



# **A Community-Based Water Quality Curriculum Which Enhances Stakeholder Involvement In Watershed Protection Plan Initiatives: A Pilot Project**

## **Final Report**

### **TSSWCB Project 05-05**

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## EXECUTIVE SUMMARY

The Texas Watershed Steward (TWS) program was conceived as a science-based watershed education program designed to help citizens identify appropriate management strategies and take action to address local water quality impairments. Though it has undergone a significant shift in philosophy from a gradual delivery of information over several months to an intensive one-day workshop, a combined approach led to a very high level of water quality literacy and involvement among local stakeholders, paying tremendous dividends in the targeted priority watershed (Plum Creek). As a result of the educational strategies utilized in this project, the Plum Creek Watershed Partnership (PCWP) completed its Watershed Protection Plan (WPP) in just 22 months and is currently moving forward with an aggressive implementation strategy. The U.S. Environmental Protection Agency (EPA) Region 6 completed review of the Plum Creek WPP and concluded that it is consistent with and satisfies the expectations of the nine elements fundamental to watershed-based plans. The WPP is now being used as the model plan by state and federal agencies that guide watershed planning in Texas.

Efforts in the Plum Creek Watershed were made possible through an intensive collaborative effort between the Texas AgriLife Extension Service (Extension) and the Texas State Soil and Water Conservation Board (TSSWCB). Together, these agencies worked to plan and coordinate a carefully designed process to guide stakeholders through successful development of the Plum Creek WPP. Work began in December 2005 when Plum Creek was selected as the pilot project by the TSSWCB's Wharton Region Watershed Coordination Steering Committee (WCSC) due to its presence on the State of Texas 303(d) List and other local factors. While the primary objective of the project was to develop a watershed protection plan to restore and protect the water quality of this impaired waterbody, a broader goal of the effort was to identify the most efficient and effective strategies for facilitating development of WPPs in watersheds across Texas.

Extension personnel designed and implemented an intensive outreach education program to support WPP development which was sustained throughout the process. Multiple public meetings, accompanied by widespread use of key media outlets, generated a high level of public interest. Specially designed training of the 27-member local steering committee, members of the five topical workgroups, and the general public facilitated greater participation and more efficient and informed decision-making throughout the project.

Effective stakeholder engagement brought about through PCWP facilitation and formal TWS program delivery also enabled a rapid transition to implementation upon stakeholder approval of the WPP in February 2008. The Partnership has pressed forward with an aggressive implementation schedule, which already has been marked by successful development, acquisition and coordination of a number of grants and projects. These include Texas Commission on Environmental Quality (TCEQ) Clean Water Act (CWA) §319(h) funds for urban stormwater projects in two key cities, TCEQ §106 funds for an extensive water quality outreach program, and TSSWCB CWA §319(h) funds to implement agricultural components of the WPP, provide education on feral hog management strategies and continue facilitation of WPP implementation. These projects, and a host of other implementation efforts currently underway, are greatly enhancing local water quality protection efforts and continue to stimulate public awareness and active participation in restoration efforts.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	ii
INTRODUCTION.....	1
RESULTS BY TASK.....	1
Task 1. Create a science-based, community responsive curriculum.....	1
Subtask 1.1.....	2
Subtask 1.2.....	2
Subtask 1.3.....	3
Subtask 1.4.....	5
Task 2. Facilitate and support development of a watershed protection plan.....	5
Subtask 2.1.....	5
Subtask 2.2.....	6
Subtask 2.3.....	9
Subtask 2.4.....	9
Task 3. Assess the effectiveness of the project.....	10
Subtask 3.1.....	10
CONCLUSIONS.....	12
APPENDIX.....	13

## INTRODUCTION

Every watershed in Texas is affected to some extent by nonpoint source pollution. Resulting water quality impairment leads to negative impacts including unsafe water supplies, degraded fisheries, constrained recreation, reservoir siltation, and habitat loss. These consequences affect communities, businesses, and individual citizens in and around a given watershed, and successful management efforts depend on significant local input. As a result, current philosophies in watershed management rely heavily upon stakeholder involvement to restore and protect water resources. This approach to developing watershed protection plans demands a sustained high level of participation by local citizens to achieve success. However, the vast majority of potential stakeholders are not equipped with a sufficient understanding of watershed concepts to engage effectively in the decision-making process.

To address this challenge, the Texas AgriLife Extension Service collaborated with the Texas State Soil and Water Conservation Board to develop a strategy to engage both rural and urban stakeholders and better enable them to make informed decisions in support of WPP development. With investment from TSSWCB CWA §319(h) funds, the project sought to develop and deliver science-based, community-responsive watershed education tailored to water quality issues in target areas. The curriculum was employed to train a local stakeholder group which was then guided by focused facilitation through the development of a WPP. Throughout project implementation, the approach was assessed for effectiveness and potential adaptation to other watersheds statewide.

## RESULTS BY TASK

### **TASK 1: Develop and/or adapt watershed education training materials and resources to create a science-based, community-responsive watershed education curriculum.**

*Subtask 1.1: In collaboration with TWRI, organize a multi-disciplinary and multi-agency team to support watershed education resource materials development. Extension will hire a Watershed Educator/Coordinator to assist with and coordinate organization and development of the water quality team and curriculum, and to assist with delivery of the water quality curriculum.*

An Extension Program Specialist was hired in 2005 to coordinate development and delivery of the water quality curriculum, facilitate stakeholder groups, and assist in the development of the WPP. Work on the TWS program began with a comprehensive review of similar programs in other states across the country and led to the development of initial presentations utilized for education and training of the steering committee and Partnership.

Potential partners for a multi-disciplinary, multi-agency team were identified and engaged in February 2006 to support the development and delivery of watershed education resource materials. The team consisted of Extension personnel in the Departments of Soil and Crop Sciences, Biological and Agricultural Engineering, Wildlife and Fisheries, Rangeland Ecology and Management, and Agricultural Communications; the Texas Water Resources Institute (TWRI), the Spatial Sciences Laboratory, the TSSWCB (Temple and the Wharton Region

WCSC), TCEQ, Texas Department of Agriculture (TDA), Texas Parks and Wildlife Department (TPWD), Texas Railroad Commission (RRC), and the EPA.

*Subtask 1.2: Utilizing the team, develop a basic watershed education curriculum designed for a general audience to educate stakeholders about the nature and function of watersheds, potential impairments and strategies for watershed protection.*

In the early stages of the project, Extension developed initial presentations for delivery to the PCWP steering committee and workgroups beginning in 2006. The presentations were designed to provide basic and then intermediate to advanced training at each PCWP meeting to enable the steering committee and Partnership as a whole, to make informed decisions as they guided WPP development. Content was delivered as appropriate to accompany and supplement ongoing progress of the project. However, as the process moved forward in Plum Creek it became apparent that a more efficient method for facilitating plan development would be to provide basic training to stakeholders at the outset to serve as a foundation and enable more informed and active participation. It was determined such a program would be most effective if delivered as a comprehensive, but condensed one-day workshop tailored to the target watershed.

To support this shift in the focus of the project, Extension hired a Program Specialist to formalize the curriculum by developing high quality Powerpoint visual aids, a supporting handbook, a program website, and a strategy for statewide implementation of one-day, intensive TWS training events.

Following consultation with and a review of existing programs in Arizona, Maine, Oregon, Washington, and other states, information utilized in the original presentations to the PCWP was adapted, expanded and packaged into the five comprehensive chapters of the TWS handbook (available at <http://tws.tamu.edu>). Members of the team served as technical reviewers and subject matter resources during the development process.

The TWS handbook includes the following chapters and sections:

Chapter 1. Program Introduction

- About the Handbook
- About the Texas Watershed Steward Program
- Who are Texas Watershed Stewards?
- The Importance of Watershed Stewardship
- The World's Water
- Water Use in the United States
- Texas Water Facts

Chapter 2. Overview of Watershed Systems

- What is a Watershed?
- Watersheds in Texas
- How do Texans Use Watersheds?
- Principles of Watershed Hydrology
- Natural Watershed Features and Functions

### Chapter 3. Overview of Watershed Impairments

- Water Quantity and Quality
- Point and Nonpoint Sources of Pollution
- Consequences of Impaired Water Quality
- Human Land Use Impacts on Water Quantity and Quality
- Water Quality Law and Policy in Texas
- Water Quality Testing, Monitoring, and Regulation

### Chapter 4. Managing to Improve Watershed Function

- Why Manage on a Watershed Basis?
- Water Quality Improvement Projects (TMDL, WPP)
- Best Management Practices and Urban and Agricultural Settings
- Management of Non-Domestic Animals and Wildlife
- Small Acreage Water Quality Stewardship
- Improving Water Quality Around the Home

### Chapter 5. Community-Driven Watershed Protection and Management

- Importance of Local Watershed Involvement
- Forming and Sustaining Community Watershed Organizations and Partnerships

For delivery in a workshop setting, the handbook was converted to PowerPoint modules (example modules available at <http://tws.tamu.edu>). As with the handbook itself, the training presentations were extensively reviewed by the development team. The presentations include the use of a variety of visually diverse training resources including animated slide transitions, photographs (local area where possible), video clips, and even water quality cartoons to encourage audience participation during the classroom-style program. In addition, various displays are used during training events to provide hands-on object lessons in water quality principles. Stations include a rainfall simulator showing the effects of land use on water quality, a Google Earth demonstration allowing an aerial view of watershed locations, benthic macroinvertebrate identification materials, water quality monitoring equipment, a nonpoint source demonstration representing nutrient, bacteria, sediment, and toxic chemical pollution, and a watershed display using the Enviroscope model. As possible and appropriate, local resources addressing the target watershed (e.g., the Guadalupe-Blanco River Authority watershed model utilized at the Plum Creek training events) are incorporated into the training program.

