Texas Riparian & Stream Ecosystem Education Program Final Report 2018

Texas Water Resources Institute TR-510
September 2018

Texas Water Resources Institute
make every drop count

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Texas Riparian & Stream Ecosystem Education Program

Final Report 2018

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The Texas Riparian and Stream Ecosystem Education Program is hosted and coordinated by the Texas Water Resources Institute, part of Texas A&M AgriLife Research, the Texas A&M AgriLife Extension Service, and the College of Agriculture and Life Sciences at Texas A&M University.

FUNDING PROVIDED THROUGH A CLEAN WATER ACT §319(h) NONPOINT SOURCE GRANT FROM THE TEXAS STATE SOIL AND WATER CONSERVATION BOARD AND THE U.S. ENVIRONMENTAL PROTECTION AGENCY

CONTENTS

ACRONYMS

BLM	Bureau of Land Management
BMPs	Best Management Practices
CE	Continuing Education
CEA	County Extension Agent
CEU	Continuing Education Unit
DO	Dissolved Oxygen
EPA	U.S. Environmental Protection Agency
ESSM	Department of Ecosystem Science & Management, Texas A&M University
GBRA	Guadalupe-Blanco River Authority
GLCI	Grazing Lands Conservation Initiative
GLO	General Land Office
IRNR	Texas A&M Institute of Renewable Natural Resources
NGO	Non-governmental Organization
NPS	Nonpoint Source
NRA	Nueces River Authority
NRCS	Natural Resources Conservation Service, part of USDA
PFC	Proper Functioning Condition
QPR	Quarterly Progress Report
SCSC	Department of Soil and Crop Sciences, Texas A&M University
SWCD	Soil and Water Conservation District
TCEQ	Texas Commission on Environmental Quality
TFS	Texas A&M Forest Service
TIAER	Texas Institute for Applied Environmental Research
TMDL	Total Maximum Daily Load
TPWD	Texas Parks and Wildlife Department
TRA	Texas Riparian Association
TSSWCB	Texas State Soil and Water Conservation Board
TST	Texas Stream Team, Meadows Center for Water and the Environment
TTU-LRFS	Texas Tech University – Llano River Field Station
TWRI	Texas Water Resources Institute
TXDOT	Texas Department of Transportation
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Services
WCSC	Watershed Coordination Steering Committee
WFSC	Wildlife and Fisheries Sciences unit of Texas A&M AgriLife Extension Service
WPP	Watershed Protection Plan

ACKNOWLEDGEMENTS

This report highlights the trainings, education and outreach and conferences of the Texas Riparian and Stream Ecosystem Education II program. The program is funded by the federal Clean Water Act section 319(h) Nonpoint Source grant provided by the Texas State Soil and Water Conservation Board (TSSWCB) and U.S. Environmental Protection Agency (EPA) to Texas A&M AgriLife Extension Service's, Texas Water Resources Institute (TWRI), and Texas A&M Forest Service (TFS). This statewide project has been a wonderful collaboration of many entities of the Riparian Team that were guiding and assisting with the program. This project has been such a success because of the Riparian Team and the network of partners across the state. Thank you to the Texas Riparian Association (TRA), who have hosted this program and online modules on their website, as well as assisted with the statewide conferences.

Special acknowledgement is given to the Course Instructors and their entities for their support of this program:

- Melissa Parker and Ryan McGillicuddy, Texas Parks and Wildlife Department (TPWD)
- Kyle Wright, Ricky Linex, James Rogers, Dennis Brezina, Matt Kraus, Kason Haby, Kathryn Brady, Ben Garcia, Brandon Steinberg, Ryan McClintock, Dan Keesee, Stephen Deiss, Ken Mayben (Retired), Garry Stephens (Formerly), all of the USDA Natural Resources Conservation Service (NRCS)
- Hughes Simpson, Lori Hazel, Todd Thomas, Hannah Cruce, Jeff McFall and Donna Work, all of Texas A&M Forest Service
- Nikki Dictson and Clare Entwistle, TWRI
- Kimberly Horndeski, Texas Comptroller of Public Accounts
- Josh Helcel, Texas A&M Natural Resources Institute
- Billy Higginbotham (Retired) and Mark Tyson (Formerly), Texas AgriLife Extension Service
- Jacob Hetzel and Adam Henry, Texas Wildlife Services Program

We would also like to thank all of the local partners and sponsors that helped with the many workshops and conferences across the State. This program has been a great success due to the support of these wonderful partners! THANK YOU!

- AgriLife Extension—Bandera County
- AgriLife Extension—Bowie County
- AgriLife Extension—Caldwell County
- AgriLife Extension—Coryell County
- AgriLife Extension—Gillespie County
- AgriLife Extension—Goliad County
- AgriLife Extension—Guadalupe County
- AgriLife Extension—Hays County
- AgriLife Extension—Jackson County
- AgriLife Extension—Lamar County
- AgriLife Extension—Lampasas County
- AgriLife Extension—Leon County
- AgriLife Extension—Marion County
- AgriLife Extension—Matagorda County
- AgriLife Extension—Montgomery County
- AgriLife Extension—Nacogdoches County
- AgriLife Extension—Navarro County
- AgriLife Extension—Nueces County
- AgriLife Extension—Tarrant County
- AgriLife Extension—Washington County
- Attoyac Bayou Watershed Partnership
- Bandera County River Authority & Groundwater District
- Castilaw Environmental Services, LLC
- City of Corsicana
- City of Pflugerville
- Colorado River Land Trust
- Goliad County Soil and Water Conservation District
- Guadalupe Blanco River Trust
- Heard Natural Science Museum & Wildlife Sanctuary
- Hill Country Alliance
- Hill Country Land Trust
- Houston-Galveston Area Council
- Jackson SWCD
- Lavaca-Navidad River Authority
- LCRA Creekside Conservation Program
- Meadows Center for Water & the Environment

- North Texas Municipal Water District
- Northeast Texas Municipal Water District
- Nueces River Authority
- Plum Creek Watershed Partnership
- San Antonio River Authority
- Sulfur River Basin Authority
- Tarrant Regional Water District
- Texas Coastal Watershed Program
- Texas Institute of Renewable Natural Resources
- Texas Parks and Wildlife Department

EXECUTIVE SUMMARY

The State of Texas has more than 191,000 miles of rivers and streams that comprise corridors of great economic, social, cultural, and environmental value. Riparian degradation is a major threat to water quality, in-stream habitat, terrestrial wildlife, aquatic species, and overall stream health. The Texas Riparian and Stream Ecosystem Education Program is funded by the U.S. Environmental Protection Agency (EPA) through the Texas State Soil and Water Conservation Board (TSSWCB). The Texas Water Resources Institute (TWRI) coordinated and partnered with the Texas A&M AgriLife Extension Service, Texas A&M AgriLife Research, TSSWCB, EPA, Texas Parks and Wildlife Department, USDA Natural Resource Conservation Service (NRCS), Texas A&M Forest Service (TFS), TTU Llano River Field Station (TTU-LRFS), the Texas Commission on Environmental Quality (TCEQ), and Texas State University-River Systems Institute to conduct the Texas Riparian and Stream Ecosystem training project. The project supports the Texas Nonpoint Source Management Program's goal of protecting and restoring water quality. It provides training to land owners, land managers, water and natural resource professionals, and the general public in impaired watersheds through the help of local partners. Only a portion of the attendees responded if they owned or managed land for a total of over 97,846 acres impacted by this project, which does not include the improvements made by professional staff, who in their jobs are impacting even more land management across Texas.

