

The Texas Watershed Steward Program

A WATER RESOURCE TRAINING CURRICULUM



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WATERSHED MANAGEMENT

- Local action is key to solving water quality problems in most watersheds.
- EPA & state agencies have embraced the local watershed planning concept.
 - **Watershed Protection Plans (WPPs)**
 - **Total Maximum Daily Loads (TMDLs)**
- Involvement of local stakeholders is important.
 - **Must know the issues and avenues for participation**



TEXAS WATERSHED STEWARD PROGRAM

- Introductory training in the fundamentals of watersheds and watershed management.
- Target audience: individuals representing all stakeholder groups...
 - **Agriculture**
 - **Urban**
 - **Business/industry**
 - **City/county officials and personnel**
 - **Landowners, homeowners**



PROGRAM FUNDING

- CWA 319(h) grant from the TSSWCB through the EPA:
 - 2005 – Curriculum development and pilot TWS program
 - 2007 – Statewide implementation of TWS program
 - 2011 – Continued statewide implementation of TWS program, feasibility of expanding to other states



TWS PROGRAM GOALS

1. Increase citizen awareness, understanding, and knowledge of the nature and function of watersheds, potential impairments, and watershed protection strategies.
2. Empower and inspire individuals to take leadership roles involving community water issues.
3. Enhance stakeholder involvement in local watershed protection planning initiatives (WPP/TMDL).



TWS PROGRAM CURRICULUM

5



Community-Driven Watershed Protection and Management

4



Managing To Improve Watershed Function

3



An Overview of Watershed Impairments

2



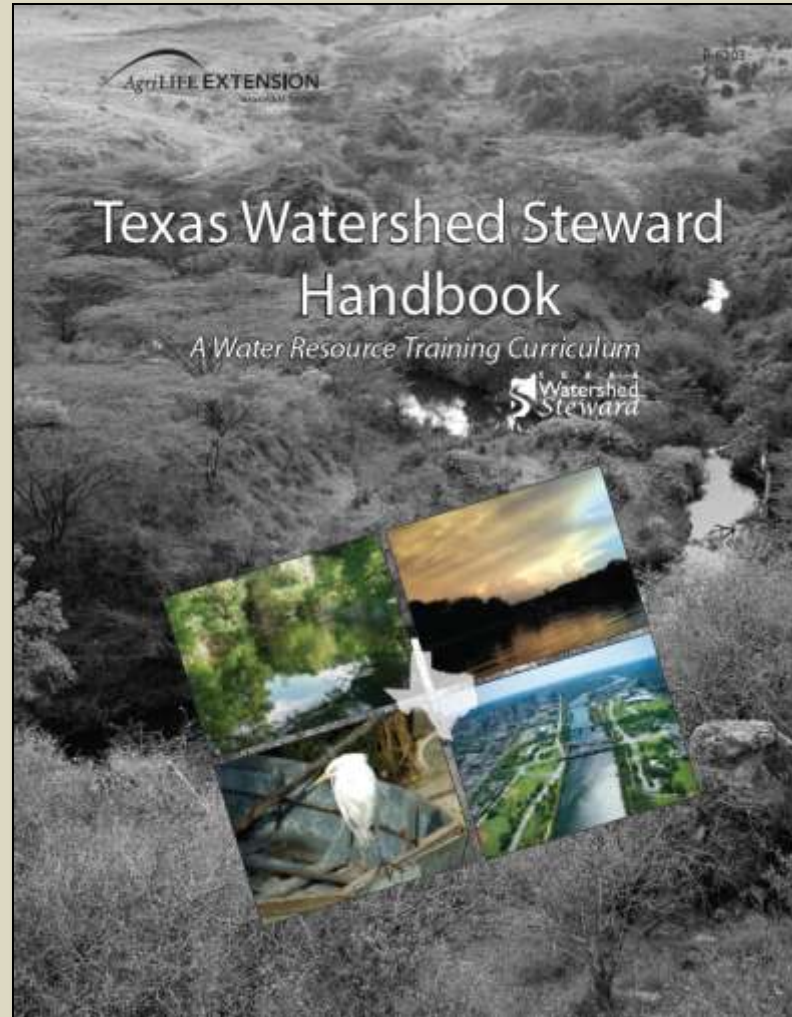
An Overview of Watershed Functions

1



Program Introduction

TWS CURRICULUM HANDBOOK



PROGRAM INTRODUCTION

- About the Texas Watershed Steward Program
- Who are Texas Watershed Stewards?
- The Importance of Watershed Stewardship
- Texas Water Facts

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. This includes homeowners, agricultural producers, decision makers and community leaders who all live in a watershed and depend on its valuable resources. The Texas Watershed Steward program is open to people of all ages regardless of socioeconomic status, race, color, sex, handicap or national origin.