The agenda for the day-long training event was crafted to integrate pertinent TWS handbook information and the interactive learning stations, leading up to a facilitated discussion of local watershed issues. Both the handbook and the presentation modules debuted at the inaugural TWS workshop held in Kyle, Texas, in December 2007.

***Subtask 1.3:** Team members will develop and/or adapt more focused, resource specific education and training components which can be delivered in watersheds where those issues are identified as most significant. For example, the Master Forester, Master Gardener or Master Naturalist program(s) components may be of higher priority in some watersheds compared to*

*others. In addition, unique local issues may require the development of new or substantively revised materials to effectively address local needs.*

Much of the material delivered during TWS training events is relevant for all watersheds, For example, the program discusses the types of water quality impairments and appropriate management practices for addressing different pollutants. These are typically applicable regardless of watershed location. However, the TWS modules serve as a flexible curriculum that can be tailored to address the needs and concerns of individual watersheds. Presentation information is supplemented with locally specific material to spur involvement in planned or ongoing watershed management efforts. Through discussion with individual project coordinators and guided by watershed information obtained from surface water quality assessments and river authority basin summaries, selected components of the TWS modules are crafted to incorporate local issues of high priority or concern ranging from urban development and flood mitigation to drought impacts on surface water resources.

Components of several modules are designed to be very watershed specific. For example, early in the training, a Google Earth presentation tailored to the watershed provides a visible representation of the watershed concept, illustrates land use patterns and land/water interrelationships, and enhances visualization of the concept of nonpoint source pollution utilizing the target watershed. Development of a more intimate understanding of, and connection to the target watershed is a major strength and the ultimate goal of the TWS program.

Initial development of the program included coordination with the Master Naturalist, Master Gardener, and Master Forester programs to ensure that program content complemented these well-established existing training programs. The TWS program serves as an advanced and continuing education component for these programs. In addition, working in concert, TWS workshops are announced through their websites, email listservs, and newsletters. This coordination contributes to enhanced attendance by local Master Naturalists and Master Gardeners, who also promote the program to other citizens in their communities and watersheds. In the Plum Creek Watershed, coordination with Master Naturalists has increased awareness of watershed issues and boosted participation in community cleanup events supported by the PCWP, and at which the PCWP interacts with the public and distributes educational resources.

The program also was certified to provide continuing education units (CEU) for various professional affiliations. This process serves as a valuable enticement to a variety of professions and enables individuals to obtain professional release to participate in the program. Qualified CEUs currently provided by the TWS program include:

- 7 AICP (American Institute of Certified Planners) CM hours for certified planners (5.5 CM credits, 1.5 CM Law)
- 7 CCA (Certified Crop Advisor) CEUs in Soil & Water Management
- 7 TBPE (Texas Board of Professional Engineers) CEPs for professional engineers
- 7 SBEC (State Board for Educator Certification) CPEs in Science
- 3 TDA (Texas Department of Agriculture) CEUs for pesticide license holders
- 3 TFMA (Texas Floodplain Management Association) CECs for Certified Floodplain Managers

***Subtask 1.4:** In collaboration with TWRI, create a watershed education website to serve as a clearinghouse for information and resources related to Watershed Protection Planning. Extension Watershed Educator/Coordinator will work with the TSSWCB Watershed Coordinator in linking or combining watershed education website with the Regional Watershed Coordination website.*

Extension and TWRI coordinated development of the TWS website which is posted at: <http://tws.tamu.edu/>. The website includes all relevant resources related to the program including:

- a program overview and curriculum outline
- workshop schedule and summary of completed events
- an introduction to watershed protection planning
- selected pertinent newsletters
- links to other watershed stewardship programs across the U.S., and
- a link to the Texas Water Program Mapping service

In addition, an online registration page and database were created to enable pre-registration for training events. This supports not only planning efforts prior to an event, but also post-training survey management. The TWS website also has links to project partners, including the TSSWCB and EPA. The website is continually updated by Extension and is hosted by TWRI.

A website also was created for the Plum Creek Watershed Partnership and can be found at <http://plumcreek.tamu.edu/>. This website contains all pertinent information related to the watershed protection planning process in Plum Creek, including meeting schedules, educational resources, publications (including the final WPP), and partners.

**TASK 2: Work in concert with the TSSWCB by providing educational information to facilitate and support the development of a Watershed Protection Plan.**

***Subtask 2.1:** In collaboration with the TSSWCB Watershed Coordinator at the Wharton Regional Office and the TSSWCB Regional Watershed Steering Committee, select a watershed from the TSSWCB Wharton Regional Service Area with at least one impaired waterbody assigned a category of 5b or 5c from the 303(d) list to serve as the target watershed for the pilot study.*

Extension supported TSSWCB regional watershed planning efforts, serving as a member of the Wharton Region WCSC and attending quarterly meetings. Extension participated in the determination of appropriate selection criteria for target watersheds, evaluated candidate watersheds based on these criteria, and pre-assessed involvement potential of local County Extension faculty in likely project counties. As part of that effort, Extension participated in the target watershed selection meeting in December 2005, which resulted in the selection of the Plum Creek Watershed for the pilot study. Plum Creek is categorized as 5c on the 303(d) List based on elevated bacteria levels and has concerns for nutrients.

***Subtask 2.2:** In cooperation with the TSSWCB, Extension will coordinate, support and facilitate stakeholder participation in the Watershed Protection Plan process. Project personnel and County Extension faculty will work in concert with the TSSWCB Watershed Coordinator to organize, host and facilitate local meetings of the stakeholder group.*

### Initial Public Outreach

Following selection of the Plum Creek Watershed, Extension coordinated a planning meeting in January 2006 with the County Extension Agents (CEA), TSSWCB, Guadalupe-Blanco River Authority (GBRA), and the Plum Creek Conservation District (PCCD) to discuss overall project strategy, potential stakeholders, and the stakeholder facilitation process. A tour of the watershed was also conducted as part of the initial meeting to familiarize key agency partners with the target area. A monthly meeting schedule was proposed by the TSSWCB and Extension to facilitate continued public participation and encourage project completion in less than 24 months.

Appropriate stakeholder group members were identified through local partners and the TSSWCB, and Extension drafted a list of approximately 100 potential candidates to serve as steering committee members. These individuals received a mailed invitation and information sheets and were contacted by phone to encourage participation. In addition, approximately 650 invitation letters and information sheets were distributed through local CEA and GBRA contact lists.

To promote cooperation among key local entities, Extension and the TSSWCB delivered numerous presentations at local meetings, including local city councils, Soil and Water Conservation Districts (SWCDs), the GBRA, the PCCD, and the Kiwanis Club. Extension and the TSSWCB also participated in the Luling Foundation Field Day prior to project kickoff to boost awareness.

To engage stakeholders and support WPP development, a suite of outreach strategies was used to inform participants in early stages of the PCWP. Extension developed the PCWP website to inform and advertise the programs to the public. In addition, Extension developed a two-page informational brochure for distribution via mail and email, and made available through local Extension offices, the PCCD, and the PCWP website. Updated versions were created as needed to provide new information about programs and accomplishments resulting from project implementation.

To reach a larger audience, Extension developed multiple press releases for distribution through AgNews which also were forwarded to approximately 100 regional outlets, including five local newspapers. Ten press releases were produced to solicit local project participation in the watershed planning process (Appendix A). Numerous newsletter articles also were distributed through the TSSWCB, local CEAs, Master Naturalist and Master Gardener programs, and local homeowners' associations.

