

Texas Nonpoint Source Pollution Assessment Report and Management Program



**Texas Natural Resource
Conservation Commission**



**Texas State Soil and
Water Conservation Board**

Texas Nonpoint Source Pollution Assessment Report and Management Program



1999



Prepared by the

Texas Natural Resource Conservation Commission
and the
Texas State Soil and Water Conservation Board



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Errata Sheet

1999 Nonpoint Source Program Assessment Report and Management Program

SFR-68/99, October 1999



Chapter 8, page 8-25 contains a description of the Dairy Outreach Program. That description, under the subheading “Outcomes,” incorrectly cites Subchapter K regulations. New CAFO regulations replacing Subchapter K became effective in July of 1999. Accordingly, the “Outcomes” section should read as follows:

OUTCOMES:

Dairies and other concentrated animal feeding operations (CAFOs) are regulated by the TNRCC. Under 30 TAC Chapter 321, Subchapter B (in §321.41) that became effective on July 27, 1999, CAFO operators in the DOPAs must obtain written authorization prior to beginning operations, complete an eight-hour course on animal waste management within 12 months, and complete an additional eight hours of training in animal waste management in each subsequent 24-month period. Also, an authorized person identified in each CAFO’s pollution prevention plan must annually complete an inspection of the facility and a report documenting the findings of the inspection.

The purpose of this program is to develop educational materials for regulated and non-regulated facilities and annual training to improve surface water quality in the DOPAs. Primary emphasis is on dairy producers; however, training manuals on animal waste management will be developed for poultry and swine facilities as well.

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LIST OF ACRONYMS

AFD - Austin Fire Department
AFO - Animal Feeding Operation
AMATP - Austin Metropolitan Area Transportation Plan
BMP - Best Management Practice
BRA - Brazos River Authority
BRC - Bureau of Radiation Control
CAFO - Concentrated Animal Feeding Operation
CBBEP - Coastal Bend Bays Estuary Program
CERCLA - Comprehensive Environmental Response Compensation and Liability Act
CIP - Capital Improvement Plan
CMP - Coastal Management Plan
COA - City of Austin
CPP - Continuing Planning Process
CRP - Clean Rivers Program
CRMWA - Canadian River Municipal Water Authority
CWA - Clean Water Act
DOPA - Dairy Outreach Program Areas
DIY - Do-It-Yourselfer
DRASTIC - D=depth to water, R=annual recharge, A=aquifer media, S=soil media, T=topography,
I=vadose impact zone, C=hydraulic conductivity
ECSD - Environmental & Conservation Services Department
EE - Environmental Education
EMC - Event Mean Concentration
EPA - Environmental Protection Agency
ERM - Environmental Resource Management
ERT - Emergency Response Team
FIFRA - Federal Insecticide Fungicide and Rodenticide Act
FY - Fiscal Year
GBEP - Galveston Bay Estuary Program
GIS - Geographic Information Systems
GLO - General Land Office
GPS - Global Positioning System
GWAS - Ground Water Assessment Section
GWNPS - Ground-water Nonpoint Source Program
HSPF - Hydrologic Simulation Program-Fortran
IBI - Index of Biotic Integrity
ICI - Invertebrate Community Index
ILM - Integrated Landscape Management
IPM - Integrated Pest Management
ISTEP - Intermodal Surface Transportation Enhancement Program
LCRA - Lower Colorado River Authority
MEP - Maximum Extent Practicable
METF - Maintenance Environmental Task Force
MPS - Mean Point Score
NAAEE - North American Association of Environmental Educators
NOAA - National Oceanic Atmospheric Administration

NRCS - United States Department of Agriculture-Natural Resource Conservation Service
NPDES - National Pollutant Discharge Elimination System
NPS - Nonpoint Source
NRDA - Natural Resource Damage Assessment
OCS - Occupational Certification Section
OPPR - Office of Pollution Prevention and Recycling
OSSF - On-Site Sewage Facilities
OWRM - Office of Water Resource Management
PARD - Parks and Recreation Department
PCBs - Poly Chlorinated Biphenyls
RCRA - Resource Conservation and Recovery Act
RCT - Railroad Commission of Texas
SMRD - Surface Mining and Reclamation Division
SOS - Save Our Springs
SRF - State Revolving Fund
STEP - Small Towns Environmental Program
SW3P - Storm Water Pollution Prevention Plan
SWCD - Soil and Water Conservation District
SWQM - Surface Water Quality Monitoring Program
TAC - Texas Administrative Code
TAEE - Texas Association of Environmental Educators
TAES - Texas Agricultural Experiment Station
TAEX - Texas Agricultural Extension Service
TDA - Texas Department of Agriculture
TDH - Texas Department of Health
TDHCA - Texas Department of Housing and Community Affairs
TEEAC - Texas Environmental Education Advisory Committee
TES - Teaching Environmental Science
TH&SC - Texas Health and Safety Code
TMDL - Total Maximum Daily Load
TNRCC - Texas Natural Resource Conservation Commission
TNRIS - Texas Natural Resources Information System
TPWD - Texas Parks and Wildlife Department
TRCS - Texas Review and Comment System
TSSWCB - Texas State Soil and Water Conservation Board
TSWQS - Texas Surface Water Quality Standards
TWDB - Texas Water Development Board
TxDOT - Texas Department of Transportation
UCRA - Upper Colorado River Authority
UNRMWA - Upper Neches River Municipal Water Authority
USFWS - United States Fish and Wildlife Service
USGS - United States Geologic Survey
VIP - Visual Index Pollution
WCID - Water Conservation Improvement Districts
WHP - Wellhead Protection
WLE - Waste Load Evaluation

WPAP - Water Pollution Abatement Plan
WQMP - Water Quality Management Plan
WRE - Water Resources Evaluation



INTRODUCTION

Texas is at a critical juncture. Already the nation's second most populous state, Texas continues to experience a high rate of population growth. Most of this growth is in urban areas. This population increase makes additional demands on the state's natural resources for housing, food, fuel, transportation, and the myriad other goods and services that today's modern economy requires. Demands made by this growing population will degrade the state's natural resources unless the state implements forward-reaching programs to prevent pollution and restore water bodies already affected by man's activities.

Water quality is degraded when storm water runoff carries pollutants like motor oil from automobiles, fertilizers from landscapes or farms, and sediments from construction sites into downstream creeks, rivers, lakes, aquifers, and estuaries. This is *nonpoint source* (NPS) water pollution. Decisions made today about how to manage nonpoint sources of pollution will help determine where and at what cost Texans draw their water for drinking, livestock, fishing, boating, and swimming. Nonpoint sources of pollution are increasingly affecting the quality of the state's waters. A nonpoint source program based upon common sense, science, and fiscal responsibility implemented now will save future generations the expense of cleaning up what we leave behind and provide good-quality water for the use and enjoyment of all Texans.

Working Partnerships for NPS Pollution Management

Texas uses an integrated watershed approach to manage and coordinate water quality management activities, including nonpoint source pollution management. The Texas Natural Resource Conservation Commission (TNRCC) has primary responsibility for implementing the provisions of the Texas Constitution and the state laws relating to water. The TNRCC is responsible for managing non-agricultural/silvicultural nonpoint source pollution and point source pollution. The Texas State Soil and Water Conservation Board (TSSWCB) is responsible for managing agricultural and silvicultural nonpoint source pollution. The TNRCC and the TSSWCB cooperate to achieve overall program goals. The TNRCC and the Clean Rivers Program (CRP) assess water quality in the state and establish where nonpoint source problems exist. The TNRCC, the TSSWCB, and other state agencies, in partnership with the CRP, have established several ongoing programs and forums to support the state's clean water goals.

The state uses the infrastructure of the Clean Rivers Program to coordinate, develop, and implement its NPS program. Established by the Texas Legislature to pursue an integrated, systematic approach to managing water quality and resource issues, the CRP is a partnership of the TNRCC, the TSSWCB, regional water authorities, other state and federal agencies, and the public. The CRP uses a watershed management approach, following a 5-year basin management cycle to:

- ! identify priority watersheds with NPS water quality problems;
- ! formulate steps necessary to mitigate known water quality problems; and
- ! secure and target resources to develop and implement NPS strategies to restore water quality in priority watersheds.

CRP activities are coordinated by the statewide CRP Stakeholders Workgroup. This Workgroup provides a unique opportunity to obtain consensus for a consistent approach to NPS water quality issues in the same forum in which the Clean Water Act (CWA) §303(d) and CRP assessment priorities are set. Annually, the TNRCC and the TSSWCB meet with the Workgroup to present information and work on statewide NPS goals, work plans, and coordination. The CRP Stakeholders Workgroup represents approximately 65 state, regional, and local government agencies, along with citizen, environmental, and industry groups. A Nonpoint Source Technical Workgroup formed as a subcommittee of the Stakeholders Workgroup develops technical, statewide, short-term NPS goals.

Several other CRP forums also support citizen involvement in NPS pollution management at the regional and local level, including:

- ! Basin Steering Committees for the individual river basins in the state;
- ! CRP Technical Subcommittees formed to provide in-depth review and analysis of water quality issues raised by the Steering Committees; and
- ! local Watershed Action Committees formed in those priority watersheds where source water protection and watershed restoration activities are planned.

Local watershed action committees established to address specific water quality issues will involve all necessary partners—federal, state, tribal, regional, and local—in achieving water quality improvements. The state believes that the grassroots support that evolves from the formation of local watershed action committees will lead to further coordination of statewide efforts in addressing water quality concerns.

Various other forums coordinate NPS management activities related to groundwater, agriculture, and silviculture. Some of these forums include the State Agricultural/Silvicultural Nonpoint Source Advisory and Coordinating Committees and the Texas Groundwater Protection Committee. These groups each represent a broad spectrum of stakeholder types.

Nonpoint Source Program Goals

Within its cooperative, watershed-based framework, Texas has identified goals and objectives to guide nonpoint source program activities. These goals and objectives encompass elements intended to provide a strong foundation for maintaining a comprehensive nonpoint source program. The success of the program will be based on the cooperation, coordination, and participation of state, federal, and local agencies, various stakeholder and interest groups, businesses and industry, and the general public at the state and local levels.

Program Mission

To protect the quality of water resources in Texas from adverse effects due to nonpoint sources of pollution through the cooperative implementation of a diverse range of strategies based on common sense, good science, and fiscal responsibility which emphasize pollution prevention, a watershed perspective, and community-based solutions.

Long-Term Goal

By 2015, Texas will establish a state-approved watershed action plan or TMDL equivalent (unless the original basis for listing a water body is no longer valid) to restore and maintain water quality in all watersheds identified as impacted by nonpoint source pollution in the state's 319 assessment. The 319 assessment is based on the TNRCC's CWA §303(d) listing process. The state will facilitate 100

percent implementation of the watershed action plans or TMDL equivalents adopted to the extent practicable under state and federal statutes, programs, and resources. In addition, Texas will continue to implement existing nonpoint source pollution abatement programs in watersheds throughout the state.

Short-Term Goals

Goal One Beginning in state fiscal year 1999, in accordance with the state’s TMDL schedule, identify and characterize water quality problems due to nonpoint sources of pollution and develop watershed action plans in eight watersheds, or 6% of the segments identified in the FY 98 §303(d) list. (See Chapter 1, “State of Texas Short Term Goals,” for a listing of targeted watersheds.)

Annually to the year 2015, TMDL assessment and implementation will begin in additional NPS-impaired watersheds in order to achieve the state’s long-term goal of establishing a state-approved watershed action plan or TMDL equivalent to restore and maintain water quality in all watersheds identified as impacted by nonpoint source pollution in the state’s 1998 §303(d) list.

Goal Two Annually to the year 2002, coordinate and administer the NPS program internally and with other federal, state, regional, and local entities. Manage all §319 funds efficiently and effectively to target the highest priority areas identified in the 1998 Section §303(d) List as impacted by NPS pollution.

Goal Three By 2002, direct 20% of §319 pass-through funds to voluntary programs that provide technical assistance and incentives to landowners, producers, citizens, and businesses for implementing best management practices.

The goals and objectives of the NPS Program are discussed in further detail in Chapter 1, “Nonpoint Source Program Goals and Objectives,” page 1-36.

Organization of This Document

Chapter 1 provides an overview of:

- ! the state’s water resources
- ! the state’s assessment of nonpoint source impairment to Texas surface and ground waters
- ! federal requirements for the nonpoint source program
- ! the state’s management approaches and challenges
- ! targeting of nonpoint source impaired waters for restoration
- ! the nine key elements of the state’s program
- ! the state’s goals and objectives for nonpoint source management

Chapter 2 explains the statewide watershed management approach that Texas uses to coordinate its water quality management activities, including management of nonpoint source pollution. Chapter 2

also discusses how stakeholders (those persons or organizations with an interest in water quality) are involved in the water quality management process.

Chapters 3, 4, and 5 describe the various state programs that are instrumental in achieving the state's nonpoint source management goals. Chapter 3 discusses TNRCC programs, Chapter 4 addresses TSSWCB programs, and Chapter 5 describes the programs of other state agencies.

Chapter 6 includes the programs of those regional and local agencies that responded to a survey undertaken by the TNRCC to identify what NPS problems local and regional agencies have identified in their areas, and what programs they are implementing to address them.

Chapter 7 identifies the best management practices being used by stakeholders throughout the state to prevent nonpoint source pollution or to restore impaired waters.

Chapter 8 includes milestone schedules that show the steps the state will take over the next five years to reach its nonpoint source program goals.

The Appendices include:

- ! a certification of the state's authority to implement its nonpoint source management program;
- ! a review of federal programs for consistency with the state's program;
- ! funding sources for NPS programs;
- ! a summary of public response to the Draft Nonpoint Source Management Program;
- ! the methodology used to assess water quality for the 1998 §305(b) and 319(a) assessments;
- ! data tables detailing nonpoint source impairments to Texas surface and ground waters; and
- ! Section 319 of the Clean Water Act.

CHAPTER 1

MANAGEMENT AND ASSESSMENT OVERVIEW



Nonpoint Source Pollution

Every river, stream, lake, reservoir, and estuary has a watershed. Each watershed encompasses many land uses and supports a variety of economic activities. To a large extent, water quality within a watershed is linked to the actions of the people who live, work, and play within its boundaries. Water quality problems can be a result of either *point source* or *nonpoint source (NPS)* pollution. A *point source* is a single, identifiable source of pollution such as a discharge from a municipal or industrial wastewater treatment plant. Point sources are regulated under the Clean Water Act (CWA) and Texas law and are subject to permit requirements that focus on water quality protection. These permits specify effluent limits, monitoring requirements, and enforcement mechanisms. Wastewater discharge permits were developed from extensive and highly coordinated research sponsored and largely funded by EPA.

Nonpoint sources are largely unregulated and have not been evaluated in the same vigorous technical manner as point sources of pollution. Nonpoint source pollution originates from many different locations. It occurs when rainfall runoff transports contaminants on the surface of the land into adjacent water bodies. Contaminated storm water can cause impairment to the beneficial uses of receiving surface waters. Groundwater can be contaminated by pollutants carried by water percolating through the soil. Agriculture, forestry, and residential and urban development are examples of nonpoint sources of pollutants. Common pollutants from these activities include:

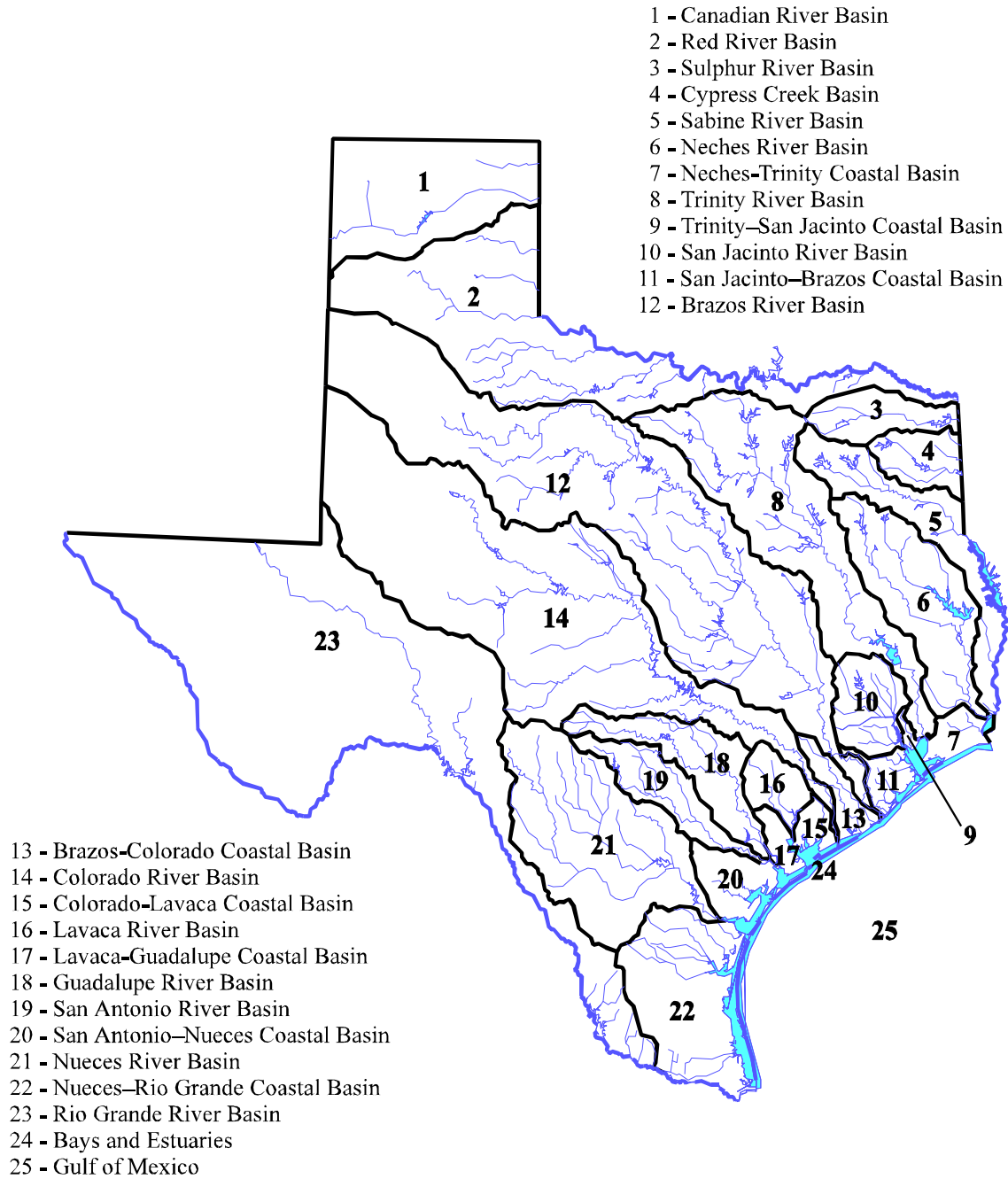
- ! sediment from croplands, forestry activities, construction sites, and stream-bank erosion;
- ! nutrients from croplands, lawn and gardens, livestock operations, septic systems, and land waste application;
- ! bacteria from livestock, septic systems, wildlife, and urban runoff;
- ! man-made chemicals, including pesticides, from roadways, cropland, lawns, gardens, and forestry operations.

Water pollution problems from nonpoint sources are less obvious than those from point sources, and are not as easy to control through traditional treatment strategies. The variability of rainfall events and the complexity of the landscape and geologic strata lead to nonpoint source pollution phenomena which are highly variable and intricate. The lack of a single identifiable source of pollution makes it difficult to establish specific cause-and-effect relationships. The familiar and often necessary nature of the activities that lead to nonpoint source pollution, such as fertilizing crops

What is a Watershed?

Everyone lives in a watershed, or drainage basin, which is defined as a geographic area in which water, sediments, and dissolved materials drain into a common body of water. The body of water could be a stream, lake, playa, estuary, aquifer, or ocean. A watershed can be as large or as small as you want to define it. In a city, the gutters that run along the curb on your street are the drainage outlets for your street's watershed. The water in the gutters, which drain the small watershed of your neighborhood, flows into the storm drain system and empties into a nearby stream, which drains several streets in a larger watershed. That stream, in turn, flows into a larger stream or river. Everything that is done in a watershed can affect the quality of the receiving water body.

Figure 1-1. Major Surface Water Basins of Texas



and lawns or washing our cars in the driveway, makes it difficult to appreciate the potential adverse consequences of those activities.

Texas Water Resources

Texas is the second-largest state in the United States, occupying about 7 percent of the total U.S. water and land area. Within its boundaries, Texas includes 262,017 square miles of area; 4,790 square miles of this total area is surface water. In addition to surface water, nine major and twenty minor aquifers, underlying approximately 76 percent of the state's surface acreage, provide an extensive groundwater resource.

Surface Water

Texas has a large number of surface water bodies, with 191,228 miles of streams and rivers. Texas has 25 major watersheds (see Figure 1-1), and ranks seventh among states on the conterminous U.S. for amount of acreage covered by surface waters (see Table 1-1).

The major surface waters of Texas have been divided into 368 classified water segments. A single river may consist of several classified segments. The term *segment* refers to the surface waters of an approved planning area that exhibit common biological, chemical, hydrological, natural, and physical characteristics and processes. Segments will also normally exhibit common reactions to external stresses such as discharges or pollutants.

Stream segments have been established by the TNRCC to facilitate planning activities, issuance of permits, and allocation of grant funds necessary to implement the federal Clean Water Act. Each segment has been assigned one or more designated uses according to the state's surface water quality standards. Designated uses for a particular segment may include one or more of the following: contact recreation, non-contact recreation, public water supply, industrial water supply, agricultural water supply, navigation, aquifer protection, or oyster waters.

Groundwater

Groundwater supplies about 41 percent of the state's municipal water systems and about 75 percent of the water used in irrigation. Major aquifers are defined as producing large quantities of water in a comparatively large area of the state. Minor aquifers produce either significant quantities of water within smaller geographic areas or small quantities in large areas. Minor aquifers are very important, as they may constitute the only significant source of water supply in some regions of the state. The major and minor aquifers are composed of many rock types, including limestones, dolomite, sandstones, gypsum alluvial gravels, and, in some parts of the state, igneous rocks. Figures 1-2 and 1-3 illustrate the geographic distribution of the state's major and minor aquifers.

Extent and Nature of the Problem in Texas Surface Waters

The TNRCC assesses nonpoint source pollution in Texas in accordance with Section 319(a) of the Clean Water Act, with the cooperation of the TSSWCB and other interested parties in the state. The 1998 assessment summarized in this document compiles available information from

various nonpoint source water quality assessments. Statewide water quality monitoring data, watershed characterization information, and information solicited through an intergovernmental coordination and public participation process are used to produce annual assessments of NPS impairments to Texas surface waters.

Table 1-1. Atlas of Texas Surface Waters

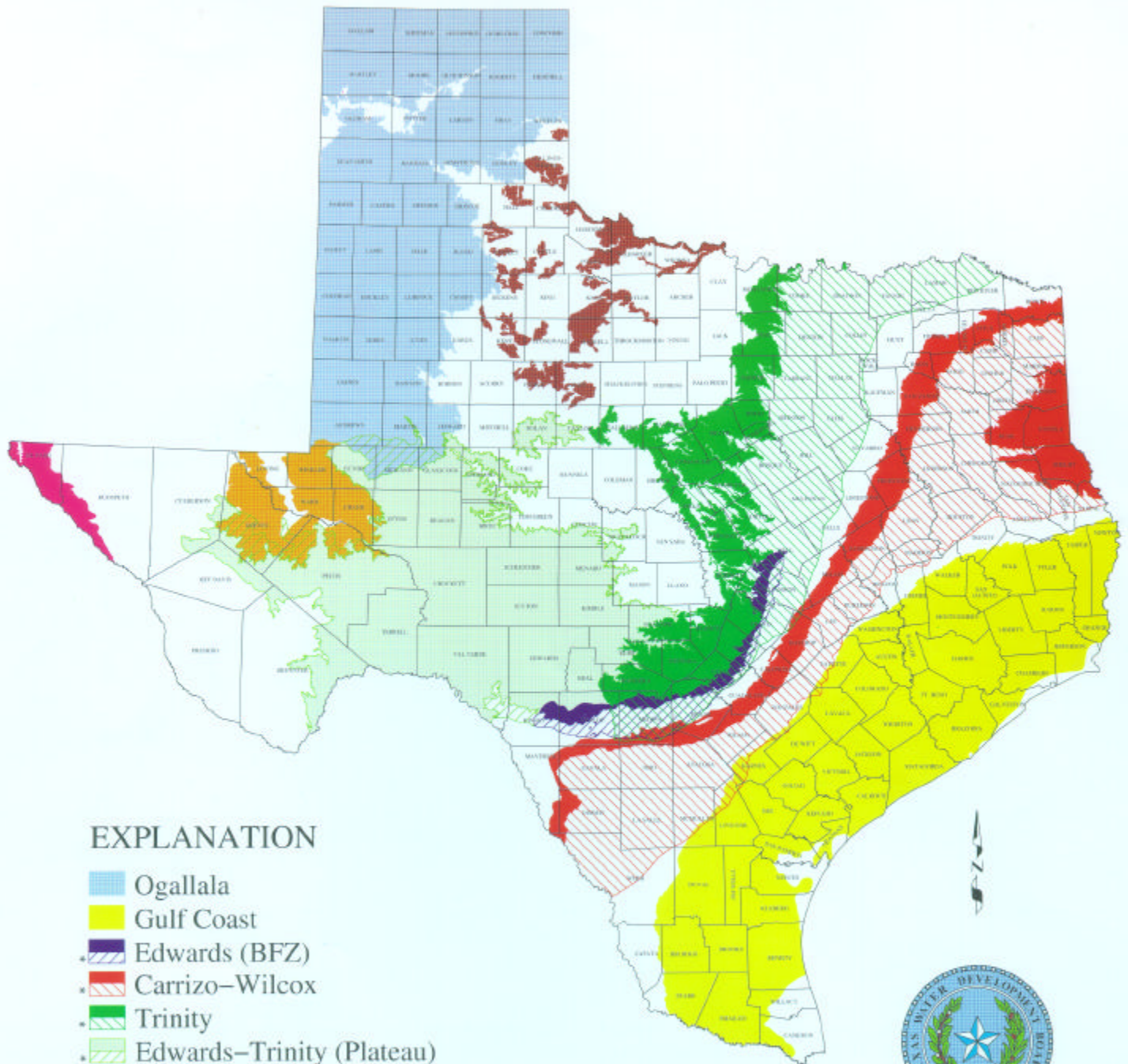
State land surface area (square miles)	262,017
Total number of river and stream miles	191,228
Number of named streams and rivers	11,247
Number of named streams and river miles	80,000
Number of TNRCC classified stream and river segments	224
Number of TNRCC classified stream and river miles	14,348
Number of perennial river miles	40,194
Number of intermittent stream miles	144,603
Number of ditches and canals	6,431
Number of border miles	2,272
Number of reservoirs (> 10 ac-ft)	6,736
Number of major reservoirs (> 5,000 ac-ft)	203
Total acres of major reservoirs	1,690,140
Total number of TNRCC classified reservoir segments	99
Total number of TNRCC classified reservoir acres	1,536,939
Square miles of TNRCC classified bays	1,990.7
Number of TNRCC classified bay segments	44
Square miles of TNRCC classified Gulf waters	3,879
Number of classified Gulf segments	1
Number of Gulf coastline miles	624
Acres of inland wetlands	6,471,012
Acres of coastal wetlands	1,648,400

Selection of NPS Impaired Waters

Texas' §319(a) assessment of NPS-impaired waters is based on its CWA §305(b) water quality inventory and §303(d) list of impaired and threatened waters. In preparing the state's §305(b) assessment, the TNRCC compares water quality monitoring data against criteria in the Texas Surface Water Quality Standards and EPA §305(b) guidance to determine how well the waters of the state support their designated beneficial uses. Section 303(d) of the Clean Water Act requires the state to identify all waters within its boundaries that do not meet water quality standards and establish a priority listing of those waters for remedial or protective action.

The §319(a) assessment focuses only on those surface waters which have been degraded by nonpoint source pollution, as identified in the state's 303(d) list. NPS-degraded surface waters

MAJOR AQUIFERS OF TEXAS



EXPLANATION

-  Ogallala
-  Gulf Coast
-  Edwards (BFZ)
-  Carrizo-Wilcox
-  Trinity
-  Edwards-Trinity (Plateau)
-  Seymour
-  Hueco-Mesilla Bolson
-  Cenozoic Pecos Alluvium

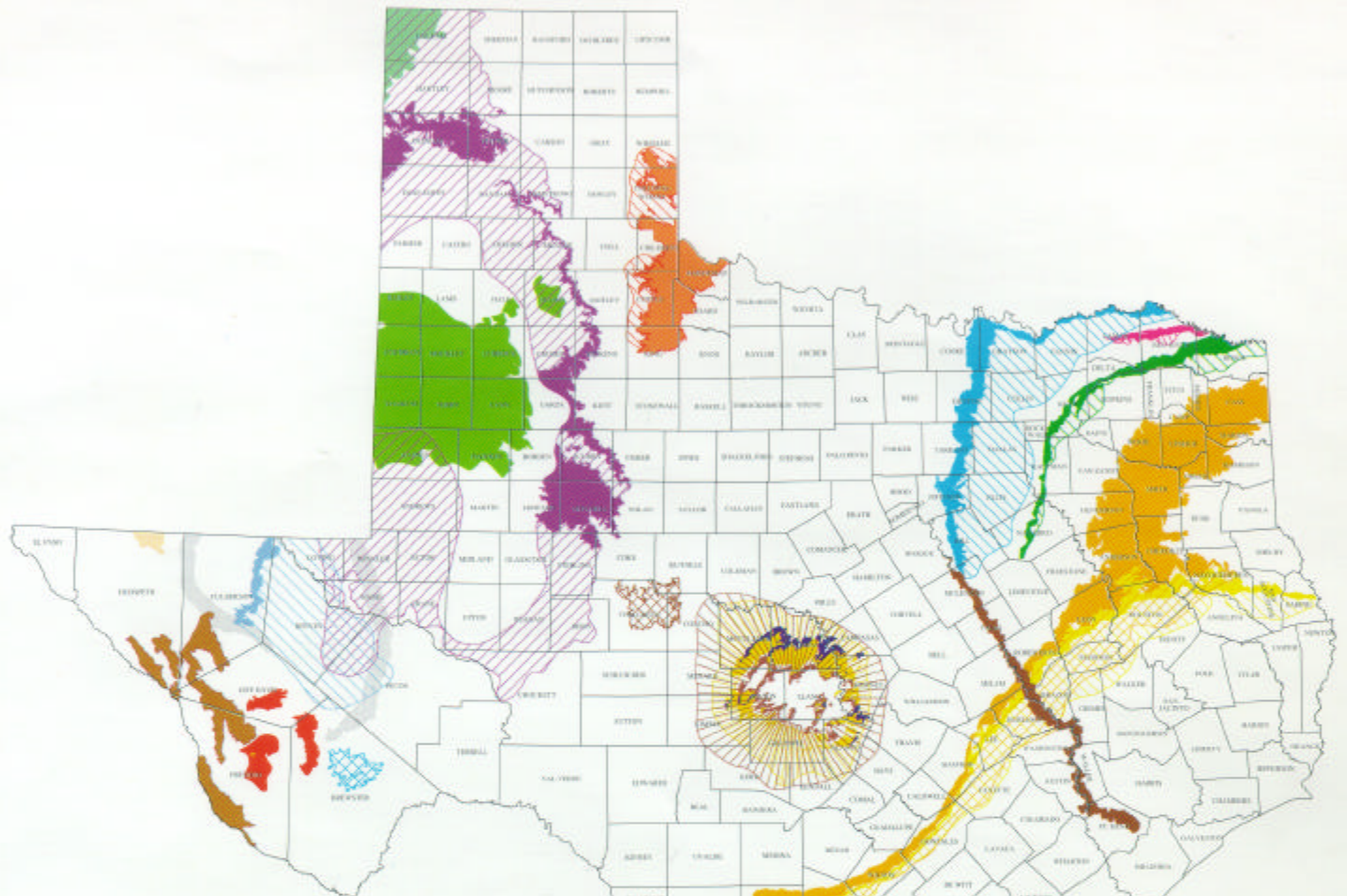
OUTCROP (That part of a water-bearing rock layer which appears at the land surface.)