The Importance of Watershed Stewardship

The word stewardship means taking the responsibility to care for the well-being of something that is valued. Watershed stewardship means caring for the water, air and biodiversity in an entire watershed, while acknowledging that all resources are connected and all are affected by natural and human activities. Water is the most critical component of life. Without clean water resources, we cannot survive. The quality and quantity of water within our watersheds are greatly affected by the way 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 educated about our watersheds and understand how our activities affect them, we will act more responsibly to preserve, protect and enhance these vital resources.



OVERVIEW OF WATERSHED SYSTEMS

Chapter 2: Overview of Watershed Systems

holds excess water, allowing it to be slowly released into the river system or seep into groundwater aquifers. Floodplains also help to filter out sediment from floodwaters, thereby keeping it out of water bodies. Floodplains often support an abundance of aquatic life and are often used as recreation areas.

The word riparian means "of the river." The riparian zone is the non-cultivated, vegetated land that touches and immediately surrounds a stream, river, lake or other body of water. This zone often includes wetlands (Fig. 8), which are areas of land that are regularly saturated with water for at least part of the year and that contain vegetation adapted to living in saturated conditions. Wetlands and other components of the riparian zone perform vital functions that help maintain the health of the watershed. Riparian zones help to:

- Stabilize watershed slopes and streambanks. The roots of trees and plants hold streambank soil in place so that ground is not lost to erosion.
- Filter pollutants. The vegetation in the riparian area traps sediment and other

pollutants, and absorbs nutrients from the watershed before they can reach the water.

- Maintain proper water temperature within the stream or river. Trees and plants hanging over the water shade it and help keep it cool all summer (this is critical to fish life, as many fish can't live with a rise in temperature of even a few degrees).
- Supplement nutrients. As leaves and insects fall into the water they provide food for animals living in the stream.
- Provide habitat and food for wildlife. Many birds (Great Blue Herons, Kingfishers, Eagles, Osprey, etc.) and other animals rely on vegetation near water for their homes and nesting places.
- Provide a "transitional zone" from bank to floodplain to watershed slope. This is critical for flood mitigation, as it gives floodwater a place to slow down and soak in or enter the stream with less energy.

A water body refers to any stream, river, pond, lake, estuary or ocean. Water bodies can be

flowing (lotic) systems (streams and rivers) or non-flowing (lentic) systems (ponds and lakes).

The flow of water in these systems, particularly in rivers and streams, is greatly affected by the natural features of the watershed (including the topography, slope, soils and vegetation). For example, the natural meanders, or curves, in a stream or river help slow down the flow of water and control flash flooding. A severe, rapid release of water will occur in straight channels with little resistance to water.



Figure 8. Wetland full of plants adapted to live in or near water. (Photo courtesy of © 2007 iStockphoto.com Corporation.)


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

OVERVIEW OF WATERSHED IMPAIRMENTS

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

Chapter 3: Overview of Watershed Impairments

How Land Use Affects Water Quantity and Quality



The quality and quantity of our water resources are determined by natural environmental influences and the activities of humans. In this section, you will learn about the ways human actions can impair water quality and quantity. In later sections, we will focus on ways people can benefit the land by implementing various watershed management and protection strategies.

Water quality and quantity are closely linked to the way land is used and the type of land cover (Fig. 21). Specific **land use** categories include agriculture, industry, recreation, residential and urban. Most of the ways people use land has the potential to generate pollutants that can impair water quality and reduce water quantity.

Land cover refers to the biological or physical features of the land surface. Types of land cover include forests, agricultural fields, lakes, rivers and even parking lots. When people change the way land is used in a watershed, they usually alter the land cover at the same time. For example, when a new housing development is built, forests and fields are replaced by a new type of land cover—pavement.

Here are some activities that can degrade water quality and quantity (Fig. 22):

- Storing water and irrigating crops
- Using fertilizers
- Using industrial or agricultural chemicals
- Extracting resources
- Constructing buildings and expanding towns and cities
- Applying wastewater

The effects of these land use activities can be severe. Such activities can alter the natural hydrology of a system, alter the land cover, create pollution, increase erosion and sedimentation, allow exotic species to invade at the expense of native vegetation, and harm biodiversity.