### PCWP Facilitation

Extension and the TSSWCB planned, advertised, and coordinated public kickoff meetings in Kyle, Lockhart, and Luling in April 2006 (Appendix C). These meetings provided background information and encouraged local citizen involvement in the planning process. Following these

initial meetings, the PCWP steering committee was formed through selection of 27 members, and monthly PCWP meetings to direct WPP development began in May 2006. Attendees drafted ground rules for the PCWP and created workgroups to guide topical discussion throughout the process. Initial meetings of the five workgroups listed below began in July 2006:

- Agriculture Nonpoint Source
- Water Quality and Habitat
- Urban Stormwater and Nonpoint Source
- Wastewater and Industry
- Outreach and Education

Once the PCWP structure was formalized and upon request from the PCWP, Extension organized and led a watershed tour (64 attendees) in July 2006 to further familiarize participating stakeholders with the Plum Creek Watershed. Presentations addressed urban, agricultural, and industrial topics and water quality monitoring efforts in the watershed. To craft an identity for the growing PCWP, Extension also worked with the Outreach and Education workgroup to obtain input for a branding campaign. As a result of several iterations of design and with input from AgriLife Communications, a project logo was developed and used in all project efforts in the Plum Creek Watershed. The Outreach and Education workgroup also developed a number of educational materials to increase public awareness of the PCWP, motivate wise stewardship of the Plum Creek Watershed, and lay the groundwork for local implementation. Documents such as “Don’t Be Clueless About Water,” developed by GBRA with project support, were widely distributed to local students to increase awareness and stimulate participation in PCWP efforts.

In conjunction with ongoing stakeholder meetings, Extension solicited involvement from regional, state, and federal agencies with an interest in water quality. This partnership formed the technical advisory group (TAG), which held its first meeting in August 2006. By bringing technical and financial resources to the implementation process, the TAG sought to enhance the likelihood of WPP implementation. TAG members included GBRA, Capital Area Council of Governments (CAPCOG), TCEQ, TDA, Texas Department of Transportation (TxDOT), TPWD, RRC, TSSWCB, Texas Water Development Board (TWDB), TWRI, EPA, U.S. Geological Survey (USGS), U.S. Department of Agriculture Farm Service Agency (USDA FSA), and the USDA Natural Resources Conservation Service (USDA NRCS). Involvement from agency partners was a tremendous asset throughout the planning process. In addition, it facilitated coordination of activities to coincide with needs in the Plum Creek Watershed, including Agricultural Waste Pesticide Collection events and urban stormwater mulch tube demonstrations in cooperation with the TCEQ.

As WPP development progressed, alternating meetings of the steering committee and workgroups supported development of individual components of the draft WPP document. By February 2007, initial draft sections of the Plum Creek WPP outlining general watershed characteristics had been produced. After further iterations of WPP release and review by the PCWP, a completed draft was developed, and Extension hosted open public meetings in Kyle, Lockhart, and Luling in January 2008 to receive comments and answer questions from local stakeholders. Following this process and the incorporation of comments from public meetings, the steering committee met in late January 2008 to finalize the draft WPP. On February 19, 2008, Extension coordinated a special signing event to mark the completion and adoption of the Plum Creek Watershed Protection Plan.

In conjunction with this meeting, attendees and PCWP participants received a plaque and a TWS certificate in appreciation for their involvement and in recognition of completion of the training received during plan development. A final version of the WPP was uploaded to the PCWP website for easy public access.

Following completion and adoption of the Plum Creek WPP, Extension continued to facilitate meetings, but the focus shifted to implementation of key management measures, and the schedule moved to quarterly meetings of the steering committee beginning in May 2008. Upon request of the steering committee, Extension immediately began efforts to actively facilitate the implementation strategy outlined in the WPP by coordinating numerous meetings with city and county officials, stakeholder groups and project partners. This ongoing coordination and facilitation led to the development of a number of implementation proposals, through TCEQ and TSSWCB CWA §319(h) and TCEQ CWA §106 programs, among others, and these partnerships have served to increase awareness and participation even further.

Project meetings to support WPP development and initial implementation efforts of the PCWP were conducted on the following dates:

<b>Date</b>	<b>Meeting</b>
April 2006	Public Meetings
May 9, 2006	PCWP/Steering Committee
June 20, 2006	PCWP/Steering Committee
July 2006	Workgroups
August 10, 2006	PCWP/Steering Committee
August 10, 2006	TAG
September 2006	Workgroups
October 26, 2006	PCWP/Steering Committee
November 2006	Workgroups
December 14, 2006	PCWP/Steering Committee
January 2007	Workgroups
February 8, 2007	Rescheduled Water Quality and Habitat Workgroup Meeting
March 8, 2007	PCWP/Steering Committee
April 2007	Workgroups
May 10, 2007	PCWP/Steering Committee
June 2007	Workgroups
July 12, 2007	PCWP/Steering Committee
August 2007	Meetings with Luling, Uhland, Buda, Kyle, and Lockhart
September 13, 2007	PCWP/Steering Committee and TAG
November 2007	Workgroups
December 10, 2007	PCWP/Steering Committee
January 31, 2008	PCWP/Steering Committee
February 19, 2008	PCWP/Steering Committee - WPP Signing/Adoption Celebration
May 8, 2008	PCWP/Steering Committee
August 14, 2008	PCWP/Steering Committee
November 13, 2008	PCWP/Steering Committee
February 12, 2009	PCWP/Steering Committee
August 13, 2009	PCWP/Steering Committee

### PCWP Representation

To represent the interests of the PCWP, Extension has participated in several other regional studies and projects with potential impacts on water quality. These included a high level of involvement in the Central Texas GreenPrint for Growth project by the Trust for Public Lands, Envision Central Texas, CAPCOG, the Caldwell County water and wastewater planning study, and the GBRA Clean Rivers Program.

***Subtask 2.3:*** Utilizing the watershed education curriculum, provide training to the stakeholder group to enhance their knowledge of watershed management and water quality issues and to facilitate effective participation in the watershed plan development process.

Early curriculum delivery involved development of presentations addressing 1) Establishment and working through a watershed action group, 2) Regulatory structure, laws and policy impacting water, 3) Water quality testing and monitoring, and 4) Primary causes of nonpoint source pollution, which were delivered to the steering committee in a phased approach at monthly meetings. As the program shifted to the one-day workshop approach utilizing the TWS handbook and resource materials, the workshop was piloted in the Plum Creek Watershed to support the PCWP. Events were conducted in December 2007 in Kyle (42 participants) and in August 2008 in Luling (86 participants) to maximize local involvement in the WPP implementation process. Both of these events were open to the general public and were publicized throughout the watershed in advance.

Prior to the first workshop, Extension worked with AgriLife Communications to design promotional items for the program, including t-shirts, tote bags, water bottles, pens, pencils, and vehicle stickers for workshop attendees. In addition, Extension developed brochures, postcards, and a banner to stir local interest in target locations prior to the TWS events.



Texas Watershed Steward workshop in Luling, 2008.

***Subtask 2.4:*** Provide access to Extension personnel specializing in the appropriate disciplines necessary to provide technical support to the stakeholder group and/or the TSSWCB during Watershed Protection Plan development.

To provide pertinent expertise during plan development and in early stages of WPP implementation, Extension worked to deliver appropriate presentations through its faculty and through external partners. Drawing on the expertise of TAG members and additional representatives of these and other entities, special presenters were invited to provide supplemental information during steering committee and workgroup meetings. Over the course of plan development, the PCWP relied heavily on AgriLife Research and Extension faculty in the Department of Biological and Agricultural Engineering and the Spatial Sciences Laboratory to respond to questions and present results during the course of watershed analysis. Faculty in Animal Science, Ecosystem Science and Management, Soil and Crop Sciences, and Wildlife and Fisheries Sciences also contributed heavily throughout plan development by providing input during watershed analysis and delivering additional information to help the PCWP make critical decisions in watershed management. Faculty from these units also provided local trainings for on-site wastewater treatment system management, sports and athletic field management, urban turf and landscape management, and nonpoint education for municipal officials (NEMO). In addition, county Extension faculty from Caldwell and Hays Counties played a significant role by contributing essential local information based on experience with producers and residents within the watershed, and by coordinating local education and training events such as the Luling Foundation Field Day, forage and row crop production meetings, and feral hog management workshops.

### **TASK 3: Develop a Final Report Assessing the Effectiveness of the Project.**

*Subtask 3.1: Extension, with assistance from TSSWCB, TWRI and TAES, will develop the final report which will include an evaluation of the watershed education curriculum to be developed as measured by:*

- *Pre/post training assessments of increased knowledge and understanding by individuals within the watershed regarding watershed principles and appropriate BMPs and other activities to address impairments caused by nonpoint source pollution.*
- *Surveys following training through the watershed education curriculum*
- *Assessment of the frequency of implementation of appropriate residential and agricultural BMPs to address causes of nonpoint source pollution.*

Early in the watershed facilitation process and before public involvement, Extension worked with faculty in the Department of Agricultural Leadership, Education, and Communication (ALEC) to gather information on potential survey methods, and identify examples from other programs that might be applicable in evaluating watershed stewardship education. From this, Extension created a survey for distribution at the initial public meetings to determine water quality knowledge levels, local involvement in land management, and project interest among potential participants (Appendix D). Of 100 surveys distributed, 69 were completed and returned, a significant response level given the approach used. The surveys showed that 44 respondents owned land in the watershed, and 36 of these owned over 100 acres. Approximately 80% of respondents were interested in learning more about the TWS program.