• DOWNDIP (That part of a water-bearing rock layer which dips below other rock layers.)



January 1994

MINOR AQUIFERS OF TEXAS



EXPLANATION

- | | |
|------------------------------------|---------------------------|
| • Bone Spring – Victorio Peak | • Nacatoch |
| • Dockum | • Lipan |
| • Brazos River Alluvium | • Igneous |
| • Hickory | • Rita Blanca |
| • West Texas Bolsons | • Ellenburger – San Saba |
| • Queen City | • Blossom |
| • Woodbine | • Marble Falls |
| • Edwards – Trinity (High Plains) | • Rustler |
| • Blaine | • Capitan Reef Complex |
| • Sparta | • Marathon |

• OUTCROP (That part of a water-bearing rock layer which appears at the land surface.)
 • DOWNDIP (That part of a water-bearing rock layer which dips below other rock layers.)



January 1994

appearing on this list will be targeted by the state for additional NPS monitoring and restoration activities. Additional details on the methodologies used for selecting priority NPS-impaired surface and groundwaters are discussed in Appendices F and G.

During the next five years, the state will be refining the process for assessing and ranking water bodies and the process used for preparing the CWA §305(b) report, the CWA §303(d) list, and the §319(a) NPS list. Basin analyses performed by the TNRCC and regional partners under the guidance of the CRP are the foundation for the state's CWA §305(b) report and subsequent statewide ranking and prioritization of NPS segments. The long-term objective of the Nonpoint Source Program is to update the assessment annually on a schedule which coincides with the preparation of the Texas Water Quality Inventory [§305(b) report] and the water quality assessments prepared by the Clean Rivers Program (CRP).

The NPS Problem in Texas Surface Waters

Nonpoint source pollution is one of the most difficult areas of environmental management. Discharges enter surface waters in a diffuse manner and at intermittent intervals during periods of precipitation. The amount, timing, and duration of these NPS events are determined by rainfall conditions. Due to their widespread and variable nature, precise sources of nonpoint source pollution can be difficult to trace. However, it is known that contaminated runoff from urban and rural areas, whether or not the source can be pinpointed, may result in degradation of water quality and nonsupport of designated water uses.

Nonpoint source pollution is known or suspected to be responsible for water quality impairment in many streams, rivers, reservoirs, and bays in Texas. According to data compiled in the 1996 *Water Quality Inventory*, the major causes of non-support in stream, reservoir, and bay segments in the state are elevated levels of fecal coliform, metals, and depressed levels of oxygen. Fish and shellfish consumption advisories have been issued by the Texas Department of Health in several watersheds due to elevated levels of fecal coliform and metals. Sources contributing to these problems are discharges from permitted facilities, runoff from urban and agricultural land uses, atmospheric deposition, natural conditions, and unknown sources (due to lack of sufficient data).

Waters with impaired uses will be targeted for further monitoring, remedial action, and possible total maximum daily load (TMDL) development. Of the 147 water bodies identified on the 1998 §303(d) list, 139 do not support or only partially support their designated uses due to nonpoint source impacts.

What is a Total Maximum Daily Load?

Under the Clean Water Act, §303(d), the state is required to develop and implement total maximum daily loads (TMDLs) for all pollutants preventing or expected to prevent the attainment of water quality standards. TMDLs, which can be costly and time consuming to develop and execute, are detailed technical assessments of water quality impairments.

Simply stated, a TMDL is an estimate of the maximum amount of pollution a body of water can receive and still meet water quality standards. It must address the specific pollutant causing the impairment, whether it originates from point or nonpoint sources. While this sounds simple, it can become quite complex. A river basin contains many smaller watersheds; thus there might be several TMDLs developed within one river basin. Within an individual watershed, it may be necessary to develop a separate TMDL for

Analyses of assessment data collected by Texas river authorities under the CRP also reveal that nonpoint source pollution is a major water quality concern. The most common assessment findings were elevated levels of nutrients and fecal coliform bacteria. Evaluation of the cumulative effects of point and nonpoint source contaminants remains an ongoing priority with local and regional entities.

The TNRCC and the CRP have developed a three-tiered monitoring approach to allow comprehensive monitoring and uniform data analyses of a wide range of pollutants throughout a watershed. Basic components of the program include a fixed-station monitoring network, intensive surveys, and special studies. During the last three years, the CRP has funded 13 NPS pollution pilot projects to develop the technical standards and criteria for municipal NPS pollution abatement programs.

Two estuary programs, the Galveston Bay Estuary Program (GBEP) and the Coastal Bend Bays and Estuaries Program (CBBEP) focus on the assessment and management of the Texas bays and estuaries targeted for protection and restoration under the National Estuary Program.

The Galveston Bay Estuary Program has identified two primary categories of nonpoint source pollution in the Bay: contaminated runoff and boat sewage and debris. Loading estimates developed in a GBEP study indicated that nonpoint source runoff was probably the largest contributor of fecal coliform to Galveston Bay. Their study indicated that storm water runoff contributed several times the annual loading of fecal coliform compared to that of sewage treatment plant bypasses/overflows, septic tanks, and other sources. Several streams in the watershed appear to exceed the state water quality standards for contact recreation due to high concentrations of fecal coliform bacteria.

The GBEP has identified urban land areas as generating the highest NPS loadings to the bay. Urban areas in the local watershed contributed over 43 percent of the total NPS sediment loading, 55-65 percent of the NPS nutrient loadings, and over 85 percent of all the fecal coliform, pesticides, and oil and grease coming from local nonpoint sources of pollution. In addition, urban nonpoint sources are important contributors of several priority pollutants such as *polyaromatic hydrocarbons* (PAHs) and *polychlorinated biphenyls* (PCBs) that can increase the health risk associated with consuming seafood from Galveston Bay. Recent studies have indicated that water quality in the immediate vicinity of marinas has been degraded with low dissolved oxygen values. Elevated concentrations of copper, lead, and arsenic were also associated with marina sites.

The Coastal Bend Bays Estuary Program (CBBEP) assesses the impact of NPS pollution on estuaries in the San Antonio-Nueces, the Nueces, and the Rio Grande-Nueces coastal basins. In 1996, the CBBEP sponsored a study to characterize nonpoint source pollution loadings to the Corpus Christi Bay system. The study utilized storm water quality and local land use information available from related technical literature to perform a pilot model for the Oso Creek watershed portion of the Bay. The model estimated 400 tons of total nitrogen are delivered to the Bay system each year in storm water runoff. Sixty percent of this total is estimated to come from agricultural land uses and 13 percent is estimated to come from residential areas of the watershed.

Summary information of nonpoint source impacts on the support of designated uses of Texas water bodies is shown in Table 1-2.

The TNRCC has identified 32 categories and subcategories (11 of which are agricultural and silvicultural) of nonpoint source pollution which may be contributing to surface water quality problems and concerns throughout the state (Table 1-3).

Table 1-2. Summary of NPS Impairments in Surface Waters

(Includes water bodies impacted by NPS pollution only, and those with both point and nonpoint source impacts)

Streams	Number	Reservoirs	Number	Bays & Estuaries	Number
Listed streams not supporting use due to NPS	79	Listed reservoirs not supporting use due to NPS	26	Listed bays not supporting use due to NPS	24
Listed streams partially supporting use due to NPS	7	Listed reservoirs partially supporting use due to NPS	2	Listed bays partially supporting use due to NPS	1
Total assessed stream miles in Texas					14,348
Stream miles not supporting use due to NPS pollution					3237.3
Percent of stream miles not supporting use due to NPS pollution					33%
Total assessed reservoir surface acres					1,536,939
Reservoir acres not supporting use due to NPS pollution					349,962
Percent of reservoir acres not supporting use due to NPS pollution					33%
Total assessed bay and estuary square miles					5,869.7
Bay and estuary square miles not supporting use due to NPS pollution					431.8
Percent of bays and estuary square miles not supporting use due to NPS pollution					7%
Percent of surface waters not attaining standards due to NPS pollution (average of percent nonattainment for streams, reservoirs, bays, and estuaries)					17.7%

Note: Some segments showed more than one category of use support (e.g., NS and PS); only the most critical category was counted for each segment.

Table 1-3. NPS Source Categories Identified in Surface Waters

Agriculture	Other
Nonirrigated crop production	Waste storage/storage tank leaks
Irrigated crop production	Highway maintenance & runoff
Pasture land	Spills
Range land	Contaminated sediments
Riparian grazing	Natural
Concentrated animal feeding operations (CAFOs)	Recreational activities
Off-farm animal holding/management area	Upstream impoundment
	Groundwater withdrawal
Silviculture	Land Disposal
Harvesting/restoration/residue management	Wastewater
Forest management (pumped drainage, fertilizations, pesticide application)	Landfills
Logging road construction/maintenance	On-site wastewater systems (septic tanks)
	Hazardous waste
	Sludge

Construction	Urban Runoff/Storm Sewers
Highway/road/bridge Land development	Industrial permitted urban runoff Other urban runoff
Resource Extraction	Hydromodification
Surface mining Subsurface mining Petroleum activities	Flow regulation Streambank modification Marina(s)
Unknown	
Undetermined Sources	

Figures 1-4, 1-5, and 1-6 illustrate the relative impact of NPS pollution in Texas streams, reservoirs, and bays. Figure 1-7 illustrates the major sources of NPS pollution in Texas streams, reservoirs, and bays.

Figure 1-4. NPS Surface Water Impacts on Use Support

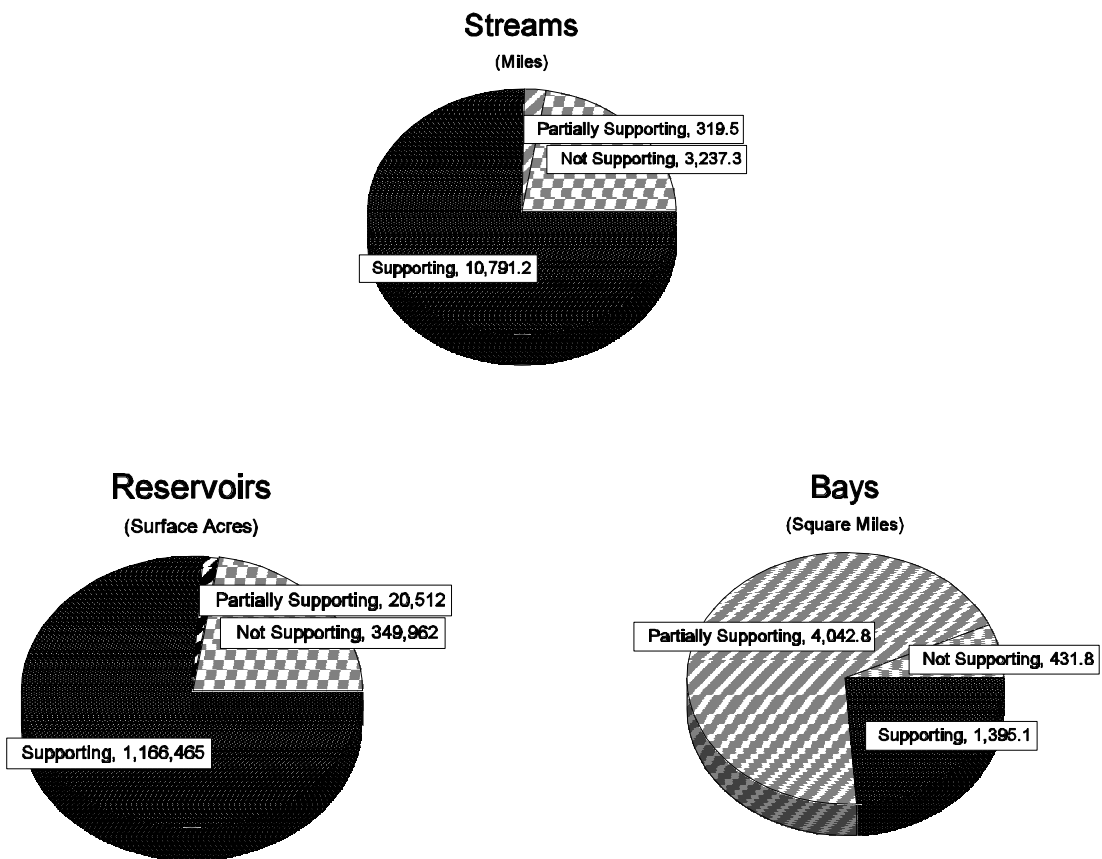


Figure 1-5. Use Impairment of Surface Water from Urban NPS
(Partially Supporting or Not Supporting Uses)

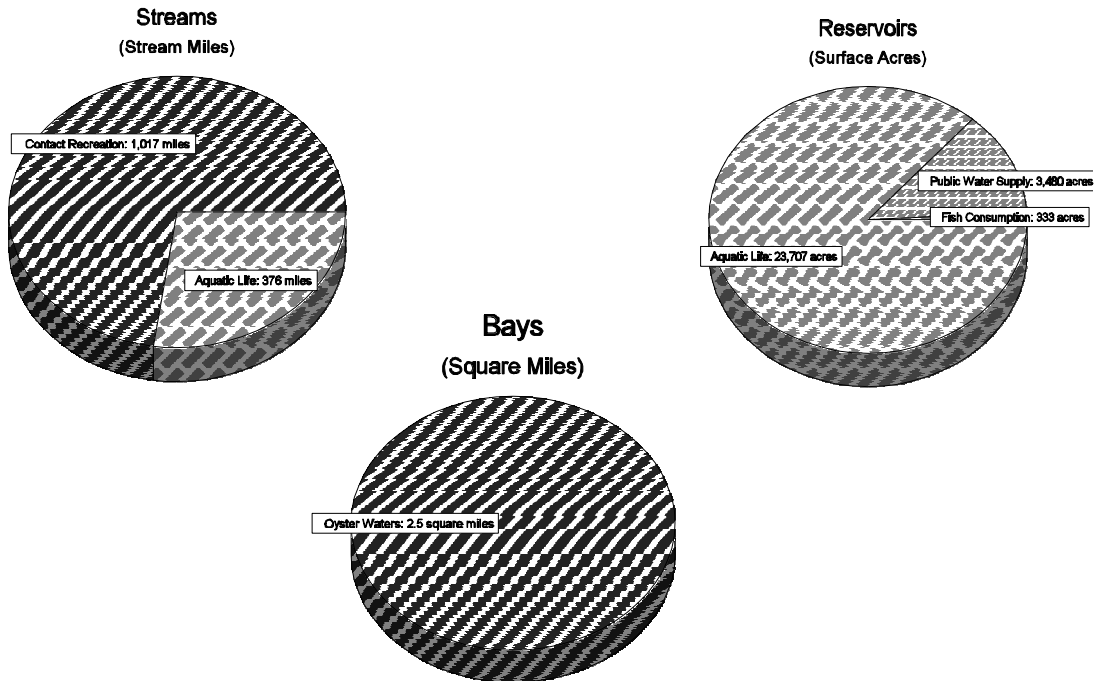


Figure 1-6. Use Impairment of Surface Water from Agricultural NPS
(Partially Supporting or Not Supporting Uses)

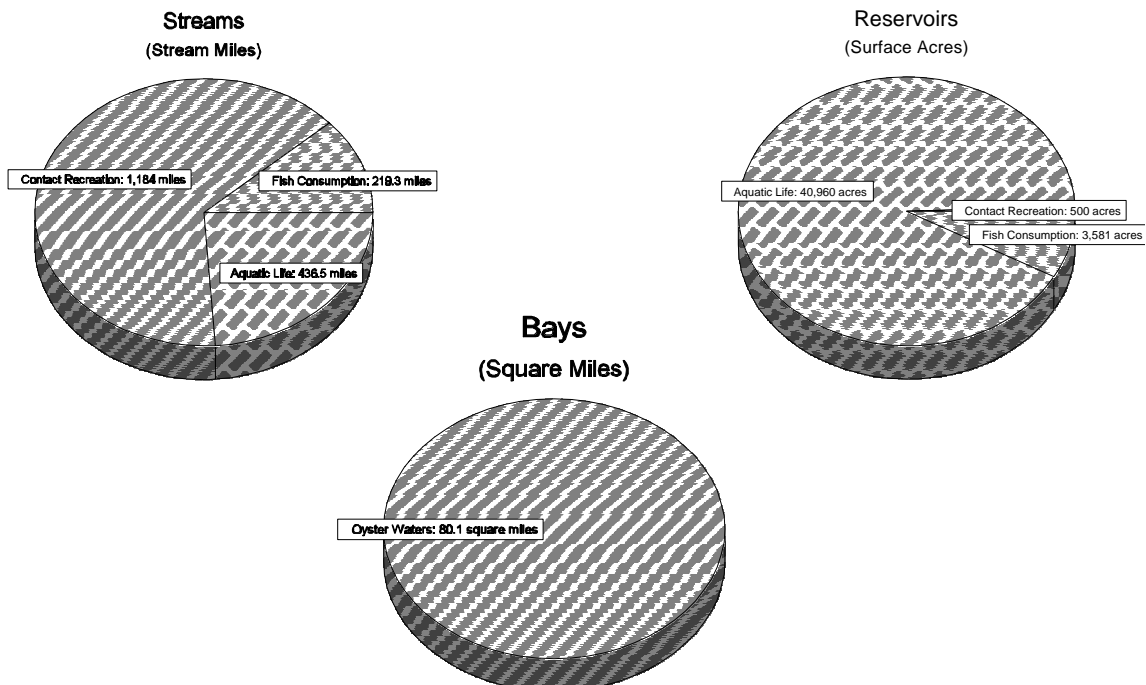
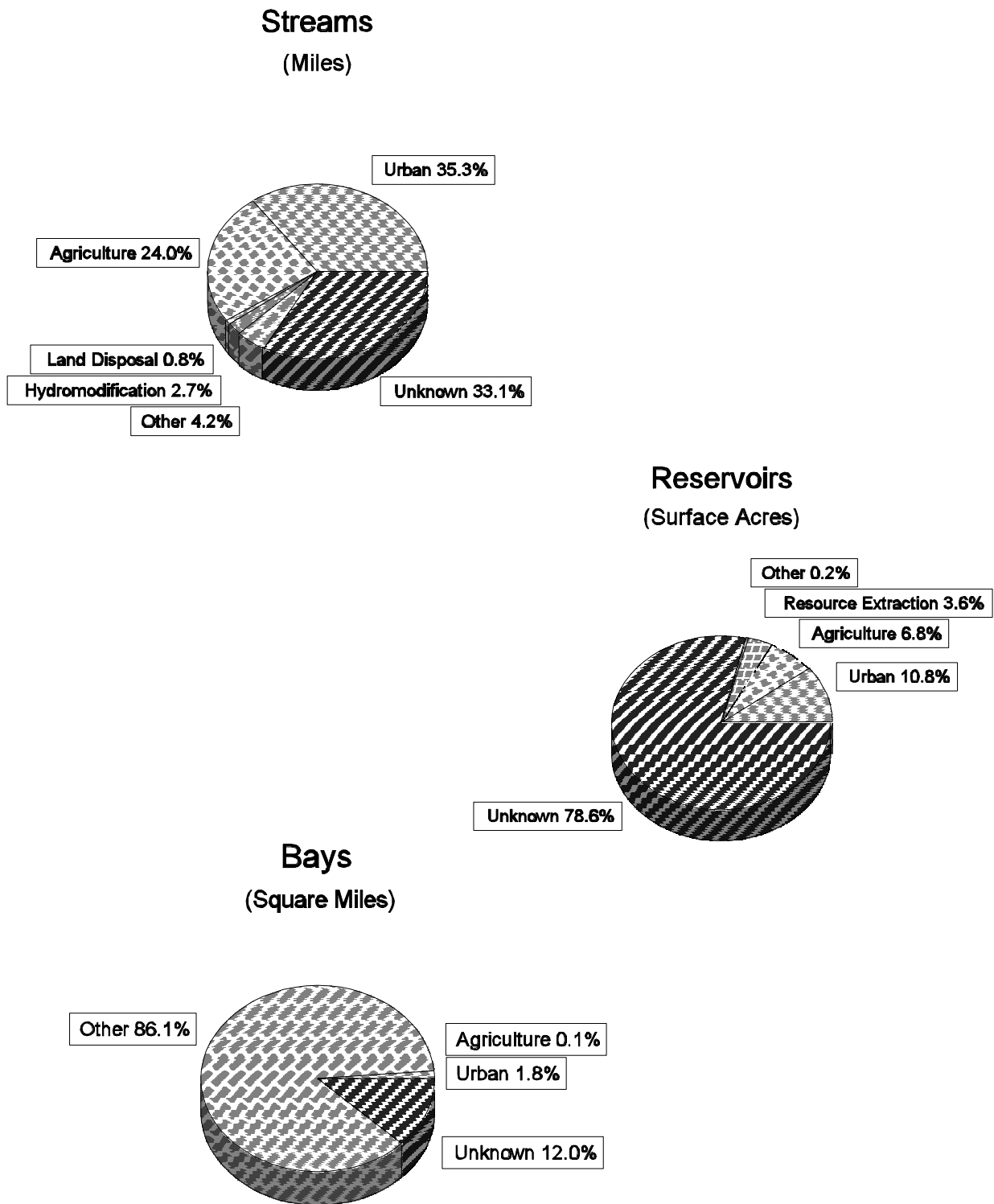


Figure 1-7. Sources of NPS Impacts in Surface Water
(Water Bodies Partially Supporting or Not Supporting Uses)



The causes of NPS pollution problems identified are shown in Table 1-4 and presented graphically in Figure 1-8.

Table 1-4. NPS Causes Identified in Texas Surface Waters

Pathogens	Unknown Toxicity
Nutrients	Noxious Aquatic Plants
Metals	Nonpriority Organics
Priority Organics	Unionized Ammonia
Salinity/TDS/Chlorides	Nitrogen
Siltation	pH (high or low)
Pesticides	Thermal Modifications
Suspended Solids	Flow Alterations
Organic Enrichment (low dissolved oxygen)	Other Habitat Alterations
Unknown	Oil and Grease
Other Inorganics	

Figure 1-8. Causes of NPS Surface Water Impacts (Water Bodies Not Supporting or Partially Supporting Uses)

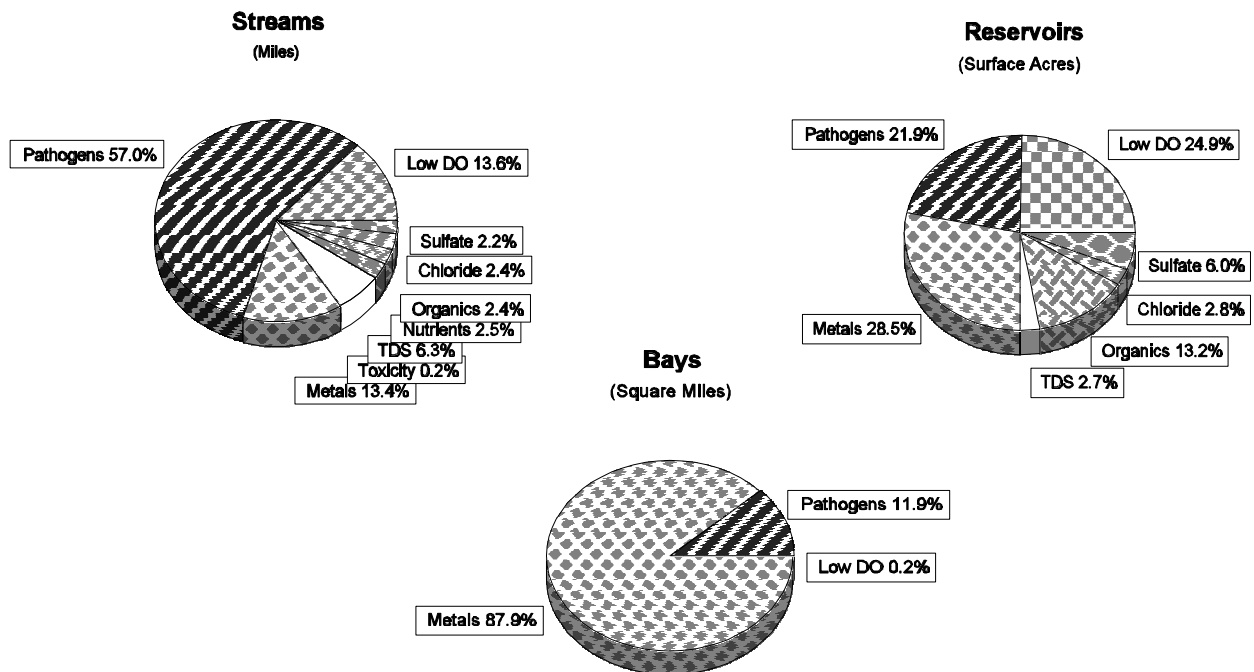


Figure 1-9 illustrates the geographic distribution of water bodies that do not meet water quality standards due to nonpoint source pollution. The sources of the pollution are color coded. Urban and agricultural sources account for the majority of the NPS impaired water bodies. Not surprisingly, water quality impairments due to urban runoff are located in association with major urban centers including Houston/Harris County, Dallas/Fort Worth Metroplex, San Antonio, and the Lower Rio Grande Valley.

Extent and Nature of the Problem in Texas Groundwaters

Based on monitoring data, groundwater resources statewide are of good quality. Groundwater generally meets drinking water standards and industrial and irrigation uses defined by the groundwater classification guidelines. There are, however, some areas where naturally-occurring constituents are at levels of concern, and there are localized impacts due to groundwater contamination in Texas.

Chapter 26 of the Texas Water Code expresses the state's non-degradation policy for groundwater. This policy is used to guide regulatory and management decisions at the TNRCC. A groundwater classification system was developed by the Texas Groundwater Protection Committee (TGWPC) to support decision-making. This system is implemented by the waste programs of the TNRCC to guide remediation and corrective action programs at the agency. Both the policy and the classification system are found in Appendix G.

The limited assessment of groundwater problems that has been performed in Texas to date has found that groundwater is affected by numerous point and nonpoint sources of pollution. Clearly, more assessment of groundwater conditions is needed in order to prioritize and target aquifers in need of pollution remediation and prevention activities. There is a distinct lack of direct data related to nonpoint sources of contamination to groundwater. Indicator data, such as land use data, have not been evaluated by the TNRCC or other agencies charged with responsibility for NPS pollution prevention.

In 1989, there were 2,241 cases of groundwater contamination documented in Texas; the number grew to 7,458 documented groundwater contamination cases addressed in the *Joint Groundwater Monitoring and Contamination Report, 1997* (TGWPC, 1998, SFR-56/97). Approximately 99 percent of the reported cases were identified by the TNRCC. The remainder of the cases were under the jurisdiction of the Railroad Commission of Texas (77 cases) and groundwater conservation districts (20 cases). The vast majority of the cases documented by the TNRCC were identified through regulatory compliance monitoring, while the cases under the jurisdiction of the Railroad Commission of Texas and the groundwater conservation districts were identified from special studies, investigations in response to complaints, or ambient groundwater quality monitoring activities.

The most common contaminants reported in TGWPC's 1998 report included gasoline, diesel, and other petroleum products. This reflects the large number of contamination sites (98 percent of the documented cases) reported by the TNRCC's petroleum storage tank program. Less common contaminants include organic compounds (such as phenol, trichloroethylene, carbon tetrachloride, dichloroethylene, and naphthalene), pesticides (such as alachlor, atrazine, bromacil, dicamba, and prometon), creosote constituents, solvents, heavy metals, and sodium chloride.

Nitrate contamination has been noted throughout the state, and the sources of this contamination include agricultural, urban, and other nonpoint sources, such as on-site wastewater disposal. Land development in urban areas has led to instances of groundwater contamination in the Edwards and other aquifers in Texas.

Highway, road, and bridge construction has contributed to and may lead to further degradation of rivers, streams, reservoirs, and groundwater. Urban runoff can contribute to contamination of aquifers that receive water from unprotected urban streams that cross their recharge zones. The Edwards Aquifer in central Texas is an example of one such aquifer, with impairments caused by urban runoff from highways and by road construction.

Figure 1-9





Nonpoint Source Pollution in Texas State Waters

Entire Segment Impaired by Source

-  Agriculture
-  Urban Runoff
-  Resource Extraction
-  Land Disposal
-  Other
-  Unknown

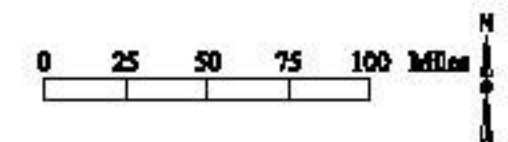
Portion of Segment Impaired by Source

-  Agriculture
-  Urban Runoff
-  Land Disposal
-  Hydromodification
-  Other
-  Unknown

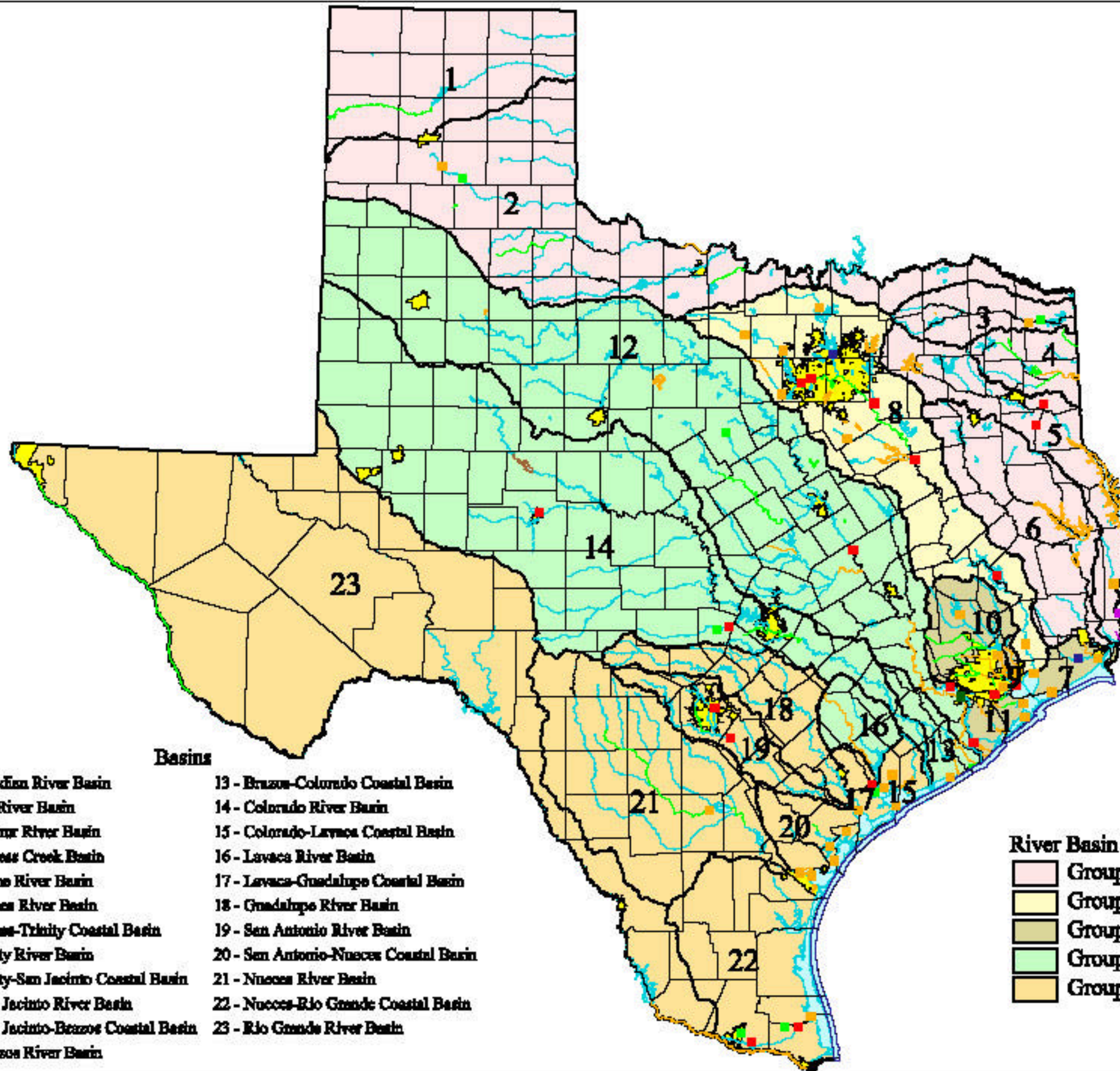
-  Stream Segment
-  Reservoir/Estuary Segment
-  City
-  County Boundary

River Basin Groups

-  Group A
-  Group B
-  Group C
-  Group D
-  Group E



This map was generated by the Texas Natural Resource Conservation Commission. No claims are made to the accuracy or completeness of the data or to its suitability for a particular use. For more information concerning this map, contact Louanna Jones, Information Specialist, at (512) 239-2310.