Results of program goals:

- Conducted Workshops in 26 Watersheds to over 1,148 participants in prioritized watersheds
- Coordinated with Partners 2 Statewide Riparian Conferences and 2 Regional Southwest US Stream Restoration Conferences.
- Increased knowledge and understanding of riparian function showed a statistically significant increase of 10% based on matching pairs of pre-/post-tests (mean scores of 81 and 89 respectively; p value=0.000 with alpha 0.05). At the training, 97% of Respondents said they plan to adopt BMPs discussed during the workshop. For the post workshop evaluation we had 289 respondents and over 83% of respondents stated that they had adopted or still plan adopt the BMPs discussed during the workshop.

TWRI in partnership with TRA has developed and maintained a website – http://texasriparian.org hosted by TRA that serves as a public clearinghouse for project-related information. The Texas Riparian website had 59,554 visitors since January 2013 and over 29,016 during this project period. The website has 7,473 subscribed to the website blog posts. The Texas Riparian Listserv has 365 subscribers. TWRI set up a Facebook and currently has 1,178 followers at https://www.facebook.com/TexasRiparianAssociation . Workshops were advertised through the websites, web blog, training newsletter, the listserv and facebook. TWRI, with assistance of the Riparian Team, with the watershed coordinators and local partners delivered daylong riparian education training events in 26 prioritized watersheds. Throughout the three year period, 53 news releases were published through 17 different media outlets across the state of Texas. Presentations of varying length were developed and delivered to a variety of audiences throughout the state. Overall 24 presentations were given about and supporting the Riparian Education Project. TWRI conducted presentations to a total of 1,396 people and a total of 43,862 contact hours to promote riparian education and stream health statewide as well as market and expand the reach of the Riparian program.

INTRODUCTION

Riparian degradation is a major threat to water quality, in-stream habitat, terrestrial wildlife, aquatic species, and overall stream health. Conversely, proper management, protection, and restoration of riparian areas decrease bacteria, nutrient, and sediment loadings to waterbodies; lower in-stream temperatures; improve dissolved oxygen levels; improve aquatic habitat; and ultimately improves aquatic and fish community integrity. Elevated bacteria, low dissolved oxygen, and degraded habitat and aquatic communities account for most of the impairments in the *2014 Texas Integrated Report*.

To improve the management of these sensitive and vital ecosystems, riparian education programs are needed regarding the nature and function of riparian zones, their benefits, and BMPs for protecting them. This will not only lead to reduced NPS pollution, it will provide tremendous ecosystem service benefits and economic benefits to the community.

The State of Texas has more than 191,000 miles of rivers and streams that, along with closely associated floodplain and upland areas, comprise corridors of great economic, social, cultural, and environmental value. These riparian corridors are complex ecosystems that include the land, plants, animals, and network of streams within them. They perform a number of ecological functions such as modulating streamflow, storing water, removing harmful materials from water, and providing habitat for aquatic and terrestrial plants and animals. Simply put, the health of riparian systems is paramount to stream health.

Streams and riparian zones reflect the sum of impacts of natural and man-induced disturbances of drainage areas or watersheds. Management of the land, streams, and riparian zones affects not only individual landowners, but also livestock, wildlife, aquatic life and ecosystem services for everyone downstream. By understanding the processes, key indicators and impacts of disturbances, activities that hinder recovery, landowners and other citizen-stakeholders can evaluate these systems and improve their management to produce desired conditions.

Changes within a surrounding ecosystem (e.g., watershed) will impact the physical, chemical, and biological processes occurring within a stream corridor. Stream systems normally function within natural ranges of flow, sediment movement, temperature, and other variables, in “dynamic equilibrium.” Over the years, human activities have contributed to changes in the dynamic equilibrium of stream systems. These activities have manipulated stream corridor systems for a wide variety of purposes, including domestic and industrial water supplies, irrigation, transportation, hydropower, waste disposal, mining, flood control, timber management, recreation, aesthetics, and fish and wildlife habitat. Increases in human population, along with industrial, commercial, and residential development have placed heavy demands on stream corridors. The cumulative effects of these activities result in significant direct and indirect changes, not only to stream corridors, but also to the ecosystems or watersheds they are located in. The direct changes include degradation of water quality, decreased water storage and conveyance capacity, loss of habitat for fish and wildlife, and decreased recreational and aesthetic values. While the indirect changes are harder to quantify such as air quality, decomposition of wastes, and other ecosystem services we all take for granted, there is direct economic benefits that can be calculated. Many cities, such as Austin, have found that improving creek and floodplain protection is needed to prevent unsustainable public expense to maintain drainage infrastructure.

Benefits of healthy riparian/stream systems:

- High quality habitat for both aquatic and riparian species
- Dissipation of flood energy and reduced downstream flood intensity and frequency
- Higher, longer-lasting and less variable baseflow between storm events
- Deposition of sediment in the floodplain, stabilizing it and maintaining downstream reservoir capacity longer
- Debris and nutrient use and filtering in the floodplain to improve water quality and dissolved oxygen levels in the aquatic system
- Riparian vegetation canopies to shade streams and reduce their temperatures, providing a food base for aquatic and riparian fauna
- Fewer invasions of exotic undesirable riparian species
- Higher biodiversity than terrestrial uplands
- "Stabilized" banks, which reduce erosion and protect ownership boundaries
- Increased economic value through wildlife, livestock, timber, and recreational enterprises
- Improved rural land aesthetics and real estate values

This program has coordinated closely with TPWD on both delivery and content to ensure landowners throughout the state are provided a consistent message of riparian enhancement and protection. TWRI also contacted groups like the Stream Teams coordinated by Texas A&M AgriLife Research at Blackland Research and Extension Center and the North Central Texas Council of Governments and EPA. These groups were focused on providing technical assistance through consultations and recommendations, informal project review and ordinance review, and also worked to improve public awareness of the benefits of healthy streams and riparian areas through a geomorphology training workshops directed to local officials, city engineers, developers and consultants. This project has created a synergy and an important network with others conducting stream and riparian education as well as built off of these past successful local programs to establish the State's mechanism to deliver riparian education in high priority watersheds. This project has implemented a riparian education program to support and enhance riparian management and water quality protection efforts by all agencies and organizations actively engaged in watershed planning across Texas. This program is and will benefit watershed efforts regardless of constituent targeted or whether the watershed is urban or rural. Further, by protecting these ecologically sensitive riparian areas, communities will be able to improve water quality while maintaining healthy ecosystems, providing wildlife habitat, opportunities for outdoor recreation and enhanced ecosystem services.

PROJECT DESCRIPTION

The main goal was to deliver riparian education programs to targeted watersheds to promote healthy riparian areas, thus healthy watersheds, by increasing citizen awareness, understanding, and knowledge about the nature and function of riparian zones, their benefits, and BMPs for protecting them and minimize NPS pollution.