As the TWS program began to take shape, faculty in ALEC were again solicited to support development of targeted pre- and post-tests and a six-month delayed post-survey. These surveys are utilized at each workshop to evaluate the overall effectiveness of the TWS program through assessments of knowledge gained and the level of management practice adoption by program

participants.

These surveys were administered to attendees of the inaugural Plum Creek TWS workshop in Kyle in December 2007. Participants rated satisfaction with the program at 98%, and 99% said they would be better watershed stewards as a result of attending the workshop. After the day's presentations, attendees demonstrated a surprising 20% knowledge increase in water quality concepts, and 80% said they intended to adopt certain management practices themselves.

The same set of surveys was administered to participants at the TWS workshop in Luling in August 2008. Overall, 99% of respondents indicated that they were satisfied with the training the workshop provided. Ninety-five percent of respondents stated that they would be better stewards of their environment, and 60% planned to adopt management practices discussed in the training. As indicated by a comparison of pre- and post-test scores, attendees demonstrated an increase in water quality knowledge of 13%.

Six months after each event in the Plum Creek Watershed, the delayed post-surveys were distributed to workshop participants, and responses were received electronically. These follow-up evaluations continued to indicate positive impacts, even several months removed from the training itself. Among respondents, 44% had participated in at least one community cleanup in the past six months and another 44% indicated that they had plans to participate in a future cleanup. Approximately 40% of attendees stated that they participated in local planning/zoning decisions, and another 33% planned to get involved in those types of activities in the near future. Furthermore, 51% stated that they had communicated with their elected officials regarding water quality issues, and an additional 35% were still planning to do so in the future. Certainly, one key goal of the TWS program is to emphasize the importance of engaging in local efforts to improve water quality, and survey results indicate that this is occurring.

WPP development typically is a multi-year process, and watershed planning currently is not being conducted in every watershed across the state. As a result, only 18% of attendees responded that they had already helped to develop a WPP in the six months since the TWS training. However, 43% responded that they did have plans to assist in WPP development. Along these same lines, 14% indicated that they had helped form or had become a member of a local watershed group. However, likely the most exciting statistic was that 49% indicated they planned to get involved in a watershed group.

Another positive result of TWS training, as indicated in the delayed post-survey, is the resulting high level of involvement of attendees in a volunteer water quality monitoring program. Approximately 41% of individuals had participated in such programs. An additional 33% of respondents still planned to get involved in volunteer monitoring.

One of the desired impacts of TWS training is to encourage participants to engage in their own community and actively share the knowledge they gain in the trainings. Within six months of receiving TWS training, 40% had given a water quality presentation to a school class or community group, and another 28% still planned to do the same. Surveys also showed that 75% of attendees had encouraged others to participate in the training.

Over 93% of attendees indicated they now more closely monitor individual actions that might impact water quality, and 83% had already adopted management practices on their property that

have a positive impact on water quality. Approximately 22% had adopted soil testing practices, while another 49% stated that they planned to conduct soil testing in the future to better manage fertilizer application.

Finally, an overwhelming 98% of attendees were satisfied with the TWS training materials, and 67% felt strongly enough about them to share the materials with their peers. As a prospective affirmation of planned future approaches, 93% of respondents indicated that they would be interested in the availability of an online training module.

## CONCLUSIONS

The combination of focused public outreach and carefully designed stakeholder education and training strengthened and significantly expedited the watershed planning process in Plum Creek. Over the course of WPP development, Extension facilitated and/or participated in over 175 events, including monthly steering committee and workgroup meetings, local board meetings, city council and commissioner's court meetings, educational workshops, and community events. Through this process, Extension interfaced directly with over 7,200 landowners and citizens in the watershed, logged over 17,700 contact hours, and communicated important water quality protection ideas and information to thousands more through their program delivery efforts.

The project resulted in creation and implementation of the Texas Watershed Stewards program, a one-day, intensive training event that prepares and empowers local citizens to become involved in their watershed. The program has received extremely positive feedback from watershed planners and program participants, and is being used across the state as both a pre-planning and pre-implementation training tool for stakeholders. Further, the TWS program has generated substantial interest nationally and is now being adapted for use in New Jersey, Hawaii, Iowa, Michigan and other states.

While the success of this project may not be achievable in all watersheds, it does indicate the potential to move the watershed planning process forward more effectively by creating a more educated and efficient decision-making body. By so doing, the watershed protection plan truly is “locally” developed and accepted, and thus, both the planning and implementation processes have a greater likelihood of success.

## **Appendix A**

### **Examples of Project News Releases**

March 20, 2006

#### **Local Watershed Planning to Begin in Plum Creek Watershed**

Contact: Nikki Dictson, (979) 458-3478, [n-dictson@tamu.edu](mailto:n-dictson@tamu.edu)

Texas Cooperative Extension (TCE) and the Texas State Soil and Water Conservation Board (TSSWCB) are partnering with local citizens to protect and improve water quality in Texas' watersheds by helping to develop and implement watershed protection plans. Watershed protection plans are designed to restore and/or protect surface waters impacted by nonpoint source pollution by implementing best management practices. Plum Creek, which runs through Hays and Caldwell Counties, has been selected for development of a watershed protection plan based on water quality data for bacteria and nutrients.

Public action is the best means for addressing local water quality problems and concerns. Local stakeholders like you will help identify potential sources of pollution and then select and promote implementation of practices to improve water quality. Key local partners supporting the process include the Guadalupe Blanco River Authority, Plum Creek Conservation District, Caldwell-Travis Soil & Water Conservation District and Hays County Soil & Water Conservation District. The ultimate goal of the program is to develop and implement a plan that protects water resources in the region now, and into the future.

To kick-off the Plum Creek Watershed Partnership, three public meetings will be conducted to introduce the program and encourage local citizen involvement. All interested individuals are encouraged to attend one of the meetings to learn how to get involved in solving these important water quality issues. Refreshments will be available at 6:00 pm and meetings will start at 6:30 pm at the following locations:

**April 10th, 2006**  
**Courthouse Annex**  
**1400B FM 20 East**  
**Lockhart, TX 78644**

**April 25, 2006**  
**Tobias Elementary School**  
**1005 East FM 150**  
**Kyle, TX 78640**

**April 26, 2006**  
**Luling Primary School**  
**118 West Bowie**  
**Luling, TX 78648**

If you have any questions regarding this process, please contact Nikki Dictson with TCE at 979.458.3478 or [n-dictson@tamu.edu](mailto:n-dictson@tamu.edu), or Brian Koch with TSSWCB at 979.532.9496 or [bkoch@tsswcb.state.tx.us](mailto:bkoch@tsswcb.state.tx.us). For further information please visit <http://pcwp.tamu.edu><http://pcwp.tamu.edu/>.

June 8, 2006

## **Preventive Measures Can Help Protect Plum Creek Watershed**

*Writer: Blair Fannin, 979-845-2259, [b-fannin@tamu.edu](mailto:b-fannin@tamu.edu)*

*Dictson, 979-458-3478, [n-dictson@tamu.edu](mailto:n-dictson@tamu.edu)*

*Contact: Nikki*

LOCKHART – Prevention is key to protecting water resources across Texas, particularly in the Plum Creek Watershed, according to officials.

Discussion on ways to protect the watershed will be an important part of the second meeting of the Plum Creek Watershed Partnership scheduled for 6:30 p.m. June 20 at Lockhart State Park. Residents of Caldwell and Hays counties are encouraged to attend, said Rachel Bauer, Texas Cooperative Extension agent for Caldwell County.

“We’re encouraging anyone interested in helping to protect water quality in the watershed to join our team,” she said.

The group is developing a Watershed Protection Plan for Plum Creek that will guide efforts to protect and improve water quality, Bauer said.

A 2004 report revealed the Plum Creek Watershed has elevated nutrient concentrations and bacteria levels. A community-led water quality project will address these concerns. The watershed begins in southeastern Hays County north of Kyle and runs south through Caldwell County, passing near Lockhart and Luling. It then joins the San Marcos River in northern Gonzales County.

“Plum Creek Watershed includes the main stem and all of the tributaries that drain into it, all of which are affected by what happens in the surrounding cities and towns,” said Nikki Dictson, Extension water quality specialist. “We’re encouraging residents in the area to implement watershed protection methods as part of the plan we’re putting together.” In an urban setting, even the simplest activity, such as improper lawn fertilization, can be hazardous to water quality, Dictson said.