Basins

- | | |
|---------------------------------------|---------------------------------------|
| 1 - Canadian River Basin | 13 - Brazos-Colorado Coastal Basin |
| 2 - Red River Basin | 14 - Colorado River Basin |
| 3 - Sulphur River Basin | 15 - Colorado-Lavaca Coastal Basin |
| 4 - Cypress Creek Basin | 16 - Lavaca River Basin |
| 5 - Sabine River Basin | 17 - Lavaca-Guadalupe Coastal Basin |
| 6 - Neches River Basin | 18 - Guadalupe River Basin |
| 7 - Neches-Trinity Coastal Basin | 19 - San Antonio River Basin |
| 8 - Trinity River Basin | 20 - San Antonio-Nueces Coastal Basin |
| 9 - Trinity-San Jacinto Coastal Basin | 21 - Nueces River Basin |
| 10 - San Jacinto River Basin | 22 - Nueces-Rio Grande Coastal Basin |
| 11 - San Jacinto-Brazos Coastal Basin | 23 - Rio Grande River Basin |
| 12 - Brazos River Basin | |

Resource extraction, exploration, and development significantly impact on groundwater in Texas. Oil and gas wells leak, brine pits discharge high total dissolved solid fluids into the subsurface, abandoned and poorly constructed wells allow oil field contaminants to reach aquifers, and mining activities all impact groundwater quality in the state. Many of the activities associated with mining and quarrying have not been studied to determine the impacts on groundwater, and more work needs to be done to assess this nonpoint source category in Texas.

Land disposal from permitted facilities and from unregulated areas has been documented as a source of nonpoint source pollution to groundwater. Landfills, particularly landfills constructed prior to the Resource Conservation and Recovery Act (RCRA) that may have been unlined or poorly maintained, on-site wastewater systems in rural Texas, and injection wells that are either unpermitted or were in operation prior to current regulatory programs have all impacted aquifers in Texas.

Hydrologic modification is not generally considered a source of pollution for groundwater; however, drought conditions in Texas have emphasized the importance of surface water/groundwater interaction and the impact each body can have on the other. Over-pumping of aquifers can lead to encroachment of poorer quality groundwater into previously higher quality aquifers. Encroachment of poor quality groundwater due to over-pumping poses a particular risk in coastal areas of Texas and in areas where fresh water overlies or is in hydrologic connection with more saline aquifers.

Other nonpoint source categories that impact groundwater include waste storage and storage tank leaks, runoff from highways and roads in rural areas, spills, and natural contaminants. Leaking underground and above ground storage tanks have impacted every aquifer in Texas. Storage of chemicals at commercial facilities such as nurseries and builder supply stores presents the potential for impacts to groundwater if spills or fires occur at these facilities. Rural road impacts have not been documented in the state, but spills occur on a daily basis and in recharge areas or where streams are in proximity to aquifer recharge zones, impacts can occur. Natural contamination is occurring due to seepage of brines from brine springs and from surface water that recharges aquifers after crossing lithologic materials that contain a high percentage of salts.

The ten major sources of documented or potential groundwater contamination in Texas have been identified in the TNRCC's 1996 *State of Texas Water Quality Inventory*. They are listed in Table 1-5.

Federal Requirements for Nonpoint Source Programs

Section 319 of the Clean Water Act (CWA), as amended in 1987, specifies requirements for state nonpoint source pollution programs (Appendix I). These requirements include provisions for the preparation of a nonpoint source assessment report and management program submitted through the Governor's Office to EPA for approval, after an appropriate public comment process.

The statute and associated federal guidance specify that the state's assessment report should identify waters that are impacted by NPS and characterize the sources that contribute to those impacts. The management program represents the state's strategy for addressing the water quality problems identified in the assessment report.

In Texas, the TSSWCB administers the §319 program for agricultural and silvicultural NPS management. The TNRCC administers the program for all other nonpoint sources. This assessment report and management program document has been prepared by the TNRCC and the TSSWCB pursuant to §319, subsections (a) and (b), of the Federal Clean Water Act.

Table 1-5. Major Sources of Documented or Potential Groundwater Contamination

Contaminant Source	Factors Considered for Selection	Contaminants
Storage tanks (underground)	documented from mandatory reporting; size of population at risk; location of the sources relative to drinking water sources; number and/or size of contaminant sources	petroleum compounds; halogenated solvents
Storage tanks (above ground)	documented from mandatory reporting; size of population at risk; location of the sources relative to drinking water sources; number and/or size of contaminant sources	petroleum compounds; halogenated solvents
Surface impoundments	documented from mandatory reporting; potential from state and other findings; number and/or size of contaminant sources; location of the sources relative to drinking water sources; geographic distribution/occurrence	petroleum compounds; salinity/brine; metals; inorganic compounds; organic compounds
Landfills	documented from mandatory reporting; potential from state and other findings; number and/or size of contaminant sources; hydro geologic sensitivity; geographic distribution/occurrence	halogenated solvents; salinity/brine; inorganic compounds; organic compounds; metals
Septic systems	potential from state and other findings; size of population at risk; location of the sources relative to drinking water sources; number and/or size of contaminant sources; hydro geologic sensitivity; geographic distribution/occurrence	nitrate; organic compounds; inorganic compounds
Agricultural activities	documented from mandatory reporting; potential from state and other findings; location of the sources relative to drinking water sources; number and/or size of contaminant sources; hydro geologic sensitivity; geographic distribution/occurrence	nitrate; inorganic compounds; organic compounds
Abandoned wells	documented from mandatory reporting; potential from state and other findings; location of the sources relative to drinking water sources; number and/or size of contaminant sources; hydro geologic sensitivity; geographic distribution/occurrence	NA
Oil & Gas activities	potential from state and other findings; halogenated solvents; petroleum compounds; hydro geologic sensitivity; geographic distribution/occurrence	petroleum compounds; salinity/brine;
Industrial/commercial sites	documented from mandatory reporting; potential from state and other findings; number and/or size of contaminant sources; hydro geologic sensitivity; geographic distribution/occurrence	petroleum compounds; nitrate; salinity/brine; metals; inorganic compounds; organic compounds
Natural sources	potential from state and other findings; hydro geologic sensitivity; geographic distribution/occurrence; other criteria	salinity/brine; fluoride; nitrate; metal

The §319 Nonpoint Source Program involves a three-step process: (1) identify the problem areas (assessment report); (2) develop management strategies to address these water quality issues (management program); and (3) implement strategies to control NPS pollution impacts that achieve water quality goals (grant program). The grant program provides funds from EPA to support local and statewide NPS pollution prevention and control programs. These funds are awarded annually and generally involve projects up to three years in length. Highest priority is given to funding those projects or activities which address priority watersheds impacted by NPS, as identified in Texas' Clean Water Act §303(d) list of impaired and threatened water bodies. In certain circumstances, a sub-segment or tributary of a listed water body could be eligible for funding if it can be shown that the sub-segment or tributary may be a contributing source of an identified pollutant.

Assessment Requirements

New circumstances and directives have changed some of the state's priorities in the seven years since the approval of the state's last NPS assessment report (1992). This situation is recognized in EPA program guidance that recommends periodic modifications to the state's assessment program in order to keep it current with prevailing state circumstances.

The state-funded Texas CRP is continually developing additional information on the assessment of NPS pollution problems in Texas by performing regional water quality assessments in each of the major river basins in the state. These assessments are performed under the guidance of local steering committees, thereby providing opportunities for significant local government and public participation. Information developed by the CRP, used in conjunction with continuing assessments by state and federal agencies reported in the state's water quality inventory, provide an appropriate basis for revising and updating the state's assessment report for NPS pollution. These assessments are then used for targeting resources to address NPS impacts to Texas waters.

Assessment activities involving agricultural and silvicultural nonpoint source pollution are coordinated with the TSSWCB. The TSSWCB continually assesses nonpoint source contributions from agricultural and silvicultural activities to identify those with a high potential for adverse impacts to the water quality of the state. The TSSWCB participated in and approved the assessment presented in this document.

The state's §319 assessment will be updated as appropriate, and as monitoring programs reveal changing trends.

Management Program Requirements

Texas is committed to a complete revision of its management program for nonpoint source pollution in the fifth year of every five-year basin management cycle (see Chapter 2, "The Basin Management Cycle"). The state will evaluate the success of existing programs in achieving water quality and program goals annually, and will make adjustments to the nonpoint source management program as appropriate. Updates will be based on basin-specific water quality assessments performed annually. New conditions or priorities which may arise through the state's Continuing Planning Process, the watershed management cycle, or the Water Quality Management Plan may also affect NPS program updates.

The TNRCC and the TSSWCB have collaborated to produce an integrated NPS management program for Texas. While the TNRCC and the TSSWCB have always worked cooperatively to address NPS problems in the state, the integration of the two programs into one management document is a significant step forward toward achieving a comprehensive NPS program. The annual meetings of the statewide CRP Stakeholders Workgroup and its Nonpoint Source

Technical Workgroup subcommittee will further strengthen coordination of water quality management, as will the grassroots efforts of local watershed action committees.

Intergovernmental Coordination and Public Participation

The TNRCC and the TSSWCB have prepared the *Texas Nonpoint Source Assessment Report and Management Program* with the cooperation of other interested parties in the state. Ambient water quality data, NPS pollution indicator data, local testimony, fish surveys, spill incidents, screening models, and other relevant data were gathered and evaluated for inclusion in the state NPS assessment report. Notice of the plan to amend the NPS assessment report and the management program was communicated via the CRP steering committees, Texas Register notice, direct mailings, and other appropriate mechanisms. A one-day workshop was conducted on November 15, 1995, to provide additional guidance on the procedures to be used to revise the NPS documents. The workshop consisted of presentations by TNRCC staff, the distribution of informational materials, and a question and answer session.

Packets for solicitation of information about water bodies in the state with NPS pollution impacts and management strategies in use around the state were mailed out on October 27, 1995. TNRCC sent about 400 packets to various federal, state, and local agencies, consulting firms, private organizations, and individuals that could have information regarding water bodies with NPS pollution impacts. In addition, 250 packets were distributed by the TSSWCB to their Regional Offices and Field Representatives, the Soil and Water Conservation Districts, and the agricultural groups that participate in NPS activities. Twenty-four packets for solicitation of information were also distributed to TNRCC Divisions and Sections that use the document, participate in the NPS Program, or have information about NPS pollution impacts. Packets were also distributed to the 15 TNRCC Regional Offices as well as the two National Estuarine Programs.

Ongoing coordination of groundwater nonpoint source issues is provided by the Texas Groundwater Protection Committee (TGWPC). The committee is made up of representatives of all state agencies and related organizations whose activities affect groundwater, including the TNRCC, the Texas Water Development Board, the Railroad Commission of Texas, the Texas Department of Health, the Texas Department of Agriculture, the TSSWCB, the Texas Alliance of Groundwater Districts, the Texas Agriculture Experiment Station, and the Bureau of Economic Geology of the University of Texas at Austin.

The Texas Groundwater Protection Committee was created by the 71st Texas Legislature in 1989 as a means to bridge the gap between existing state groundwater programs and to optimize water quality protection by improving coordination among agencies involved in groundwater activities. The Nonpoint Source Subcommittee of the TGWPC was reactivated in 1995 to further enhance interagency communication and coordination with regard to nonpoint source matters, to support the §319(h) grant program, and to ensure that updates to the state assessment and management reports are inclusive.

The state's watershed management approach, described in Chapter 2, will establish partnerships through the CRP that will foster a stronger cooperation in the area of surface water nonpoint source pollution management.

Current Challenges to the Management of Nonpoint Source Pollution

Since the passage of the Clean Water Act, much attention and funding has been focused, in Texas and nationwide, on controlling point source pollution. At the time the Act was passed, point sources accounted for roughly 80 percent of the water pollution problems in the country. Through a concerted effort, point sources of pollution are now effectively controlled in most areas. It is now time to increase attention to nonpoint source pollution. In Texas, 94 percent of the surface water bodies on the 1998 §303(d) list are impacted by nonpoint sources. The state *Nonpoint Source Assessment Report and Management Program* identifies numerous stream segments impacted by urban runoff in or downstream from each of the 30 largest cities in Texas.

The major challenges to NPS pollution management in Texas are low public awareness of the issue, the size and complexity of the problem, the lack of rigorous scientific definition of NPS problems, institutional barriers to directing multiple source of funding to a single problem, and availability of funding sources other than §319(h) grants to address the problems. Because of its diffuse nature, nonpoint source pollution is more difficult and costly to characterize and control than is point source pollution.

The public at large is not well informed about this type of pollution; many do not even know what it is. Public education about nonpoint source pollution must be a part of any good management program, as public awareness is necessary for developing the political will of the public to address the water quality problems posed by nonpoint source pollution. Numerous polls have indicated that a large percentage of the U.S. population considers protecting the environment an important issue, so the public is receptive to addressing proven environmental problems. It is also through public education that we will foster voluntary compliance with the kind of everyday practices, like environmentally sensitive lawn care, that individuals can use to help control some of the causes of nonpoint source pollution that would be impractical to address through regulation. Educational efforts must also be directed to policy makers and governmental agency managers. These efforts should include sound scientific data to document the problems and provide information and demonstrations of existing best management practices capable of addressing those problems.

The complexity of nonpoint source pollution issues can be daunting. Since NPS pollution is related to rainfall runoff, it is difficult to point to specific cause-and-effect relationships. It is also a problem of cumulative impacts resulting from what may be very small problems at an individual source. The amount and nature of precipitation vary by watershed, as do the types and variety of land use, and these also define the impacts seen from nonpoint sources. Monitoring, assessment, and modeling for nonpoint source impacts are also complex, and methods developed for point sources do not readily translate to nonpoint source monitoring and assessment. Dealing with the complexity of these issues will take the kind of rigorous, concerted effort that has gone into control of point source pollution in the past. Without this kind of rigorous characterization of the NPS problem, it will be difficult to provide the information which will convince the public and policy makers that this issue, among the many with which they are faced, is worth the time and tax dollars it will take to address. This is a problem for many states, not just Texas.

Over the past several years, much work has been done to demonstrate effective and innovative practices for controlling nonpoint source impacts, and to a lesser extent, to develop assessment protocols and gather data on NPS problems. River authorities, municipalities, and water districts, in coordination with the CRP, have been active in gathering NPS data and developing

management practices in their local watersheds. Analysis, evaluation, and dissemination of this information will contribute to the development of an aggressive statewide program for nonpoint source pollution management.

Groundwater management is hindered by a distinct lack of direct data related to nonpoint sources of contamination. Most groundwater assessment activities have been limited in their scope and nature, and no statewide assessment of groundwater conditions related to NPS pollution has been performed since 1989.

Given these and other challenges of the state's water quality program, the TNRCC implemented a watershed management approach which was initiated in pilot form in 1997, with full implementation completed in 1998. Draft Guidance on this approach was approved by the EPA, and the final guidance was published in March of 1997 under the title, *The Statewide Watershed Management Approach for Texas: The TNRCC's Framework for Implementing Water Quality (GI-229)*. The TNRCC participated in a series of outreach efforts from January through August of 1997 to communicate this approach to a variety of stakeholders.

The watershed management approach serves to address coordination issues by dividing the state into more manageable areas, strengthening partnerships between the TNRCC and local stakeholders, and conducting phased activities to collect data, assess problems, target priorities, and plan implementation activities in each watershed (basin management cycle). This approach is described in more detail in Chapter 2. The Nonpoint Source Program staff will work actively in the watershed management process to ensure that nonpoint source management is properly addressed in watershed action plans.

Targeting and Prioritization of NPS Impacted Waters

The state's primary mechanism for targeting surface water bodies is the §303(d) list. Water bodies are prioritized based on:

- ! overall state priorities,
- ! level of impact on the water body,
- ! pollutant types,
- ! identified uses,
- ! scientific validity of assessment data, and
- ! size of geographic area affected.

These priorities are then considered within the context of the watershed management approach (for instance, whether the watershed is in the implementation phase of the basin management cycle). High priority water bodies may be targeted for immediate action, regardless of the basin management cycle.

The TSSWCB uses the state's CWA §303(d) list of priority surface water bodies to determine how best to allocate limited resources in all phases of its nonpoint source management programs. Priority watersheds impaired by agricultural and silvicultural nonpoint sources are further prioritized by the TSSWCB based on the following considerations:

- 1) Adequacy of available data
- 2) Severity of the problem
- 3) Frequency of the problem

- 4) Designated uses and value of the water body
- 5) Potential for the problem to worsen

The TSSWCB will place highest priority on watersheds determined to have known water quality problems and/or concerns related to agricultural or silvicultural activities. The TSSWCB will work in conjunction with the TNRCC to assist them with the TMDL assessment and to implement watershed action plans in areas with water quality impairment from agricultural or silvicultural sources.

For setting groundwater priorities, Texas has adopted the DRASTIC methodology for assessing the state's aquifers based on their vulnerability to both point and nonpoint source contamination. DRASTIC is a systematic approach for assessing the groundwater pollution potential of hydrogeologic settings. The methodology involves delineation of hydrogeologic settings and data analysis to develop a single index number which represents the sensitivity of that setting to groundwater pollution potential. Seven parameters are used to develop and index number for each setting.

A statewide ranking table for aquifers (Appendix H) was developed in 1991. The ranking takes into account other factors including population served, water quality, and vulnerability. This list serves as the state prioritization list for determining which aquifers are in the most serious need of nonpoint source pollution prevention. Groundwater NPS activities can then be prioritized in coordination with the basin management cycle, based on the changing needs of the state.

The opportunity for annual updates to the state's nonpoint source assessment report and management program provided by the state's watershed management approach will provide the flexibility to target high priority problems in specific watersheds for immediate action. Problems that are statewide in nature, such as impacts from legacy pollutants or fecal coliform bacteria, will be addressed at the statewide level. The state strives to maintain a balance between statewide efforts and watershed-specific programs.

Texas NPS Management Approach

Previous state Management Programs for the TSSWCB and the TNRCC placed priority on working closely with federal, state, and private agencies to promote NPS pollution prevention and abatement projects. The majority of these projects either demonstrated innovative NPS pollution abatement technologies or were statewide NPS pollution educational projects. Although these past projects have been effective in terms of accomplishing work plan tasks and raising awareness of NPS pollution, it has been difficult to quantify the success of these projects in terms of water quality improvements.

As previously discussed, NPS management presents an enormous challenge to federal, state, and local agencies because of the difficulty in identifying the sources of the pollution, the relatively low public awareness of the problem, the huge variation in vegetation and land types, and the economic and technical infeasibility of some best management practices¹ (BMPs). Even though significant funding sources exist, there seems always to be a gap between available funding

¹ **Best management practice (BMP)** - the most effective practice or combination of practices to control nonpoint source pollution. BMPs may be structural, such as detention ponds or filter systems, or nonstructural, such as riparian buffer zones or educational activities.

and the amount needed to address all program priorities. These problems have become very evident over the past four years to the TSSWCB and the TNRCC.

Therefore, to obtain quantifiable water quality improvements, a shift in the program to a more strategic use of state and federal assistance dollars is needed. Consequently, the TSSWCB, the TNRCC, and the EPA are directing §319(h) funds toward implementation and demonstration projects within the boundaries of impaired Texas watersheds. Eligible projects must address NPS-impacted water bodies identified on the most current 303(d) list of impaired waters in Texas.

The state uses the infrastructure of the Clean Rivers Program to coordinate, develop, and implement its NPS program. Established by the Texas Legislature to pursue an integrated, systematic approach to managing water quality and resource issues, the CRP is a partnership of the TNRCC, the TSSWCB, regional water authorities, other state and federal agencies, and the public. The state, with the CRP, coordinates water quality issues and activities, including nonpoint source pollution management, using a statewide watershed management approach. This approach is described in detail in Chapter 2. Chapter 2 also discusses how stakeholders are involved in the water quality management process.

Under this new management program plan, the state will increase its efforts to leverage and direct other funding sources, such as the United States Department of Agriculture (USDA)–Environmental Quality Incentive Program (EQIP) and the State Revolving Fund (SRF). State funding and establishment of priorities will be coordinated through annual meetings of the statewide CRP Stakeholders Workgroup and the Nonpoint Source Technical Workgroup. Regional and local funds will be leveraged strategically through the watershed management approach.

This change in focus presents an exciting opportunity to strengthen interagency cooperation at all levels of government. It will allow the state to target water quality improvement activities in a specific watershed, identify what the water quality problems are and from where they stem in the watershed, and begin working closely with the stakeholders to implement effective solutions to reduce or prevent the problems.

Assessment and Prioritization

The state's management program for nonpoint source pollution utilizes baseline water quality management programs and regulatory, non-regulatory, financial, and technical assistance approaches to achieve a balanced NPS management program. These programs are described in Chapters 3, 4, and 5, and include ongoing work to update and establish water quality standards and monitor and assess water bodies for water quality impacts.

State resources for implementation will be focused on water bodies that do not meet their standards as scoping and assessment activities are initiated in each individual watershed. Through basin steering committees and local watershed action committees, local stakeholders will be encouraged to participate in the assessment and evaluation of a watershed's water quality impairments, as well as in the development and implementation of necessary management strategies. Watershed analyses will be used to specify quantifiable targets for water quality improvement, and watershed action plans will outline activities necessary to attain and maintain applicable water quality standards. The Nonpoint Source Program will be active in supporting each phase of the watershed management process, from initial identification of NPS-impaired waters for the §303(d) and §319(a) lists to implementation and oversight of priority management activities.

Regulatory Approaches

The TNRCC's regulatory approach to urban NPS management is found in the Texas Water Code, Section 26.177, which defines the water pollution control duties of cities in Texas. Under this section, cities having a population of 10,000 or more inhabitants may be required to establish a water pollution control and abatement plan. In addition to addressing point sources of water pollution, these plans will include management measures for the control and abatement of pollution or potential pollution resulting from nonpoint sources. Section 26.177 allows voluntary development of pollution control and abatement plans by any community, regardless of population. The plans are required only for communities with populations of 10,000 or greater where the Clean Rivers Regional Assessment of Water Quality or other TNRCC assessments or studies demonstrate a water pollution impact not associated with permitted sources. Additionally, §26.177 allows cities to contract with river authorities or other political subdivisions to meet the requirements of the section. The TNRCC may provide assistance to cities to identify alternative funding sources to meet the requirements. Rules were promulgated to implement the nonpoint source component of this legislation, and became effective in March 1999.

The TNRCC adopted rules in 1996 for the implementation of the Water Quality Protection Zones created by State Senate Bill 1017. The bill provides for the voluntary formation of these zones in areas within the extraterritorial jurisdiction of certain municipalities. These rules provide the flexibility necessary to facilitate land development within the zone, while providing for the protection of water quality. This bill is currently undergoing a constitutional challenge in the courts, and its fate is uncertain. Other regulatory programs of the state are detailed in Chapters 3, 4, and 5.

Voluntary Approaches

In 1994, the TSSWCB began a statewide voluntary compliance program directed at controlling nonpoint source pollution associated with agricultural and silvicultural production operations. The general purpose of the program is to provide incentive to landowners or operators for the installation of land improvement measures that control erosion, conserve water and soil, and/or protect water quality. Many producers have participated in the program since its inception in 1994. Comparisons of the biennial 305(b) inventories and 303(d) lists show trends of water quality improvement based on these programs. These trends will be highlighted in NPS program annual reports.

The program is centered on the voluntary development and implementation of water quality management plans (WQMPs). A WQMP is site-specific, reflecting the production operating parameters of the individual farm or ranch. It may include appropriate land treatment practices, production practices, technologies, and combinations thereof, and an implementation schedule. When the producer signs a cooperator's agreement, the TSSWCB district office develops the plan for the producer and his/her particular production operation. The plan is then forwarded to the TSSWCB state office in Temple for review. Approval and certification by the TSSWCB, along with the implementation of the plan into the farm or ranch operation, satisfies Section 26.121 of the Texas Water Code. Producers may qualify for cost-share assistance (Senate Bill 503) and/or BMP implementation assistance (319 specific projects) to facilitate WQMP implementation. Many producers have participated in the program since its inception in 1994.

Other voluntary programs include source water and wellhead protection, pollution prevention programs, pollution cleanups, sustainable forestry practices, technical assistance for on-site sewage facility installers and operators, and environmental education. These programs are discussed in detail in Chapters 3, 4, and 5.

Nine Key Elements of an Effective State Program

As prescribed by 1997 EPA guidance, Texas' program is designed to comply with EPA's nine key elements of an effective program. These elements are listed below, with a summary of how the state has addressed them in its program. Many specific examples of the state's application of the nine key elements may be found in the chapters describing state programs and milestones for managing NPS pollution.

Element 1 *The state program contains explicit short- and long-term goals, objectives, and strategies to protect surface and groundwater.*

The long-term strategy of the state is embodied in the watershed management approach described in Chapter 2. By dividing the state into geographic basin areas and addressing them progressively, the state can ensure that all areas of the state receive focused attention and that action plans appropriate to the local area are implemented. Because it will take five years to completely phase in this watershed approach, the state will use existing data and priority lists to address implementation in priority water bodies of basin groups which will not reach the implementation phase until the later years of the transition to the watershed management approach. Further detail on the watershed management approach is provided in Chapter 2.

Through the water quality management activities of monitoring and assessment, certain water quality issues may arise at the statewide level. In some instances, such as in the problems of legacy pollutants or fecal coliform bacteria, the state may develop a broad strategy for use in all watersheds, with refinements as needed for local watershed conditions. Statewide education activities will continue at several levels to increase public awareness of NPS issues. The state also intends to use educational tools developed for statewide use in areas where watershed projects are initiated.

The section "Goals, Objectives, and Strategies" in Chapter 1 describes the TSSWCB and TNRCC long and short term goals of the Nonpoint Source Program. Basin steering committees established under the Texas Clean Rivers Act and the watershed management cycle may establish additional goals, objectives, and strategies applicable to local areas. Chapter 8 outlines milestones related to the nonpoint source program.

Element 2 *The state strengthens its working partnerships and linkages to appropriate state, interstate, Tribal, regional, and local entities (including conservation districts), private sector groups, citizen groups, and Federal agencies.*

The state coordinates, develops, and implements the NPS program using the existing infrastructure of the CRP to leverage the efforts of state, federal, tribal, regional, and local entities. Through the CRP, the state establishes working partnerships for obtaining consensus and input on NPS issues. The CRP uses the

statewide watershed management approach and the TNRCC's 5-year basin management cycle to organize the participation of all stakeholders to:

- (1) identify priority watersheds with NPS water quality problems;
- (2) formulate steps necessary to mitigate known water quality problems; and
- (3) secure and target resources to develop and implement NPS strategies to restore water quality in priority watersheds.

NPS Coordination and Outreach

The state continues to pursue written agreements with the organizations identified in Table 1-6 to further the goals of the NPS Program. Each year, the state will make presentations at regional and state meetings to evaluate, revise, and obtain consensus on the state's NPS goals and to solicit proposals for implementation projects in priority watersheds identified on the 1998 §303(d) List. Details about the proposed implementation projects will then be presented at local watershed committee meetings for additional stakeholder input. The state will ensure that each §319-funded implementation project includes a public education and outreach component in order to demonstrate successful pollution prevention technologies to the public. The state will provide technical assistance to appropriate organizations in the priority watersheds to support their watershed restoration activities.

Statewide Forums for Coordination of the NPS Management Program

Clean Rivers Program (CRP) Stakeholders Workgroup

Role: Coordination with the CRP Stakeholders Workgroup provides a unique opportunity to obtain consensus for a consistent approach to NPS water quality issues in the same forum in which the Texas §303(d) list and CRP assessment priorities are set. Annually, the TNRCC and the TSSWCB will present information to this group and obtain consensus on statewide NPS long-term goals, work plans, and opportunities to coordinate and cooperate to more efficiently address NPS pollution.

Members: Approximately 65 state, regional, and local government entities, including citizen, environmental, and industry group representatives.

Nonpoint Source Technical Workgroup

Role: A subgroup of the larger CRP Stakeholders Workgroup will be formed for the development of technical, statewide NPS short-term goals. This subgroup will report to the larger workgroup annually to re-evaluate the goals. Initially, the subgroup may meet more than once per year to fully develop strategies for addressing NPS issues.

Members: Members of the larger workgroup that are specifically interested in NPS issues include but are not limited to: River Authorities, the Texas Municipal

League, the Environmental Defense Fund, Water Conservation Districts, the Sierra Club, the Texas Association of Cattle Feeders, the Texas Farm Bureau, the Texas Agricultural Extension Service, the Texas Irrigation Council, the TNRCC, and the TSSWCB. State and federal agencies that have entered into NPS agreements will be invited to participate.