Adequate supplies of good quality water are vital to the health and social and economic well-being of all Texans. Yet water quality and quantity are at risk in many areas of the state because our population is growing and our use of the land is changing so rapidly (Table 4). We must ensure the safety of our water resources for generations to come.

Table 4. Population projections for Texas through 2040. (Source: Texas State Data Center and Office of the State Demographer.)

YEAR	POPULATION ESTIMATE
2010	28,092,545
2015	29,213,001
2020	32,736,893
2025	36,602,183
2030	41,117,824
2035	46,103,913
2040	51,707,500

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MANAGING TO IMPROVE WATERSHED FUNCTION

Chapter 4: Managing to Improve Watershed Function



Figure 30. Center pivot irrigation system. (Photo courtesy of USDA Natural Resources Conservation Service.)

and other pollutants, and promote the infiltration of water into the soil. The width of a filter strip depends on the slope and amount of land area delivering water to the strip and on the type of vegetation used.

Structural Practices

Water and sediment control basins are erosion control structures commonly installed across the bottoms of drainage ways to prevent bank and gully erosion on farmland and to minimize sedimentation of nearby water bodies (Fig. 34). Basins help improve water quality downstream by trapping sediment, by controlling water flow within a drainage area, and by storing runoff

water and allowing it to slowly infiltrate into the soil profile.

Terraces are level soil embankments that are usually constructed on the contour of the land. They help control runoff and soil erosion. Because they tend to promote water infiltration into the soil, these structures also are effective in reducing both nutrient and pesticide losses.

Grassed waterways are natural drainages that are planted to sod-forming grasses to help control runoff water from agricultural lands (Fig. 35). Covering the drainage way with grass helps

Cover and green manure crops are crops of close-growing grasses, legumes or small grains grown primarily for temporary, seasonal soil protection and improvement, except where there is permanent cover as in orchards or vineyards (Fig. 33). Green manure crops are plowed under and incorporated into the soil to control erosion, add organic matter and nutrients, suppress weeds, remove surplus nitrogen remaining in the ground after harvest, and reduce the need for nitrogen fertilizers.

Vegetative buffer strips or filter strips are strips of grasses or other vegetation placed along streams or drainage areas to trap sediment, filter nutrients



Figure 31. Conservation tillage. Farmers leave crop residue on soil surface to reduce erosion by wind. (Photo courtesy of USDA Natural Resources Conservation Service.)



Figure 32. Contour farming. (Photo courtesy of USDA Natural Resources Conservation Service.)

- Using a Watershed Approach
- Water Quality Improvement Projects (WPPs, TMDLs)
- Best Management Practices
- Water Quality Stewardship on Small Acreages
- Managing Non-Domestic Animals and Wildlife
- Protecting Water Quality Around the Home

COMMUNITY-DRIVEN WATERSHED PROTECTION AND MANAGEMENT

- Importance of Local Watershed Involvement
- Forming and Sustaining Community Watershed Organizations and Partnerships
 - **Facilitated discussion with participants about their watershed.**
 - **Work to stimulate formation of a local action group.**

streams, rivers and lakes in the watershed. A float trip can help people understand how bodies of water are connected to the watershed, learn more about water and watersheds in general, and just have fun. This might be an effective way to bring group members closer together, especially if the group is just starting out. It could also be a great way to attract different members of the community to your group's cause—people who otherwise wouldn't have known about or gotten involved with the group.

Volunteer water quality monitoring. Volunteer water quality monitoring is a special way for people to be actively involved in gauging the health of their watershed. To start a volunteer water quality monitoring group, consider contacting Texas Watch, a network of volunteers and partners who are trained to collect water quality data. Pick some easily accessible sites along a popular stream, river, lake or other body of water and test the quality of the water at those sites regularly. Keep track of your data and monitor how it changes over time. If problems are identified, the partnership could encourage action to protect or restore watershed health.

Stream cleanups. Stream cleanups can be very successful because participants can see a visible difference afterward and know they are making a difference to the land and water resources in their community. There are many federal, state and local entities (EPA, TCEQ, Keep Texas Beautiful) that have experience in organizing and conducting stream cleanups. They will often sponsor the event and provide trash bags and other materials at no cost.