“It’s important that we have an understanding that many storm drains go directly to streams,” Dictson said. “For example, when homeowners fertilize lawns, they should be certain to use the correct rate and type of fertilizer. Over-spread fertilizer that lands on sidewalks or curbs will travel into storm drains that lead directly to streams. This can have adverse effects on fish and other aquatic organisms, and on wildlife that drink and use the water.”

Nitrogen and phosphorus – key nutrients in commercial fertilizer that are essential for plant growth – can pollute water if concentrations get too high, Dictson said.

Pet owners can help prevent this kind of runoff water contamination by removing their pets’ waste when visiting parks or walking animals in the neighborhood, she said.

“Pet waste contains both nutrients and bacteria, and can lead to contaminated water,” she said. Malfunctioning septic systems are another major potential source of bacteria and other pathogens, as well as nutrients.

“It’s very important to carry out proper maintenance of a septic system,” Dictson said. “Have your system inspected regularly. When installing a new system, make sure you have the right type for your location. It’s also important to size the system appropriately to fit the needs of the household, and to be certain it can operate efficiently.”

Other potential sources of contamination include inadequately treated discharge from wastewater treatment plants, as well as discharges or land application of wastes from other industries or businesses.

In agriculture, preventive measures include ensuring enough vegetative cover is available on rangeland.

“Vegetation covers the surface and acts as a natural filter to trap nutrients and bacteria that might otherwise be transported into a nearby stream,” Dictson said.

Providing alternative water sources and adequate shade on rangeland also can reduce the tendency for livestock to congregate in riparian areas adjacent to creeks or streams. These and other issues will be considered during the planning process, Dictson said. The resulting Watershed Management Plan developed by local citizens will be used as a guide to help improve and protect the quality of water in Plum Creek.

More information on the Plum Creek Watershed Partnership can be found at <http://pcwp.tamu.edu> . More information on the Texas Watershed Steward program can be found at <http://watershedsteward.tamu.edu> .

-30-

# The Plum Creek Watershed Needs You!

Have you heard of the Plum Creek Watershed before? If you live in Hays or Caldwell Counties, chances are that you have because the Plum Creek Watershed is where you live, work, and play. A watershed is an area of land that water flows across, through, or under as it drains into a stream, river, lake or ocean. The Plum Creek Watershed covers almost 256,000 acres of land and drains water to Plum Creek, a 52-mile stream segment that begins near Kyle and flows into the San Marcos River south of Luling.

Historically, Plum Creek has been used for fishing, wading and swimming. It has also provided valuable habitat for many types of aquatic plants and animals. But, these values are being threatened by declining water quality in Plum Creek. According to a biennial report that lists impaired water bodies in the state, Plum Creek has excessive levels of bacteria and nutrients. This report is developed by the Texas Commission on Environmental Quality (TCEQ) which is the state's water quality regulatory agency.

How do high levels of bacteria and nutrients get in water and what kinds of problems can they cause? Primary sources of bacteria and nutrients in water include septic systems, wildlife, livestock, family pets, urban runoff, and wastewater treatment plants. Another major source of nutrients is runoff from agricultural fields, lawns, golf courses, and sports fields where fertilizers, composts or manures have been applied. Bacteria in water are a concern because they often indicate the presence of other pathogenic organisms that can cause disease in humans and animals. High nutrient levels in a stream can lead to excessive aquatic plant growth, oxygen depletion, and even fish kills.

Unfortunately, Plum Creek is not alone. Data from the TCEQ indicate that nearly 92 percent of the streams, rivers, and lakes in Texas are impacted by some form of water pollution.

What can be done? Because we all live in a watershed, things we do at home and where we work and play can affect water quality and the health of our watershed. So, protecting water quality begins with you and those in your community. And, there is help to get started. The Texas Watershed Steward program is a new one-day training event sponsored by Texas Cooperative Extension and the Texas State Soil and Water Conservation Board. It is designed to help watershed residents improve and protect their water resources by getting involved in local watershed protection and management activities.

Texas Watershed Stewards learn about watershed systems, water quality regulation and monitoring, methods to improve water quality, and community-driven watershed protection and management. The training also provides the basic knowledge and tools needed to form a watershed action group, participate in and organize local watershed activities, and become more involved in protecting and enhancing your community water resources.

Three separate training events will be held in the Plum Creek Watershed beginning on Tuesday, December 4<sup>th</sup> in Kyle from 8am-4pm at the Plum Creek Community Center (459 Haupt). Two additional training events will be held in Lockhart and Luling in early 2008. All program participants will receive a free day of education and training, a free copy of the Texas Watershed Steward Curriculum Handbook, free prizes and gifts, and a certificate of completion. The program also provides a total of 7 Continuing Professional Education credits for certified teachers in Science, 7 Continuing Education Units (Soil and Water Management) for Certified Crop Advisors, and 3 Continuing Education Units (General) for TDA Pesticide License holders.

Texas Watershed Stewards is a great opportunity to get involved and make a difference in your watershed. For more information and to get your name on the pre-registration list, please visit the Texas Watershed Steward website at <http://tws.tamu.edu> or call/email Jennifer Peterson at 979-862-8072/ [jlpeterson@ag.tamu.edu](mailto:jlpeterson@ag.tamu.edu).

# **Parks, golf course and sports field management workshop to be held March 25 in San Marcos**

March 10, 2009

Contact(s): Dr. Jim McAfee, 972-952-9220, [j-mcafee@tamu.edu](mailto:j-mcafee@tamu.edu)  
Nikki Dictson, 979-845-2425, [n-dictson@tamu.edu](mailto:n-dictson@tamu.edu)

SAN MARCOS – Those interested in learning about turf management and irrigation for parks, golf courses, and sports field maintenance are invited to attend a free workshop from 8:30 a.m. to 3:30 p.m. on March 25 in San Marcos.

The workshop is being presented by the Texas AgriLife Extension Service, the Plum Creek Watershed Partnership and Texas State University.

The morning session will be held at the AgriLife Extension office for Hays County, located at 1253 Civic Center Loop. The afternoon session, which will include a sports field audit, will take place on the campus of Texas State University.

The workshop will be of interest to park, golf course and sports facility managers who want to maintain the highest quality fields possible and conserve water through proper irrigation principles, said Jim McAfee, AgriLife Extension turf grass specialist in Dallas.

The overall purpose of the course is to present information on turf grass management, soil fertility, and irrigation equipment-design and to assist them with determining the condition of their fields by conducting an audit, McAfee said. The sports field audit portion of the workshop will include evaluation of irrigation, fertilization, mowing, aerification and water conservation.

The workshop will address the importance of developing an effective and economical fertilization program; the best mowing height and frequency; creating a customized irrigation program; developing an aerification program to promote turf grass growth; and proper water use to assure continued high-quality water availability.

The workshop is free due to funding by AgriLife Extension and the Plum Creek Watershed Partnership through a CWA §319(h) Nonpoint Source Grant from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.

To receive a registration form and for more information, contact Nikki Dictson, phone: 979-845-2425 or email: [n-dictson@tamu.edu](mailto:n-dictson@tamu.edu).

A registration form also can be downloaded from: <http://pcwp.tamu.edu/sanmarcos-safeworkshop.html>

## **Free home aerobic septic system workshops in Hays and Caldwell counties**

April 30, 2009

*Paul Schattenberg, 210-467-6575, [paschattenberg@ag.tamu.edu](mailto:paschattenberg@ag.tamu.edu)*

Contact(s): Dr. Bruce Lesikar, 979-845-7451, [b-lesikar@tamu.edu](mailto:b-lesikar@tamu.edu)

Nikki Dictson, 979-458-3478, [n-dictson@tamu.edu](mailto:n-dictson@tamu.edu) [un-dictson@tamu.edu](mailto:un-dictson@tamu.edu)

SAN MARCOS – Homeowners interested in learning about the maintenance of their aerobic treatment system are invited to attend a free Texas AgriLife Extension Service workshop in San Marcos. A “Homeowner Maintenance of Aerobic Treatment Units Workshop” will be held from 9 a.m.- 4:30 p.m. May 27 at the AgriLife Extension office for Hays County, 1253 Civic Center Loop.

“The workshop will be of interest to homeowners who want to learn more about the components and maintenance of an aerobic treatment unit and spray field of their on-site systems,” said Dr. Bruce Lesikar, AgriLife Extension water and wastewater resource specialist in biological and agricultural engineering. It is important for homeowners to properly maintain and operate these systems to help protect water quality.

“The purpose of the course is to present information on the function, operation and maintenance of aerobic treatment units, and to provide hands-on demonstration of evaluation techniques to determine operational status of the treatment system,” Lesikar said.

Topics will include the importance of maintaining the system, health and safety considerations, basic concepts about the aerobic treatment processes, and system testing and reporting. It also will address “care and feeding” of the unit, system maintenance, system evaluation tools and supplies, and how effective wastewater treatment protects water resources.