Table 1-6: Federal, State, and Local Agreements to Facilitate Cooperation on NPS Issues

Cooperative Entities	Type of Agreement	Purpose of Agreement
TNRCC and TSSWCB	Memorandum of Understanding (MOU)	Facilitate cooperation between the two primary Texas NPS control agencies in achieving program goals.
TSSWCB with NRCS, Texas Agricultural Extension Service, Texas Agricultural Experiment Station	Memorandum of Understanding (MOU)	Establish commitments to work together to accomplish statewide NPS pollution reduction goals with the state’s agricultural and silvicultural producers.
TNRCC and EPA	Performance Partnership Agreement	Establish and accomplish mutual NPS goals.
TNRCC with other state agencies: Parks and Wildlife, Departments of Health and Agriculture, Water Development Board, Texas A&M University System (TAEX, TAES)	Memorandum of Agreement (MOA)	Establish agreements with key state and federal partners to set priorities, achieve water quality goals, and plan and implement watershed projects to protect and restore NPS-impacted water bodies.
TNRCC or TSSWCB with Contractor	Contract for Services	Ensure proper representation and technical expertise to define NPS loadings under a TMDL and to develop and implement strategies to reduce the loadings.
NPS Program and TNRCC Strategic Environmental Assessment Group	TNRCC Internal Support Group	Communicate and facilitate cross-media solutions.
NPS Program and State Agricultural/Silvicultural Nonpoint Source Advisory and Coordinating Committees	Standing Committee	Facilitate cooperation between agricultural and silvicultural organizations and the government organizations responsible for meeting NPS goals and objectives.

Forums to Engage Citizen Participation in NPS Management

Clean Rivers Program Basin Steering Committees

Role: CRP Basin Steering Committees meet at least annually in each of Texas’ major river basins. The meetings provide an opportunity for local citizens and stakeholders to provide input about water quality issues. The CRP Planning Agency responsible for managing water quality in the basin (or basins, in some instances) holds the meeting, presents and discusses the known and potential water quality concerns for the basin, and requests input from the attendees in identifying potential sources of pollution and setting local priorities. The meeting

provides a way for state agency representatives to communicate statewide NPS goals to stakeholders at the local level. Information collected from these meetings will be included in the CRP Basin Action Summary that outlines recommended actions for NPS issues in each river basin.

Members: These meetings are advertised locally and open to the public. Typically, they are attended by representatives from local and regional environmental, citizen, and industry groups along with state, regional, and local government organizations.

CRP Technical Subcommittees

Role: Small groups are formed from the larger CRP Basin Steering Committees on an ad hoc basis to address issues at the local watershed level. The subcommittees provide in-depth review and input regarding water quality issues raised by the CRP Basin Steering Committee, and report their findings back to the larger basin-wide committee to obtain consensus on recommended actions.

Members: A CRP Technical Subcommittee is a group of local stakeholders, citizens, and technical specialists that have an interest in and an ability to provide detailed and technical input to the process of addressing a specific water quality issue.

Local Watershed Action Committees

Role: For those priority watersheds where source water protection and TMDL activities are planned, a local Watershed Action Committee is formed to engage stakeholders and citizens. The committees are formed to assist the state in developing and implementing watershed action plans that have undergone review and approval by the full committee. Information from these committees is reported back to the larger basin-wide committee to obtain consensus on recommended actions.

Members: The local Watershed Action Committee is a group of local stakeholders, citizens, and technical specialists that have an interest in and ability to provide detailed and technical input to the process of addressing a specific water quality issue.

Element 3 *The state uses a balanced approach that emphasizes both State-wide nonpoint source programs and on-the-ground management of individual watersheds where waters are impaired or threatened.*

The state has a variety of nonpoint source programs that are implemented statewide through the watershed approach. One of the state's primary statewide efforts is public outreach and education, which is accomplished through activities of the TNRCC and TSSWCB Nonpoint Source Programs. The TSSWCB educates producers throughout the state on how their activities may contribute to NPS

pollution, measures they can take to minimize their impacts, and money that is available to help them implement these measures. This is accomplished through statewide conferences, news articles, a web site and quarterly newsletters. The TNRCC Office of Pollution Prevention and Recycling, the TNRCC's estuary programs, and the Texas Watch program also play significant roles in the area of public education. The outreach activities planned for these programs are detailed in Chapters 3 and 4.

Other statewide programs of the TNRCC include on-site sewage installer certification and sludge site assessment, and 401 certification of dredge and fill projects. Statewide programs are also carried out by agencies such as the Railroad Commission of Texas, the Texas Department of Transportation, and Texas Parks and Wildlife (see Chapter 5).

On-the-ground management projects are implemented through a wide variety of activities by the TNRCC and many other regional and local entities, including the TSSWCB (for agricultural and silvicultural projects). Examples include the TNRCC's Edwards Aquifer Protection and Galveston Bay Estuary Programs, as well as LCRA's Colorado River Watch Network and the City of Austin's Watershed Master Plan. These and other regional and local programs are described in Chapters 3, 4, and 6. As assessment and planning efforts are completed in each basin under the watershed approach, new and existing implementation projects will be tied to strategies outlined in watershed action plans.

The TSSWCB has a number of nonpoint source programs designed to improve water quality where waters have been listed as impaired or threatened. The Senate Bill 503 program, which has been in effect since 1994, is an incentive-based program designed to help agricultural and silvicultural producers develop and implement site-specific water quality management plans (WQMPs) that are consistent with state water quality goals. Over the past four years approximately 2,500 producers statewide have implemented WQMPs.

Both the TSSWCB and the TNRCC receive federal funding from §319 of the Clean Water Act. The majority of these funds will now be used in specific impaired or threatened watersheds in a variety of ways, including funding, incentive payments, and technical assistance to landowners, cities, counties, or other agencies for implementing on-the-ground practices in their operations. These funds are considered seed money to encourage local partnerships and activism; several previous §319 grant projects have been very successful in that regard.

Element 4 *The state program (a) abates water quality impairments from nonpoint source pollution and (b) prevents significant threats to water quality from present and future nonpoint source activities.*

The TNRCC and TSSWCB Nonpoint Source Programs, within the context of the watershed management approach, use the 303(d) list to provide a basis for prioritizing implementation projects to address water quality impairments from

existing sources. Highest consideration is given to projects with the best potential to prevent or reduce nonpoint sources of pollution.

Although the majority of NPS funds will be expended in priority impaired areas, it is crucial that the state also encourage the implementation of practices in areas of concern in non-impaired watersheds. Therefore, the TSSWCB will reserve some pollution prevention money for non-priority areas.

Many TNRCC programs are preventive in nature or incorporate pollution prevention activities. Examples include the Texas Watch Program, the Galveston and Corpus Christi Bay Programs, the Source Water Protection Program, the Clean Texas 2000 Program, and the On-Site Wastewater Program.

The state also uses regulatory approaches to prevent pollution. The TNRCC Edwards Aquifer Protection Program is an example of a regulatory program designed to protect water quality from present and future construction activities. The TNRCC Occupational Certification program regulates installers of irrigation systems, water wells, water pumps, and septic system operations for the protection of surface and groundwater quality.

Other TNRCC, TSSWCB, and state programs which carry out nonpoint source management activities are described in Chapters 3, 4, and 5.

Element 5 *The state program identifies waters and their watersheds impaired by nonpoint source pollution and identifies important unimpaired waters that are threatened or otherwise at risk. Further, the state establishes a process to progressively address these identified waters by conducting more detailed watershed assessments and developing watershed implementation plans, and then by implementing the plans.*

Texas routinely assesses and monitors water quality under programs administered by the TNRCC. This data is collected by federal, state, regional, and local agencies and Texas Watch volunteer monitors, and is compiled into the §305(b) report. Using that report, the TNRCC prepares the §303(d) and §319 lists of water bodies in need of remediation. Texas recently completed its Unified Watershed Assessment under the new federal Clean Water Action Plan.

The watershed management approach (Chapter 2) is the process that the state will use to progressively address impaired or threatened water bodies. The TSSWCB works closely with the TNRCC in each water body impaired by agricultural or silvicultural activities to perform additional targeted water quality assessments. The TSSWCB will lead the development of watershed action plans for water bodies primarily impacted by agricultural or silvicultural sources, and will implement practices in those watersheds to mitigate the water quality problems. The TNRCC will lead the development of watershed action plans and implementation in areas affected by all other nonpoint sources.

Element 6 *The state reviews, upgrades, and implements all program components required by Section 319(b) of the Clean Water Act, and establishes flexible, targeted, and iterative approaches to achieve and maintain beneficial uses of water as expeditiously as practicable. The state programs include:*

- ! A mix of water quality-based and/or technology-based programs designed to achieve and maintain beneficial uses of water; and*
- ! A mix of regulatory, non-regulatory, financial, and technical assistance as needed to achieve and maintain beneficial uses of water as expeditiously as practicable.*

The state's watershed management approach is based on a water quality-based model, under which Texas waters are monitored for compliance with defined standards. If water bodies are identified as being out of compliance, the state uses a variety of approaches to remediate the identified problems. Since the state does not have statutory authority to enact certain types of regulatory measures, it must work cooperatively with local authorities to implement regulations. The TSSWCB develops and implements programs and plans to remediate the water bodies that are identified by water quality-based models as having agricultural or silvicultural sources of impairment. As noted under Key Element 2, annual meetings with the CRP Stakeholders Workgroup are used to coordinate statewide scoping and targeting. This annual review increases the state's flexibility in responding to changing conditions.

Development of a TMDL for an impaired water body is the first step of the NPS implementation program. The TMDL is the scientific basis for the second step, formulation of a watershed action plan to restore water quality. The successful implementation of these action plans will largely be dependent on the early participation and involvement of stakeholders in the watershed. Participation and involvement of a large number of local stakeholders is critical to developing accurate and comprehensive data for each action plan. Early stakeholder buy-in also provides the best possible setting for implementing subsequent management strategies called for in the watershed action plan. The purpose of utilizing a watershed steering committee is to provide that level of involvement. Both the TNRCC and the TSSWCB are committed to this approach to addressing water quality concerns.

Chapter 2 describes the iterative approach which the state will use to address all areas of the state in a coordinated fashion. Chapters 3, 4, and 5 describe the programs the state will use to implement management activities. Chapter 6 describes regional and local programs which are used to manage NPS pollution, and Chapter 7 identifies best management practices which the state and regional agencies use.

Element 7 *The state identifies federal lands and activities which are not managed consistently with state nonpoint source program objectives. Where appropriate, the state seeks EPA assistance to help resolve issues.*

No federal programs have been found to be inconsistent with the state's approach at this time. The state has identified those programs which have potential for activities that are inconsistent with the state's nonpoint source program. These federal programs are listed in Appendix B.

One goal of the basin steering committees is to include discussions with federal agencies to ensure coordination in initial stages of planning. Should activities inconsistent with the state's nonpoint source program be discovered in the course of these meeting, or during monitoring or TMDL development, the state will bring them to the attention of EPA's Region VI office.

As discussed under Key Element 2, the state is working on establishing formal agreements with key state and federal agencies to enhance the state's ability to provide a coordinated response to needs identified in priority watersheds.

Element 8 *The state manages and implements its nonpoint source program efficiently and effectively, including necessary financial management.*

The TSSWCB and the TNRCC have established operating procedures and tracking systems to ensure the effective use of §319 grant funds for addressing identified water quality problems. The TSSWCB conducts training at the beginning of all projects with all contractors to review what will be required of them in the project, maintains close contact with project managers throughout the course of the project, provides internal review of all invoices by two TSSWCB employees, and stays in continuous contact with the EPA project officer regarding the status of the program. To strengthen policies and procedures that govern the contracting process, the TNRCC is currently developing contractor performance criteria and invoice review criteria, along with an updated contract shell and contract manager qualification criteria to enhance the efficiency and effectiveness of grant management.

Element 9 *The state periodically reviews and evaluates its nonpoint source management program using environmental and functional measures of success, and revises its nonpoint source assessment and its management program at least every five years.*

The TNRCC and the TSSWCB are committed to updating the state's nonpoint source program every five years. The success of NPS programs will be evaluated for each basin group every five years in conjunction with the scoping phase of the basin management cycle. To that end, the TSSWCB and TNRCC Nonpoint Source Programs will produce annual updates to the management program as necessary to reflect any new activities planned through the watershed management approach for particular basins (one of the five basins will be in the scoping phase each year). These updates will serve as the basis for work plans with specific targeted output measures that can be reviewed for success at the end of the year. Recognizing that just meeting output measures does not tell the whole story of the achievement of desired environmental benefits, annual progress evaluations may include more

critical analyses of major program components and highlight trends in improved water quality.

Additionally, the TSSWCB and the TNRCC will continue to produce an annual report for the Nonpoint Source Program that assesses the state's progress in meeting both the short-term and long-term goals of the program. Through the process of preparing the annual report, the TSSWCB and the TNRCC will measure progress against the goals and objectives of this Management Program, using the annual §305(b) and §303(d) assessment process to measure environmental improvements against long-term goals. When annual program reviews highlight an area where short-term measures are not making appropriate advances toward the long-term goal, those programs will be revised to better achieve the targeted outcomes. The TSSWCB and the TNRCC will also continue to ensure that all §319 grant projects include appropriate environmental and functional measures of success.

Nonpoint Source Program Goals and Objectives

Within its cooperative, watershed-based framework, Texas has identified goals and objectives to guide nonpoint source program activities. These goals and objectives encompass elements intended to provide a strong foundation for maintaining a comprehensive nonpoint source program.

Long-Term Goal

By 2015, Texas will establish a state-approved watershed action plan or TMDL equivalent (unless the original basis for listing a water body is no longer valid) to restore and maintain water quality in all watersheds identified as impacted by nonpoint source pollution in the state's §319 assessment. The §319 assessment is based on the TNRCC's CWA §303(d) listing process.

The state will facilitate 100 percent implementation of the watershed action plans or TMDL equivalents adopted to the extent practicable under state and federal statutes, programs, and resources. In addition, Texas will continue to implement existing nonpoint source pollution abatement programs in watersheds throughout the state.

Objectives

Focus NPS abatement efforts, implementation strategies, and available resources in watersheds identified in the 1998 §303(d) list and schedule for TMDL development.

Implement state, regional, and local NPS programs to reduce NPS pollution.

Develop partnerships, relationships, memoranda of agreement, and other instruments to facilitate collective, cooperative approaches to manage NPS pollution.

Enhance public participation and outreach by providing forums for citizens and businesses to contribute their ideas and concerns about the water quality

management process. Increase overall public awareness of NPS issues and prevention.

Develop TMDLs for impaired water bodies identified on the 1998 §303(d) list.

Short-Term Goals

Goal One By 2015, in accordance with the following TMDL schedule, identify and characterize existing and potential water quality problems in Texas due to nonpoint sources of pollution in eight watersheds, or 6 percent of the segments identified in the 1998 §303(d) list, as detailed by watershed in the following pages.

Annually to the year 2015, TMDL assessment and implementation will begin in additional NPS-impaired watersheds in order to achieve the state's long-term goal of establishing a state-approved watershed action plan or TMDL equivalent to restore and maintain water quality in all watersheds identified as impacted by nonpoint source pollution in the state's 1998 §303(d) list.

Objectives

Big Cypress Creek and Lake O the Pines Segments 0404 and 0403

Objectives	1999	2000	2001	2002	2003-2015
Develop a local Watershed Committee to solicit input and encourage the involvement of affected stakeholders in the decision-making process.	X	X	X	X	X
Complete the assessment of dissolved oxygen and metals by reviewing existing water quality data and conducting an inventory of land use data, point/nonpoint sources, and all known stressors influencing water quality.	X				
Complete water quality monitoring and analyze data for trends, point/nonpoint source loadings and origin, and distribution of priority pollutants.		X			
Develop and apply TMDL model(s) to determine numerical load allocations for dissolved oxygen and metals reductions. Recommend control strategies or other appropriate actions for implementation.			X		
Coordinate with SWCD, NRCS, and TSSWCB Regional Office personnel to most efficiently provide technical and financial BMP assistance to the landowners in the targeted area.		X	X		

Implement Water Quality Management Plans with landowners in the Big Cypress watershed in areas prioritized through monitoring and modeling.		X	X		
Implement additional voluntary and regulatory actions in the Big Cypress and Lake O' the Pines watersheds . Adjust action plans based on follow-up and verification monitoring of TMDL effectiveness.				X	X

**E.V. Spence Reservoir
Segment 1411**

Objectives	1999	2000	2001	2002	2003-2015
Develop a local Watershed Committee to solicit input and encourage the participation of affected stakeholders in the decision-making process.	X	X	X	X	X
Complete the assessment of chloride, TDS, and sulfate problems by reviewing existing water quality data and conducting an inventory of point/nonpoint sources, land use data, and all known stressors influencing water quality.	X				
Develop and apply TMDL model(s) to determine numerical load allocations for chloride, TDS, and sulfate reductions and recommend control strategies for implementation.		X			
Identify and plug 171 abandoned, non-compliant oil wells (57 per year) that are contributing to salinity problems in the watershed.		X	X	X	
Assess and remediate saltwater seeps and brine pits in the Snyder Oil Field, East Howard-Iatan Oil Field, and Vincent Oil Field areas in Howard County.		X	X	X	
Implement additional voluntary and regulatory actions in the E.V. Spence watershed and adjust action plans based on follow-up verification monitoring of TMDL effectiveness.				X	X

**Salado Creek
Segment 1910**

Objectives	1999	2000	2001	2002	2003-2015
Develop a local Watershed Committee to solicit input and encourage the participation of affected stakeholders in the decision-making process.	X	X	X	X	X

Objectives	1999	2000	2001	2002	2003-2015
Complete the assessment of dissolved oxygen problems by reviewing existing water quality data and conducting an inventory of point/nonpoint sources, land use data, and all known stressors influencing water quality.	X				
Complete water quality monitoring and analyze data, point/nonpoint source loadings and origin, and distribution of priority pollutants.		X			
Develop and apply TMDL model(s) to determine numerical load allocations for dissolved oxygen. Recommend control strategies or other appropriate actions for implementation. For example, other actions might include developing site-specific water quality standards and criteria.		X			
Implement voluntary and regulatory actions in the Salado Creek watershed and adjust action plans based on follow-up and verification monitoring of TMDL effectiveness.			X	X	X

Marlin City Lake System Segment 1242-A

Objectives	1999	2000	2001	2002	2003-2015
Develop a local Watershed Committee to solicit input and encourage the participation of affected stakeholders in the decision-making process.	X	X	X	X	X
Complete water quality monitoring. Analyze data, assess loadings, and determine the origin and distribution of pollutants.		X			
Develop and apply TMDL model(s) to determine numerical load allocations for atrazine. Recommend control strategies for implementation.		X			
Implement voluntary and regulatory actions in the Marlin City Lake System and adjust action plans based on follow-up verification monitoring of TMDL effectiveness.			X	X	X

**North Bosque River
Segments 1225, 1246, 1226, 1255**

Objectives	1999	2000	2001	2002	2003-2015
Develop a local Watershed Committee to solicit input and encourage the participation of affected stakeholders in the decision-making process.	X	X	X	X	X
Complete the assessment of nutrient issues through review of existing water quality data.	X				
Complete water quality monitoring. Analyze data, loadings, and determine the origin and distribution of nutrients.	X				
Develop and apply TMDL model(s) to determine numerical load allocations for nutrients. Recommend control strategies for implementation.	X	X			
Coordinate with SWCD, NRCS, and TSSWCB Regional Office personnel to most efficiently provide technical and financial BMP assistance to the landowners in the targeted area.		X	X		
Implement Water Quality Management Plans with landowners in the North Bosque Watershed in areas prioritized through monitoring and modeling.		X	X		
Implement additional voluntary and regulatory actions in the North Bosque River watershed. Adjust action plans based on follow-up and verification monitoring of TMDL effectiveness.		X	X	X	X

**Arroyo Colorado
Segments 2201, 2202, 2202A**

Objectives	1999	2000	2001	2002	2003-2015
Develop a local Watershed Committee to solicit input and encourage the participation of affected stakeholders in the decision-making process.	X	X	X	X	X
Complete the assessment of low dissolved oxygen and legacy pesticides problems by reviewing existing water quality data and conducting an inventory of all known stressors influencing water quality.	X				
Complete water quality monitoring. Analyze data, loadings, and the origin and distribution of pollutants.	X				

Objectives	1999	2000	2001	2002	2003-2015
Develop and apply TMDL model(s) to determine numerical load allocations for dissolved oxygen, pesticides, and PCBs. Recommend control strategies for implementation.	X	X			
Coordinate with SWCD, NRCS, and TSSWCB Regional Office personnel to most efficiently provide technical and financial BMP assistance to the landowners in the targeted area.		X	X		
Implement Water Quality Management Plans with landowners in the Arroyo Colorado Watershed.		X	X		
Implement additional voluntary and regulatory actions in the Arroyo Colorado watershed. Adjust action plans based on follow-up and verification monitoring of TMDL effectiveness.		X	X	X	X

**Armand Bayou
Segments 1113 and 1113-A**

Objectives	1999	2000	2001	2002	2003-2015
Develop a local Watershed Committee to solicit input and encourage the participation of affected stakeholders in the decision-making process.	X	X	X	X	X
Complete the assessment of dissolved oxygen by reviewing existing water quality data.	X				
Complete water quality monitoring and analyze new data.	X				
Develop and apply model(s) to recommend strategies for addressing dissolved oxygen issues.	X	X			
Implement voluntary and regulatory actions in Armand Bayou watershed. Adjust action plans based follow-up and verification monitoring of TMDL effectiveness.		X	X	X	X

**Aquilla Lake
Segment 1254**

Objectives	1999	2000	2001	2002	2003-2015
Develop a local Watershed Committee to solicit input and encourage participation of affected stakeholders in the decision-making process.	X	X	X	X	X

Objectives	1999	2000	2001	2002	2003-2015
Complete water quality monitoring. Analyze data, assess loadings, and determine the origin and distribution of pollutants.	X				
Develop and apply TMDL model(s) to determine numerical load allocations for atrazine. Recommend control strategies for implementation.		X			
Implement voluntary and regulatory actions in Aquilla Lake watershed. Adjust action plans based on follow-up and verification monitoring of TMDL effectiveness.			X	X	X

Goal Two Annually to the year 2002, coordinate and administer the NPS program internally and with other federal, state, regional, and local entities. Manage all §319 funds efficiently and effectively to target the highest priority areas identified in the 1998 §303(d) List as impacted by NPS pollution.

Objectives

Focus BMP implementation by state, regional, and local entities in high priority watersheds by targeting 75 percent of §319 pass-through funds in watersheds included on the 1998 §303(d) List. (For each annual grant award to the state, 10 percent of the funds are allocated to grant administration needs, 20 percent are allocated to assessment activities, and 70 percent are passed through to various organizations to support implementation of BMPs. Of these pass-through funds, 75 percent will be targeted for use in the 303(d) listed watersheds.)

Focus TMDL and other water quality assessment activities in high priority watersheds included in the 1998 §303(d) List.

Goal Three By 2002, direct 20 percent of §319 pass-through funds to voluntary programs that provide technical assistance and incentives to landowners, producers, citizens, and businesses for implementing best management practices.

Objectives

Implement select projects statewide and conduct education and technology transfer activities to prevent degradation of water bodies that are not on the 1998 §303(d) list.

Maximize the participation of affected stakeholder groups at the regional and local levels by developing and maintaining targeted outreach efforts in each river basin, and in each NPS-impacted watershed included on the 1998 §303(d) List.

Enhance existing outreach programs at the state, regional, and local levels to maximize the effectiveness of NPS education (for example, *Clean Texas 2000, Texas*

Watch Citizen s Monitoring, Master Composter Program, and Storm Drain Stenciling).

Educate landowners about their potential roles in causing NPS pollution and solicit their cooperation in abatement programs.

Continue to implement existing water quality programs with landowners.

CHAPTER 2

THE WATERSHED MANAGEMENT APPROACH TO NONPOINT SOURCE POLLUTION MANAGEMENT



The watershed management approach directs and coordinates the state's water quality programs, including nonpoint source management, and provides the context within which the state will carry out its nonpoint source management responsibilities under state and federal law. The Nonpoint Source Program has been working since 1995 to synchronize its programs with this approach. A complete description of the approach can be found in *The Statewide Watershed Management Approach for Texas* (TNRCC, GI-229).

Watershed management is a resource-centered approach in which success is gauged by progress made toward protecting or restoring specific water uses such as drinking water supply, aquatic life habitat and propagation, recreation, and irrigation. Making successful management decisions depends on understanding the relationships between water quality, water use, and conditions within the watershed. This understanding is gained through accurate watershed assessments based on representative data. Assessments characterize physical, chemical, and biological conditions; identify sources and causes of water resource contamination and degradation; and evaluate the effectiveness of alternative management actions. The single most significant impediment to implementation of nonpoint source management measures in Texas has been the lack of specific information pertaining to the sources of water quality impairments and the most cost-effective solutions to those impairments. By focusing activities at the watershed level, and

especially on impaired water bodies where TMDLs are developed, the state can better define impairments related to nonpoint sources and accomplish the goal of reducing nonpoint source pollution to the degree necessary to restore beneficial uses of impaired water bodies.

The primary products of the watershed management approach are watershed action plans. Action plans are based on the scientific data necessary to accurately identify the sources of nonpoint source pollution in water bodies, and thereby enable the cost-effective use of state and federal funds. The magnitude of resources that will ultimately be needed to restore beneficial uses and address nonpoint source of pollution is much larger than the amount of funding available from the §319 grant program. Therefore, the Nonpoint Source Program must be able to mobilize state, regional, and local resources to be effective both statewide and at a watershed level. This objective can best be achieved through the state's comprehensive watershed management

What is a Watershed Action Plan?

A watershed action plan consists of a quantitative assessment of water quality problems and contributing pollutant sources (TMDL), along with an implementation plan that identifies responsible parties and specifies actions needed to restore and protect a water body. TMDLs are the scientific basis for watershed action plans, and provide the foundation necessary to identify appropriate management objectives and strategies.

Watershed action plans provide critical direction for managers at the local, regional, and state levels by establishing implementation schedules and identifying potential sources of funding. The TNRCC's watershed management approach coordinates the technical assessment of impairments in priority watersheds and the subsequent implementation of necessary management

approach, which increases cooperation among agencies and the public, builds public support for restoration activities, and thereby leverages available resources.

Goals of the Watershed Management Approach

The TNRCC envisions a dynamic watershed management approach which provides a flexible framework in which interested programs and parties may participate. Participation and contributions from other agencies or individuals outside the TNRCC will be continuously promoted. The state's goals for the approach are as follows.

- ! **Goal One:** Implement a consistent method for establishing total maximum daily loads.
- ! **Goal Two:** Increase the flexibility of TNRCC operations to accommodate geographic differences in local/regional water resource priorities.
- ! **Goal Three:** Implement cost-effective solutions to water quality problems.
- ! **Goal Four:** Increase the scientific validity of water resource management decisions.
- ! **Goal Five:** Improve the administrative efficiency of the TNRCC's water resource programs.
- ! **Goal Six:** Improve public participation in water resource management.

These goals are consistent with several of the key elements of state nonpoint source programs identified by the EPA in the most recent NPS program guidance, most particularly elements one, two, five, six, eight, and nine.

Throughout the next five years, NPS Program emphasis will be placed on:

- ! coordinating program work plans and outcomes to synchronize with the statewide schedule for implementation;
- ! improving public participation through the CRP Stakeholders Workgroup and basin steering committees; and
- ! developing watershed action plans in priority watersheds impacted by nonpoint source pollution.

Core Components of the Watershed Approach

The watershed approach consists of five core components:

- ! **Geographic units** (river basins and subwatersheds) are the spatial basis for coordinating activities. The major river and coastal basins are grouped into five management areas.
- ! **A basin management cycle** coordinates key activities in individual watersheds.
- ! **A statewide basin management schedule** establishes a statewide calendar and sequence for conducting key watershed management activities in each river basin over time.
- ! **Watershed action plans and total maximum daily loads** identify pollution sources and responsible parties and specify actions needed to restore and protect water quality.

- ! **Stakeholder involvement** recognizes the need to include stakeholders throughout the watershed management cycle to achieve greater understanding of water quality issues and support for implementing management strategies.

Geographic Units

The TNRCC currently uses river basins and stream segments as the spatial basis for coordinating selected water quality management activities. River basins are the 23 historically recognized drainage areas for major river basins and coastal areas within the state. The state's nine estuarine systems are grouped and identified as planning area 24, and the Gulf of Mexico is identified as planning area number 25. Because the state and its surface and groundwater areas are so large, the state established basin groups and implementation schedules under the Texas Water Code (Figure 2-1). The basin management cycle will be repeated for each basin group every five years.

The readily identifiable boundaries of watersheds provide a functional spatial unit for coordinating management efforts. A common set of geographic units provides a standardized means for locating, inventorying, exchanging, and assessing data relevant to basin hydrology, land use, and water quality issues. Units of different sizes, such as subwatersheds, watersheds, and river basins, allow for activities at different scales.

The Basin Management Cycle

Just as the state's river basins and watersheds provide geographic focus for coordination, the basin management cycle provides the focus for scheduling activities and coordinating resources within each watershed. The cycle has three key components:

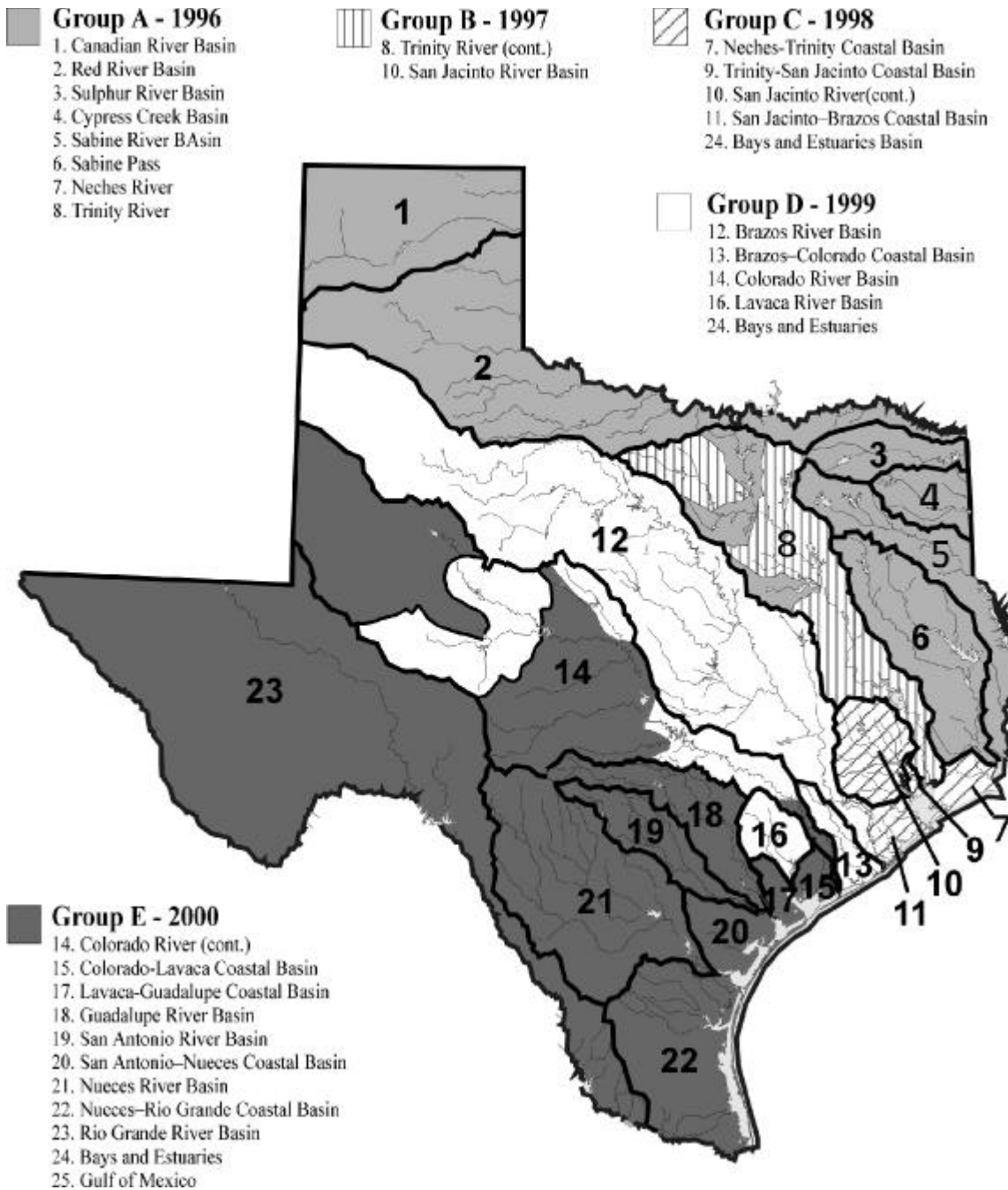
- ! A phased series of five major watershed management planning and implementation activities (Figure 2-2);
- ! Deadlines for each of the activities necessary to achieve a complete iteration of the basin management cycle every five years (Figure 2-3); and
- ! A sequence and schedule for conducting these activities in all major river basins (Figure 2-4).