Nikki Dictson and Clare Entwistle, have served as the Riparian Education Program Coordinators for coordination of all project activities and for promoting, coordinating, and delivering riparian education training events and web-based tools. TWRI has assembled and coordinated closely with the Riparian Team to assist with the development of the Texas Riparian and Stream Ecosystem Program, marketing, and delivery (Table 1). TWRI has partnered with TRA to host all of the information on the TRA website found at http://texasriparian.org . TWRI has developed an RSVP system on the Natural Resources Training website that allows registrants to RSVP for the trainings online at http://naturalresourcestraining.tamu.edu/schedule/ . TWRI has set up a newer registration

system on the TAMU Marketplace where RSVP and registrations can occur on a secure site. TWRI has coordinated with the County Agent for each event as well as the local watershed coordinators for all of the workshops. Partners of the program have been instructors at these workshops. TWRI developed a flier/registration form for each workshop to advertise the workshop in multiple places

TWRI has coordinated the delivery of daylong riparian education programs by conducting riparian trainings in targeted watersheds and providing access to the program through web-based tools delivered via web, conferences, website, listserv, and facebook. TWRI organized instructor teams for each event, composed of members of the Riparian Team, contractors, and others as needed to deliver the riparian education programs. TWRI has hosted coordination meetings or conference calls, at least quarterly, with project partners to discuss project activities, project schedule, communication needs, deliverables, and other requirements. TWRI kept in constant contact with instructors and planning members.

Table 1. Riparian Team List of Members and Organizations

Riparian Team		
First	Last	Organization
Blake	Alldredge	Upper Trinity River Authority
Tom	Arsuffi	Texas Tech – Llano River Field Station
Nikki	Dictson	Texas Water Resources Institute/Auburn University
Jacquelyn	Duke	Baylor University
Clare	Entwistle	Texas Water Resources Institute
Wesley	Gibson	Texas State Soil & Water Conservation Board
Lori	Hazel	Texas A&M Forest Service
Megan	Henson	Texas Commission on Environmental Quality
Kimberly	Horndeski	Texas Comptroller of Public Accounts
Fouad	Jaber	Texas A&M AgriLife Extension Service
Ingrid	Karklins	Environmental Survey Consulting
Sky	Lewey	Nueces River Authority
Melissa	Parker	Texas Parks & Wildlife Department
Anne	Rogers-Harrison	Texas Riparian Association
Hughes	Simpson	Texas A&M Forest Service
Staryn	Wagner	Austin Watershed Protection
Loren	Warrick	Texas State Soil & Water Conservation Board
Kyle	Wright	USDA- Natural Resource Conservation Service
Lauren	Young	Texas Commission on Environmental Quality

TWRI in partnership with TRA has developed and maintained a website – http://texasriparian.org hosted by TRA that serves as a public clearinghouse for project-related information. This website serves as a means to

disseminate information to stakeholders and the general public. The training registration site has the newly scheduled dates available for attendees to RSVP to the workshops and it is linked to the TRA website. These websites are coordinated and linked to http://RemarkableRiparian.org website that is being managed by the Nueces River Authority and both have the online educational materials.

TWRI in partnership with TRA has developed and maintained a website – http://texasriparian.org hosted by TRA that serves as a public clearinghouse for project-related information. The Texas Riparian website had 59,554 visitors since January 2013 and over 29,016 during this project period. The website has 7,473 subscribed to the website blog posts. The Texas Riparian Listserv has 365 subscribers. TWRI set up a Facebook and currently has 1,176 followers at https://www.facebook.com/TexasRiparianAssociation . Workshops were advertised through the websites, web blog, training newsletter, the listserv and facebook. TWRI, with assistance of the Riparian Team, with the watershed coordinators and local partners delivered daylong riparian education training events in 26 prioritized watersheds. Materials were developed and added to the websites weekly. Including information about upcoming Conferences, voice over PowerPoint videos, online tools and resources, and upcoming workshops. Workshops were advertised through the websites, the listserv and facebook.

The original program goals included:

- Deliver 24 riparian education programs to participants in prioritized watersheds, typically watersheds with watershed planning or total maximum daily load efforts due to impaired water quality.
- Coordinate 2 Statewide riparian conferences
- Increased knowledge and understanding of riparian function and implementation of BMPs by individuals participating in the program, as measured by pre-/post-tests and post follow up evaluation.

Results of program goals:

- Conducted Workshops in 26 Watersheds to over 1,148 participants in prioritized watersheds
- Coordinated with Partners to develop and deliver 2017 Urban Riparian Symposium in Houston, 2018 Annual Meeting in Seguin, and 2 Southwest US Stream Restoration Conferences in San Antonio in 2016 and 2018.
- Increased knowledge and understanding of riparian function showed a statistically significant increase of 10% based on matching pairs of pre-/post-tests (mean scores of 81 and 89 respectively; p value=0.000 with alpha 0.05). At the training, 97% of Respondents said they plan to adopt BMPs discussed during the workshop. For the post workshop evaluation we had 289 respondents and over 83% of respondents stated that they had adopted or still plan adopt the BMPs discussed during the workshop.

PROGRAM

The program is adapted to each location and the local presentation was selected to meet local needs. For example, the program was adapted in coordination with the Riparian Team and others for urban areas and coastal areas. TFS was integral for both adapting the program and delivering it in East Texas and urban areas. Due to logging activities in this region and specific requirements placed on such operations, the program was adapted in coordination with the TFS to meet the needs of landowners and issues these logging areas and ensure consistency with existing logger training programs. Further, TFS is the recognized expert in Texas with regards to bottomland hardwood forests and their vegetation and management. As these bottomland forests are vital to riparian protection and improvements, the TFS expertise was needed to ensure the program retains the needed expertise to appropriately manage these critical systems.

Feral hogs remain an important issue in managing and protecting riparian and stream ecosystems, so we have continued to partner with other entities to present the latest information and technology. We also partnered with the Texas Comptrollers of Public Accounts to discuss their role with the mussel research program.

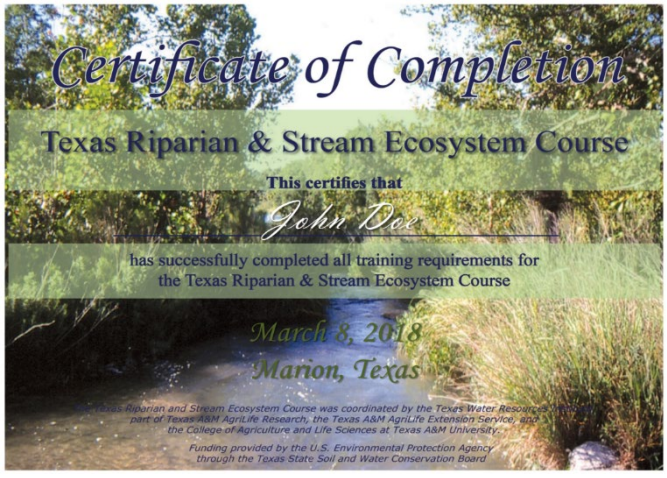
A 3-4 person instructor team was used at each training program along with local presentations. The basic existing framework established by TRA and other partner trainings was utilized and expanded upon to incorporate water quality and watershed management. The morning session includes indoor classroom style presentations. During lunch additional presentations were provided that relate to the issues and or landscape for the area. The afternoon session were conducted outside at one or more stream locations. Participants can see in the field firsthand the vegetation and functions they learned about in the classroom setting. Depending on the number of attendees the group was broken into two or more smaller groups and then rotated through the presentations and stream walk.

Coordinate and Advertise Riparian Education Programs

The Riparian Team has assisted with program development, marketing, and delivery. This Riparian Team has served as the primary pool of instructors to deliver the Riparian Education Program. Multiple calls and emails occurred with planning team members to discuss who was available to be instructors for the workshops during the quarter. This included planning and assistance with the two Riparian Proper Functioning Conditioning Courses for Professionals in June.