“The workshop is free thanks to funding provided by the Plum Creek Watershed Partnership and Guadalupe-Blanco River Authority through a U.S. Environmental Protection Agency grant administered by the Texas Commission on Environmental Quality,” said Nikki Dictson, AgriLife Extension water quality program specialist.

Workshops are being offered in Hays and Caldwell counties as part of the Plum Creek Watershed Protection Plan implementation strategies to reduce potential pollutants from entering area streams and creeks by way of aerobic and septic systems.

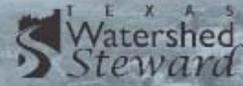
Another South Central Texas homeowner aerobic treatment unit maintenance workshop will be held from 9 a.m.- 4:30 p.m. June 24 at the AgriLife Extension office in Caldwell County, 1402 Blackjack Street, Suite B, Lockhart.

Class attendance is limited, so attendees are required to pre-register to ensure adequate space. To pre-register for either workshop and to get a registration form or more information, contact Susan Levien at 979-845-7451 or [s-levien@tamu.edu](mailto:s-levien@tamu.edu).

A registration form also can be downloaded from the Plum Creek Watershed Partnership Web site at <http://pcwp.tamu.edu/PChomeowner-workshop.html>

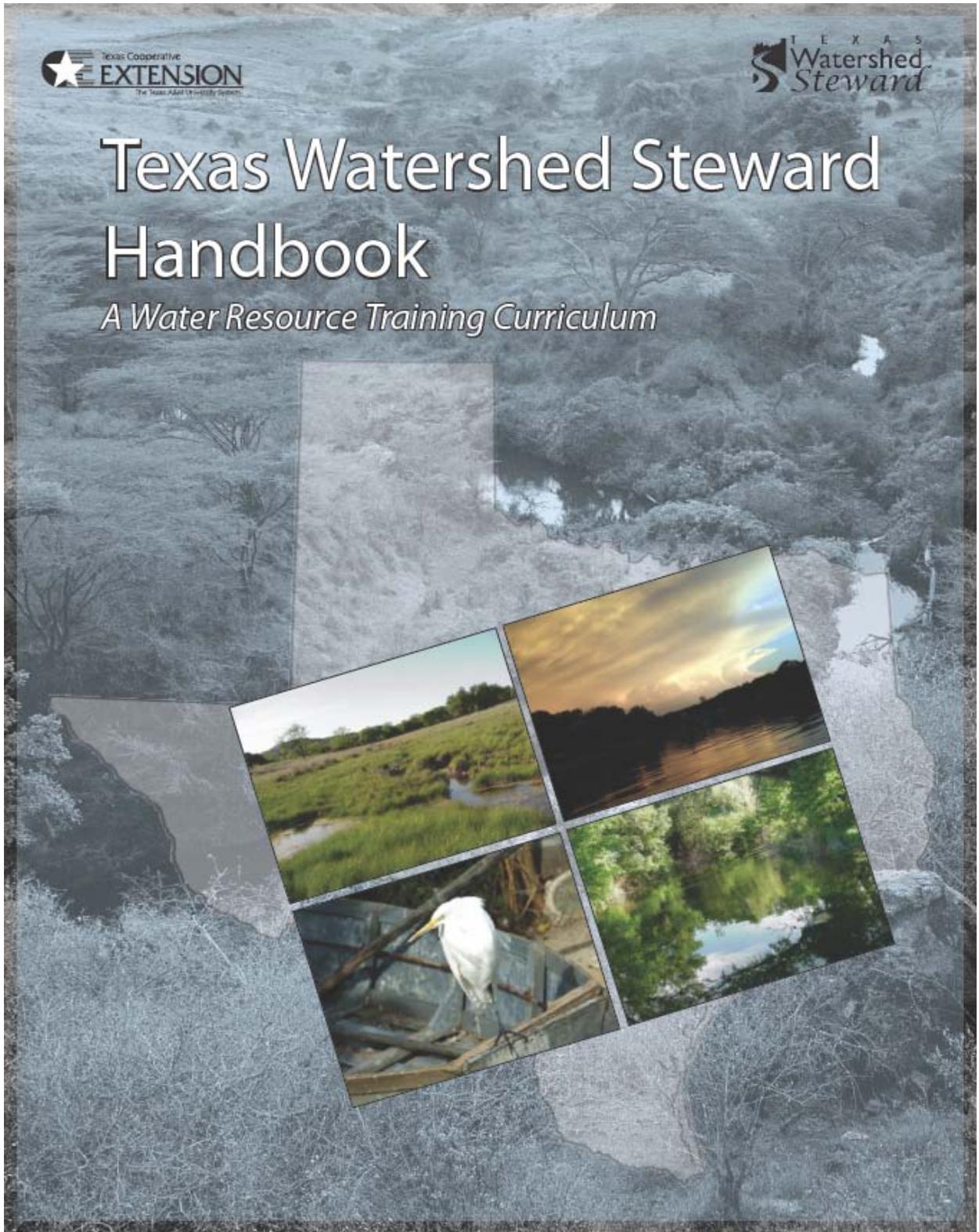
**Appendix B**  
**Texas Watershed Stewards Handbook and Materials**

TWS Curriculum Handbook



# Texas Watershed Steward Handbook

*A Water Resource Training Curriculum*



TWS Fact Sheet

# Texas Watershed Steward Program

*Water bodies within a watershed can be affected by many types of nonpoint source pollution. Recognizing these sources of pollution and methods for their control and prevention is critical. The Texas Watershed Steward (TWS) program is a partnership between Texas Cooperative Extension (TCE) and the Texas State Soil and Water Conservation Board (TSSWCB) to provide science-based, watershed education to help citizens identify and take action to address local water quality impairments.*



## Who Are Texas Watershed Stewards?

Anyone with a willingness to learn and a desire to improve and protect community water resources can become a Texas Watershed Steward. Anyone living in a watershed including homeowners, agricultural producers, decision-makers, and community leaders are all encouraged to learn more about this program and become Texas Watershed Stewards.

## Why is Watershed Stewardship Important?

Watershed stewardship means caring for the water, air, and biodiversity in the entire watershed, while acknowledging that everything is connected and is affected by natural and human activities. Water is the most critical component of our life's existence. Without clean water resources, we simply cannot survive. The quality and quantity of water found within our watersheds are greatly affected by how we choose to live on the land. And since each and every one of us lives in a watershed, good watershed stewardship is crucial to ensuring the sustainability of our water resources for generations to come.

If we become aware of our watersheds, become educated about the needs of our watersheds, understand the effects that our activities have on watersheds, and discover ways to get involved in our watersheds, we will act more responsibly to preserve, protect, and enhance them.

## What are the Goals of the Program?

The Texas Watershed Steward program promotes healthy watersheds by increasing citizen awareness, understanding, and knowledge about the nature and function of watersheds, potential impairments, and watershed protection strategies to minimize nonpoint source pollution.

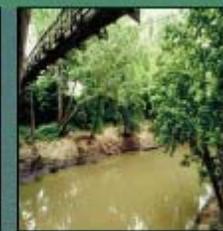
The broad goals of the Texas Watershed Steward Program include the following:

- ◆ Increase stakeholder involvement in Watershed Protection Plan (WPP) and/or Total Maximum Daily Load (TMDL) development processes by educating and organizing local citizens.
- ◆ Increase citizen awareness and knowledge of water issues.
- ◆ Empower individuals to take leadership roles involving community water issues.
- ◆ Protect and improve local water resources.