The basin cycle of the watershed management approach is the mechanism whereby the Nonpoint Source Program will continuously identify nonpoint source problems within the various river basins in the state, establish statewide and local water quality priorities, develop community-based solutions to be implemented at both the statewide and local levels, and obtain collaboration with local interest groups.

Phases of the Basin Management Cycle

The basin management cycle has five sequenced activity phases that are repeated for each basin at fixed five-year intervals to ensure that management goals, priorities, and implementation strategies are routinely updated and progressively implemented (Figure 2-2). Planning and implementation are not one-time activities. The repeating management cycle reflects the TNRCC's understanding that the nature of watershed management is dynamic, and a framework must be flexible enough to address this dynamic nature in an orderly manner over time. Collectively, the activities and outcomes of the basin management cycle support the nine key elements identified by the EPA in its most recent NPS program guidance.

Figure 2-1. Basin Groups for the Watershed Management Approach



Phase One: Scoping and Re-evaluation

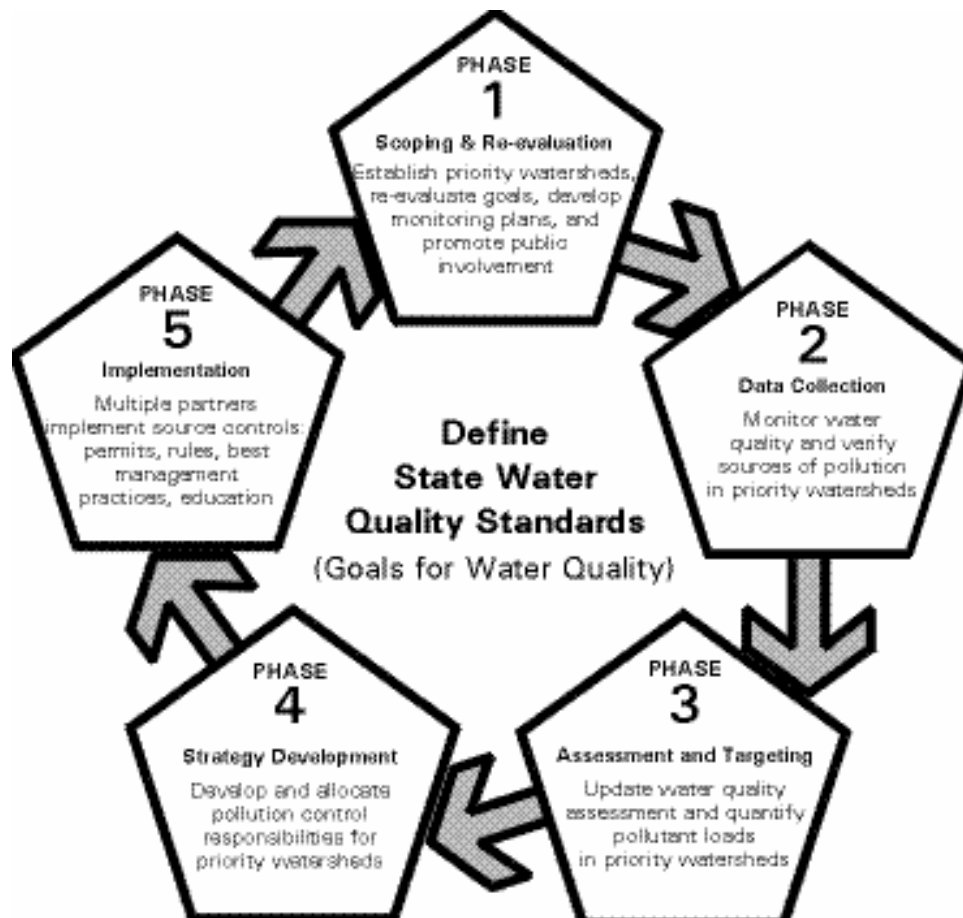
This phase involves three basic activities:

- ! conducting public outreach,
- ! identifying priority watershed issues, and
- ! planning for coordinated data collection.

The TNRCC will work with local partners to ensure that the broadest audience is reached through scheduled outreach efforts. To achieve this goal, the TNRCC will solicit input and participation, provide educational materials, and make presentations in the appropriate basins. Presentation materials will include information about NPS impairments and objectives in the basin. Special emphasis will be placed on outreach aimed at priority nonpoint source impaired watersheds listed on the §303(d) list.

The TNRCC will also review existing data and identify the need for collection of additional data to support planning for targeted monitoring. The TNRCC will work with local stakeholders to prioritize NPS problems on the §303(d) list, based on available scientific data, local concerns and support, and basin-wide goals and objectives. In subsequent iterations of the cycle, planning may involve re-evaluating previously identified issues and goals to determine their current relevance in light of new information.

Figure 2-2. The Basin Management Cycle



Phase Two: Data Collection

Watershed-based data (for example, chemical, physical, biological, hydrological, hydraulic, and land use data) are collected by responsible parties (such as private, local, regional, state, and federal organizations) during this phase. Efforts are guided by quality assurance project plans (QAPPs). Monitoring plans incorporate three major components:

- ! **Baseline monitoring** is conducted on every important water body in each basin. This is the traditional monitoring performed continually at key sites on high-profile water bodies regardless of the basin cycle. Data are collected using a monitoring network to adequately characterize water quality trends and monitor progress in protecting or restoring water quality. Monitoring at these important sites may be conducted by the TNRCC or other organizations. The monitoring design will depend on the actual use of the water body and on potential sources of contamination.
- ! **Status monitoring** is also conducted on every important water body in each basin. An intense two-year period of status monitoring commences in Phase One of the five-year basin management cycle and ends at the beginning of third year. This is the effort necessary to collect data on undesignated water bodies as well as more extensive status and trend analyses of those classified segments not on the 303(d) list. These data are critical for determining compliance with water quality standards and will be primarily used to revise interim updates of the CWA §305(b) assessment.
- ! **Targeted monitoring** commences at the beginning of Phase Two and ends at the beginning of fourth year. Targeted monitoring focuses on those water bodies identified on the CWA §303(d) List. This monitoring will establish the geographic extent and degree of water quality impairment necessary to apply models for establishing TMDLs, determine sources of contamination to revise water quality standards, and support specific wastewater permit limits.

The TNRCC will provide oversight and technical assistance for NPS data collection by partner agencies. Data gathered will be used for updates to the state's NPS assessment report, §305(b) assessment, and §303(d) list.

Phase Three: Assessment and Targeting

During this phase, quantitative and qualitative analyses are performed on baseline, status, and targeted watershed data by developing and applying tools such as GIS, statistical analysis methods, contaminant fate and transport models, and forecasting models. Information gathered during Phases One and Two for priority watersheds is analyzed to determine the appropriateness of water quality standards and to establish load allocations for point and nonpoint sources of pollution. Additional issues identified during assessment are the basis for subsequent assessment reports and revisions to the CWA §303(d) list. The TNRCC will provide oversight and technical assistance for NPS data evaluation by partner agencies. Updates of the state's NPS assessment report will be prepared during this phase in accordance with CWA §319 guidance.

Figure 2-3. Time Line for the Basin Management Cycle

TASK	Year 1			Year 2			Year 3			Year 4			Year 5					
	A		*			*			*		*		*	B	C	*D		E
1. Initiate Public Outreach and Education	5																	
2. Establish Basin Goals, Watershed Priorities, and Monitoring Plans		11																
3. Implement Strategic Data Collection and Monitoring Plans						33												
4. Compile and Maintain Information and Data								21										
5. Analyze and Evaluate Information and Data									18									
6. Quantify Impacts and Sources and Rank Watersheds										16								
7. Develop Management Strategies for Priority Watersheds													12					
8. Document Management Strategies and Recommendations														6				
9. Finalize Watershed Action Plans																6		
10. Implement Watershed Management Strategies																		8

Note: Numbers in each block denote approximate number of months allocated for each task.

Key Milestones & Major Deliverables:

- * Basin steering committee meeting to inform and obtain input/recommendations from key stakeholders
- A Statewide Strategic Monitoring Plan - Status and targeted monitoring efforts
- B Interim State of Texas Water Quality Inventory Report Update - CWA §305(b) report, §319(a) NPS assessment report, and CWA §303(d) list
- C Interim Nonpoint Source Pollution Statewide Management Plan Report Update - CWA §319(b)
- D Watershed Action Plans for priority watersheds
- E Issue domestic and industrial permits

Phase Four: Strategy Development

In this phase, the TNRCC and technical experts from partner agencies work with basin stakeholders to identify management strategies for the basin as a whole and for priority impaired watersheds within the basin. Stakeholders will identify new strategies and evaluate existing ones, then choose those management strategies that will be effective at maintaining water quality in unimpaired watersheds and achieving pollutant reduction goals for priority impaired watersheds.

In NPS-impacted watersheds, the TNRCC will work with stakeholders to develop strategies that target NPS management activities and financial resources when and where they will have the greatest environmental benefit. Sound science and stakeholder consensus will be emphasized to establish cost-effective solutions that have strong support.

The NPS Program will assist stakeholders in the development of watershed action plans that outline nonpoint source load reduction goals, specific NPS management activities and schedules, and funding sources. Action plans will be communicated to a targeted public audience and fine-tuned as necessary to strengthen public support. Updates to the NPS management program may be prepared to reflect these plans, and recommendations will be made for future monitoring to address any information gaps identified.

Phase Five: Implementation

During this phase, the TNRCC and other stakeholders carry out basin and watershed action plan activities. For example, TNRCC actions include implementing revisions to monitoring plans, reclassifying uses for misclassified streams, classifying unclassified streams, revising stream standards (as appropriate), implementing wastewater pretreatment programs, issuing wastewater permits, and implementing structural or nonstructural NPS BMPs or other water quality control measures. At the watershed level, the Nonpoint Source Program will work with local stakeholders in priority impaired watersheds to implement NPS pollution controls and provide technical assistance for NPS controls. Public outreach will be conducted for the basin as a whole and in impaired watersheds to inform stakeholders of the progress of activities and the achievement of goals. Upon completion of the implementation phase in any given basin, the cycle will begin again with Phase One to maintain the continuous planning process.

Of course, implementation is continuous. Therefore, completion of Phase Five is not the end, but rather the beginning or refocusing of implementation activities. By the end of Phase Five, basin and watershed action plans, based on the work performed in the previous four phases, are initiated. The action plans are implemented over the next five years, until revised action plans are developed in the strategy development phase of the next basin management cycle. At this time, activities from previous action plans (including those developed before the watershed approach was instituted) are evaluated in light of the new information gained in the latest cycle, and are revised or continued in the new action plans as appropriate.

In some instances, it is clear at the beginning of the basin management cycle that a particular BMP is best suited to address a high priority, well-defined water quality problem. Or, for instance, that awareness of NPS issues in the watershed is low, and broader community support could be gained through a targeted public awareness education campaign. In these cases, the state may implement new BMPs before reaching Phase Five in the cycle.

Tasks Within the Cycle

The basin management cycle is further broken out into 10 major tasks encompassed within the five phases. Figure 2-3 is a time line showing the number of months allocated for each major step in the management cycle of a single basin. The cycle of activities is based on the state's fiscal year, which begins on September 1 (S) and ends on August 31 (A). Public meetings, tasks, and major deliverables are scheduled to ensure that NPS activities are synchronized with other programs, resources, and outputs in individual river basins.

The tasks for a particular water body can be used as an example of how the cycle works in the basin as a whole. For instance, a certain reservoir in Basin Group A called Public Lake may have been identified during baseline monitoring as a water body that may not be supporting designated uses due to nonpoint source pollution. During the scoping phase, Public Lake might be designated for targeted monitoring to verify and characterize the suspected impairment. If, after assessment, Public Lake is determined to have a use impairment caused by nonpoint source pollution, the water body would be included on the state's §303(d) and §319 lists. Public Lake would then be ranked and prioritized, during the strategy development phase, for TMDL development or other appropriate management activities. If the problem in Public Lake was a high priority, TMDL development would most likely begin in the fifth year of the basin management cycle, as early as possible in the implementation phase. If, however, Public Lake was a low priority water body, implementation might not begin for its watershed until one to nine years after the beginning of the implementation phase.

Or, in a different scenario, say that during the scoping phase, Public Lake was identified as a reservoir with good water quality that has many beneficial uses of importance to the surrounding communities. Assessment confirms that the water body is not impaired, but notes that there is a great deal of development anticipated within the watershed over the next several years. During the strategy development phase, the basin steering committee may identify regulatory or voluntary measures that can be implemented to minimize impacts from development and maintain the water quality of Public Lake.

Tasks associated with major program outputs required under the Clean Water Act are synchronized with appropriate steps in the basin management cycle. Five deliverables are mandated: the Nonpoint Source Pollution Assessment Report and Management Plan (§319), the State of Texas Water Quality Inventory Report [§305(b)], the List of Impaired Water Bodies [§303(d)], and the issuance or renewal of domestic and industrial permits. The TNRC will work with the EPA to coordinate the due date of these deliverables with the planning cycle. Two other documents, the Strategic Monitoring Plan and the Watershed Action Plan, are essential planning tools in the basin management cycle.

Prioritization of Impaired Watersheds

Within a basin group, several factors are considered when prioritizing its impaired or threatened watersheds for restoration. First, the basin is assessed to determine whether any of the impaired watersheds are hydrologically-linked with others in the basin. For example, two adjacent subwatersheds may have the same pollutants of concern from the same sources. In this case, the two subwatersheds would be combined into one TMDL project.

Next, the priority rankings shown on the most recent 303(d) list (high, medium, low, threatened-high, and threatened-medium) are considered. These rankings were based on three factors: degree of use support (nonsupport or partial support), degree of understanding of the sources and severity of the pollutant, and the amount of data available for effective development

of a TMDL. Water bodies for which TMDLs are already underway are automatically considered high priority.

The third step is to examine all the pollutants in hydrologically-linked watersheds to determine which pollutants might be related in terms of causes and sources. For example, two linked subwatersheds might have low dissolved oxygen due to the same source, yet have mercury impairments from different sources. In this case, three TMDL projects would be needed: one for dissolved oxygen covering the two subwatersheds, and one in each of the subwatersheds for mercury.

Fourth, the basin is examined for impairments that lend themselves to a statewide approach, and those water bodies that require further data before a TMDL project can be effectively initiated. The water bodies that will be addressed through a statewide approach, such as those with legacy pollutants or those not supporting contact recreation due to fecal coliform bacteria, will not begin implementation until the statewide strategy plan is completed. The water bodies for which additional data are needed will be included in a targeted monitoring plan for the next round of the basin management cycle. Monitoring results will then be used to devise action plans for these watersheds in the next strategy development phase.

Finally, the remaining water bodies (those for which sufficient data exist to proceed with implementation activities) are scheduled to begin implementation during the upcoming five year period (before the next implementation phase), based on original 303(d) list priority and available resources. For instance, a particular water body might be ranked medium, but because time is needed to marshal a large number of resources for the project, implementation may be initiated after a water body ranked low where all the necessary resources are in place.

Public Involvement in the Cycle

Public participation is a key aspect of all phases of the basin management cycle. In the first year of the cycle, the TNRCC will participate in public meetings to establish basin goals, monitoring objectives, and TMDL priorities, and to recruit stakeholders from priority watersheds to participate in local watershed action committees. In the second year, the TNRCC will conduct public meetings to inform and obtain input from local stakeholders who have been recruited to assist in identifying management strategies for priority watersheds. Once the monitoring and assessment phases are complete, additional public meetings will be held in the third year to inform stakeholders in the basin and in priority watersheds of assessment results. In the fourth year, public meetings will be held in priority watersheds to provide stakeholders with the opportunity to play a role in adopting watershed action plans and other management strategies for priority watersheds. At the end of the basin management cycle, during the implementation phase, meetings will be held to involve as many interested parties as possible with the watershed management strategies to be implemented and to support stakeholder roles in implementing them.

The Statewide Basin Management Schedule

Although some flexibility in meeting schedules may be allowed under certain circumstances, programs need to stay on the statewide basin schedule to maintain the continuity and integrity of the framework. The TNRCC recognizes that circumstances differ in each basin in a given year—for example, weather patterns may delay planned strategic monitoring, complexity may delay development of management strategies for certain issues, or wastewater permits may need to be issued at specified times. If circumstances occur that prevent the collection of all recommended information, the available data will be used to formulate the most complete

Figure 2-4. The Statewide Basin Management Schedule

River Basins*	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
GROUP A: Canadian River, Red River, Sulphur River, Cypress Creek, Sabine River, Sabine Pass, Neches River, and Trinity River	IMPLEMENTATION	SCOPING					SCOPING	
		DATA COLLECTION			BASELINE MONITORING		DATA COLLECTION	
			ASSESSMENT & TARGETING		STRATEGY DEVELOPMENT			
						IMPLEMENTATION		
GROUP B: Trinity River (continued) San Jacinto River		IMPLEMENTATION	SCOPING					SCOPING
		BASELINE MON.	DATA COLLECTION			BASELINE MONITORING		DATA COLL.
				ASSESSMENT & TARGETING		STRATEGY DEVELOPMENT		
							IMPLEMENTATION	
GROUP C: San Jacinto River (cont.) San Jacinto–Brazos Coastal, Neches-Trinity Coastal, Trinity–San Jacinto Coastal, Bays and Estuaries			IMPLEMENTATION	SCOPING				
		BASELINE MONITORING		DATA COLLECTION			BASELINE MONITORING	
					ASSESSMENT & TARGETING		STRATEGY DEVELOPMENT	
								IMPLEMENTATION
GROUP D: Brazos River, Brazos-Colorado Coastal, Lavaca River, Colorado River, Bays and Estuaries		ASSESS & TARGET	STRATEGY DEV.	IMPLEMENTATION	SCOPING			
		BASELINE MONITORING			DATA COLLECTION			BASELINE MON.
						ASSESSMENT & TARGETING		
								STRATEGY DEV.
GROUP E: Colorado (cont.), Guadalupe, San Antonio, Nueces, & Rio Grande Rivers, San Antonio–Nueces Coastal, Colorado-Lavaca Coastal, Lavaca-Guadalupe Coastal, Nueces–Rio Grande Coastal, Bays and Estuaries, Gulf of Mexico						SCOPING		
		DATA COLLECTION		BASELINE MONITORING			DATA COLLECTION	
			ASSESSMENT & TARGETING		STRATEGY DEVELOPMENT		ASSESS. & TARGETING	
						IMPLEMENTATION		

2-11

* Note: Chronological order of river basins is derived from the Title 30 Texas Administrative Code §305.71 Permit-by-Basin Rule. Wastewater permits for each group of basins are issued to coincide with the implementation phase.

management strategies possible. Activities not completed and priorities not addressed in one iteration of the cycle can be addressed in the next five-year cycle.

Stakeholder Involvement

The TNRCC and the TSSWCB are not exclusively responsible for managing water resources or cleaning up the environment. Citizens, businesses, agriculture, universities, and government agencies must work together to ensure the protection and restoration of water resources and aquatic habitats. The watershed management approach establishes a consistent process for citizens and businesses to collaborate and participate with government by coordinating programs and services that lead to the desired environmental results. One of the guiding principles of the watershed management approach is ensuring meaningful public participation in the decision-making process.

Stakeholders may be grouped into four general categories of people or organizations:

- ! **Government:** City, county, regional, state, federal, and international governmental agencies;
- ! **Business:** Commercial and industrial firms, utilities, business groups, and trade associations;
- ! **Agriculture:** Corporate and individual farmers and ranchers; and
- ! **Public:** Individual citizens, schools and universities, and activist groups (including citizen, environmental, consumer, and community groups).

The watershed management approach provides additional opportunities for stakeholders to become more aware of water-related issues and participate meaningfully in all phases of the basin management cycle. Outreach and participation increase communication between the state and watershed stakeholders, often leading to greater trust and interest among parties that are addressing water resource issues. Through partnerships with stakeholders, the state strives to improve the means to establish goals, identify problems, and implement cost-effective solutions.

Coordination of stakeholders will be pursued at three levels:

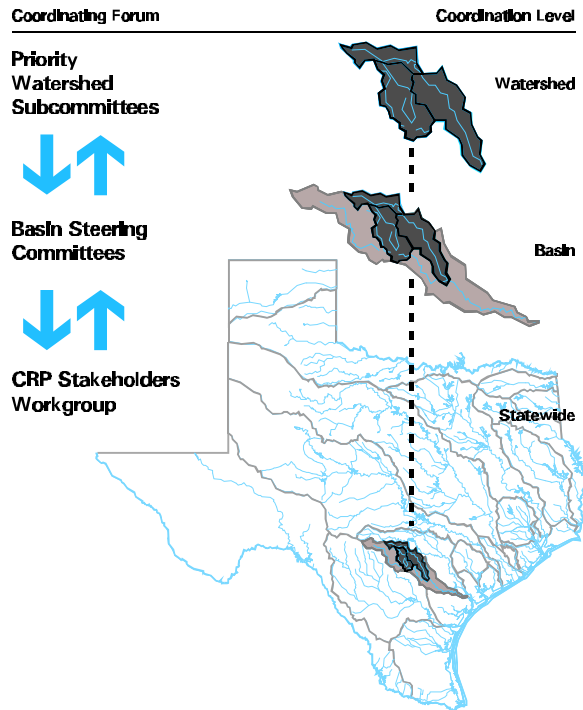
- ! **Statewide** for agencies and organizations that conduct watershed-management-related activities across the entire state, and therefore need a statewide structure for targeting and synchronizing efforts with one another;
- ! **Basin-wide** for assessing water quality conditions within a basin and establishing basin-specific management goals and priorities; and
- ! **Within local watersheds** to rally public support and participation of stakeholders to establish watershed-specific action plans that incorporate nonregulatory and regulatory mechanisms to protect or restore water quality.

The framework includes three separate, but related, coordinating forums to meet these needs (Figure 2-5). The statewide CRP Stakeholders Workgroup will set priorities for watershed management activities in cooperation with the TNRCC and the TSSWCB (the primary responsible state agencies).

In addition, TNRCC basin coordinators, acting on priorities set by the CRP Stakeholder Workgroup, will support statewide coordination needs. The coordinators will serve as a point of contact for stakeholders and state program staff for information on the approach and basin

management activity schedules, and will compile key pieces of information for basin management documents.

Figure 2-5. Forums for



Stakeholder Participation

Basin steering committees, currently required under the Clean Rivers Program and administered by CRP contractors, provide the primary forum for coordinating stakeholder involvement at the basin level.

Local watershed action committees, comprised of key stakeholders from priority watersheds, will be established to provide valuable input about local conditions and develop site-specific strategies. These local committees will not be active in all watersheds at the same time because of administrative constraints. A limited number of local watershed action committees will be formed during each iteration of the management cycle to focus efforts on priorities identified by the CRP Stakeholders Workgroup and the regional basin steering committee.

In addition to the primary forums for coordinating stakeholders described above, the Nonpoint Source Program will continue to use

other complementary means of involving and informing stakeholders, such as workshops, educational brochures, and volunteer programs such as Texas Watch (see Chapter 3 for a description of the Texas Watch program). The Nonpoint Source Program will work with the Clean Rivers Program to identify stakeholders, increase stakeholder involvement, and support outreach efforts.

Watershed Action Plans and Total Maximum Daily Loads

The current trend toward a comprehensive interpretation of TMDL requirements under CWA §§303(d) and (e) is forcing local, regional, state, federal, and international water resource management agencies to consider a much broader approach to point and nonpoint source pollution controls. Dynamic watershed management is a process that begins with a written, quantitative assessment of water quality problems and allocation among contributing sources (a TMDL), followed by the development of an implementation plan identifying responsible parties and specifying actions needed to restore and protect water quality standards. A watershed action plan (a TMDL plus an implementation plan) provides a blueprint of activities calculated to mitigate water quality problems. As such, the watershed action plan is useful for educating and assisting local stakeholders in the prevention and control of water pollution.

TMDLs are the technical and scientific foundation of watershed action plans, documenting sources of water resource impairment and pollutant load allocations. In a priority watershed, the TMDL provides a pollutant allocation mechanism that is useful in coordinating local, regional, state, federal, and international actions to restore water quality. Allocations for point source

pollutants can be incorporated as pollution limits in enforceable discharge permits. Allocations for nonpoint source pollutants are targets to be met through existing state regulatory and non-regulatory programs and initiatives.

The level of effort and the extent of documentation necessary for developing a TMDL will vary from watershed to watershed. The primary factors affecting the development of TMDLs include watershed size, model complexity, number and complexity of pollutants, distribution and quantity of point and nonpoint sources, and extent of public participation.

By outlining appropriate management strategies and objectives, establishing implementation schedules, and identifying potential sources of funding, watershed action plans provide critical direction for watershed management at the local and regional levels. The watershed action plan provides a consistent reference document that presents specific management strategies and corresponding roles for those responsible for implementing them.

While the state's water resource programs will rely on watershed action plans when coordinating BMP implementation, water quality permitting, monitoring, and assessment activities within the watershed, the plans are also intended to promote public participation by as representative a group as possible. The state will provide interested stakeholders with the necessary assistance to ensure that plans are successfully implemented. Given the gap between §319(h) funding and the number of water quality issues to be addressed in a state the size of Texas, local action plans must be supported with local funding. However, in those cases where meaningful implementation would fail without program support, §319(h) funding will remain an option.

TMDL Development for Agricultural and Silvicultural NPS

The TNRCC, as the state's lead water quality agency, has overall responsibility for maintaining the state's §303(d) list, targeting water bodies for TMDL development, developing and submitting TMDLs to EPA for approval, and carrying out the overall TMDL and watershed action plan development process. The TSSWCB has overall responsibility for developing and implementing provisions of TMDLs and watershed action plans related to agricultural and silvicultural nonpoint sources. The TSSWCB and the soil and water conservation districts will cooperate in the TMDL process by participating in and concurring with the determination of load allocations attributed to NPS pollutants from agricultural and silvicultural activities and implementing management measures necessary to achieve those load allocations.

A key element of action plans in priority watersheds impacted by agricultural or silvicultural sources will be development, certification, and implementation of water quality management plans that abate nonpoint source pollution on private lands. Implementation of these plans is crucial in achieving and documenting the attainment of water quality goals relating to agricultural and silvicultural NPS management.

Programs administered by the TSSWCB are voluntary. To help ensure successful implementation, landowner participation in the TMDL development process will be sought. Assistance from the Cooperative Extension Service, as well as numerous producer groups, will be used to inform landowners and secure participation. The complaint resolution process in Senate Bill (SB) 503 can be used as a last resort to assure necessary participation. Producers who fail to implement corrective action plans requested as the result of a complaint investigation are referred to the TNRCC.

Mechanisms exist in several federal agencies to assist landowners with implementation of nonpoint source management measures. The SB 503 program is also available on the state level in Texas to help landowners accomplish implementation. An effort is currently underway in

Texas to coordinate the Clean Water Act §319(h) Agriculture and Silviculture Program in Texas with the SB 503 Water Quality Management Program. By correlating these two programs, both state and federal resources can be concentrated on implementing water quality management plans in watersheds where TMDLs require reduction in loadings from agricultural and silvicultural nonpoint source activities.

WQMPs are site-specific plans, authorized under state law, that are designed to control nonpoint source pollution from agricultural and silvicultural activities. Funds supporting development of WQMPs come from legislative appropriations. WQMPs are traditional conservation plans that meet the resource management system criteria in the USDA Field Office Technical guide, and contain measures to address all potential sources of nonpoint source pollution. WQMPs are developed through soil and water conservation districts with assistance from the Natural Resources Conservation Service and the TSSWCB staff, and are certified by the State Soil and Water Conservation Board. This approach to NPS abatement and management is unique because it uses a voluntary approach while affording the landowner a mechanism by which he can be consistent with state water quality standards for a given stream segment.

The TNRC, because of its central role in establishing state water quality standards and determining compliance with those standards, has particular responsibilities to fulfill in the state's overall water quality management program. The TSSWCB supports the process by providing input to the technical analyses, participating in steering committee meetings, and by implementing NPS management programs and projects as necessary to address the agricultural and silvicultural contributions to impaired water bodies in the state.

Groundwater Management

Because groundwaters do not fit neatly into watershed boundaries, it is necessary to take a unique approach to the management of groundwater. This 1999 update to the Nonpoint Source Management Program represents a significant change from the existing program by the integration of groundwater and surface water NPS management programs into one document. Since the last update of the NPS Management Program, Texas has formed a groundwater nonpoint source working group under the auspices of the Texas Groundwater Protection Committee (TGWPC).

Texas is in the process of developing its comprehensive state groundwater protection program. The Texas Groundwater Protection Committee is responsible for development and implementation of this program. Nonpoint source management activities that are identified in the Texas Comprehensive Groundwater Protection Program are eligible for §319(h) grants, as are those contained in this document. Pollution prevention, through wellhead protection and public education activities, is the cornerstone of the Texas groundwater management plan. The primary means for measuring success in the management of groundwater nonpoint sources are: nonpoint source pollutant load reductions; prevention of new loadings; implementation of nonpoint source controls; and public education, awareness, and action. The Texas groundwater NPS management focuses on wellhead protection areas, groundwater recharge areas, and zones of significant interaction of groundwater with surface water. The Nonpoint Source Program works cooperatively with groundwater programs to ensure that best management practices that are implemented to address surface water quality do not adversely impact groundwater in Texas, and that groundwater interaction with surface water is identified as a priority for nonpoint source pollution management activities.

Section 26.401 of the Texas Water Code establishes the state's groundwater protection policy, which sets out non-degradation of the state's groundwater resources as the goal for all state programs. The policy recognizes the variability of the state's aquifers, the importance of maintaining water quality for existing and potential uses, the protection of the environment, and the maintenance and enhancement of the long-term economic health of the state. The policy mandates that discharges of pollutants, disposal of wastes, and other regulated activities be conducted in a manner that will maintain present uses and not impair potential uses of ground water, nor pose a public health hazard. The use of best professional judgement by the responsible state agencies is also recognized.

The Texas Groundwater Protection Committee actively seeks to implement this policy by identifying opportunities to improve existing groundwater quality programs and promoting coordination between agencies. The Committee also strives to improve or identify areas where new or existing programs could be enhanced to provide additional protection.