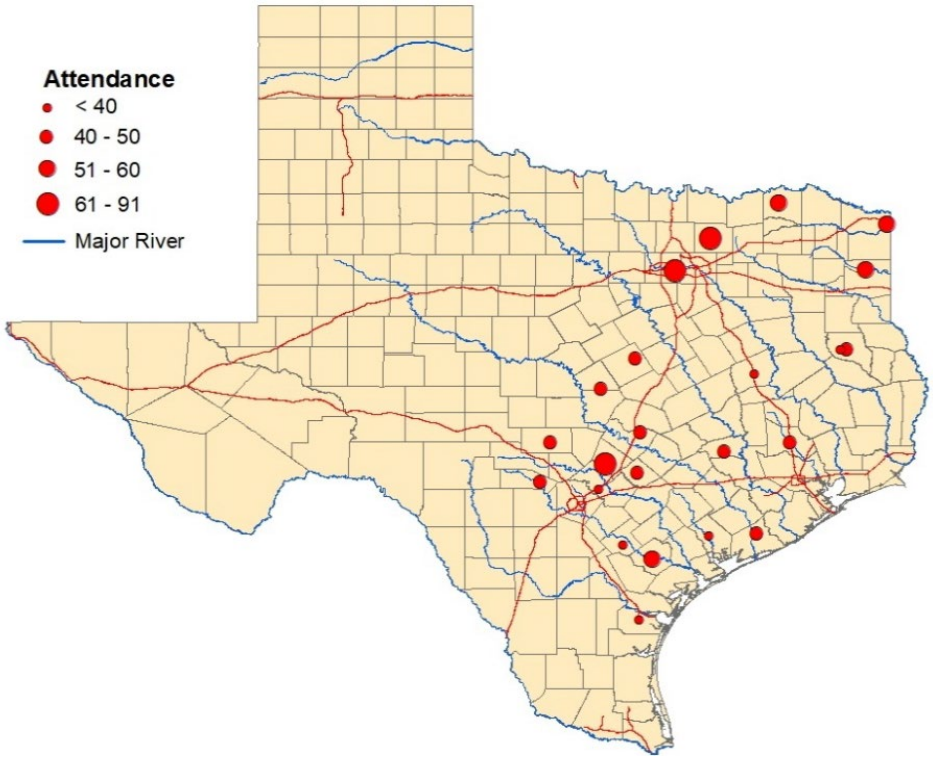
TWRI worked in concert with TSSWCB, TCEQ, TPWD, NRCS, TFS, and other state and local organizations to select locations for the riparian education training events. This project delivered riparian education programs to targeted watersheds across the state. Priority watersheds were selected in collaboration with TSSWCB, and with input from TCEQ and others, and primarily represent watersheds with WPP or TMDL efforts ongoing or those planning development of WPPs or TMDLs.

TWRI, with assistance of the Riparian Team, with the watershed coordinators and local partners delivered daylong riparian education training events in 26 prioritized watersheds. Certificates of completion were provided to all participants in the trainings.



Trainings have been conducted at the following:

a. Attoyac Bayou on December 3, 2015.
b. Lampasas River Watershed on March 3, 2016.
c. Lavaca Navida River Basin on March 29-31, 2016.
d. Big Cypress Creek Basin-Lake of the Pines on April 27, 2016.
e. Gilleland Creek on May 5, 2016.
f. Village Creek Lake Arlington May 24, 2016.
g. Attoyac Bayou on September 29, 2016.
h. Navasota River on November 9, 2016.
i. Sulphur River Basin in Paris on December 1, 2016.
j. Lower San Antonio on December 7, 2016.
k. Sulphur River Basin in Texarkana on January 31, 2017
l. Medina and Sabinal River on April 18, 2017.
m. Pedernales River on May 16, 2017.
n. Blanco River & Cypress Creek on June 1, 2017.
o. Leon River on June 8, 2017.
p. Lake Lavon & Upper Trinity on September 13, 2017.
q. Plum Creek on September 26, 2017.
r. Lower Nueces River on October 3, 2017.
s. Mill Creek on November 8, 2017.
t. East and West San Jacinto on March 1, 2018.
u. Lower Cibolo Creek on March 8, 2018.
v. Mission, Aransas & Lower San Antonio on Apr. 25, 2018
w. Tres Palacios & Lower Colorado on May 8, 2018.
x. Richland Chambers in Corsicana on September 19, 2018



TWRI, with assistance of the Riparian Team, has actively marketed riparian education trainings through news releases (AgriLife News and local media outlets), internet postings, newsletter announcements, public/conference presentations, flyers, etc., to enhance awareness and utilization. TWRI advertised the workshops and conferences on the TRA listserve, post to the website subscribers, the Texas Watershed Coordinators listserve, and facebook. TWRI worked with the County Extension Agents and Watershed Coordinators to develop press releases. Throughout the three year period, 53 news releases were published through 17 different media outlets across the state of Texas.

TWRI has developed a Workshop flier and registration form for each of the workshops. TWRI provided them the flier and registration form and materials to advertise to their local groups. TWRI has developed the RSVP system online to track attendance at the workshops and continues to update it for each workshop. TWRI and the Riparian Team developed a program fact sheet and fliers for each workshop, which can all be found at the website. TWRI developed a program banner to advertise about the program and use to direct folks at each workshop.

To help market the program and further expand the reach of the program, presentations of varying length (15/30/45/60 min.) were developed and delivered to audiences throughout the state through county Extension programs, watershed stakeholder meetings, Clean Rivers Program Basin Steering committees, and other venues. These presentations are available for delivery by anyone on the Riparian Team. Overall 24 presentations were given about and supporting the Riparian Education Project across the state. TWRI conducted presentations to a total of 1,396 people and a total of 43,862 contact hours to promote riparian education and stream health statewide as well as market and expand the reach of the Riparian program. Additionally, key elements and messages were incorporated into presentations delivered by the TWRI Program Coordinator, TFS, and others on the Riparian Team throughout the state to generate greater interest in riparian protection efforts and increasingly expand requests for the program and its resources. This has greatly increased program momentum, attendance and implementation of riparian protection concepts by landowners, setting the stage for greater improvements in riparian habitat, stream stability, and water quality.

Texas Riparian & Stream Ecosystem Training

Cibolo Creek ~ Agenda
March 8, 2018

8:00 Meeting Registration
8:15 Welcome & Introductions
- Travis Franke, Guadalupe County Extension Agent

8:30 Program Overview, Watershed Management and Water Quality
- Clare Entwistle, Texas Water Resources Institute

9:15 How Creeks Function & Bear Creek Example
- Ryan McGillicuddy, Texas Parks and Wildlife Department

10:00 Break
10:15 Riparian Vegetation
- Matt Kraus, USDA Natural Resources Conservation Service (NRCS)

11:00 Management Practices, Local Resources and Photo Monitoring of Streams
- Clare Entwistle, Texas Water Resources Institute

11:45 Lunch
12:15 Lunch time Presentation: Mill Creek Watershed Protection Plan Overview
- Clare Entwistle, Texas Water Resources Institute/ Cibolo Creek WPP

12:30 Role of Forests and Trees in Watershed Protection
- Jeff McFall, Texas A&M Forest Service

1:00 Trip to the Creek (Lead by USDA NRCS, TPWD, and TFS)
- Creek Walk & Lane's Balance Demonstration Activity
- Agricultural Nonpoint Source Program: Kathryn Brady, NRCS
- Feral Hog Education: Josh Helcel, Texas A&M Natural Resources Institute

4:00 Wrap up and Head for Home!

http://texasriparian.org/ and https://www.facebook.com/TexasRiparianAssociation

Funding provided through a Clean Water Act Section 319(h) nonpoint source grant from the Texas State Soil and Water Conservation Board and U.S. Environmental Protection Agency.

texasriparian.org

Texas Riparian & Stream Ecosystem Workshop
Mission, Aransas and Lower San Antonio Rivers
April 25, 2018 | 8:00 a.m. - 4:00 p.m.
The Fire Pit
144 N Courthouse Square
Goliad, Texas 77963
Online RSVP and Agenda: http://texasriparian.org/upcoming-training-locations/

For more information and to register please contact Clare Entwistle at 210-277-0292 ext 205 or clare.entwistle@ag.tamu.edu.