Educational programs and exhibits. These are great tools for increasing community awareness about the watershed and informing people of steps they can take to help improve watershed health (Fig. 51). A short presentation to a school class or community group can really make a



Figure 51. Interpretive signage helps raise awareness in the community. (Photo courtesy of USDA Natural Resources Conservation Service.)

difference and can also garner more support for watershed improvement. You might also create an exhibit that showcases your group's mission, vision and goals and describes concerns the group has about the community watershed. Display it at community gatherings and events.

Media campaign. An effective way to get the word out about water quality issues in your watershed is to advertise. Options include mass mailings, fliers, public service announcements, watershed fact sheets and newspaper articles. You can also create posters and other visuals to display at local libraries, shopping centers, coffee shops, and other popular places around town. It's a great way to raise awareness in the community, get

TWS EDUCATIONAL TRAINING

- 1-day training (8 hours)
 - Reach a broader audience
 - No “master” requirements
 - Stimulate initial interest and involvement
- Interactive ‘stations’
 - Enviroscape
 - NPS containers
 - Rainfall simulator
 - WQ monitoring equipment
 - Macroinvertebrate ID
 - Google Earth...



GOOGLE EARTH WATERSHED TOUR

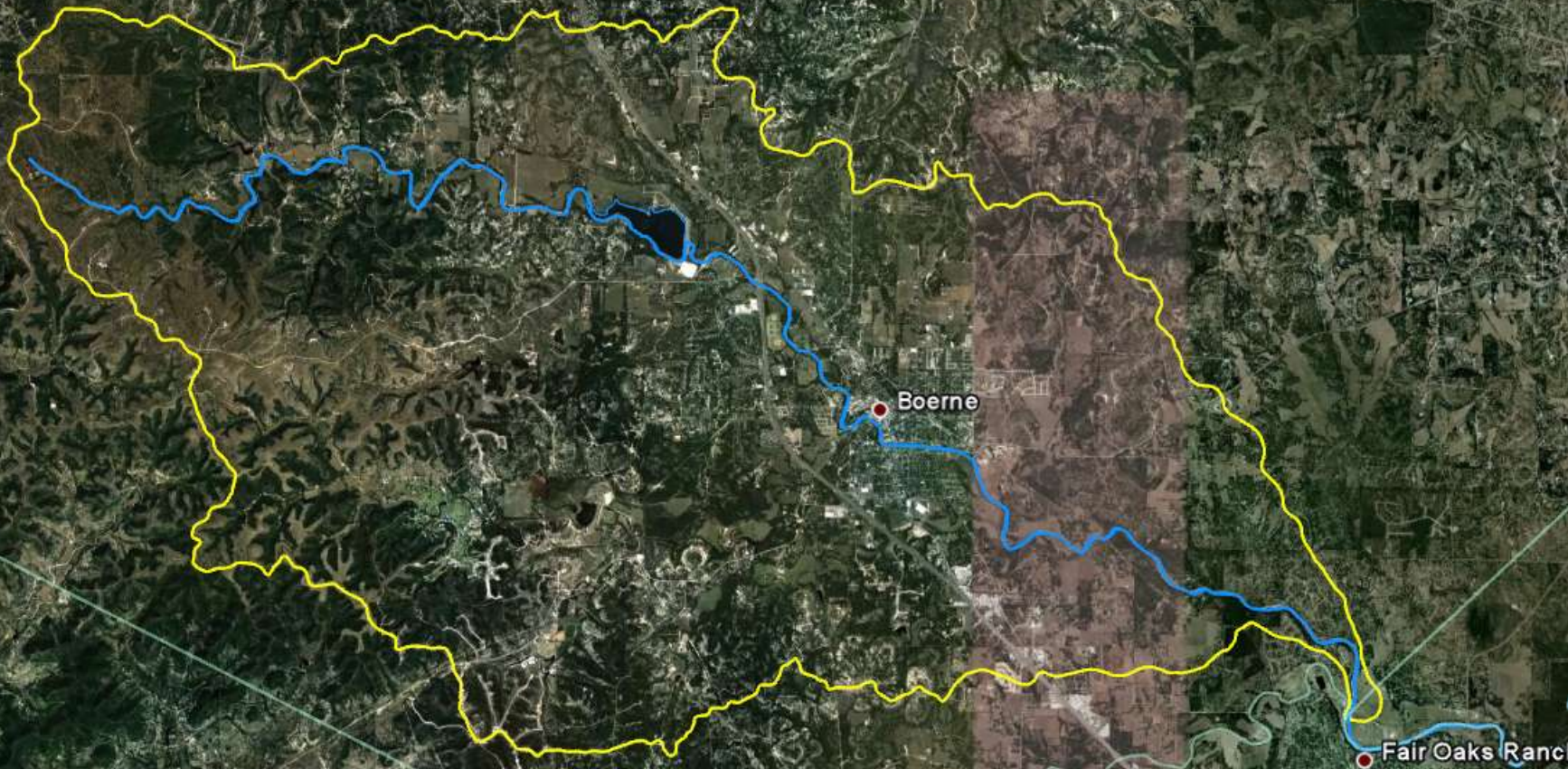