The TNRCC, as the designated lead agency of the Texas Groundwater Protection Committee, has the primary responsibility for the regulatory protection of ground water. However, certain activities subject to regulatory protection of groundwater are under the jurisdiction of the Railroad Commission of Texas (RCT), the Texas Department of Agriculture (TDA), and the Texas State Soil and Water Conservation Board (TSSWCB). The Texas Water Development Board (TWDB) has certain monitoring authorities in regard to groundwater but does not possess the statutory authority to regulate activities which may contaminate groundwater. The Texas Alliance of Groundwater Districts, as an organization, has no regulatory or enforcement authority, but individual groundwater districts may have limited authorities for action with regard to groundwater contamination. The Texas Agriculture Experiment Station and the Bureau of Economic Geology conduct research activities related to groundwater. Responsibilities of other state agencies are addressed in further detail in Chapter 5.

CHAPTER 3

TNRCC PROGRAMS FOR

NONPOINT SOURCE POLLUTION MANAGEMENT



The TNRCC has a number of programs which address various aspects of nonpoint source pollution management through planning, the setting of standards, data collection, assessment, targeting and prioritization, and implementation. This chapter will address the activities of each of the TNRCC program areas which play a role in managing nonpoint source pollution in Texas.

The implementation of a TMDL process to provide water-quality-focused control plans based on the calculated assimilative capacity of impacted water bodies will play a focal role in the management of nonpoint sources of pollution. As a management strategy, the TMDL process promotes the consensus of stakeholders in the technical evaluation and development of management strategies for identified water quality problems.

Programs described in this chapter are grouped according to the primary function they serve in managing nonpoint source pollution. Many of these programs are multi-functional; that is, they combine planning, assessment, and implementation activities. Two tables are included after the program descriptions to provide an easy cross reference for specific topics related to NPS management. Table 3-1, “TNRCC Programs by Function,” shows which programs perform functions such as monitoring, planning, or assessment. Table 3-2, “TNRCC Programs by Nonpoint Source Category,” shows which programs address identified nonpoint sources of pollution.

Planning and Coordination

Nonpoint Source Program

This program coordinates nonpoint source issues for the state, and produces the state Nonpoint Source Assessment Report and Management Program in cooperation with the TSSWCB and in accordance with Section 319 of the Clean Water Act. The NPS Program administers the CWA §319(h) grant funds for non-agricultural projects in the state, and carries out educational projects to inform the public and other governmental agencies about the issues related to nonpoint source pollution management.

In the recent past, this program has also had the responsibility of submitting applications and providing administrative oversight for the CWA §314 Clean Lakes grant program. The Clean Lakes program focused on identifying pollution sources within a watershed that were negatively impacting water quality in a lake, and preparing a feasibility study of the best management practices to adopt for their mitigation. While no new federal appropriations have been made for the Clean Lakes program, the NPS Program continues oversight of the remaining active projects.

The NPS Program is also active in the total maximum daily load (TMDL) development process that addresses priority water quality problems. The NPS Program will be involved in all phases of this initiative in order to assure appropriate assessment and mitigation of issues related to nonpoint sources of pollution. Priority activities will involve oversight of grants and data collection, outreach activities, and development of watershed action plans.

Coordination

The NPS Program coordinates its activities with the basin management cycle (see Chapter 2) through the Clean Rivers Program. While continuing all of its ongoing programs, the program will

focus new assessment, educational activities, and §319(h) funds in various watersheds at the appropriate phase in each basin's planning cycle. For example, during the scoping phase, the NPS Program will focus educational efforts in the targeted basin to inform regional agencies and the public about sources and solutions to NPS pollution. During the data collection phase, efforts to collect NPS data will be concentrated in the target watersheds. In the assessment, prioritization, and strategy development phases, the NPS Program will participate in determining priorities and developing watershed action plans. In the implementation phase of a particular basin, §319(h) funds will be targeted to activities which will support the watershed action plans developed for NPS-impacted water bodies.

Assessment and Planning

The NPS Program produces the NPS Assessment Report and the NPS Management Program every five years, and provides annual assessment and management program updates as necessary. The NPS Program will coordinate with other federal, state, regional, and local authorities in the formulation of these documents, as outlined in Chapter 1. The Assessment Report and the Management Program will be coordinated with developments in the basin cycles, and with state and regional agencies engaged in assessment and management activities.

Grant Administration

The Program administers §319(h) grants for the implementation and demonstration of best management practices for controlling nonpoint source pollution. Grant administration includes such activities as publication of requests for proposals, conducting workshops for grant applicants to explain the process and format for applications, reading and ranking project proposals, and making recommendations to EPA. After award of the grant, intergovernmental/interlocal agreements must be executed, and contract administrative activities carried out, such as preparing progress reports, processing vouchers, and making site visits.

Educational Programs

The TNRCC NPS Program is committed to a statewide program to educate people in urban areas about nonpoint source pollution, since public awareness is necessary for developing the climate in which the public is willing to address the water quality problems posed by nonpoint source pollution. Control of nonpoint source pollution involves the cooperation of land owners. The state has the burden, then, of documenting the problems associated with nonpoint source pollution, demonstrating the need to control it, and showing that these controls can be implemented economically for the benefit of the property owner and the community. Educational efforts must include convincing data to demonstrate the problem, and information and demonstrations related to best management practices for NPS control.

Educational efforts will take the form of brochures, pamphlets, mass mailings, and videos; print, radio, and television media coverage; and state and regional workshops. The NPS Program will seek a closer relationship with the TNRCC Clean Texas 2000 Program (a statewide pollution prevention initiative which is presented in further detail later in this chapter) to increase the amount and quality of information disseminated about NPS pollution and to capitalize on the partnerships established by Clean Texas 2000. New educational opportunities will be identified and implemented through the watershed planning cycle.

The NPS Program managed a recent §319(h) grant designed to achieve many of its educational goals:

The Urban Nonpoint Source Community Outreach Project

This project was carried out in cooperation with the Texas Watch and Clean Texas 2000 Programs of the TNRCC. These groups developed resources in the form of workshops, educational and promotional materials, technical expertise, and citizen volunteer monitoring. The resources developed during the project and the lessons learned from coordinating it will be used to support efforts in other watersheds around the state that are targeted for action plan development.

The project was formulated on the belief that local action to manage NPS is a necessary component of a statewide NPS management plan. For this reason, a central objective of the project was to initiate partnerships which will continue local efforts beyond the life of the project. In keeping with this objective, local contractors in six targeted regional areas were chosen to implement the pollution prevention and monitoring elements of the plan in their regions. Contractors organized workshops and provided assistance to individuals, organizations, and small businesses who volunteered to participate in the project. Activities first familiarized residents with the impacts of human behavior on the environment, and then developed and put into practice specific ways of addressing those impacts.

The following nonpoint source awareness and prevention activities were implemented for this project:

! Watershed Land Use Surveys and Streamwalks

Organizations, schools, and individuals conducted watershed surveys and streamwalks to record local conditions and identify sources of pollution. This information was used as a basis for promoting targeted local nonpoint source pollution prevention programs such as storm drain stenciling and stream clean-up. Conducting watershed surveys allowed residents to see first-hand how land uses and day-to-day human activities can impact water quality. Three publications were developed by the NPS Program and Texas Watch to support these activities: *Nonpoint Source Pollution: Answers to Frequently Asked Questions* (GI-162); the *Watershed Owner's Streamwalk Guide* (GI-218) and the *Manual for Conducting a Watershed Land Use Survey* (GI-232).

! NPS Prevention and Community Organizations

Some of the most effective ways to address nonpoint source pollution involve education and small changes of behavior. These nonstructural best management practices cost very little and are easy for individuals to use. Examples of activities the project promoted include backyard composting, household hazardous waste collection, storm drain stenciling, and recycling. To the extent possible, the project concentrated on locally relevant practices which were based on information gathered in neighborhood surveys. Workshops were offered for interested organizations and individuals. Partnerships with local organizations promoted long-term use of these practices.

Publications of the Clean Texas 2000 program which were used to support these activities include the *Green Guide to Yard Care* (GI-28); *Storm Drain Stenciling: A Manual for Communities* (GI-212); *Household Hazardous Wastes: Alternatives and General Storage Directions* (GI-163); and the *Household Hazardous Waste*

Guide (GI-193), used for conducting community household hazardous waste collections. A publication developed by the NPS Program entitled *Nonpoint Source Pollution Prevention: Directory of Volunteer Programs* (GI-172) was also used. Additionally, "Household Hazardous Waste Wheels" were purchased by the program for distribution at community workshops. These wheels illustrate various waste categories, the chemical products that are included in them, the hazardous ingredients involved, less toxic alternatives to those chemicals, and proper management procedures for handling, storing, and disposing of hazardous materials.

! NPS Prevention for Small Businesses

This task took the same approach as the program for individuals and communities, but was tailored to small businesses. Materials were developed that address nonpoint source pollution issues that affect small businesses and best management practices that businesses can utilize to manage NPS impacts from their operations. Recruiting small businesses as participants in community efforts to prevent nonpoint source pollution maintains the "grassroots" approach necessary in efforts to reach the largest number of residents in each community.

! Volunteer Monitoring

This component of the project was implemented by the TNRCC's Texas Watch program in cooperation with the local contractors and communities. Texas Watch monitoring activities are described in further detail later in this chapter.

Legislation and Regulations

The NPS Program serves as the lead for the TNRCC in the development of administrative rules and procedures for implementing certain state statutes pertaining to nonpoint source pollution prevention and control. Two such statutes were passed in 1995 in the 74th Session of the Texas Legislature. One of these statutes provided for the designation of Water Quality Protection Zones whereby owners of 500 or more acres of land located in certain areas of the state can designate their property as a Water Quality Protection Zone and implement water quality protection plans with authorization from the TNRCC. The second statute authorized the creation of the Southwest Travis County Water District and required the District to submit a water pollution control and abatement program to the TNRCC for review and approval. This legislation is currently undergoing a constitutional challenge in the Texas court system, but implementation will continue pending the outcome of the case.

The NPS Program is responsible for implementing provisions of §26.177 of the Texas Water Code, the Water Pollution Control Duties of Municipalities. This statute establishes statutory responsibility of cities for control and abatement of water pollution within their jurisdiction. The statute currently applies to cities with populations greater than 10,000 persons and allows all other cities to establish water pollution control and abatement programs and to submit these programs to the TNRCC for review and approval. The water pollution control and abatement programs are to inventory, monitor, and obtain compliance for waste discharges and to provide for reasonable and realistic plans for controlling nonpoint sources of pollution.

The NPS Program is also responsible for developing portions of a Coastal Nonpoint Source Management Program for the state in accordance with Section 6217 of the Coastal Zone Act

Reauthorization Amendments of 1991. The Coastal Management Plan for Texas received federal approval in January of 1997. The state submitted a Coastal Nonpoint Source Management Program to the EPA and the National Oceanic and Atmospheric Administration (NOAA) for approval in December of 1998, as required by program guidance. The state's Coastal Nonpoint Source Management Program delineates a boundary identifying areas where nonpoint sources of pollution affect the quality of coastal waters. Within the state's coastal nonpoint source management area, the state program identifies categories of nonpoint source pollution which are present and represent a potential to contribute to water quality impairments, ensures minimum technological-based management measures are implemented for those categories of nonpoint source pollution, and provides for the implementation of additional management measures in instances where the technological-based management measures are found to be inadequate to protect the designated uses. The TNRCC worked in cooperation with the Texas General Land Office, the Texas State Soil and Water Conservation Board, Texas Parks and Wildlife, the Texas Department of Transportation, and others in the development of the Coastal Nonpoint Source Management Program.

Watershed Management Program

The Watershed Management Program is responsible for planning and coordination of watershed activities for the protection of water quality. This program coordinates the Clean Rivers Program, prepares the State Water Quality Management Plan, and is responsible for the Water Quality Continuing Planning Process. The Watershed Management Program will participate in the development and implementation of total maximum daily load (TMDL) analyses. The Clean Rivers Program is discussed later in this chapter, under the section "Monitoring and Assessment."

The *Water Quality Management Plan* (WQMP) for the State of Texas is a group of planning documents designed to provide long-range planning and technical data for the water quality management activities mandated under the Texas Water Code and the Federal Clean Water Act. The WQMP serves as a waste treatment plan developed according to state and federal law to accomplish Texas' clean water goals. Continuing water quality management planning coordination in Texas is conducted by the TNRCC, in cooperation with other appropriate state and local planning agencies, in accordance with Sections 205(j), 208, and 303(e) of the federal Clean Water Act.

The *Continuing Planning Process* (CPP) document provides the current management and technical procedures developed and implemented by the TNRCC to control, manage, and abate water pollution in the State of Texas. The Clean Water Act (CWA), as amended, requires the State to prepare and publish a CPP which includes the procedures by which the TNRCC will operate. These operating procedures are developed by the various divisions responsible for the implementation of the TNRCC's water quality management program. Sections of the CPP contain information on TNRCC's nonpoint source pollution abatement programs and the implementation of these programs throughout Texas.

Coordination of water quality programs to develop TMDLs will require a significant effort. The TNRCC anticipates directing additional full-time personnel to assist in coordinating the tasks associated with the statewide effort to develop and implement watershed action plans. These staff will be responsible for leading the coordination, public communication, and outreach efforts necessary to ensure local participation in watersheds slated for TMDLs. These individuals will also seek to identify additional funding sources to support continuing TMDL development.

TNRCC staff will coordinate the basin management cycle and the TMDL process through the statewide Stakeholders Workgroup and the basin steering committees established under the Texas Clean River Program. These committees consist of representatives with an interest in water quality conditions in the state's watersheds. The committees will provide a forum for the selection of water bodies for TMDL development from the state list of impaired waters, the generation and evaluation of technical information, and the development and review of watershed action plans.

Groundwater Program

The Groundwater Program seeks to protect groundwater through assessment and management activities. The Program coordinates with the Texas Groundwater Protection Committee, established as an inter-agency group for the protection of groundwater quality in Texas. In addition, the program leader co-chairs the Ground-Water Nonpoint Source Subcommittee of the Texas Ground-Water Protection Committee. This workgroup was formed in 1995 to provide a forum for implementation of the state groundwater nonpoint source program and to provide for interagency coordination on matters related to the program. The committee meets on a quarterly basis.

The TNRCC was designated as the lead agency for the Committee and is the designated State/EPA liaison for groundwater issues under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA). As the state lead agency for water resources, the TNRCC administers the development of state management plans for groundwater under FIFRA.

The Groundwater Program carries out §319(h)-funded grant activities for the state of Texas. This Program implements the groundwater portion of the Texas nonpoint source program, primarily through wellhead protection activities, the TEX-A-Syst program, other regional aquifer protection activities, technical assistance and education, and assessment of current and potential groundwater nonpoint source problems.

The Program conducts a variety of aquifer protection activities throughout Texas that focus on pollution prevention. Staff are responsible for updates of the Groundwater Nonpoint Source Assessment Report and Management Plan and provide groundwater input from programs across the state for the Annual Nonpoint Source Program Effectiveness Report. The Program crafted the Texas Comprehensive State Ground-Water Protection Program and compiles and publishes the Annual Ground-water Monitoring & Contamination Report. The Program coordinated development of the Texas Pesticides in Ground Water Program and participates with the Agricultural Resources Protection Authority.

The Groundwater Program is also responsible for groundwater investigations, permitting, and enforcement support. Staff also support the Texas Groundwater Protection Committee and its activities.

The Program evaluates impacts to groundwater from regulated wastewater treatment facilities, and evaluates self-reporting soil and groundwater data related to permits. Staff also assist in enforcement cases related to groundwater impacts from permitted facilities.

The Program compiles and publishes wellhead protection data and maps as part of the §106 program. Program staff are conducting wellhead protection activities in the Lake Fork Reservoir watershed.

The program uses geographic information system (GIS) tools extensively to support management decisions and convey information about groundwater issues. Staff members map aquifer vulnerability to point and nonpoint source pollution using the DRASTIC methodology, and conduct surface-based geophysical investigations of groundwater contamination.

Recent grant-supported NPS projects of the Groundwater Program include:

! **Brownsville Watershed Management**

A regional aquifer protection project in the Nueces-Rio Grande Coastal Watershed to document baseline conditions, provide GIS data layers, and monitor implementation of BMPs.

! **Brazos River Basin**

A regional aquifer protection project that included wellhead protection and Tex-A-Syst activities in the Brazos River Basin. Monitoring sought to document the effectiveness of tillage practices to reduce pesticides in shallow groundwater.

! **Galveston Bay Watershed Project**

This project documented the interaction of surface water and groundwater related to concerns associated with on-site wastewater systems.

! **Edwards Aquifer Protection**

The Edwards Aquifer BMP Evaluation project documented performance effectiveness and maintenance recommendations for BMPs installed over the recharge zone of the Edwards Aquifer. This project was a follow-up to previous efforts to monitor the effectiveness of BMPs required for development activities over this vulnerable sole source aquifer.

Monitoring and Assessment

Surface Water Quality Monitoring Program (SWQM)

The TNRCC maintains an ambitious Surface Water Quality Monitoring (SWQM) program in order to characterize existing water quality and emerging problems, define long-term trends, determine water quality standards compliance, evaluate the effectiveness of water quality control programs, and describe seasonal variation and frequency of occurrence of selected water quality constituents. Approximately 445 fixed SWQM sites are sampled by the TNRCC, with the frequency of sampling and parametric coverage dependent on specific needs and location. The SWQM Program coordinates the water quality monitoring efforts of TNRCC central and regional office staff and the Clean Rivers Program contractors to achieve the greatest possible monitoring coverage without duplication of effort.

The State of Texas Water Quality Inventory is prepared and submitted to the EPA by the TNRCC in accordance with §305(b) of the Clean Water Act. The biennial report describes the status of the state's waters based on recent surface and groundwater quality data. An overview is provided of water quality trends, the extent to which surface water quality standards are attained, the relative impacts of pollutants from various sources, water bodies where additional actions are needed, existing water pollution control, public water supply, and the water rights program. Surface water quality data are summarized for individual stream, reservoir, bay, and Gulf of Mexico segments. Information is also provided on the state's wetlands.

Included in the report are descriptions of the Texas Surface Water Quality Standards and the TNRCC Surface Water Quality Monitoring Program. The TNRCC's Drinking Water Program

and the agency's program to provide for protection of instream uses are detailed. The water pollution control programs the TNRCC utilizes to ensure protection and restoration of the State's waters are also described.

Procedures used by SWQM personnel in the collection and reporting of surface water quality data can be found in the *Surface Water Quality Monitoring Procedures Manual* (GI-252). This manual promotes consistent methods statewide and documents the quality assurance procedures used to demonstrate that surface water quality data collected under TNRCC's monitoring program are of known and adequate quality. This manual is available to other agencies, universities, contractors, and citizens engaged in water quality monitoring.

The Program also maintains the SWQM database as one component of the TNRCC's integrated data base system (TRACS). The SWQM database contains data collected by the TNRCC as well as other agencies such as the USGS, International Boundary and Water Commission, Texas Department of Health, Texas Watch volunteers, and some river authorities and cities. SWQM data are available to other agencies, institutions, consultants, local governments, and the public in paper report formats and as ASCII files formatted for loading into spreadsheets or databases. The TNRCC maintains a data line to provide access to this information (512-239-DATA).

The Program's nonpoint source monitoring activities have continued to expand by targeting EPA grant funds and Clean Rivers Program funds to watersheds where specific water quality problems require evaluation. Many of the studies which are underway require monitoring of best management practices in the watersheds before and after their installation in order to evaluate their effectiveness for nonpoint source control.

Development of An Invertebrate Community Index for Texas Streams

For the past nine years, TNRCC has employed a Mean Point Score (MPS) technique to assess aquatic life use attainment based on benthic macroinvertebrate communities. Through time, it has become apparent that the method has several shortcomings. In light of the shortcomings of this and other evaluation methods, a project was undertaken to develop an invertebrate community index (ICI) for Texas streams. The first step, completed in FY 1995, involved the construction of a data base. Approximately 450 sets of historical macrobenthic data were incorporated, including results from ecoregion studies, intensive water quality surveys, and special investigations. The data base will be used to select metrics for a Texas ICI, correlate metric ranges with aquatic life use subcategories, explore relationships to physicochemical variables, and identify ecoregional influences.

Benefits of the project will be the generation of a sound method for assessing aquatic life uses in Texas streams based on macrobenthos. Derivation of a Texas ICI will facilitate establishment of biocriteria in the Texas Surface Water Quality Standards.

Update of the Nonpoint Source Assessment Report

Through a §319(h) grant, the SWQM program has been working to develop expertise and standard operating procedures for nonpoint source assessments. The Brazos-Colorado Basin was selected as the most representative watershed to pilot this approach. The Brazos-Colorado Basin was also identified as the pilot watershed for developing the five-year process outlined in the watershed management approach. This watershed has multiple partners that can participate in the development of an assessment and management plan. The project supports the goals of the watershed management approach and the Clean Rivers Program by developing scientifically sound methods for identifying potential nonpoint sources of pollution and quantifying NPS loadings and

impairment of water quality. The TSSWCB will carry out a concurrent project to develop land use best management practices in the basin.

Texas Clean Rivers Program

The goal of the Clean Rivers Program is to maintain and improve the quality of water resources within each river basin in Texas through an ongoing partnership involving the TNRCC, other agencies, river authorities, regional entities, local governments, industry, and citizens. The program uses a watershed management approach to identify and evaluate water quality issues, establish priorities for corrective action, and document current basin actions and future strategies for action to improve water quality within each basin.

The CRP was designed on the basic premise that water quality is determined by the watershed; that the same system of topography, climate, soils, and vegetation that determines the flow of a river and its tributaries also determines how pollutants are collected and dispersed; how and where these pollutants do damage; and how and where they can be most effectively corrected. The CRP Program will:

- ! enhance public participation and education
- ! encourage comprehensive watershed planning
- ! identify pollutant sources
- ! provide a scientific approach to water quality issues
- ! focus on priority issues
- ! prevent and reduce pollution at the source
- ! ensure better use of public funds
- ! promote water conservation
- ! provide assistance for local initiatives.

The program is carried out through a collaborative effort of the TNRCC and 16 regional agencies, including river authorities, municipal water authorities, and councils of governments. These partners perform basin-specific water quality assessments in 21 of the 23 river and coastal basins of Texas; the TNRCC assesses the two remaining basins. The CRP provides a vehicle for local, regional, and statewide interests to examine water quality issues in an integrated fashion by considering all the activities and conditions affecting water quality in a particular geographic region.

Through coordination with the CRP partners, the Clean Rivers Program is conducting an inventory of storm water permits, and will assist cities in developing storm water pollution abatement plans. The CRP will also conduct an inventory of nonpoint source contributions from urban, agricultural, and silvicultural sources. CRP partners will recommend implementation activities in priority watersheds. A regional data clearing house has been established to increase access to data by all Program partners.

Texas Watch Program

The Texas Watch program educates people about the causes and effects of pollution by involving interested citizens in measuring water pollution. The program coordinates partners among citizens, business, industry, educational institutions, and regional authorities in order to improve communication and resolve conflict about environmental issues. Business, industry, and

university partners frequently provide financial and technical assistance for citizen monitoring efforts.

Volunteer monitoring efforts are generally focused at locations not monitored by TNRCC field staff or other water quality professionals. Consequently, the data collected by Texas Watch volunteers have been extremely useful to TNRCC in making environmental decisions and in filling gaps in the agency's knowledge of local water quality. Texas Watch will support the agency's commitment to accurately assess environmental conditions and will promote voluntary efforts to prevent pollution.

Texas Watch has embraced the goals of the TNRCC's watershed management approach. Accordingly, Texas Watch will coordinate the efforts of volunteer monitoring groups within the basin management cycle and develop strong links, grounded in quality science and technology, between environmental professionals and volunteers and their respective institutions. This approach will minimize the monitoring burden placed on limited government resources while maximizing the amount of useful information obtained.

Coordination with the statewide basin management schedule through the §319 program has already begun. Starting in 1997, Texas Watch implemented its first NPS grant to target technology transfer activities according to the basin management cycle. Additional areas of coordination include: creation of a Professional/Volunteer Integration Work Group; inclusion of volunteer monitoring in the TNRCC's comprehensive water quality monitoring strategy; inclusion of a Texas Watch component in the Clean Rivers Program guidance; participation in the Governor's 10-State Border Initiative; and coordination with the initiatives set forth at the 1996 Texas Water Monitoring Congress.

Texas Watch volunteers undergo training in sampling techniques based on the EPA-approved Texas Watch Quality Assurance Plan. Volunteers receive training in one or more monitoring efforts:

- ! the core kit, which is used for ambient water quality and enhanced nutrient testing;
- ! the urban kit, which measures for detergents, phenol, copper, chlorine, pH, and ammonia; and
- ! the benthic kit, which measures the diversity and number of macroinvertebrates to examine the integrity of a stream's biological community.

Volunteers have the opportunity to enhance their training at the annual Meeting of the Monitors. This event features workshops to further monitors' understanding of water quality, watersheds, nonpoint source pollution, and citizen involvement. Monitors also receive the Texas Watch newsletter, which contains regular features on nonpoint source pollution and ways individuals can affect NPS or promote community projects, such as revegetation of stream banks.

The Texas Watch program affords many educational and public awareness opportunities. In areas where Texas Watch is active, local media have advertised the program and featured nonpoint source educational materials in various articles. Texas Watch holds numerous meetings around the state for the purpose of enlisting support for the program from local government and community leaders. Through these meetings, environmental managers and community leaders have been educated about nonpoint source pollution. These meetings are supported with videos, slide shows, and informational brochures. In their local communities, Texas Watch volunteers promote better understanding of NPS issues.

Texas Watch has accomplished several goals in support of nonpoint source pollution prevention, monitoring, and education through four recent §319(h) grants.

! **The Statewide Urban NPS Pollution Prevention Project**

This project was carried out in cooperation with the Nonpoint Source Program and Clean Texas 2000. Texas Watch recruited volunteers and partners in six target geographic regions. The project enrolled municipalities in voluntary water pollution control and abatement efforts, including storm drain stenciling and educational best management practices.

! **The Environmental Monitoring and Outreach Project**

This project recruited volunteers to monitor the effectiveness of BMPs implemented by the City of Brownsville in its Town Resaca Runoff project under another §319(h) grant. Volunteers from local businesses, schools, and citizen groups were recruited to join in outreach activities that included storm drain stenciling, stream bank and resaca revegetation, erosion control, watershed mapping, and streamwalks.

! **The East Bouldin BMP Implementation and Evaluation Project**

This project attempted to decrease the NPS pollutant load to Town Lake in Austin from the East Bouldin Creek watershed. Town Lake has been identified as having known impacts from NPS pollution. The Green Classroom at Becker Elementary School, located in the East Bouldin watershed, was recognized as an exemplary project with the 1992 President's Environmental Youth Award and the 1992 Clean Texas 2000 Governor's Excellence Award. The combination of these factors made the East Bouldin watershed an ideal project area.

A paired watershed design was implemented to monitor the effects of several nonstructural BMPs. Volunteer monitors worked within a tight monitoring design to gather data before, during, and after BMP implementation to quantify the effects of BMPs implemented in the watershed. Successful elements of this project will be transferred to other subwatersheds of Town Lake and to other watersheds in the state.

! **The NPS Tech Transfer and Education Project**

This project conducted statewide and regional workshops in conjunction with the basin management cycle of the watershed management approach. These workshops provided a forum where all stakeholders, including the public and resource management agencies, such as municipalities and river authorities, could discuss nonpoint source pollution issues and management strategies. The workshops also provided transfer of technological information and were useful in forming partnerships to support citizen monitoring and nonstructural NPS BMPs.

Standards and Criteria

Water Quality Standards Program

Texas Surface Water Quality Standards (TSWQS) establish explicit water quality goals throughout the state. Regional hydrologic and geologic diversity is given consideration by dividing major river basins, bays, and estuaries into defined segments (referred to as classified or designated segments). The standards rule contains:

- (1) general standards which apply to all surface water in the state, and
- (2) segment-specific standards which identify appropriate uses (such as aquatic life, contact or non-contact recreation, drinking water, fish consumption)

and lists upper and lower limits for common indicators (criteria) of water quality, such as dissolved oxygen, temperature, pH, dissolved minerals, and fecal coliform bacteria. The Texas Surface Water Quality Standards provide long-term, instream targets for water quality that can be used to assess the effectiveness of BMPs and other pollution control programs.

Water quality standards are publicly revised at least every three years in order to incorporate new information on potential pollutants and additional data about water quality conditions in specific water bodies, and to address new state and federal regulatory requirements. The current standards were revised during 1994/1995 and adopted by the Commission on June 14, 1995.

The Surface Water Quality Standards Program also administers the Section 401 certification of Army Corps of Engineer Section 404 wetlands permits. Section 404 permits are reviewed for impact to water quality standards and certified, conditionally certified, denied, or certification is waived.

Most current standards were developed to apply at low flow and long-term conditions. They do not fully address nonpoint source impacts, which change in concentration with weather conditions. Another issue is the amount of data on nonpoint source impacts, which is not sufficient to determine effective instream goals for nonpoint source management. Although not included in the 1995 revisions, several kinds of innovative standards are under national and state development. These will be considered in future standards revisions along with other avenues for NPS water quality management. Funding for development and implementation of these new standards is currently a challenge.

Nutrients

Development of numerical nutrient criteria and implementation procedures was beyond the scope of the 1995 triennial revision. TNRCC staff are reviewing regulatory options and other incentives to control nutrients, and nutrient impact will remain an important issue for water quality management.

Sediment Criteria

Existing numerical criteria for toxicants in water do not necessarily preclude accumulation of toxic substances in bottom sediments. Sediment criteria to protect bottom-dwelling aquatic life are under development by EPA, and the states of Washington and Florida have established limited-purpose sediment criteria. Additional development is needed to establish technically adequate criteria, and to define realistic implementation procedures.

Wet-weather, Nonpoint Source Criteria

Many of the existing standards are not appropriate for conditions which occur during periods of wet weather. These conditions are of shorter duration than the applicable period of exposure for most of the criteria used to evaluate water quality. In addition, data on ambient instream water quality during wet weather are limited. As NPDES storm water permitting and nonpoint source programs progress, however, there will be an increasing need for developing or modifying criteria to address wet-weather flows and nonpoint source pollution. One of the priorities of the Clean Rivers Program is to acquire additional data to measure nonpoint source impacts and develop reasonable water quality goals for nonpoint source control programs.

Biocriteria

Biocriteria are based on quantitative measures of the health of indigenous aquatic communities. These measures include various indices of diversity, species number, and proportion of sensitive species. Potentially, biocriteria can be utilized as a direct indicator of pollutant impacts on aquatic organisms. TNRCC has already developed quantitative biological indices to define aquatic life categories, and for many purposes these indices are equivalent to biocriteria. EPA is formulating new policies and requirements for biocriteria in state standards.

Wetlands Certification

Wetlands Certification (§401 state certification of §404 permits) plays a role in managing nonpoint source pollution, as wetlands can play an important role in the natural abatement of nonpoint source pollutants. Any development resulting in the removal of wetlands must present a plan for remediating the loss of functional wetlands, and use of best management practices is required for certification. The Railroad Commission provides the technical review for these plans for oil and gas certifications; the TNRCC provides review for all others. Special conditions for certification may be applied to prevent Section 404 permit activities from impacting water quality and violating Texas surface water quality standards. The TNRCC has increased resources committed to evaluating federal permits and recommending appropriate NPS best management practices in order to improve protection of water quality in wetlands and coastal waters.