Continuing Education Units available: Texas Department of Agriculture Pesticide Applicators License – 3 CEUs; Texas Water Resources Institute – 1 CEU; Certified Crop Advisor - 7 CEUs; Texas Nutrient Management Planning Specialists – 6 hours; Texas Floodplain Management Association – 7 CECs; Texas Forestry Association - 6 hours; Society of American Foresters - 6 hours; Texas Board of Professional Land Surveying - 7 hours; Texas Board of Architectural Examiners "Acceptable for HSW credit"; and may also be used for CEUs for Professional Engineers.

The free workshop will include both indoor classroom and outdoor presentations by multiple natural resource agency experts and an outdoor field portion on a creek to discover how it functions and the role of riparian vegetation in properly functioning systems. RSVPs by April 20, 2018 at the link above or by contacting Entwistle. The San Antonio River Authority is sponsoring a lunch of a brisket plate, beans and potato salad.

First name: _____ Last name: _____
Email address: _____ Phone: _____
Org./Employer: _____ Lunch Options: ___ I will have the catered lunch ___ I will bring my own

Funding provided through a Clean Water Act Nonpoint Source Grant from the Texas State Soil and Water Conservation Board and U.S. Environmental Protection Agency

Presentation Date	Presenter Name	Presentation Title	Event Title	# of people	Location	Duration (hours)	Total Contact Hours
9/3/15	Nikki Dictson	Program Overview, Watershed Management and Water Quality	Texas Stream and Riparian Ecosystem Workshops	92	Georgetown, TX	0.5	46
9/4/15	Nikki Dictson	Water Quality in the Brazos Valley	Brazos County Feral Hog Workshop	155	Bryan, TX	1	155
10/8/15	Nikki Dictson	Riparian Area Management	Central Texas Hay Show	49	Burnett, TX	1	49
10/13/2016	Nikki Dictson	Texas Water Issues		95	Belton, TX	1	95
10/20/15	Nikki Dictson	Texas Riparian and Stream Ecosystems	Watershed Planning Short Course	25	Bandera, TX	0.75	18.75
1/11/16	Nikki Dictson	Watershed Roundtable Upcoming Trainings	Watershed Coordinator Roundtable	74	College Station, TX	0.25	18.5
1/28/16	Nikki Dictson	Riparian Issues, Water Quality and Watershed Planning Issues	Capital Area Erosion Control Network	50	Austin, TX	1.25	62.5
3/29/16	Allen Berthold	Water Quality Management and Matagorda Basin Project	Riparian Education	26	Edna, TX	0.25	6.5
4/27/16	Nikki Dictson	Water, Aquatic Ecology, and Riparian	Master Naturalist Training	38	Brenham, TX	2.5	95
7/13/16	Nikki Dictson	Clean Water Act §319(h) NPS Grant Program Panel & WrapUp	July Roundtable	68	Waco, TX	7	476

Presentation Date	Presenter Name	Presentation Title	Event Title	# of people	Location	Duration (hours)	Total Contact Hours
10/18/2016	Nikki Dictson	Managing Riparian Areas	Texas State Soil & Water Conservation Districts Annual Meeting	45	Waco, TX	0.5	22.5
10/21/2016	Nikki Dictson	Instruments of Watershed Change	Texas Master Naturalist Meeting - Water Specialist Certification	101	Conroe, TX	1	101
11/8/16	Kevin Wagner/Clare Entwistle	Texas Water Resources	Texas Master Naturalist New Member Training	35	Bryan, TX	1.5	52.5
11/29/2016	Nikki Dictson	Aquatic Ecology and Water	Good Water Chapter Texas Master Naturalist	36	Georgetown, TX	1.5	54
2/1/2017	Nikki Dictson	Wrap UP and Upcoming Trainings	Watershed Coordinators Roundtable	85	Dallas, TX	0.25	21.25
2/15/2017	Nikki Dictson	Urban Riparian Symposium Workshops	Urban Riparian Symposium Workshop	60	Houston, TX	7	420
2/16/2017	Nikki Dictson	Riparian Educational Programs	Texas Riparian Association Annual Meeting	46	Houston, TX	1	46

Presentation Date	Presenter Name	Presentation Title	Event Title	# of people	Location	Duration (hours)	Total Contact Hours
7/26/2017	Nikki Dictson	Wrap-Up	Watershed Coordinator Roundtable	65	College Station, TX	0.25	16.25
7/27/2017	Clare Entwistle	Texas Stream and Riparian Ecosystem Program	Texas Master Naturalist Monthly Meeting	60	Georgetown, TX	1	60
11/29/2017	Nikki Dictson	Texas Riparian and Stream Ecosystems	Texas Watershed Planning Short Course	36	Navasota, TX	0.67	24.12
1/23/2018	Nathan Glavy	Wrap-Up & Upcoming Trainings	Texas Watershed Coordinator Roundtable	55	Austin, TX	0.25	13.75
5/30/2018	Clare Entwistle	Texas Riparian & Stream Ecosystem and Urban Riparian & Stream Restoration Programs	Southwest Stream and Wetland Restoration Conference	20	San Antonio, TX	0.25	5
7/20/2018	Clare Entwistle	Update on Texas Riparian and Stream Education Program	Texas Riparian Association Annual Meeting	25	Seguin, TX	0.5	12.5
7/24/2018	Nathan Glavy	Wrap-Up & Upcoming Trainings	Texas Watershed Planning Short Course	55	College Station	0.25	13.75
			Totals	1396		31.42	43862.32

Continuing Education Units

The Extension Program Specialist established CEU credits for the riparian education program to encourage participation by landowners and water resource professionals. TWRI provided program materials to potential CEU providers who reviewed the agenda and evaluated the program and established the following:

- Texas Water Resources Institute – 1 hour
- Texas Nutrient Management Planning Specialists – Approved for 6 hrs.
- Texas Floodplain Management Association – 7 CECs
- Texas Forestry Association – approved for up to 6 hrs approved
- Society of American Foresters – approved for up to 6 hrs
- Texas Board of Professional Land Surveying - 7 hours
- Texas Master Naturalists – approval required at the chapter level each time
- Texas Master Gardeners – approval required at the chapter level each time
- Texas Waters Specialist Certification training hours - approval required
- Texas Board of Architectural Examiners does not approve courses but said we should advertise as "Acceptable for HSW" – or good for State CE hours
- TWRI will coordinate with County Extension Agents in each county for Texas Department of Agriculture – Pesticide Applicators – approved for 3 hrs (2 general and 1 IPM).
- The program may also be used for CEUs for Professional Engineers.