VISIT US ON OUR WEBSITE AT: <http://tw.s.tamu.edu/>



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TWS Workshop Banner



*Learn about your*



*watershed and the ways*



*you can improve and*



*protect water quality.*



<http://tws.tamu.edu>

## Appendix C



### Plum Creek Watershed Partnership Steering Committee Meeting May 8, 2008

#### Agenda

- 6:30 Meeting Overview & Introductions**  
– Mark McFarland, Texas AgriLife Extension Service
- 6:40 Update on Submitted Proposals**  
– Nikki Dictson and Matt Berg, Texas AgriLife Extension Service  
– James Earp, Assistant City Manager, City of Kyle
- 7:00 Update on Additional Implementation Avenues**  
– Nikki Dictson, Texas AgriLife Extension Service  
– Matt Berg, Texas AgriLife Extension Service
- 7:20 Update on Feral Hog Management Workshops and Education**  
-- Rachel Bauer, Former Caldwell County Texas AgriLife Extension Service
- 7:25 Update on Regional Feasibility Studies – TWDB Proposals**  
– Debbie Magin, Guadalupe-Blanco River Authority
- 7:30 Break**
- 7:45 Update on Plum Creek Outreach and Education 106 Grant Project**  
– Debbie Magin, Guadalupe-Blanco River Authority  
– Nikki Dictson, Texas AgriLife Extension Service
- 8:00 Report on Plum Creek Cleanup Project**  
– Lee Gudgell and Debbie Magin, Guadalupe-Blanco River Authority
- 8:15 Update on Targeted Water Quality Monitoring Project**  
– Debbie Magin, Guadalupe-Blanco River Authority  
– Lee Gudgell, Guadalupe-Blanco River Authority
- 8:30 TPWD Report on Plum Creek Fish Kill on February 16<sup>th</sup>, 2008**  
– Stephen Twidwell, Texas Parks and Wildlife
- 8:50 Next Steps:**  
**Next Meeting: August 14, 2008**  
**Partnership/Steering Committee Meeting**



**First Lockhart National Bank**  
**6:00 – 9:00 pm**



## Appendix D

### Pre-test evaluation instrument



Birthdate:  /  /

Location of Training: \_\_\_\_\_

### TEXAS WATERSHED STEWARD PROGRAM

#### Pretest

*The purpose of this pretest is to help us learn more about you and to determine baseline data on watershed related information. Please read the following questions and circle the answer you think is correct. Please do not worry if you do not know the answer, simply circle "unsure." THANKS!!!*

**MARKING INSTRUCTIONS**

CORRECT: ● INCORRECT: ✖ ☒ ☑

1. Watershed hydrology is the study of how:
  - Water interacts with various parts of a watershed including the land, the sea, and the sky
  - Water quality and quantity are affected by point and nonpoint source pollution
  - Chemical, physical, and biological water quality parameters change over time
  - Water is formed on the Earth
  - Unsure
2. A healthy watershed exhibits which of the following natural hydrologic functions?
  - Water capture
  - Water storage
  - Water release
  - All of the above
  - Unsure
3. All of the following are natural features found in healthy, functioning watersheds EXCEPT:
  - Upland
  - Erosion zone
  - Floodplain
  - Riparian zone
  - Water body
  - Unsure
4. The quantity and quality of freshwater in Texas are not affected by the state's climate.
  - True
  - False
  - Unsure



**MARKING INSTRUCTIONS**

CORRECT: ● INCORRECT: ✖ ✘ ☹ ☺

5. \_\_\_\_\_ is a term used to describe the chemical, physical, and biological characteristics of water.
- Water quantity
  - Water clarity
  - Water quality
  - Water availability
  - Unsure
6. Point source pollution refers to pollution that is discharged from a clearly defined, fixed point such as a pipe, ditch, channel, sewer, or tunnel.
- True
  - False
  - Unsure
7. The most common nonpoint source impairment in Texas is:
- Bacteria
  - Dissolved oxygen
  - Sediment
  - Hazardous and Toxic Substances
  - Unsure
8. All of the following are examples of major sources of nonpoint source pollution, EXCEPT:
- Bacteria
  - Nutrients
  - Algae
  - Sediment
  - Toxic Chemicals
  - Unsure
9. The actions of humans can significantly impair water quantity and quality through which of the following land use activities?
- Construction and urbanization
  - Fertilizer application
  - Resource extraction
  - Wastewater discharge
  - All of the above
  - Unsure
10. Who lives in a watershed?
- Farmers and ranchers
  - City residents
  - Small and large businesses
  - Everyone
  - Unsure

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**MARKING INSTRUCTIONS**

CORRECT: ● INCORRECT: ✖ ✘ ☹ ☹

11. The Clean Water Act of 1972 was passed to:

- Protect the water quality of all of the nation's waterbodies
- Protect threatened and endangered plant and animal species
- Enable dredging in water bodies to prevent sedimentation and erosion
- Increase the funding for water treatment plants
- Unsure

12. Water quality standards exist for surface water, wastewater effluent, and drinking water.

- True
- False
- Unsure

13. Which state agency is the primary water quality agency in Texas?

- Environmental Protection Agency (EPA)
- Texas Water Development Board (TWDB)
- Texas Commission on Environmental Quality (TCEQ)
- Texas State Soil and Water Conservation Board (TSSWCB)
- Unsure

14. A watershed approach is a flexible framework for managing the quantity and quality of water resources found within specified watershed boundaries.

- True
- False
- Unsure

15. Which of the following are important types of water quality improvement projects in Texas?

- A. Watershed protection plans (WPP)
- B. Water quality standards assessment
- C. Total maximum daily loads (TMDL)
- A and C
- B and C
- Unsure

16. Best Management Practices (BMPs) should be widely used to minimize and/or prevent the harmful impacts of nonpoint source pollution in urban and rural areas.

- True
- False
- Unsure

17. Local involvement is not critical to the success of watershed management and protection activities.

- True
- False
- Unsure

18. Which of the following are benefits to forming a watershed group?

- Strength in numbers
- Increased resources
- Diverse expertise
- Creative/collaborative solutions
- All of the above
- Unsure

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**MARKING INSTRUCTIONS**

CORRECT: ● INCORRECT: ✘ ☒ ☑ ☒

19. Please tell us if any of the following items interest you.

ITEM	Not Interested	Possibly Interested	Probably Interested	Definitely Interested
A. Protecting my watershed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B. Participating in additional watershed education workshops or seminars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C. Becoming active in a local watershed group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D. Having a leadership role in a local watershed group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E. Participating in a volunteer water quality monitoring program	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20. Please answer the following questions by marking YES or NO related to where you have received water quality information. If the question does, not apply, select "NA."

Have you received water quality information from the following sources?	Yes	No	NA
A. Television	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B. Newspapers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C. Internet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D. Texas AgriLife Extension Service (formerly Texas Cooperative Extension)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E. Texas AgriLife Research (formerly Texas Agricultural Experiment Station)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
F. Universities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
G. Environmental Agencies (government)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
H. Environmental groups (citizens groups)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21. How did you hear about the Texas Watershed Steward Program?

- Extension                       Texas Coop Magazine  
 Newspaper                       Utility insert  
 Newsletter                       Friend  
 Internet                           Other:

22. How would you best describe yourself? (fill in one only)

- Rural landowner                       Member of a non-governmental organization  
 Urban landowner                       Teacher / educational professional  
 Agency Professional                       Other:   
 Watershed council member

23. You are . . . .  Female  Male

24. Your age?  18 - 24     30 - 34     40 - 44     50 - 54     60 - 64     70 - 74  
 25 - 29     35 - 39     45 - 49     55 - 59     65 - 69     75+

25. Place of residence?  Farm or ranch                       Town or city between 10,000 and 50,000 persons  
 Rural area, not a farm / ranch     City between 50,000 and 250,000 persons  
 Town under 10,000                       City over 250,000 persons

26. Highest level of education obtained?

- Some high school or less                       Vocational or technical degree                       Bachelor degree  
 High school graduate or GED                       Some college                       Post-graduate degree(s)

**THANK YOU!**

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## Appendix E Post-test evaluation instrument



Birthdate:  /  /

Location of Training: \_\_\_\_\_

### TEXAS WATERSHED STEWARD PROGRAM Post Test

Your views on the quality and effectiveness of Extension programs are extremely important. Please take a few minutes to tell us about your experience with this program. Your answers to the following questions will help us better meet your needs in the future. Thank you!

**MARKING INSTRUCTIONS**

CORRECT: ● INCORRECT: ☒ ☓ ☑ ☒

Overall, how satisfied are you with this activity?

- Not at all   
  Slightly   
  Somewhat   
  Mostly   
  Completely

If not "Completely Satisfied," please tell us what we could have done better in order for you to be "Completely Satisfied?"

How satisfied are you with the following aspects of the activity?      Not at all    Slightly    Somewhat    Mostly    Completely

a. <u>Quality</u> of course materials . . . . .	<input type="radio"/>				
b. <u>Location</u> of the activity . . . . .	<input type="radio"/>				
c. <u>Accuracy</u> of information . . . . .	<input type="radio"/>				
d. Information being <u>new</u> to you . . . . .	<input type="radio"/>				
e. Information being <u>easy</u> to understand . . . . .	<input type="radio"/>				
f. <u>Range</u> of topics covered . . . . .	<input type="radio"/>				
g. <u>Completeness</u> of information given . . . . .	<input type="radio"/>				
h. <u>Timeliness</u> of information (being received in time to be useful) . . . . .	<input type="radio"/>				
i. <u>Helpfulness</u> of the information in decisions about your own situation . . . . .	<input type="radio"/>				
j. Instructor's <u>knowledge level</u> of subject matter . . . . .	<input type="radio"/>				
k. Instructor's <u>responses to questions</u> . . . . .	<input type="radio"/>				

Based on the information and technical assistance you received today, what is the likelihood that you would recommend Texas AgriLife Extension Service to your family and friends as a contact for information and assistance on water-related issues? **Mark only one number below with 1 = not likely and 10 = likely.**