Toxicity/Modeling Program

The Toxicity/Modeling Program is responsible for preparing model analyses in support of TMDLs. TMDLs may address small (i.e., one undesignated tributary) to large (i.e., an entire segment or basin) areas, and must include nonpoint source loads. Point source discharge analyses are the program's original purpose and major existing capability, and continue to require most of the program's resources for the permitting process. TMDLs will take on a higher priority as the agency continues to implement its initiative to address impaired waters in accordance with the federal Clean Water Act.

TMDL allocations are typically, but not necessarily, based on model simulations and predictions. Nonpoint source pollution is difficult to characterize and allocate in a way that is fair and scientifically valid. This issue is prevalent across the country, and appropriate models are being developed. The work of modeling nonpoint source is complex and requires sophisticated GIS tools which have a long learning curve and a large infrastructure of monitoring and modeling.

NPS Model Development

The program received grant funding under a 104(b)(3) grant to develop NPS modeling methods and anticipates having suitable GIS-based methods. The model and the report for this project have been completed and submitted to the EPA for review.

NPS National Pilot

The Modeling Program is also providing technical assistance and monitoring developments in the North Bosque River project, which is a cooperative effort of nine agencies, led by the USDA. The Bosque project is a national pilot for developing NPS identification, monitoring, and modeling of source constituents.

New developments in modeling will have to have concurrence of watershed stakeholders to support the validity of the methods used. The Modeling Program will work through the CRP to develop partnerships with local agencies to build that credibility, as well as identify problems and develop the sizeable amount of data needed to accurately model nonpoint source impacts.

Ecosystem Research Program

The TNRCC has authority to grant water rights permits for unappropriated waters of the state. The Ecosystem Research Program conducts technical reviews of water rights permits. The TNRCC assesses the possible impact of granting a water right permit action on the instream uses of the affected body of water. These instream uses include, but are not limited to, water quality, fish and wildlife habitat, and recreation. In addition to instream uses, possible impacts to bays and estuaries must be assessed for those permitted dischargers within 200 miles of the Gulf of Mexico. The technical reviews are a means whereby the TNRCC can implement its rules and policies to protect senior and superior water rights, address environmental concerns and requirements, and insure the water resource is equitably used throughout the state.

Use of water rights often involves hydrologic modification, which alters sediment transport and delivery. This is of concern because in general, sediment delivery is undesirable for reservoirs and desirable for bays and estuaries. The Program will study how channel and maintenance flows are altered by water uses and identify BMPs which will mitigate undesirable effects of alterations in sediment delivery. The program will also develop a methodology for determining flows needed to maintain instream uses.

Use of water rights may also have potential to cause NPS concerns due to loss of wetlands and removal of riparian vegetation. Through the process of water rights review, permit requests will be assessed for potential impacts on water quality, and will include recommendations pertaining to riparian habitat and wetlands mitigation.

The Ecosystem Research Program will also be investigating wetlands and their role in water quality, including the mitigation of nonpoint source pollution. Some water rights permits involve the removal of wetlands, and when this happens, the permit holder must mitigate the effects of the wetlands removal. A more thorough understanding of wetlands function will ensure the use of correct BMPs for mitigation of wetlands removal.

Regulatory NPS Control Programs

Agriculture Permitting

A concentrated animal feeding operation (CAFO) is any operation that stables, confines, feeds, or maintains for a total of 45 days or more in any 12-month period more than a specified number of animals. CAFOs are subject to permits that are designed to control water and air pollution as a result of these operations. Animal Feeding Operations (AFOs), which are smaller than CAFOs, do not require permits, and are overseen by the TSSWCB. AFOs are required to develop Waste Management Plans, which receive technical review by the TNRCC.

The Program conducts various NPS-related activities in its Dairy Outreach Program Areas (DOPA):

- ! Presentations to producer groups on water quality protection and the NPS program
- ! Review of permit applications for dairies, feedlots, and poultry facilities
- ! Review of Waste Management plans for non-permitted facilities
- ! Provide information on CAFOs rules
- ! Educate and train producers on NPS issues such as land application

The Dairy Outreach Program Areas include Erath, Bosque, Hamilton, Comanche, Johnson, Hopkins, Wood, and Rains counties, which have large numbers of dairies in watersheds with water quality concerns. TNRCC Field Operations conducts compliance inspections of agricultural producers to determine compliance with permits or waste management plans.

Petroleum Storage Tank Program

This program regulates underground and above ground product storage tanks and requires groundwater monitoring and remediation at contaminated sites.

Industrial and Hazardous Waste Program

This program has responsibility for preventing groundwater contamination and ensuring remediation at industrial sites through the waste disposal facility permitting program, the Class I and Class III underground injection control programs, and uranium and radioactive waste disposal programs.

Used Oil and Used Oil Filter Recycling Program

Oil is the largest pollutant of water in the nation. Even oil that is dumped on the ground eventually finds its way into streams, rivers, and groundwater. The used oil from one oil change can pollute up to one million gallons of fresh water—enough to supply water to 50 people for one year. One pint of used oil can create a one-acre oil slick on the surface of water. A used oil filter can contain ½ to one pint of residual oil. Household do-it-yourself oil changers generate an estimated 16.7 million gallons of used oil and 25.8 million used oil filters in Texas annually.

Used oil and used oil filters are valuable resources. Used oil can be burned for fuel oil or it can be re-refined into high quality motor oil. It takes 42 gallons of crude oil to make 2½ quarts of new oil, yet only 1 gallon of used oil to produce the same 2½ quarts of oil. Re-refining oil takes 70% less energy than refining it the first time. Used oil can also be used to produce diesel fuel, greases

and other lubricants. Two gallons of used oil will provide enough electricity to run the average household for about 24 hours. Used oil filters are recycled by the steel industry to produce new steel products such as rebar and construction beams.

The TNRCC conducts an education program to inform the public of the need for and the benefits of used oil collection and recycling by:

- (1) establishing, maintaining and publicizing a used oil information center to disperse materials and information about the laws and rules regulating used oil, and informing the public of procedures and places to recycle used oil;
- (2) encouraging the voluntary establishment of used oil collection and recycling programs by local governments and private businesses, and providing technical assistance to persons who organize used oil collection and recycling programs;
- (3) developing a grant program for local governments and private businesses to assist in setting up collection centers for do-it-yourselfer (DIY) used oil, and establishing procedures for the application and awarding of grants; and
- (4) encouraging local governments to procure recycled oils or oils blended with recycled oils if these oils meet equipment specifications.

The TNRCC has promulgated rules for the registration and reporting requirements for used oil collection centers and persons transporting, processing, marketing or recycling used oil, including burning for energy recovery.

There is a need for additional used oil and used oil filter collection centers to be set up in the state. Currently, there are 19 counties without a single used oil collection center and 85 counties that do not meet the current criteria for being properly served, i.e., one collection center for every 15,000 people and one collection center for every 400 square miles.

The Used Oil Program

The Used Oil & Used Oil Filter Recycling Program manages the used oil program and is the point of contact for the regulated community. This group is responsible for providing education and technical guidance to the regulated community and the public, the development of training programs and presentations, the development of rule making, processing applications for registration for used oil collection centers and used oil handlers, reviewing and processing used oil collection center reimbursement applications, reviewing and processing of the EPA 8700-12 notification forms, assisting the Used Oil Grant Program Advisory Committee, and administering the Used Oil Grant Program.

Education of the Public and Regulated Community

Education of the public about the need for and benefits of recycling used oil has involved a variety of methods, including the use of radio, television, and newspaper advertisements, billboards, utility bill inserts, bumper stickers, posters, notices for display at retail stores, TNRCC staff involvement with community cleanup events, TNRCC staff communication with oil industry and trade associations, set-up and publication of a toll-free number for recycling program information, and availability of up-to-date lists of registered DIY used oil collection centers. The location of DIY used oil collection centers is publicized by the TNRCC through responses to phone inquiries and hard copy lists provided to local governments.

The Used Oil & Used Oil Filter Recycling Program staff provides technical assistance to persons who are setting up collection centers and has developed documents including “Typical Set Up of a Used Oil Collection Center,” “Establishing a Used Oil Collection Program,” “Information and Registration Guidelines For Used Oil or Used Oil Filter Collection Centers & Used Oil or Used Oil Filter Handlers,” and a videotape on how to set up a used oil collection center. Up-to-date lists of registered used oil transporters are available to assist used oil collection centers in removing the collected used oil from their facilities.

Used Oil Grant Program

Local governments or private facilities in unserved and/or underserved areas have been targeted and encouraged to set up new collection centers. The program may approve a grant for projects involved in: (1) curbside pickup of DIY used oil by a local government; (2) retrofitting of municipal solid waste equipment to facilitate curbside pickup of DIY used oil; (3) setup of used oil collection centers; (4) provision of used oil collection tanks; or (5) other activities that the used oil advisory committee determines will encourage proper recycling of DIY used oil. Through 1995, a total of \$3.7 million in grants has been awarded, and has resulted in the development of 720 publicly operated used oil collection centers. In FY 97, the TNRCC plans to distribute over \$5 million in new grants. The new grant program will be expanded to include the distribution of grant money to the private sector as well.

Used Oil Grant Program Advisory Committee

Effective August 30, 1995, the Used Oil Grant Program Advisory Committee was established by TNRCC appointment. The function of this committee is to recommend grant criteria, establish guidelines for allowable administrative expenses, and recommend grant recipients. The committee consists of seven members representing oil manufacturers (three members), local governments (two members), and operators of used oil collection centers (two members), who serve at the pleasure of the TNRCC.

Used Oil and Used Oil Filter Collection Centers

All appropriate businesses (those where automotive oil is changed, used, consumed, or sold) and local governments are encouraged to serve as used oil collection centers.

Pollution Cleanup Program

Pollution Cleanup oversees the Superfund, Voluntary Cleanup, and Emergency Response programs for the state. This involves cleanup of hazardous waste and first response to the accidental release of oil and hazardous substances on land and inland waterways. The Program also conducts remedial investigations and seeks funding for remedial activities based upon a health risk ranking program.

Emergency Response Program

The mission of the TNRCC Emergency Response program is to discover, respond to, and assess releases, and to pursue cleanup and damage assessment claims on behalf of the public. The program responds to environmental emergencies and pursues responsible party cleanup 24 hours a day, 365 days a year.

Staff of the TNRCC Emergency Response Program are on-call 24 hours a day to respond to spills, reports of pollution, environmental emergencies, citizens' complaints, and natural disasters. The activities of the TNRCC Emergency Response Program include:

- ! Spill Reporting and Response
- ! Coordination with and secondary supervision of field office spill response staff
- ! Spill waste classification and management
- ! Abandoned waste assessment and removal
- ! Technical assistance to regulated and regulatory communities
- ! State-funded response actions
- ! Coordination with Damage Assessment and Restoration Program (DART)
- ! State contingency plan development
- ! Management of the Spill Incident Information System (SIIS)
- ! Coordination role in State superfund immediate removal actions
- ! Implementation of TNRCC portion of the State Emergency Management Plan should the Governor declare a disaster

Other responsibilities of the program include:

- ! Coordination with other State and Federal agencies to develop contingency plans and other planning activities, such as the federal Regional Response Program.
- ! Providing technical assistance from the initiation of a response through the ultimate disposal of spill waste.
- ! Maintaining the Spill Incident Information System (SIIS).
- ! Requesting and coordinating federal removal actions.
- ! Assisting other TNRCC Divisions in special projects.

Response actions are often complicated because of the 50 to 60 million unique chemical substances known to exist, approximately 63,000 of these are immediately hazardous. These are known by approximately 183,000 chemical names and up to 1.83 million trade names. Quick response is emphasized, and the TNRCC has established a "one call" system to speed response. The program coordinates closely with the EPA to decide which agency will take the lead for any given incident.

Best management practices implemented for spills are site specific, and may include containing contaminated surface runoff, containing subsurface discharge to surface water, removing surface soil contamination, over packing leaking drums, removal and disposal of abandoned waste and contaminated surface soil, and treatment and authorized discharge of spills to surface waters. Restoration activities may include establishment of wetlands habitat and filter vegetation.

New initiatives are planned for this program. One initiative establishes a Statewide Emergency Response Contract. This process will provide for establishment of three contractors to provide immediate first response in extreme emergencies, where public health is threatened, there is significant public access, and there is no identified responsible party. Establishment of regular contractors will eliminate procurement time for individual incidents and reduce mobilization time. Electronic spill reporting is also being established to reduce time and resources necessary to manage reporting data. The program has also developed an Agency-wide Unified Command System. This system will design incident plans to eliminate confusion of responsibilities, establish

inter-agency channels, and develop an internal agency procedures manual. Lastly, the program will publish a new State of Texas Oil and Hazardous Substances Spill Contingency Plan in cooperation with the GLO and the Railroad Commission.

Natural Resource Damage Assessment Program

The Natural Resource Trustee Program of this program coordinates with GLO, TPWD, NOAA, and the U.S. Fish and Wildlife Department for CERCLA releases of hazardous substances and abandoned hazardous facilities to seek compensation for the public for damages to state resources from responsible parties. The program also seeks restoration settlements; incentive for these settlements is a release from CERCLA responsibilities.

Remediation and restoration projects carried out under this program often include NPS controls such as the construction of wetlands and tertiary bays.

Superfund Site Discovery and Assessment Program

This program evaluates abandoned sites containing wastes and releases of hazardous substances, identifies the human and environmental receptors, and determines the relative risk these sites pose for further evaluation through the state or federal superfund programs.

This program assesses threats to surface water due to runoff from these sites.

Illegal Disposal Program

Illegal dumping and burning in the Border area between Texas and Mexico is a frequent problem which appears to be increasing due to high population growth in the area. Many county unincorporated areas in the region do not have organized waste collection services. An estimated 431,902 people reside in this area; 343,321 reside in unincorporated areas, known as colonias. Population growth for this area over the next 15 years is estimated at between 80% - 130%. Illegal dump sites are generally easily accessible to vehicles, somewhat hidden from view, and are perceived to be a no-man's land where dumping is permissible without costs. Approximately 70% of these sites are located in drainage swales or in resacas or arroyos. Irrigation canals also receive illegal dumping. Environmental risks associated with illegal dumping and burning are surface and groundwater contamination; impact to wildlife and aquatic habitat; impact on endangered or threatened plants, animals, and species; and air pollution from open burning, especially in areas of concentrated population. There is also concern about the comingling of household hazardous wastes in these dumps, and some evidence that there may be a risk of comingling with hazardous wastes from illegal dumpings of maquiladora plants in the border region. Leachate from the sites can contaminate water supplies, as can ash with concentrated contaminants created during illegal burnings. Burn sites are often buried, creating potential for future water contamination.

The Illegal Disposal Abatement Program has been assessing the impacts from these activities in 32 counties in the Border region. These assessments will be used to identify pilot projects with local governments to address the environmental issues caused by these activities. These pilot projects are targeted for six counties in which the problems are most pronounced. Technical assistance for these projects will be provided by the TNRCC to county governments, which currently have few resources to address this problem. Pilot projects will utilize a multi-faceted approach to target the causes of illegal dumping. This approach will include the establishment of basic waste collection and disposal alternatives, use of enforcement regulations, public education about the health hazards associated with illegal disposal, and clean-up of existing sites. In addition

to providing start-up self-help projects at the local and regional scale, the pilot projects will be used to develop a model for self-help programs in the region and in other rural areas of the state.

On-Site Wastewater Program

Currently, approximately one-third of the state's population rely on on-site sewage facilities (OSSF). The number of OSSF systems continues to increase dramatically, with the number of permits doubling over the last 5 years.

Prior to the late 1960s, the regulation of OSSFs was only administered by municipal governments through local building inspection and plumbing inspection programs. There was no statewide standard for installation. Significant nonpoint source pollution problems from failing septic systems threaten public health. The On-Site Wastewater Program addresses these issues through several avenues.

The On-Site Wastewater Program establishes standards for installation of OSSFs, and outlines licensing and educational requirements for installers. Since May of 1995, the TNRCC has been working on a revision of the rules governing OSSFs. A working group of 14 members of the regulated community met on several occasions to recommend modifications to the rules. The TNRCC also conducted 11 public meetings statewide to develop comments for rule changes. The recommendations from these meetings and the working group were incorporated into a set of rules which became effective February 4, 1997. These rule changes accomplished the following:

- ! Made technical improvements by updating the minimum OSSF construction standards; provided better testing criteria for aerobic units; provided a protocol for testing and approval of innovative systems; and required maintenance for all systems.
- ! Required more strict education and certification by expanding the levels of installer certification and training; expanded inspector training; and required inspector certification.
- ! Required better site evaluations by improving the site evaluation process and the subdivision reviews.
- ! Increased the permit, installer registration, and inspector fees to provide better funding sources, and added civil and administrative penalties.
- ! Established enforcement procedures.

To better facilitate the training requirements for the installers and inspectors, the Research Council helped fund the On-Site Wastewater Treatment Training Center in College Station. This center will be used to provide hands-on training for installers and inspectors of on-site wastewater treatment and disposal systems and soils evaluations. This facility is complete and is being used for training. Two more training centers were approved by the Research Council for Weslaco and El Paso. These centers were completed in 1997.

The TNRCC is currently undertaking an effort to develop a state management plan for the on-site wastewater program. The plan will address issues concerning on-site wastewater treatment and disposal, solutions for those issues, and priorities for accomplishing the work. Areas that will be evaluated will include training and education, local on-site wastewater programs, alternative systems, and demonstration projects. The plan will also identify problem areas of the state that need attention. This process will take approximately one year.

The TNRCC is also working with members of the regulated community to develop a process for correlating data from experimental and demonstration constructed wetlands projects that will enable the TNRCC to establish standards for the design and installation of constructed wetlands for on-site sewage disposal. Several projects currently being funded under Section 319(h) of the Clean Water Act will be included in this process. They are scheduled for completion in two years.

On-Site Sewage Facilities Technical Assistance

Multiple segments in Southeast Texas are not meeting water quality criteria, and improperly treated on-site sewage facilities (OSSF) effluent has been identified as a major nonpoint source contributor to these problems. The TNRCC On-Site Sewage Facilities Program develops minimum standards for the construction, installation, and operation of OSSF systems and provides administrative procedures guidance for local government agencies which administer permitting functions under the program. In cooperation with the OSSF Program, TNRCC Field Operations will provide technical assistance consultations to designers, installers, and local permitting authorities who wish to utilize non-conventional OSSFs in selected basins in the targeted area. Additionally, Field Operations will conduct 6-8 OSSF plan reviews, installation inspections, and monthly follow-up inspections. These inspections will assist in pinpointing areas of concern. The program is expected to improve state water quality standards compliance and to reduce pathogens, organics, and metals from contributions of faulty OSSF systems to stormwater runoff.

Occupational Certification Program

Regulated licensure ensures conformance with the protection of surface and groundwater through the prevention and reduction of nonpoint source pollution in Texas. The Occupational Certification Program (OCP) functions within all federal and state mandated legislation, rules, and regulations to certify those environmental professionals regulated by the TNRCC. The OCP is responsible for the competency of those individuals who design, construct, install, operate, and maintain environmentally sensitive equipment, facilities, and systems providing landscape irrigation, drinking water treatment, wastewater processing, water well drilling, and on-site sewage facility installation services. The OCP is responsible for the timely processing and accurate review of certification applications, which must include all education, experience, technical training, and examination qualification requirements; the administration and validation of consistent and uniform examinations; the efficient issuance of new and renewal certificates; and the establishment and maintenance of certification rules and standards. The OCP provides for the investigation and resolution of all competency review cases and provides technical assistance for effective voluntary compliance.

Landscape Irrigation

Under state law, any individual in the business of selling, designing, consulting, altering, installing, servicing, or repairing a landscape irrigation/sprinkler system for non-agricultural purposes must be a Licensed Irrigator. System connections to a water supply may be made by a Licensed Installer only under the direct supervision of a Licensed Irrigator. The responsibilities of a Licensed Irrigator include the conservation and protection of the quality of public and private water supplies and the use of proper backflow prevention devices. The landscape irrigation industry estimates that approximately 80% of Texas water consumption goes toward landscape maintenance. Regulation of Landscape Irrigators assists in the protection of potable water supplies and provides assurance to the public that individuals performing landscape irrigation

services have shown a level of competence in promoting sound water conservation practices in Texas. Irrigator and Installer Licenses are valid for one year, and applicants for both must pass an examination and show proof of continuing education. Application fees are required for both licenses.

On-site Sewage Facility Installation

Under state law, any individual who is compensated by another individual to construct, install, alter, repair, or extend an on-site sewage facility must be registered as an On-Site Sewage Facility Installer. The responsibilities of a Registered Installer include the setting of tanks and the laying or replacement of pipe, lines, or tubing in an on-site wastewater sewage disposal facility according to minimum state standards or the more stringent conditions in the Authorized Agent's Order/Ordinance. Approximately 33% of the state's population relies on on-site sewage facility systems. The proper design and installation of on-site sewage systems by Registered Installers provides for safe and reliable sewage disposal and protects the health and welfare of Texans by reducing the risk of nonpoint source pollution from human and domestic waste contaminants. Installer Registration is valid for one year, and applicants must have completed 16 hours of training. Beginning August 1, 1998, there will be two levels of installers (Installer I and II). An Installer I can install, modify, or repair conventional trench drainfields, unlined evapotranspiration beds, gravel-less drainfields, and leaching chambers. An Installer II can install, modify, or repair all types of OSSF systems. Individuals seeking to become OSSF installers will be required to serve a minimum one-year apprenticeship with a certified installer and be registered with the TNRCC. An Installer I must complete 16 hours of training, and an Installer II must complete 24 hours. Persons in each installer category must complete eight hours per year of continuing education courses. Additionally, an Installer II must have a site evaluator certificate from the TNRCC in order to perform site evaluations to determine site suitability for an OSSF system.

Water Well Drilling

In accordance with state law, any individual performing services as a well driller must be licensed for the appropriate class of drilling, which includes monitor wells, injection wells, and dewatering wells. An individual who constructs a well on her own property for her own use is exempt. A Licensed Driller's responsibilities include the proper site location, well installation, drilling completion, and the proper plugging of water wells. Approximately 750,000 water wells have been drilled in Texas since the state began licensing water well drillers in 1965. The Water Well Driller Licensure Program enables the TNRCC to obtain measurable levels of compliance to required construction standards for the provision of safe, clean drinking water and the prevention of surface and groundwater contamination through nonpoint source pollution. There are several classifications of Water Well Driller Licenses; all are valid for one year and require some experience. Driller Trainee Registration is also conducted by this program.

Water Pump Installation

Any individual who repairs or installs water well pumps must obtain a Pump Installer License, except an individual who repairs or installs water well pumps on his own property for his own use. A Licensed Pump Installer's responsibilities include establishing the minimum requirements which will ensure the safe removal of water in an acceptable manner to protect existing water. The Water Pump Installer Licensure Program enables the TNRCC to obtain measurable levels of compliance to required construction standards for the proper installation of pumping equipment for the prevention of nonpoint source groundwater pollution. There are several classifications of

Pump Installer Licenses; all are valid for one year and require an examination and some experience. Apprentice Pump Installer Registration is also conducted by this program.

Beneficial Sludge/Biosolids Use Program

This Program is designed to utilize sludge and biosolids for beneficial uses as an alternative to disposal of these as waste. Under this program, sludge and biosolids are applied to agricultural lands to enrich the soil. An operator who wishes to install such a system must apply to the TNRCC for a permit to construct and operate the site. Because improper management of these systems may lead to water quality impacts, TNRCC works to ensure the proper design, construction, and operation of beneficial sludge use facilities through on-site inspections. These inspections examine compliance with permit limits on rates and frequency of application at permitted sites.

Currently, there are more than 400 registered facilities in Texas which are utilizing sludge for agricultural purposes. TNRCC surface water quality monitoring has identified problems with water use support in multiple segments in North Central and Southeast Texas which appear to be associated with runoff from sludge use facilities. In order to address the NPS concerns resulting from these operations, the TNRCC will conduct site inspections to assess beneficial sludge use sites in selected basins in the North Central Texas and Southeast Texas areas. Initial assessment will identify specific segments which require further attention, and will initiate activities necessary for the reduction of pathogens, organics, and metals contained in contaminated stormwater runoff from mismanaged beneficial sludge use sites.

Beginning in FY 1998, and continuing over the next four years, the TNRCC will focus on segments identified as problems during the assessment phase. New and existing sludge use operations in these segments will be systematically inspected for proper design, operation, and compliance with permit limits. Operators who are causing nonpoint source pollution will receive technical assistance necessary to enable them to achieve compliance. These activities are expected to achieve a 25% reduction in the occurrence of pathogens, priority organics, and metals from NPS runoff in the selected basins.

Surface Casing Program

This program provides groundwater quality protection recommendations to the energy minerals industry, primarily oil and gas producers. The program conducts research on the occurrence of fresh to slightly saline groundwater; reviews fresh water requests for enhanced oil recovery; and reviews salt water disposal recommendations.

The program provides technical assistance to the oil and gas industry by providing information on groundwater protection depths for construction or plugging of oil and gas wells. In addition, the program researches oil and gas-related pollution complaints and administers the Class V injection well regulatory program, which includes inventory and assessment of injection wells.

Water Quality Protection Zones Program

The TNRCC will implement compliance programs for the governing of Water Quality Protection Zones recently created in some areas under Senate Bill 1017. This legislation is currently under challenge in the Texas court system, but will continue to be implemented pending the outcome. The purpose of these zones is to provide the flexibility necessary to facilitate the development of the land within a zone, while providing for the protection of water quality within the zone. The zones are created voluntarily at the request of the landowner. Zones may be formed

in areas within the extraterritorial jurisdiction of cities with populations less than 900,000 but greater than 5,000, which have enacted or proposed at least three ordinances to regulate water quality within their extraterritorial jurisdictions in the five years prior to June 17, 1995, or which enact at least three or more ordinances to regulate water quality in their extraterritorial jurisdiction in any five-year period.

Section 26.179 of the Texas Water Code was created to codify these Water Quality Protection Zones. This law represents the first time the state has been given authority over the regulation of runoff outside the jurisdiction of municipalities. The rules set out the procedures and criteria to be used by the TNRCC in the:

- 1) review and approval of water quality plans and amendments submitted for tracts of land, 500 acres or larger, designated as water quality protection zones;
- 2) approval of requests to designate water quality protection zones for tracts of land that are less than 1,000 acres but not less than 500 acres in size;
- 3) determination of the adequacy of annual reports to be submitted for water quality protection zones; and
- 4) the assessment of fees.

The rules delineate the capabilities and obligations of responsible parties, including preparing and implementing a water quality plan, filing an annual report, taking corrective actions, and paying the fees for the zones. Water Quality Plans must be submitted which achieve water quality protection by either

- 1) maintaining background levels of water quality, or
- 2) retaining and disposing of the first 1.5 inches of rainfall from developed areas.

Under the rules, if maintaining background levels is the chosen course, water quality monitoring must be carried out for three years after development is completed to determine if the plan is achieving water quality protection. Annual reports submitted to the TNRCC will show average annual constituent loadings compared to background levels, and will describe BMPs used in the zone. Modifications must be made if performance monitoring indicates that background levels were not maintained for the previous year. If the applicant chooses to capture rainfall runoff, the plans shall include supporting design information, maintenance procedures, record keeping provisions, and BMP information, all of which shall be reported on annually to the TNRCC.

Voluntary NPS Control Programs

Source Water Protection Program

The Source Water Protection Program focuses on the protection of public drinking water supplies taken from surface waters. This Program works with municipalities to delineate water protection zones based on watershed boundaries. The City of Marlin was selected as the pilot for this project, which will be the first of its kind in the country. Plans for the City of Marlin, as well as those that follow, will be site-specific. Activities and findings for this pilot project will be documented and analyzed. A second implementation project will be undertaken, and improvements will be made based on findings from the City of Marlin project. A recruitment drive will then be launched, and implementation plans for individual cities will be developed based on interest, staffing, and funding.

The Source Water Protection Program will draw on applicable BMPs from the Wellhead Protection Program and will develop new BMPs through analysis and implementation. GIS models will be used to delineate protection zones. These BMPs include signs to increase public awareness, educational programs, site-specific protection plans, and local ordinances.

Wellhead Protection Program (WHP)

The WHP Program was the first such program in the United States, and has served as a national and international model for wellhead protection. This voluntary program works with municipalities that rely on groundwater as their sole source for public drinking water. Wellhead protection zones are delineated using GIS technology, and site-specific reports are prepared for each community in the program. WHP staff serve on various national organizations and committees: co-chair of the Groundwater Protection Council's Groundwater Protection Division, chair of the Groundwater Protection Council's Wellhead Protection Committee, member of the management program of the Groundwater Guardian Foundation, and a member of the technical committee of the League of Women Voters Education Fund.

The WHP Program promotes a cooperative relationship between the TNRCC and local communities. Once municipalities identify issues with the help of the TNRCC, land use ordinances are often enacted at the local level by local initiatives for the protection of groundwater resources. Communities also formulate contingency plans and engage in public awareness campaigns with assistance from the WHP Program. The WHP Program will continue to work with 20-25 communities per year in the formulation of wellhead protection plans. The Program will seek new sources of funding for implementation of GIS and GPS technologies, since the mapping produced by these technologies make water protection information accessible to the layman and more accurate and precise for the water quality professional.

The WHP program will also continue work on plugging abandoned water wells. The City of Lubbock, through its voluntary WHP program, identified a number of unplugged abandoned wells. A CWA §319(h) grant, funded in FY 96, will assist the city of Lubbock in plugging these abandoned wells. The Lubbock project will be used as a pilot for other abandoned well projects around the state.

The WHP program has a history of working cooperatively with government agencies in Mexico in the establishment of wellhead protection programs for that country. The Public Drinking Water Program of the TNRCC continues to work jointly with the cities of El Paso, Texas and Juarez, Mexico, in the establishment of an International Regional Wellhead Protection Program. This effort is organized through the University of Texas at El Paso's EPA Americorps Groundwater Protection Program. The work of the project will be carried out over 5-10 years.

Participating Americorps students will use GPS and GIS to identify contaminant sources from both sides of the border. The project will then formulate and implement BMPs to address the problems identities.

Community Recycling and Composting Program

This Program provides assistance for the implementation of local government recycling and composting programs, and promotes environmental awareness. The Composting Program contributes to the reduction of NPS pollution from fertilizers and pesticides. Over one-fifth of the trash going to landfills in Texas is made up of yard trimmings and vegetative food material. These materials can be used, instead of being wasted, as an organic, environmentally-friendly substitute for home chemical fertilizers. Excess chemical fertilizers entering receiving waters through runoff from urban landscapes can cause excessive growth of aquatic vegetation and can lead to eutrophic conditions that are damaging to aquatic habitat. Master Composter Training and Centralized Composting Training were developed by the TNRCC with the support of §319(h) funds, and are now ongoing programs. These programs take a dual approach to promoting the use of composting, with one part of the program aimed at directly educating individual citizens, and the other part aimed at educating waste control professionals. The Program also provides technical support for local governments.