Riparian Landowner Trainings

Riparian landowner trainings focus on the nature and function of riparian zones (fluvial geomorphology, hydrology, and vegetation), the benefits and economic impacts from ecological services of healthy riparian zones, BMPs for enhancing and protecting riparian zones, and technical and financial resources and incentives available for implementing riparian BMPs and riparian protection measures. Riparian education programs cover an introduction to riparian principles, watershed processes, basic hydrology, erosion/deposition principles, and riparian vegetation, potential causes of degradation and possible resulting impairment, and available local resources including technical assistance and tools that can be employed to prevent and/or resolve degradation.

The goal was for participants to better understand and relate to riparian and watershed processes, the benefits that healthy riparian areas provide, and the tools that can be employed to prevent and/or resolve degradation and improve water quality. As a part of the training, participants were educated on the importance of riparian protection activities. A major goal of the program was to foster implementation of riparian BMPs. Trainings also emphasized the need for watershed planning that supports maintenance of a natural hydrograph. Restoration of riparian areas degraded by changes to the natural hydrologic regime must be conducted in concert with efforts to remedy those upstream disturbances. At the conclusion of the trainings, participants received a certificate of completion.

TWRI and the Riparian Team worked in concert with state and local organizations to select and schedule locations for the riparian education programs. TWRI conducted workshops for over 26 watersheds with 1,148 in attendance. Priority was given to agencies and organizations currently involved in WPP or TMDL processes and those planning future watershed efforts. Subsequently, additional watersheds will be selected based on impairment status, environmental sensitivity, and/or other priority issues. Due to the size of many watersheds in the state and in an effort to enhance outreach, riparian education programs, in both urban and rural settings, may be offered multiple times and at different locations within prioritized watersheds. In some instances it made sense to combine close watersheds for one workshop and advertise to both watershed groups.

Conferences

The workshops and conferences were coordinated with the TPWD, TFS, NRCS, TRA, River Authorities, local soil and water conservation districts (SWCDs), County Extension Agents (CEAs), on its riparian programs. Two Statewide Riparian Conferences were held to provide additional riparian information to interested attendees and two Southwest US Stream Restoration Conferences were coordinated with the Resource Institute. TWRI and TRA were on the planning committees, coordination committees, coordinated and conducted pre-conference workshops, assisted with moderating, and presented at these conferences. More information about these conferences can be found at http://texasriparian.org.

2016 Southwest Stream Restoration Conference In June 2016, TWRI co-chaired the planning committee with Resource Institute, TRA, TPWD, and Texas A&M Forest Service, and co-sponsored the third Southwest Stream Restoration Conference in San Antonio. Dictson was a plenary speaker at the conference and moderator. The conference included three workshops, two receptions, opening and closing plenary speakers, a panel on Urban Stream Restoration, and 48 presentations during concurrent sessions on a variety of topics dealing with stream and riparian issues with over 180 attendees over the three days June 1-3, 2016.

2018 Southwest Stream & Wetland Restoration Conference TWRI and TRA participated on the planning committee for the Southwest Stream Restoration Conference in San Antonio on May 30th-June 1, 2018 titled Restoration to Build Resilient Ecosystems. Clare Entwistle was a presenter on the closing panel and presented on this project at the conference. The conference included three workshops, two receptions, and 42 concurrent sessions with 157 attendees. The opening and closing plenaries both consisted of six speaker panels and Dave Rosgen.

Urban Riparian Symposium in Houston 2017

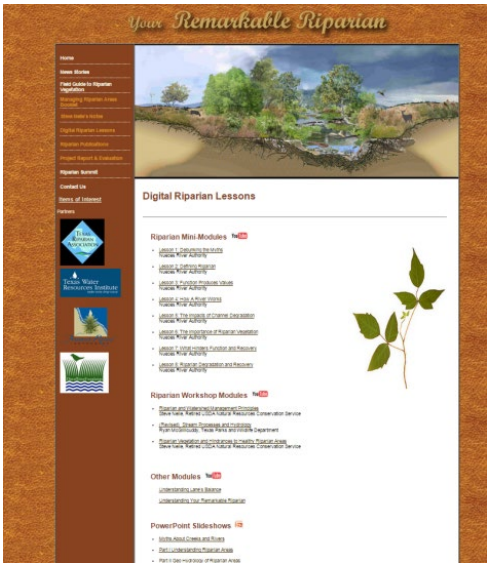
TWRI chaired the planning committee and coordinated the Urban Riparian Symposium on February 15-17, 2017 in Houston. The conference included three workshops with a field trip to the creek, three opening and closing plenary speakers, a reception and 48 presentations during concurrent sessions on a variety of topics dealing with stream and riparian issues with over 130.

MAINTAINED WEB-BASED RIPARIAN EDUCATION AND RESOURCES

Goal: To expand the reach and participation in the Riparian Education Program via web-based resources.

In cooperation with this project, web-based resources were developed by the Nueces River Authority with non-federal funding from several private foundations delivering comprehensive riparian information. These included voice-over PowerPoint presentations from the riparian landowner trainings, videos, and other resources designed to help K-12, nature groups, and landowners better understand the many functional benefits of our Texas riparian landscapes. Citizens unable to attend face-to-face events are encouraged to utilize the web-based voice over PowerPoint presentation versions of the training. The NRA "Remarkable Riparian" website was linked to the TWRI Water Resources Training Program website to increase program availability and accessibility.

NRA has maintained and updated materials and links on the website: http://remarkableriparian.org . NRA has recorded voice over powerpoint videos of the workshop presentations and mini module videos. They are on both the http://texasriparian.org/ and http://www.remarkableriparian.org/. NRA has tracked usage of Remarkable Riparian website and had a total of 29,944 hits. NRA has provided the Remarkable Riparian Field Guide Publication for attendees at the Workshops.



Voice over PowerPoint of Workshop Presentations

1. Riparian and Watershed Management: Steve Nelle, Retired USDA Natural Resources Conservation Service
2. Stream Processes and Hydrology: Ryan McGillicuddy, Texas Parks and Wildlife Department
3. Riparian Vegetation and hindrances to Healthy Riparian Areas: Steve Nelle, USDA NRCS
4. Management Practices and Local Resources: Nikki Dictson, Texas Water Resources Institute
5. Riparian Considerations for Land Operators: Lori Hazel, Texas A&M Forest Service

Riparian Mini-Modules

Lesson 1: Debunking the Myths Nueces River Authority
Commonly held beliefs about riparian areas that are only partially true

Lesson 2: Defining Riparian Nueces River Authority
Riparian Area Defined, Where is it? What does it do?

Lesson 3: Function Produces Values Nueces River Authority
What area some of the values people expect from Riparian areas and what are the components of function that produce them.

Lesson 4: How A River Works Nueces River Authority
Concepts and Definitions; Base Flow/Bank Full, Flood Flow, Floodplain. How water moves in a channel and erosion and deposition processes

Lesson 5: The Impacts of Channel Degradation Nueces River Authority
Too Much Energy and Not enough energy dissipation can cause degradation and it can be predicted or interpreted using Lane's Balance

Lesson 6: The Importance of Riparian Vegetation Nueces River Authority
Role of vegetation in riparian function and photographic evidence of recovery

Lesson 7: What Hinders Function and Recovery Nueces River Authority
Photographic evidence of recovery and hindrances to recovery

Lesson 8: Riparian Degradation and Recovery Nueces River Authority
Visual examples of how rivers degrade and recover

Understanding Lane's Balance for streams – A YouTube video with Steve Nelle explaining Lane's Balance.