Image USDA Farm Service Agency

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Image CAPCOG

Image © 2010 DigitalGlobe

29°49'10.24" N 98°45'58.00" W elev. 1562.0'

2009

Go



ston

Corpus Christi

Austin

San Antonio

WORKSHOPS ARE TAILORED FOR EACH WATERSHED

- Maps and materials
- Local issues
- Local impairment(s)
- Local RAs, organizations
- Google Earth tour
- Facilitated discussion



PROGRAM MARKETING

- Media campaign (3 months in advance)
 - Newspapers
 - Local/regional magazines
 - CEA, MG, MN, HOA newsletters
 - TV/radio
 - Fact sheets, brochure
 - Word of mouth
- Local events
 - Field days
 - Project poster and banner



INCENTIVES FOR PARTICIPATION

- Educational credits:
 - 7 AICP CM hours (planners)
 - 7 TBPE CPEs (engineers)
 - 7 CCA CEUs (soil & water management)
 - 7 SBEC CPEs (teachers)
 - 3 TFMA (floodplain mgr)
 - 3 TDA CEUs (general)
- Promotional items



PROGRAM EVALUATION

- 2-phase evaluation approach:
 1. Pre-test/post-test
 2. 6 mo. delayed post-test
- To evaluate:
 - Knowledge gained
 - Satisfaction with program
 - “Intentions to change”

Location of Training _____ Birth Date _____

TEXAS WATERSHED STEWARD PROGRAM
Pretest

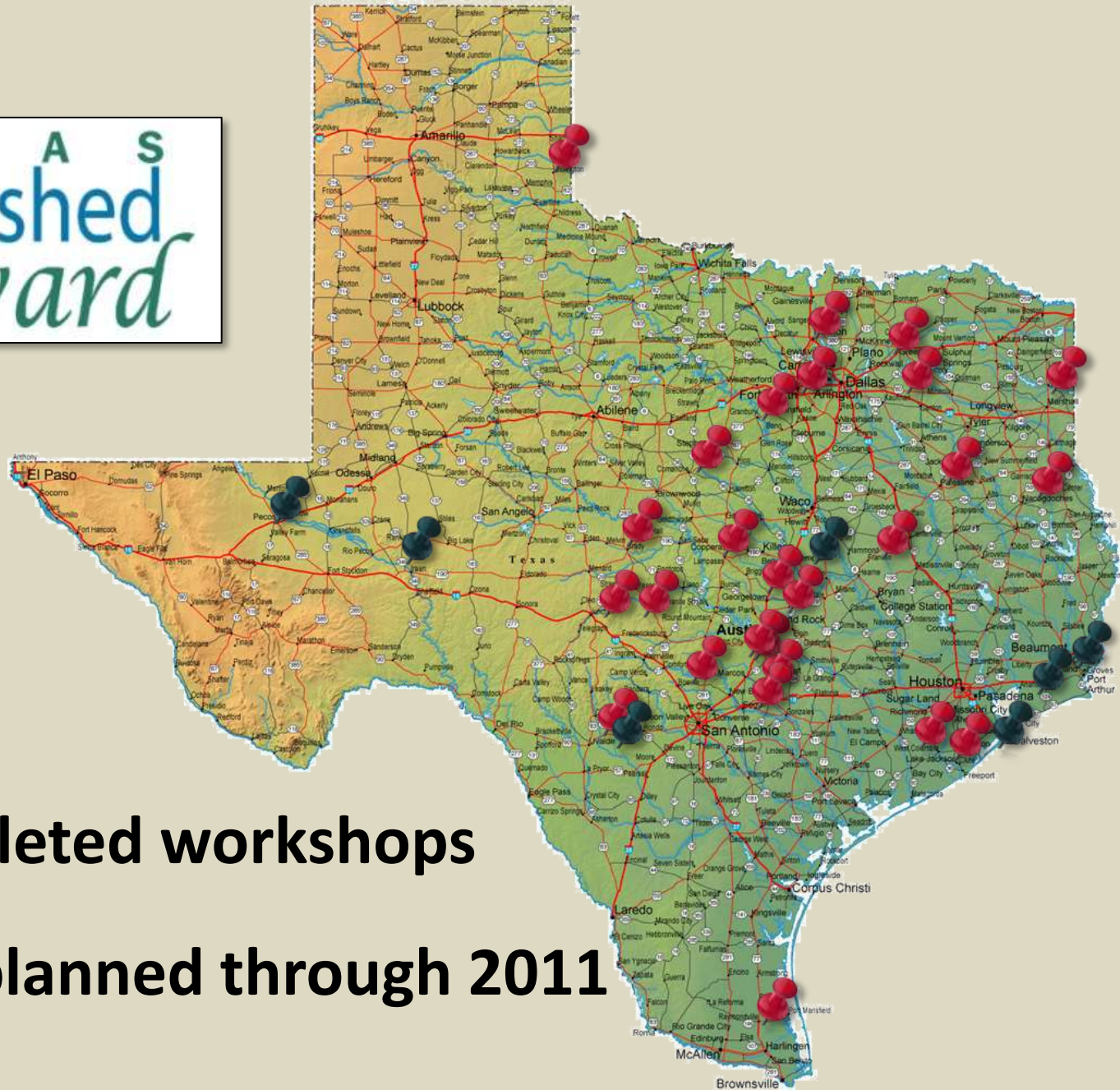
The purpose of this pretest is to help us learn more about you and to determine baseline data on watershed related information. Please read the following questions and circle the answer you think is correct. Please do not worry if you do not know the answer, simply circle "unknown." THANKS!!!

