[8,30,34] affect local fauna,[2,23,28] moderate flooding, help recharge underground water supplies, and provide land owners with valuable biomass, timber, and nut crops[30].

Benefits from buffers accrue primarily from their ability to trap and retain sediments and nutrients. Riparian buffers have the ability to filter groundwater nitrate (NO3-) effectively through conversion of NO3- to NO2 gas (denitrification)[7,9,12,13,14]. According to Fennessy and Cronk[9], this process depends on NO3- loading, carbon availability from litter, and moisture status. Accordingly, the ability of a riparian buffer strip to support denitrification varies strongly with vegetation composition, soil type and pH[11]. Buffer strips along waterways have also been shown to effectively protect streams from phosphorus (P) pollution[6,] (Reed and Carpenter, 2002). According to Cooper and Gilliam[6], buffers can serve as sinks for P in several ways, including sorption of P from the throughflow water by soil and sediments, deposition of enriched sediment, and plant uptake of P. If plants are harvested and removed from the site, P can be removed and exported from the system. The degree to which a buffer serves as a sink for nutrients and sediments can vary seasonally. For example, riparian areas can function as long-term sinks for total P though soluble forms are released during periods of increased discharge[6].

Ecological benefits also arise from the creation of riparian buffer strips. Riparian trees and shrubs decrease stream temperature, an important habitat criterion for many fish species[3]. Zimmerman et al. [35] found a 98% decrease in lethal concentrations of suspended sediment for fish with an increase in conservation tillage, riparian buffers, and permanent vegetation cover. Insect populations increase in vegetated riparian zones along with insectivorous birds[33]. Buffers enhance movement and act as corridors for birds[21]. Amphibians and reptiles actively use the lands adjacent to waterways, making buffers a necessity for sustainable populations[31]. Chapman and Ribic[5] found that buffer strips supported a particularly rich and abundant small mammal community.

There are also on-farm and social economic benefits to riparian buffer strips. On-farm benefits include intensive rotational grazing, haying, and logging. Social benefits include reduced costs of water treatment, reduced flood damage to communities and croplands, and improved quality of groundwater supplies, commercial fisheries, and agriculture by reducing the amount of sediment, nutrients, and other contaminants that reach the streams and lakes[16].

To ensure that benefits from pollution reduction and ecological enhancement accrue, the design, installation, and maintenance of buffers should be planned since pesticides, concentrated flow patterns, and excessive nutrient loading can negatively influence a buffer's ability to function properly. While the general concept for a riparian buffer is a simple strip or strips adjacent to a waterway, there are numerous design combinations that may provide more effective function for specific sites[26]. A buffer should be created with its intended use in mind. For example, if the goal is minimizing sediment delivery, a strip running along the edge of a field may be effective for diffuse flow patterns while a dense, strategically-located buffer may be the most cost effective way to reduce sediment transport at critical points of flow concentration more typical of rolling and hilly terrain. Buffer strips may have different widths that can be adapted to fit individual landscape settings. Table 1 provides an overview of suggested buffer widths.

Table 1. Buffer Widths and Benefits

Buffer Width	Slopes	Benefit
1.8m to 4.6m	5%	Sediment and nutrient discharges were reduced with increasing length and % cover[1]
>15m		Protects streams under most conditions[4]
20-30m		Nitrate removal[9]
"Narrow"		Nitrate removal[12]
<16m		Nitrate removal[14]
>15m	0-5%	Sediment removal[27,28,29]
20-30m	0-5%	Nutrient removal[27,28,29]

Choosing appropriate plants for a riparian buffer is an important step in creating an effective buffer strip. The usefulness of different plants in buffers depends on four main criteria: 1) their ability to filter nutrients and sediments, 2) adaptation to the local environment, 3) metabolism, uptake and tolerance of pesticides and other toxins,[15] and 4) potential for economic benefits from the plants. In addition, trees, shrubs, and grasses provide different benefits within a buffer system. The tap and feeder roots of trees stabilize nearly vertical streambanks while providing a large nutrient sink that can be removed from

Riparian Buffer Strips continued on page 5.

Calendar of Riparian Events

March 15. Deadline for submission of grant application to Texas Water Development Board for funds to develop a Flood Mitigation Plan. For more info: http://www.twdb.state.tx.us/assistance/financial/fin_FloodMitigation/FMA_RA_request_2006.pdf

◆ March 17-19. TRA Board Meeting. Fort Davis, TX

April 2. East Fork-West Fork Canoe Challenge. San Jacinto River near New Caney, TX. Go to www.active.com to register.

April 22-27. Ntnl Ground Water Association 2006 Ground Water Summit. San Antonio, TX. For more information, go to www.ngwa.org

May 8-10. AWRA Conference on GIS and Water Resources. Houston, TX. For more info: www.awra.org

June 11-15. American Water Works Association 2006 Annual Conference and Exposition. San Antonio, TX. For more info: www.awwa.org/ace06/

June 26-28. AWRA Adaptive Water Resources Management Regional Conference. Visit www.awra.org for more info.

◆ = Events sponsored by TRA.