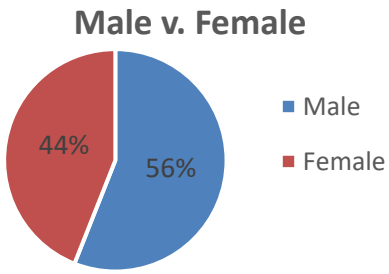
Understanding Your Remarkable Riparian Area – A webinar on You Tube featuring Sky Jones-Lewey of the Nueces River Authority that was sponsored by Texas Wildlife Association and AgriLife Extension Service in 2012.

EVALUATE THE EFFECTIVENESS OF THE RIPARIAN EDUCATION TRAININGS

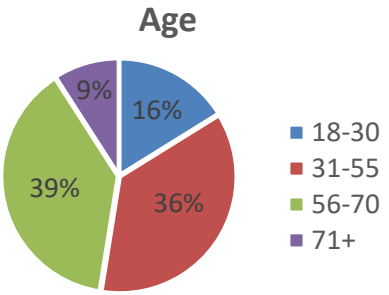
The face-to-face training and presentations included an evaluation component to assess program effectiveness and to modify and enhance curriculum content to achieve project goals. A two-stage evaluation approach was used to measure both knowledge and behavior changes of individuals participating in the program.

Stage 1. A pre-/post-test evaluation strategy was implemented at the beginning and end of the face-to-face educational program. The pre-test asked knowledge-based questions and the post-test measured the same knowledge-based questions to determine the knowledge increase of participants as well as 'satisfaction' questions and 'intentions to change or adopt' questions.

Stage 2. A post six-month follow-up assessment instrument was also sent to participants via email to complete the assessment and ascertain what practices were actually adopted six months after participating in the program.



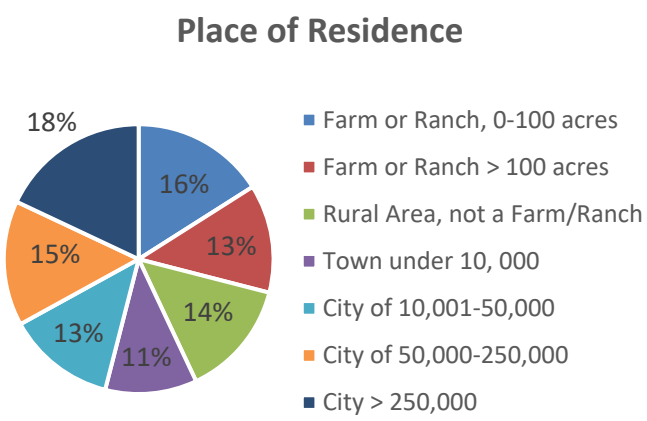
The evaluations asked demographic data, program satisfaction, and willingness to adopt conservation practices. We had a 78% response rate (898/1148). Of the participants who participated in the workshops and evaluations, 44% were female and 56% were male (n=768).

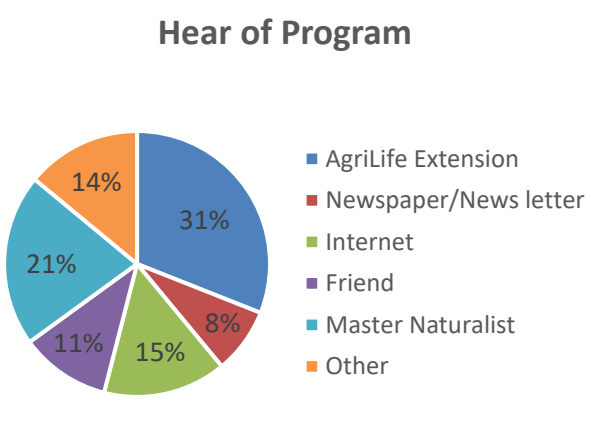


The largest age group represented was 56-70 years old with 39%. The second largest age group represented was 31-55 years old with 36%. Participants ages 18-30 made up 16% of the participants present. Participants with the age of 71+ were the least represented age group at the workshops making up 9% of all the participants (n=777).

Most participants (18%) stated that they resided in a city with a population greater than 250,000. Second with 16%, were participants who live on a farm or ranch consisting of 0-100 acres. A close third with 15%, were participants who resided in a city with population 50,000-250,000. Participants represented 14% who resided in a rural area. Cities with populations between 10,001 and 50,000 and farm or ranch residences with greater than 100 acres represented 13% each. Lastly, towns under 10,000 residents were represented by 11% of the participants (n=732).

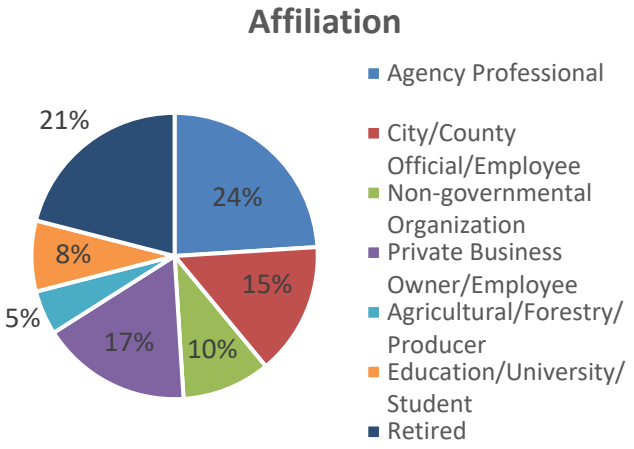
When asked how they heard of the program, the majority of respondents 31%, stated that they heard about it through AgriLife extension. 21% of respondents heard about the program through Master Naturalist, 15% heard through the internet, and 14% other. Respondants also stated that they heard from friends (11%) or newspapers/newsletters (8%) (n=760).

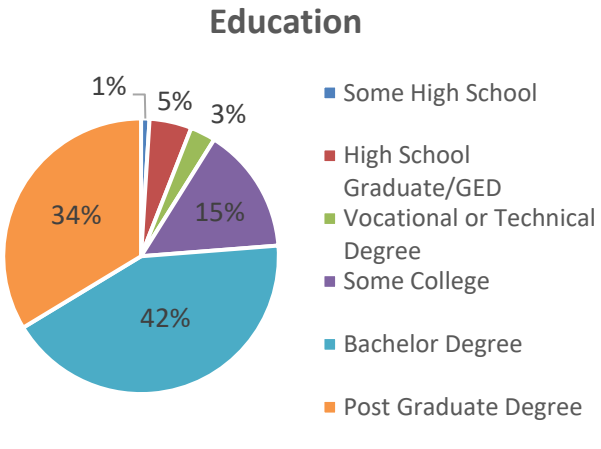




On all evaluations we asked how much land did the participant own or manage. Of the responses, 31% of participants stated that they did not own or manage any land and around 12% stated that they worked with less than one acre of land. Around 26% of participants stated that the owned or managed between 1 – 10 acres of land, while almost 14% stated that they managed between 11 and 49 acres. There were 10% of participants who stated that they owned or managed 51-100 acres of land. Almost 23.3% of participants owned 100 – 499 acres and almost 4.5% of workshop attendees stated that they owned 500-1,000 acres of land and another 8% of participants own or manage 1,000 -10,000 acres, and 2.2% own or manage 10,000 acres of land or more (maximum acreage = 71,000). In addition we have attendees in regional management roles that manage at very large scales with maximums of 250,000 acres. The total combined acreage for all workshop participants is more than 897,846 acres impacted by the project.