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

Point source such as a pipe.

Page 1.1





 **29 completed workshops**

 **7 more planned through 2011**

RESULTS/IMPACTS: *KNOWLEDGE*

- ***Overall knowledge Increase***..... **32.2%**
 - Pollutant sources and BMPs..... **28.8%**
 - Watersheds **29.6%**
 - Freshwater..... **23.5%**
 - Policy and Government..... **43.0%**



RESULTS/IMPACTS: *SATISFACTION*

- With overall activity..... **97.9%**
- Quality of materials..... **98.7%**
- Range of topics covered..... **95.6%**
- Information being easy to understand..... **95.1%**
- Helpfulness of info. in decision-making..... **89.4%**



RESULTS/IMPACTS: *INTENTIONS TO CHANGE*

- ***Intent to:***

- Participate in cleanup activities..... **64.6%**
- Get involved in local P&Z **59.1%**
- Communicate with elected officials..... **66.7%**
- Help develop plan for their watershed..... **58.7%**
- Form or become a member of a local watershed group..... **57.9%**



RESULTS/IMPACTS: *ADOPTION OF PRACTICES*

- More closely monitored individual actions that can impair water quality **68%**
- Adopted/maintained BMPs on property or in community..... **67%**
- Encouraged others in community to attend a TWS workshop..... **65%**
- Communicated water issues with elected officials..... **60%**

RESULTS/IMPACTS: *ADOPTION OF PRACTICES*

- Participated in at least one cleanup activity..... **67%**
- Communicated water issues with elected officials **64%**
- Gotten involved in local P&Z..... **54%**
- Help develop a WPP in watershed..... **52%**
- Become a volunteer water quality monitor..... **50%**



ADDITIONAL TOOLS AND MATERIALS

- Online version of TWS:

<http://tws.tamu.edu/online-course>

Home Exit Contributors Tech Notes Help 

Texas Watershed Stewards

A Water Resource Training Curriculum



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MODULE 1 Watershed Stewardship | MODULE 2 Watershed Systems | MODULE 3 Watershed Improvement | MODULE 4 Watershed Assessment | MODULE 5 Watershed Implementation | Home Exit Glossary Handbook

What is a Watershed?

Section 1 Page 1 of 4




A watershed is an area of land that water flows across, through, or under as it drains to a stream, river, lake, ocean or other body of water.

Each kind of drainage system has its own watershed and all drainage systems and watersheds are connected across the landscape.

[Click to Play a Watershed Video!](#)

[BACK](#) [NEXT](#)

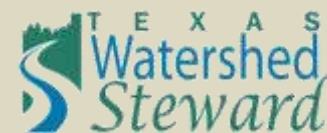


THE TEXAS WATERSHED STEWARD PROGRAM

<http://tws.tamu.edu>



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