- 1   
  2   
  3   
  4   
  5   
  6   
  7   
  8   
  9   
  10  
 Not Likely Likely

25880



**MARKING INSTRUCTIONS**

CORRECT: ● INCORRECT: ✖ ✘ ☹ ☹

*Please read the following questions and mark the answer you think is correct. Please do not worry if you do not know the answer, simply mark "unsure." THANKS!!!*

1. Watershed hydrology is the study of how:
  - Water interacts with various parts of a watershed including the land, the sea, and the sky
  - Water quality and quantity are affected by point and nonpoint source pollution
  - Chemical, physical, and biological water quality parameters change over time
  - Water is formed on the Earth
  - Unsure
  
2. A healthy watershed exhibits which of the following natural hydrologic functions?
  - Water capture
  - Water storage
  - Water release
  - All of the above
  - Unsure
  
3. All of the following are natural features found in healthy, functioning watersheds EXCEPT:
  - Upland
  - Erosion zone
  - Floodplain
  - Riparian zone
  - Water body
  - Unsure
  
4. The quantity and quality of freshwater in Texas are not affected by the state's climate.
  - True
  - False
  - Unsure
  
5. \_\_\_\_\_ is a term used to describe the chemical, physical, and biological characteristics of water.
  - Water quantity
  - Water clarity
  - Water quality
  - Water availability
  - Unsure
  
6. Point source pollution refers to pollution that is discharged from a clearly defined, fixed point such as a pipe, ditch, channel, sewer, or tunnel.
  - True
  - False
  - Unsure
  
7. The most common nonpoint source impairment in Texas is:
  - Bacteria
  - Dissolved oxygen
  - Sediment
  - Hazardous and Toxic Substances
  - Unsure
  
8. All of the following are examples of major sources of nonpoint source pollution, EXCEPT:
  - Bacteria
  - Nutrients
  - Algae
  - Sediment
  - Toxic Chemicals
  - Unsure
  
9. The actions of humans can significantly impair water quantity and quality through which of the following land use activities?
  - Construction and urbanization
  - Wastewater discharge
  - Fertilizer application
  - All of the above
  - Resource extraction
  - Unsure
  
10. Who lives in a watershed?
  - Farmers and ranchers
  - City residents
  - Small and large businesses
  - Everyone
  - Unsure

25880



**MARKING INSTRUCTIONS**

CORRECT: ● INCORRECT: ☒ ☓ ☐ ☑

11. The Clean Water Act of 1972 was passed to:

- Protect the water quality of all of the nation's waterbodies
- Protect threatened and endangered plant and animal species
- Enable dredging in water bodies to prevent sedimentation and erosion
- Increase the funding for water treatment plants
- Unsure

12. Water quality standards exist for surface water, wastewater effluent, and drinking water.

- True
- False
- Unsure

13. Which state agency is the primary water quality agency in Texas?

- Environmental Protection Agency (EPA)
- Texas Water Development Board (TWDB)
- Texas Commission on Environmental Quality (TCEQ)
- Texas State Soil and Water Conservation Board (TSSWCB)
- Unsure

14. A watershed approach is a flexible framework for managing the quantity and quality of water resources found within specified watershed boundaries.

- True
- False
- Unsure

15. Which of the following are important types of water quality improvement projects in Texas?

- A. Watershed protection plans (WPP)
- B. Water quality standards assessment
- C. Total maximum daily loads (TMDL)
- A and C
- B and C
- Unsure

16. Best Management Practices (BMPs) should be widely used to minimize and/or prevent the harmful impacts of nonpoint source pollution in urban and rural areas.

- True
- False
- Unsure

17. Local involvement is not critical to the success of watershed management and protection activities.

- True
- False
- Unsure

18. Which of the following are benefits to forming a watershed group?

- Strength in numbers
- Increased resources
- Diverse expertise
- Creative/collaborative solutions
- All of the above
- Unsure

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**MARKING INSTRUCTIONS**

CORRECT: ● INCORRECT: ☒ ☓ ☐ ☑

19. Please indicate your intentions to do the following:

Practice related to . . .	Definitely Will Not	Probably Will Not	Undecided	Probably Will	Definitely Will	Already Adopted
A. Participate in community cleanup activities	<input type="radio"/>					
B. Get involved in local planning / zoning decisions	<input type="radio"/>					
C. Communicate water issues with elected officials	<input type="radio"/>					
D. Help develop a plan for my watershed (WPP)	<input type="radio"/>					
E. Help form or become a member of a local watershed group	<input type="radio"/>					

20. Are there any Best Management Practices (BMPs) that you plan to adopt to help protect your watershed?

- Yes     No     Unsure

*if yes, please list the ones you plan to adopt in the space below*

21. Do you feel what you learned in the program provided you the ability to be a better steward of your watershed?

- Yes     No     Unsure

22. What is the most significant thing you learned during the program (feel free to list more than one)?

23. How much would you be willing to pay for this program?

- \$0 - \$9   
  \$30 - \$39   
  \$60 - \$69   
  \$90 - \$100  
 \$10 - \$19   
  \$40 - \$49   
  \$70 - \$79  
 \$20 - \$29   
  \$50 - \$59   
  \$80 - \$89

24. What other information do you need pertaining to these topics?

**THANK YOU!**

25880



## Appendix F Phase 2, 6-month delayed post-test

Follow-Up Survey - Mozilla Firefox

https://www.nri.com/take/?i=133056&h=JVNyrFy4ObSYLA71cgE-LQ

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### Texas Watershed Steward Program Follow-Up Survey

This survey is 3 pages in length and should take 5-10 minutes to complete. If you would like to return to a previous page at any point while taking the survey, please use the back button in your Internet browser.

**PAGE 1 - Birth date**  
Please indicate your date of birth.  
Example: 00/00/1900

**Location of Training**  
Please indicate the location where you completed your training.

Next

[Reset Answers](#)

[Click here to continue this survey later](#)

Please send any comments about this survey to the [survey owner](#).  
If you encounter any technical problems, please contact [technical support](#).

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Highlight all  Match case



## Texas Watershed Steward Program Follow-Up Survey

This survey is 3 pages in length and should take 5-10 minutes to complete. If you would like to return to a previous page at any point while taking the survey, please use the back button in your Internet browser.

### PAGE 2 - Adoption of Practices

Please tell us if you adopted any of the practices below based on what you learned at the Texas Watershed Steward Workshop.

	I am still undecided	NO, and I don't plan to	NO, but I still plan to	YES, I did
Participated in at least one community cleanup activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gotten involved in local planning/zoning decisions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communicated water issues with elected officials	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helped develop a plan for your watershed (Watershed Protection Plan)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helped form or become a member of a local watershed group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<b>Gotten involved in a volunteer water quality monitoring program</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Given a presentation to a school class or other community group on watershed stewardship/water quality issues</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Encouraged others in your community to attend a TWS workshop</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>More closely monitored individual actions that can impair water quality</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Adopted/maintained Best Management Practices (BMPs) on your property or in your community related to improving water quality?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Adopted soil testing practices</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Please list any other activities you have done as a result of the Texas Watershed Steward workshop.**

Please list any other activities you have done as a result of the Texas Watershed Steward workshop.

If you don't plan to adopt the practices above, what would help you adopt those practices in the future?

Next

[Reset Answers](#)

[Click here to continue this survey later](#)

Please send any comments about this survey to the [survey owner](#)  
If you encounter any technical problems, please contact [technical support](#)



## Texas Watershed Steward Program Follow-Up Survey

This survey is 3 pages in length and should take 5-10 minutes to complete. If you would like to return to a previous page at any point while taking the survey, please use the back button in your Internet browser.

**PAGE 3**  
The following questions are Yes / No questions. Please read them and provide a response.

Select one of the following

	Yes	No
Have you used the resources/materials provided to you at the workshop?	<input type="radio"/>	<input type="radio"/>
Have you shared the resources/materials provided to you at the workshop with others?	<input type="radio"/>	<input type="radio"/>
Were you satisfied with the resources/materials provided to you at the workshop?	<input type="radio"/>	<input type="radio"/>

How have you used the resources/materials provided to you at the workshop (i.e., curriculum handbook, extra publications)?

http://is-nri.com/Take/getsurvey.asp?i=133056&PageId=3&r=27587872&h=JVNyrFy40bSYLA71cgE-LQ&qn=&cn=

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Have you shared the resources/materials provided to you at the workshop with others?

Were you satisfied with the resources/materials provided to you at the workshop?

How have you used the resources/materials provided to you at the workshop (i.e., curriculum handbook, extra publications)?

[Empty text input area]

Would you be interested in TWS on-line modules if they were available in the future?

Select one of the following

Yes  
 No

Finish

Reset Answers

[Click here to continue this survey later](#)

Please send any comments about this survey to the [survey owner](#).  
If you encounter any technical problems, please contact [technical support](#).



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