From our evaluations, we also learned more about each attendee's demographic information. Most participants identified as being an agency professional, but there was a fairly even showing of all affiliations overall. The evaluations also show that a majority of participants, 76% had a bachelor's degree or higher.





The score of each participant's pre- and post- test were statistically analyzed and show that we have a statistically significant difference within the 635 pairs. The mean score of the pre-tests were 80.82 with a standard deviation of 16.46. The post tests had a mean score of 89 with a standard deviation of 17.22. This showed a 10% increase between pre and post- test scores and knowledge gained overall. Our p-value was 0.000 given that our

F(1,634)=535.0 with alpha = 0.05, which lets us know that there was a statistically significant change from the pre- and post- tests and that post- tests typically resulted in higher scores than pre-tests.

Overall we had 98.7% of respondents mostly or completely satisfied with the program (79.4% completely satisfied). As well as, 98.7% of respondents were mostly or completely satisfied with the course materials (80.2% completely satisfied). The majority of respondents, 99.1%, stated that they were mostly or completely satisfied with the ease of understanding the course (81.9% completely satisfied) (n=679). Almost all respondents (99.4%) would recommend this course to others (n=678). Close to half of all respondents, 51.5%, believed they would benefit economically from this course in the future (n=672).

The last section of the evaluation went through the conservation practices covered during the workshop. All participants were asked to respond whether they were or were not planning to adopt the practices discussed at the workshop. Most respondents, 96.8%, said they would adopt the best management practices discussed at this workshop (n=680). Most participants stated that they were planning to adopt each of these conservation practices (Range of 68% – 89% adoption rates; Table 2; n=635).

We evaluated land area and if the respondents thought they would benefit economically due to this course with cross-tabulations that showed landowners of 50 acres or more were likely to respond that they would benefit economically with ranges of 43% - 79% of yes (Table 3). We also evaluated if the respondent thought they would participate in conservation programs with cross-tabulations that showed landowners of 50 acres or more were likely to respond that they would participate with ranges of 43% - 75% of yes (Table 4).

Table 2. Percent of Participants that plan to adopt each of the Conservation Practices

	% Plan to Adopt	% Undecided	% Will not Adopt
Riparian Herbaceous Buffers	82.9%	14.4%	2.7%
Riparian Forest Buffers	77.0%	19.1%	3.9%
Prescribed Grazing	68.0%	20.1%	11.9%
Rotational Grazing	72.0%	17.0%	11.0%
Manage Feral Hogs	79.1%	16.8%	4.1%
Rangeland Planting of Vegetative Cover	71.7%	23.2%	5.1%
Manage to Reduce Bare Ground	88.6%	8.8%	2.7%
Monitor Stream Sites through Photos	72.4%	21.7%	5.9%

Table 3. Land Owned or Managed by Acre Range vs. Benefit Economically Cross-Tabulation

		Benefit Economically			
		Yes	%	No	%
Acre Range	0	6	60	4	40
	less than 1 acre	25	30	59	70
	1 - 10 acres	35	54	30	46
	11 - 50 acres	30	52	28	48
	51 - 100 acres	22	56	17	44
	100 - 500 acres	49	69	22	31
	501 - 1,000 acres	14	74	5	26
	1,001 - 10,000 acres	19	79	5	21
	10,000 + acres	3	43	4	57
Total		196		164	

Table 4. Acre Range vs. Participated in Conservation Programs Prior Cross-Tabulation

		Participated in Conservation Prior			
		Yes	%	No	%
Acre Range	0	**4**	40	**6**	60
	less than 1 acre	**28**	33	**57**	67
	1 - 10 acres	**34**	52	**32**	48
	11 - 50 acres	**25**	43	**33**	57
	51 - 100 acres	**18**	46	**21**	54
	100 - 500 acres	**45**	64	**25**	36
	5001 - 1,000 acres	**13**	68	**6**	32
	1001 - 10,000 acres	**18**	75	**6**	25
	10,000 + acres	**5**	71	**2**	29
Total		181		179	

Post Workshop Follow-up Evaluations

After each of the workshop we followed up with the participants who we had their email address and sent them an email with a link to a post workshop evaluation to again determine adoption and willingness to adopt best management practices discussed at the training. This data includes all 289 respondents. We reminded them that at the riparian training that was held about 6 months ago, they shared some opinions about adopting management practices and asked them to share some additional information regarding the same practices and their plans to adopt them. After the workshop an average of 83% of respondents stated that they had adopted the best management practices discussed at the workshop or still plan to adopt these practices (Responses ranged 75-96% depending on the practice, Table 5). A total of 84 respondents who adopted BMPs believed they would financially benefit them in the future. From the respondents about 25% estimated they have benefited between $100 and $500, 17% estimated they benefited between $1,000 and $4,000, 15% estimated they benefited between $5,000 and $10,000, and 5% estimated they have benefited over $10,000 because of the information they learned at the training (Table 6). About 26% of respondents believed that they had benefited economically, but it was difficult to quantify the exactly how much. The final 12% of respondents stated that they have received other benefits from attending the trainings (Table 6). Other benefits include job raise from improved understanding and performance, acquired new skills for future careers, reduced erosion on property, wildlife tax exemption, and improved land values. An additional 32% of attendees or 60 individuals have participated in a conservation program since attending the riparian training (Table 7).

Table 5. Participants Willingness to Adopt Practices Post Workshop Results.

Question	I have adopted in the last 6 months		I plan on adopting in the future		I will not adopt the practice		I am undecided	
	Response	Percent	Response	Percent	Response	Percent	Response	Percent
Riparian Herbaceous Buffers	17	20%	60	70.59%	2	2.35%	6	7.06%
Riparian Forest Buffers	17	24.29%	42	60%	4	5.71%	7	10%
Prescribed Grazing	7	23.33%	16	53.33%	4	13.33%	3	10%
Rotational Grazing	10	38.46%	11	42.31%	3	11.54%	2	7.69%
Manage Feral Hogs	12	28.57%	23	54.76%	2	4.76%	5	11.90%
Rangeland Planting of vegetative cover	16	24.61%	33	50.77%	4	6.15%	12	18.46%
Manage to reduce bare ground	27	36.49%	44	59.46%	1	1.35%	2	2.70%
Monitor stream sites through photos	20	20%	60	60%	3	3%	17	17%
Total	**126**		**289**		**23**		**54**	

Table 6. Responses to How Much Participants Benefitted Economically in Terms of Dollars.

Economic Benefit	Response	Percentage
$100-500	21	25%
$1,000-4,000	14	17%
$5,000-10,000	13	15%
$10,000+	4	5%
Difficult to Quantify	22	26%
Other Benefits*	10	12%
Total	84	100%

*other benefits included job raise from improved understanding and performance, future career, reduced erosion on property, wildlife tax exemption, and improved land values.

Table 7. Response to If They Had Participated in a Conservation Program Either Before or Since Attending the Riparian Training

Answer	Response	Percentage
Yes	60	31.6%
No	71	37.4%
I had already participated in a program prior to attending the training	51	26.8%
I do not plan to participate in a program at all	8	4.2%
Total	190	100%