The Master Composter program teaches individual citizens about the reasons for composting and the best methods to follow. Volunteers committed to the Master Composter program participate in 20 hours of formal instruction and perform 20 hours of community outreach hours to earn their certification as Master Composters. Training sessions are conducted in partnership with other state agencies, regional planning agencies, or cities. The *Master Composter Training Manual*, *Master Composter Program Planning Guide*, and *Resource Notebook* are made available to all participants. Current statistics show that 30% of the participants in these workshops have reduced their fertilizer usage since the training. All participants have stopped bagging lawn waste, reducing the need for additional fertilizers by ½ to 1/3. Current funding levels only provide for the distribution of the manuals; funding is being sought for future workshops.

In the Centralized Compost Planning program, professionals responsible for planning and implementing waste management policies are given information on effective methods for setting up community composting plans. Participants in this program are provided with instruction on collection, processing, and marketing strategies; equipment selection; facility siting and design issues; and regulatory compliance. Participants are also provided with a Centralized Composting Planning Notebook, a Compost Information Kit including posters and brochures, and other information resource materials.

Urban Composting in Texas is spreading. Local governments have embraced the initiative begun with this §319 project, and are now supporting urban composting without the need for federal money. Fifteen communities have implemented, or have made plans to implement, the Master Composter program. Several cities have expressed interest in beginning the program or in conducting training sessions in their cities on backyard composting.

The program provides several publications to assist citizens in reducing nonpoint source pollution through lawn care best management practices. These publications include *The Green Guide to Lawn Care* (GI-028), which covers topics such as environmentally friendly pest management, mulching, xeriscaping, and watering frequency and conservation; *Composting and*

Mulching (GI-036), which provides “how to” information; and *Worm Composting* (GI-219), which provides information on this special composting technique.

Cleanups Program

This Program supervises the Household Hazardous Waste Collection Program, the Texas Country Cleanup Program, the Agricultural Waste Pesticide Program, and the Lake & River Cleanup Program. All of these programs contribute to the reduction of NPS by removing hazardous chemicals from the environment in a proper manner, cleaning up trash, and promoting environmental awareness. The programs also reduce the solid waste stream. The Program is developing plans to hold comprehensive cleanup events, which will collect agricultural and household wastes and recyclables in unserved or under-served areas at one event, instead of several. This should lead to economies in travel and media expense. Various media are used to promote these events, including press releases, posters and flyers, and word of mouth through field operatives of various state and local agencies. The programs are carried out in partnership with other state and regional agencies and local governments.

Agricultural Waste Pesticide Collection Program

The Agricultural Waste Pesticide Collection Program was initiated in response to growing concern over the improper storage and disposal of canceled, banned, or otherwise unusable agricultural chemicals. These wastes, if improperly managed, can cause personal injury through exposure or contamination of water supplies. Farmers and ranchers have supplies on hand from before the pesticides were banned, and because of the prohibitive costs of disposal, do not have the means to provide for proper disposal. To meet this need, pesticide wastes are collected at one-day collection events around the state. Through the collection program, the TNRCC intends to eliminate stockpiles of banned or canceled products throughout the state, educate the agricultural community about the proper storage and disposal of hazardous chemicals, and develop partnerships with other state agencies and agricultural organizations which could lead to a waste exchange for agricultural chemicals. The Program will develop a newsletter to transmit news and highlights about agricultural chemical management, conduct four regional collections annually, and develop a waste exchange program for the agricultural community.

Texas Country Clean Up Program

The Texas Country Clean Up Program began as an effort to offer recycling opportunities to the agricultural community. The program began in 1991 as a recycling outlet for properly rinsed empty pesticide containers. A pilot program was introduced in the Rio Grande Valley, and later expanded to the Winter Gardens. Because of the success of the pilot program, the Texas Water Commission (the TNRCC predecessor agency) established an ongoing empty pesticide container recycling program in 1992. On January 1, 1994, the program was expanded to include waste oil, oil filters, used batteries, and used tires to meet the needs of underserved areas. The program includes an educational component which addresses the proper rinsing procedure for empty pesticide containers. Temporary collection sites are established at under-served areas around the state. Plastic containers are granulated into plastic flakes, and metal containers are crushed. Recycling companies are recruited to pick up recyclables from these events free of charge.

The goals of the Program are to eliminate improper disposal of these items, including illegal burying and burning; to remove these materials from the waste stream in an environmentally sound manner; and to assist in establishing markets for recycled plastic and metal.

Household Hazardous Waste Collection Program

Household hazardous waste is specifically exempted from hazardous waste regulations. However, when collected during a household hazardous waste collection event, regulations govern the collection procedures, transport, and disposal of collected household hazardous wastes. Included in the regulatory requirements are 90-day notification of a collection event, and an operational plan detailing collection activities at least 45 days prior to the event. TNRCC staff review the collection plans for administrative and technical completeness and issue approval when all requirements have been fulfilled.

Grants are used to provide financial assistance to those interested in conducting a household hazardous waste collection event. A request for proposals is published in the Texas Register. Proposals received are scored using a uniform scoring system, and grants are issued based on the top scores and money available.

Technical assistance is provided in the form of a guidance document which assists in planning and implementing a collection event. Community Hazardous Waste Management staff are available to answer questions regarding the program. The Program is developing activity books which identify hazardous wastes and explain their dangers for use in public schools.

Goals of the Program are the collection of hazardous wastes in accordance with existing rules to protect public safety and the environment; providing education on identification of household hazardous chemicals, use of less toxic alternatives, and the consequences of improper use and disposal; and development of creative methods of funding household hazardous waste collection and education.

Lake and River Cleanup Program

The Lake and River Cleanup Program is an all-volunteer effort of the TNRCC to involve civic organizations, private companies, schools, youth groups, and individuals in cleaning the waters and shorelines throughout Texas. The objectives of this program are to raise public awareness of the problem of trash dumped in and around public waters; to educate citizens about the sources of debris; and to generate public support for state, national, and international action to clean up lake shores, rivers, and streams. In addition, the program promotes recycling of aluminum, glass, paper, plastic metal, oil, and tires in an effort to keep trash out of the environment, and promotes Texas Watch, the TNRCC's volunteer water monitoring program.

Lake and River Cleanups are sponsored and supported by the Wildlife Department, Keep Texas Beautiful affiliates, local county Water Districts, area City Parks and Recreation Departments, local businesses, local industries, and other community sponsors. The Program is working with the Texas Department of Transportation to develop an Adopt-a-River program similar to the successful Adopt-a-Highway program.

Small Towns Environmental Program (STEP)

Texas STEP is a comprehensive technical assistance program that uses Texas state agency staff to help small communities solve their water and wastewater infrastructure problems through self-help. STEP was developed by the Rensselaerville Institute and has been successful in other states as a way for small communities to use their own resources to construct or rehabilitate wastewater facilities to solve a nonpoint source pollution problem. STEP projects use less money and less time than some traditional methods of addressing nonpoint source pollution problems. Texas STEP is a collaboration of the following state agencies:

- ! Texas Department of Health (TDH),
- ! Texas Department of Housing and Community Affairs (TDHCA),
- ! Texas Water Development Board (TWDB),
- ! General Land Office (GLO), and
- ! TNRCC.

One of the main features of Texas STEP is that it draws upon the resources of the participating state agencies to help community leaders solve problems at the local level. Communities are accustomed to dealing with Texas state government in a fragmented way. For example, the TNRCC would document a nonpoint source pollution problem due to failing septic tanks, the TDH would document the incidence of water-borne diseases in the community, and the TDHCA would provide funding to fix the problem. Community leaders would need to communicate with each agency separately. Many times, a local effort to fix the problem would be discouraged by the conflicting requirements or lack of communication among the agencies involved.

Texas STEP emphasizes a “seamless to the customer” framework. In a Texas STEP project, each of the state agencies involved are focused on the outcome, not the process, as the goal. Each participating agency stays informed of each STEP project and of its role in supporting the community. Any differences in program requirements are discussed among agency staff and resolved at the state level. A TNRCC staff member serves as the liaison with community leaders. Communities are able to focus on the project, and not on juggling different sets of requirements from different state agencies. Technical assistance is provided by STEP from the start to the finish of the project, and STEP addresses any problem or barrier that may get in the way of a solution.

Communities are carefully screened to ensure that technical assistance resources are invested wisely. There are no population or income requirements. The only two factors which must be present are:

- ! **Readiness.** The community must recognize that it has a problem, fixing the problem must be a community priority, and residents must be willing to pay the costs of fixing the problem. The total project cost is determined by how much the residents are able to pay, not by standard outside project arrangements.
- ! **Capacity.** The community must have the right people to make the project work. A local community leader, known as the “sparkplug,” must be willing to take responsibility for the outcome of the project. Capacity requirements may also involve availability of the necessary equipment (on-hand, donated, or leased) to complete the project.

Communities are in control of their projects. Therefore, the commitment of property owners to improving their wastewater infrastructure is confirmed. The public is aware of how deficiencies in the wastewater infrastructure are affecting water quality and this motivates the homeowners to address the problem. Several Texas STEP communities are currently in the process of evaluating whether to improve existing on-site systems, construct innovative facilities to process small wastewater flows, or install a conventional wastewater collection and treatment system. STEP encourages ongoing inspection and ensures that appropriately licensed installers provide the necessary work, whether paid or voluntary.

Education

Clean Texas 2000 Partnership

Clean Texas 2000 is an effort to involve all Texans—everyone from major petrochemical corporations to elementary school students—in cooperative projects and long-term commitments to clean up and take care of Texas. Clean Texas 2000 is a statewide pollution prevention program whose goal is to reduce pollution and waste across the state. Businesses, industries, local governments, schools, civic organizations and citizens are encouraged to work together as partners to achieve the goals of Clean Texas 2000. Clean Texas 2000 also serves as a clearinghouse for project ideas and for bringing together partners with complementary resources.

Clean Cities 2000 and Clean Texas 2000 Public Education Programs

Clean Texas 2000 increases environmental awareness. Clean Cities 2000 is a program that helps communities develop a comprehensive environmental program, including initiatives to reduce waste disposal by 50% by the year 2000. Some 50 cities, large and small, are current members. Cities may participate in the program by satisfying these requirements:

- ! Phase I includes a commitment to implement community and backyard composting programs, community-wide recycling, workplace recycling, recycling market development, participation in used-oil and used-tire collection, a "Buy Recycled" program and a local public education program.
- ! In Phase II, cities with more than 50,000 residents are asked to select six annual water and air quality projects from a list. Water projects include creating household hazardous waste collection centers, sponsoring city-wide volunteer water quality monitoring programs, sponsoring wellhead protection programs, appointing a citizens' advisory committee, and developing and implementing a municipal water pollution abatement program for nonpoint source pollution. Approximately 20 cities are currently implementing nonpoint source projects such as chemical collections, wellhead protection programs, and NPS abatement programs.

The program offers a variety of materials ranging from general information about environmental programs to specific step-by-step instructions that address common environmental situations, including practices to prevent nonpoint source pollution.

The following lists the public education campaigns, projects, and materials of Clean Texas 2000 which are related to NPS issues:

- ! **Don't Bag It Lawn Care**
Television and radio spots highlight this program, and partnership with the Texas Agricultural Extension Service serves to raise awareness at local levels.
- ! **Governor's Awards for Environmental Excellence**
Winners are recognized in 13 categories by the Governor at an annual banquet attended by some 600 guests, including members of CLEAN CITIES 2000 and CLEAN INDUSTRIES 2000. A video featuring the 13 winners is produced and played at the banquet.

Other planned Clean Texas activities related to NPS issues include:

- ! **Storm Drain Stenciling: A Manual for Communities**
This manual provides guidelines for implementing a community storm drain stenciling effort. These manuals will be distributed through various divisions within the TNRCC and to all Clean Cities 2000 Partners. Keep Texas Beautiful will distribute 300 copies to their local affiliates. Clean Texas 2000 has purchased approximately 200 Mylar stencils which are available for check-out through the TNRCC's regional offices. Through the CLEAN CITIES 2000 workshops given in cooperation with the Councils of Government, Storm Drain Stenciling will be presented and promoted.

- ! **NPS Videos for the Clean Texas Reporter**
The *Clean Texas Reporter* is a series of 90-second environmental segments which will be marketed to news programs across Texas. Research tells us 93 percent of Texans have strong concerns about environmental pollution and 89 percent turn to mass media -- especially TV -- to get environmental information. The *Clean Texas Reporter* will provide Texans with environmental tips in weekly segments covering a variety of topics, including NPS pollution. Some NPS-related videos that have already been made include: *Let it Rot!* (how to start a compost bin), *Don't Bag It! Leave it a Lawn* (promoting yard trimmings management), and *Look Under Your Sink* (how to reduce household hazardous waste).

K-12 Education Program

This program provides leadership in environmental education (EE) for the state of Texas by participating in a number of statewide, regional, and national EE organizations and serving as the agency clearinghouse for environmental information for educators and students. The program provides one-stop shopping for teachers and students to retrieve EE materials from across the agency. Teaching Environmental Science (TES) courses is a program to provide teacher training in the areas of air, water and waste through graduate classes in coordination with partner state universities. The projects and products of the K-12 Education p\Program include:

- ! **NPS Education Outreach**
A program to train teachers in the implementation of nonstructural BMPs to reduce and prevent pollution. Customized curriculum on nonpoint source pollution will be used at three universities during FY 1997. Lamar, Texas Southern, and Texas A&M - Corpus Christi will be the campuses where these courses are initiated. These courses will include a field trip coordinated with the TSSWCB to increase understanding of agricultural issues. Additional funding will be sought to expand these efforts to other universities. This project will also provide for the expansion of the on-line library system to increase public access to NPS information.

- ! **Educators Eco-Link Newsletter**
Education newsletter to inform educators on the latest air, water and waste information. These articles are coordinated with all program areas of the TNRCC. The biannual newsletter provides supplementary information to teachers who have attended training, and include three lesson plans written by TES course participants.

! Teaching Environmental Sciences

The goal of this teacher training course is to provide knowledge and resource materials for K-6 teachers in environmental issues so they will introduce these issues into their classroom curriculum in all subject areas.

! Environmental Magic Kit

The kit makes presenting environmental issues easier for teachers and more interesting for students. The kits, which were developed under an EPA Region 6 Environmental Education grant, are loaned to teachers through a check-out system, and are available for purchase. Each kit contains a training manual and video showing how the magical illusions are performed and how to use the illusions to illustrate environmental concepts. Two illusions illustrate water concepts: one shows that water can be changed from dirty to clean, while the other demonstrates that our water supply is limited.

! Project WET Workbooks

These workbooks contain water quality exercises aimed at grades 4-6, but are used by teachers in the upper grade levels as well. The goal of these workbooks is to improve the knowledge and comfort level of teachers in grades 4-6 in environmental issues so they will emphasize environmental topics in their classroom curriculum. The workbook trains teachers in water quality monitoring and NPS issues through simple workbook exercises.

Texas Environmental Awareness Network (TEAN)

TEAN is an informal consortium of state agencies, federal agencies, nonprofits, and others with environmental interests and responsibilities. TEAN members focus efforts on education and outreach activities, with the goal of avoiding duplication of effort among the agencies to reduce expenses to taxpayers. All environmental issues are covered, including nonpoint source pollution. TNRCC staff in the K-12 Education Program participate in monthly TEAN meetings.

TEAN publishes a directory of free resources for teachers and produces the “Eye on Earth” television show on the Texas Education Agency’s T-STAR satellite network. “Eye on Earth” show is broadcast live once a month during the school year (September-May). It is also rebroadcast by cable television stations and is archived on tape at Education Service Centers. The audience for “Eye on Earth” is teachers and school administrators. Content is aimed at promoting education activities related to environmental issues, particularly those related to increasing student test scores on academic assessment tests (TAAS). The TNRCC K-12 Program staff assists with production of the show monthly, while staff from other TNRCC program areas participate in “Eye on Earth” shows as necessary.

The K-12 Program staff are members of several environmental education groups which have an impact on nonpoint source management issues:

- ! TEEAC - The Texas Environmental Education Advisory Committee**, which advises the Commissioner of Education on incorporating environmental issues into all subject areas at all grade levels across the K-12 curriculum. Environmental education training workshops for teachers are certified by TEEAC; teachers who attend 45 hours of training receive a recognition certificate from TEEAC and letters are sent to their principals. All environmental topics are covered, including nonpoint source pollution.

- ! TAAEE - the Texas Association of Environmental Educators, primarily teachers with interest in environmental education. All environmental issues are covered, including nonpoint source pollution.
- ! NAAEE - the North American Association of Environmental Educators, of which TAAEE is the state affiliate. All environmental issues are covered, including nonpoint source pollution.
- ! EPA Region 6 Solid Waste Education Roundtable - Primary focus of this group is pollution prevention and recycling. Participants have concluded, however, that it is difficult to separate only one issue when talking about environmental education programs, and often cover other environmental issues. Common topics include such NPS issues as recycling used oil to reduce the amount of oil dumped down storm drains, storm drain stenciling projects, and less-toxic alternatives to common pesticides. An effort is being made to compile lists of currently existing educational materials on these topics.

Watershed-Specific Programs

Galveston Bay Estuary Program

The Galveston Bay Estuary Program (GBEP) of the TNRCC is an outgrowth of the Galveston Bay National Estuary Program (GBNEP)—the partnership which drafted *The Galveston Bay Plan: a Comprehensive Conservation and Management Plan for the Galveston Bay Ecosystem*, to address threats to the bay resulting from pollution, development, and overuse. Over the five-year development period of the plan, bay problems were agreed upon, numerous scientific studies conducted, and 82 management initiatives were established to address 17 specific problems. The problems related to nonpoint sources of pollution are listed below.

- ! Contaminated runoff from nonpoint sources degrade some of the bay's tributaries and near-shore areas.
- ! Water and sediments are degraded in and around marinas from boat sewage and dockside wastes from nonpoint sources.

Specific goals, objectives, and actions to address nonpoint source pollution:

- ! **Implement storm water programs for local municipalities**
The GBEP will coordinate the establishment of a technical assistance group to assist local governments in developing storm water management plans for their jurisdiction. The GBEP will coordinate the efforts of this group.
- ! **Perform pilot projects to develop NPS best management practices**
The GBEP will support the performance of specific pilot projects to demonstrate viability of various best management practices for new development. The GBEP will also compile a Galveston Bay BMP performance document to inventory NPS control techniques which have been evaluated.

- ! **Identify and correct priority watershed pollutant problems**
The GBEP will maintain and publish its own inventory of NPS concerns in the bay watershed by compiling data from ongoing and new water quality initiatives carried out by various organizations and researchers.
- ! **Establish residential load reduction programs**
The GBEP will coordinate and implement a Galveston Bay public education program aimed at NPS pollution reduction from residential areas.
- ! **Correct malfunctioning shoreline septic tanks**
The GBEP will work with the five counties surrounding Galveston Bay to conduct a bay-wide septic system and geologic survey for use in regulations and management. The GBEP will coordinate efforts by counties to require septic system certification and upgrades upon sale or transfer of property in problem areas.
- ! **Establish roadway planning to minimize NPS effect**
Galveston Bay Estuary Program will work with the Texas Department of Transportation (TxDOT) to organize educational workshops for county highway agencies, municipal public works departments, and private transportation engineering consultants in the Galveston Bay area regarding NPS control and prevention in roadway planning and design.
- ! **Adopt regional construction standards for NPS reduction**
The GBEP will work with other agencies to provide technical assistance to local governments on appropriate NPS controls and model guidance for construction activities. The GBEP will also develop a regional education initiative on construction BMPs for developers and contractors.
- ! **Boater sewage pump-out, storage, and treatment**
The GBEP will coordinate an educational effort for marina users to provide technical assistance to marinas on boater pump-out requirements.
- ! **Require use of marine sanitary chemicals that can be treated in publicly owned treatment works (POTWs)**
The GBEP will coordinate an effort to promote marina demonstration projects that illustrate alternatives for effective sewage management.

Coastal Bend Bays and Estuaries Program (CBBEP)

The CBBEP is responsible for formulating and implementing a plan to protect the estuaries in the San Antonio-Nueces, the Nueces, and the Rio Grande-Nueces coastal basins. Established in late 1993, the CBBEP completed the planning phase with publication of the *Coastal Bend Bays Plan* (CBBEP-1) in August 1998.

Current plan goals related to urban nonpoint source pollution are as follows:

- ! Identify urban nonpoint sources and determine pollutant loads and the fate of pollutant loads. Conduct necessary studies to validate or invalidate Action Agenda assumptions.
- ! Determine what federal and state government controls are in place for municipalities and determine if additional regulations or non-regulatory authorities are needed to provide local governments and citizens the necessary incentives to implement cost-effective and environmentally-protective actions if needed.
- ! Investigate whether local governments' development policies and/or private land development practices are or are not consistent with known practices that effectively reduce nonpoint source pollution and related impacts.
- ! Determine if atmospheric sources contribute to urban nonpoint source pollution.
- ! Educate urban residents of the potential impact of household and yard management practices on receiving water bodies.

Current plan goals related to agricultural nonpoint source pollution are as follows:

- ! Educate and inform the public with regard to agricultural nonpoint source runoff issues.
- ! Support and encourage funding for continued peer-reviewed research on new BMPs and agricultural nonpoint source runoff issues.
- ! Develop educational, technical assistance, and economic incentive programs (both funding and internal) to promote adoption of BMPs that are adaptive and are economically and environmentally beneficial.
- ! Promote partnerships that consider agricultural land use and conservation practices as a beneficial alternative to the continuation of urban development, while at the same time ensuring the protection of critical habitat areas.
- ! Promote better inter-agency understanding, training, and communication regarding agricultural practices.
- ! Better coordinate governmental programs involving agribusiness activities to minimize agricultural nonpoint source pollution.
- ! Promote soil conservation measures that reduce soil erosion.

The CBBEP is moving forward in identifying, characterizing, and assessing NPS problems in the watershed. The following projects have been proposed or are in progress.

- ! **Characterize Septic System Problems**
This project will attempt to identify and characterize NPS impacts from septic systems in the watershed. Funded by the CBBEP and the Clean Rivers Program, the project will characterize septic system problems in the Nueces Coastal Basins and develop a plan to reduce septic system problems. The study will focus in four counties—Aransas, Nueces, Refugio and San Patricio.
- ! **Study of Atmospheric Deposition to Bays**
This project will study the contribution of atmospheric deposition (wetfall and dryfall) to the total pollutant loadings of the bay system.

! Implementation/Demonstration Projects

CBBEP is the sponsoring a program for three implementation/demonstration projects near Edroy, Ingleside, and Refugio that will examine the control of agricultural and urban nonpoint source runoff.

CBBEP is also coordinating a project with the King Ranch which will shed light on nonpoint source issues in the Nueces-Rio Grande Coastal Basin.

! The King Ranch Project

This project will examine the relationship between agricultural loadings and Brown Tide events which have plagued Baffin Bay and the Laguna Madre estuary system since the spring of 1990. The King Ranch has approximately 60,000 acres of cropland in production adjacent to Baffin Bay, and is a voluntary participant in the project to determine agricultural loadings in the area. Two studies will be conducted under this project. One will quantify the loadings of nutrients, pesticides, and other selected constituents which originate from the King Ranch. In the second study, the CBBEP is partnering with the University of Texas (U.T.) Marine Science Institute to extend the assessment of runoff to include its possible effect on the perpetuation of the brown tide phytoplankton bloom.

Another related project involving the CBBEP is one to develop a NPS model.

! Estimating Total Pollutant Loadings

The CBBEP is partnering with the U.T. Center for Research in Water Resources to develop a total constituent loadings model for the CBBEP study area, which includes the 12 counties of the coastal bend. This loadings model project builds on an earlier pilot project conducted for the San Antonio-Nueces Coastal Basin, and results from two other recently completed projects. In the completed projects, event mean concentration (EMC) values were determined, and a model was developed to estimate NPS pollutant loadings. This new model is simpler than the standard HSPF model and will support an examination of the relationship between the loading estimates and observed in-bay constituent concentrations within the three estuaries of the CBBEP study area.

Edwards Aquifer Program

The Edwards Aquifer Protection Program requires that new construction over the Edwards Aquifer receive the review and approval of the TNRCC, prior to the start of any construction. The review process includes site inspections prior to, during, and after construction to ensure compliance with storm water mitigation requirements and to evaluate/determine best management practices. The plan review determines if the proposed temporary and permanent storm water contaminant mitigation measures are adequate.

In order to reduce the number of new sources of pollution, the Edwards Aquifer Protection Rules require two types of storm water cleanup at new construction sites. Prior to the start of construction, land developers are required to install silt fences, settling ponds, stabilized construction entrances, rock berms, or some combination of these in such a manner as to minimize the transport of silt from the site. Inspections are conducted regularly at construction

sites by the TNRCC Edwards Aquifer Protection program staff to insure that temporary erosion and sedimentation controls are adequate and functioning properly.

Prior to the completion of construction, commercial and industrial developers must construct a permanent structure(s) to filter contaminated storm water runoff. Filtration is usually accomplished with appropriately sized sedimentation-filtration basins, vegetated filter strips, or other permanent storm water treatment structures which are shown to have the same removal efficiency as sedimentation-filtration or vegetated filter strips. Developers or owners are required to register a signed Maintenance Plan and Schedule for the long-term care of the permanent storm water treatment structures.

By requiring appropriate temporary storm water mitigation at each discrete point, storm water contamination during construction is minimized. And, because of the required permanent controls, individual sites should not contribute to the nonpoint source pollution-producing infrastructure. Controls for each project are site-specific, thus reducing the potential for systematic degradation of the Edwards Aquifer water quality.

Enforcement is conducted through the issuance of Notices of Violation and formal enforcement. The TNRCC is empowered to levy fines of up to \$10,000 per day for each act of noncompliance, including unauthorized construction, failure to maintain approved water pollution abatement measures, or deviation from the conditions in an approved Water Pollution Abatement Plan.

In FY 1997, TNRCC intends to expand compliance and follow-up investigations in the Edwards Aquifer recharge zone. This expansion will increase the level of investigations from three counties to five. An additional 4-6 water pollution abatement plans will be reviewed each month, and 10 additional compliance inspections will be conducted monthly.

In an effort to better inform the regulated public, the Edwards Aquifer Program has established a program library on the TNRCC Bulletin Board and the TNRCC Internet Web Site. This enables the public to have ready access to the application forms required for the program and for the staff to communicate any changes in the program.

Table 3-1. TNRCC Programs by Function

This table shows which TNRCC Programs participate in implementing the various functions necessary for watershed management.

Function	Program	Page Number
Monitoring	Surface Water Quality Monitoring Program	3-7
	Texas Watch Program	3-9
Assessment	Nonpoint Source Program	3-1
	Watershed Management Program	3-5
	Toxicity/Modeling Program	3-13
	Wellhead Protection Program	3-25
	Source Water Protection Program	3-25
	Groundwater Program	3-6
	Galveston Bay Estuary Program	3-33
	Coastal Bend Bays and Estuaries Program	3-34
	Emergency Response Program	3-17
	Natural Resource Damage Assessment Program	3-19
	Superfund Site Discovery and Assessment Program	3-19
Illegal Disposal Program	3-19	
Planning & Coordination	Nonpoint Source Program	3-1
	Watershed Management Program	3-5
	Clean Rivers Program	3-9
	Toxicity/Modeling Program	3-13
	Groundwater Program	3-6
	Galveston Bay Estuary Program	3-33
	Coastal Bend Bays and Estuaries Program	3-34
	Illegal Disposal Program	3-19
	Edwards Aquifer Program	3-36
Used Oil and Used Oil Filter Recycling Program	3-15	
Research & Development	Nonpoint Source Program	3-1
	Wellhead Protection Program	3-25
	Source Water Protection Program	3-25
	Ecosystem Research Program	3-14
	Groundwater Program	3-6
	Galveston Bay Estuary Program	3-33
	Coastal Bend Bays and Estuaries Program	3-34
On-Site Wastewater Program	3-20	
Standards & Criteria	Water Quality Standards Program	3-12
	Toxicity/Modeling Program	3-13
	Ecosystem Research Program	3-14
Regulatory & Compliance	Nonpoint Source Program	3-1
	Ecosystem Research Program	3-14
	Water Quality Standards Program	3-12
	Toxicity/Modeling Program	3-13
	Occupational Certification Program	3-21
	Groundwater Program	3-6
	Agriculture Permitting	3-15
	Used Oil and Used Oil Filter Recycling Program	3-15
	Emergency Response and Assessment Program	3-17
Edwards Aquifer Program	3-36	

Function	Program	Page Number
Implementation	Nonpoint Source Program	3-1
	Wellhead Protection Program	3-25
	Source Water Protection Program	3-25
	FIFRA Program/Groundwater Program	3-6
	Galveston Bay Estuary Program	3-33
	Coastal Bend Bays and Estuaries Program	3-34
	Cleanups Program	3-27
	Emergency Response and Assessment Program	3-17
Financial Assistance	Nonpoint Source Program	3-1
	Used Oil and Used Oil Filter Recycling Program	3-15
Technical Assistance	Nonpoint Source Program	3-1
	Wellhead Protection Program	3-25
	Source Water Protection Program	3-25
	Galveston Bay Estuary Program	3-33
	Coastal Bend Bays and Estuaries Program	3-34
	Small Towns Environmental Program	3-28
	Agriculture Permitting	3-15
	Community Recycling and Composting Program	3-26
	Used Oil and Used Oil Filter Recycling Program	3-15
Education & Training	Nonpoint Source Program	3-1
	Texas Watch Program	3-9
	Clean Texas 2000 Partnership	3-30
	K-12 Education	3-31
	Community Recycling and Composting Program	3-26
	Occupational Certification Program	3-21
	On-Site Wastewater Program	3-20
	Used Oil and Used Oil Filter Recycling Program	3-15

Table 3-2. TNRCC Programs by NPS Category

This table shows which specific categories of nonpoint source pollution are addressed by TNRCC programs.

Category	Program	Page Number
Wastewater Disposal	Groundwater Program	3-6
	Galveston Bay Estuary Program	3-33
Urban Runoff	Nonpoint Source Pollution Education Programs	3-2
	Galveston Bay Estuary Program	3-33
	Coastal Bend Bays and Estuaries Program	3-34
	Clean Cities 2000 Program	3-30
	Clean Texas 2000 Education Programs	3-30
	Community Recycling and Composting Program	3-26
	Lake & River Cleanup Program	3-28
	Used Oil and Used Oil Filter Recycling Program	3-15
	Occupational Certification Program	3-21
Household Hazardous Waste Collection Program	3-28	
Construction	Galveston Bay Estuary Program	3-33
	Edward Aquifer Program	3-36
On-Site Sewage Facilities	On-Site Wastewater Program	3-20
	Occupational Certification Program	3-21
	Coastal Bend Bays Estuary Program	3-34
	Galveston Bay Estuary Program	3-33
	Small Towns Environmental Program	3-28
Atmospheric Deposition	Coastal Bend Bays and Estuaries Program	3-34
Abandoned Wells	Wellhead Protection Program	3-25
Spills	Emergency Response Program	3-17
	Natural Resource Damage Assessment Program	3-18
	Superfund Site Discovery and Assessment Program	3-18
Hazardous Waste	Household Hazardous Waste Collection Program	3-28
	Superfund Site Discovery and Assessment Program	3-18
Landfills	Illegal Disposal Program	3-19
Land Development	Edwards Aquifer Program	3-36
	Galveston Bay Estuary Program	3-33
Agriculture - Crop Production	FIFRA Program	3-6
	Agricultural Waste Pesticide Collection Program	3-27
	Texas Country Cleanup Program	3-27
Agriculture - Animal Management	Agriculture Permitting	3-15

CHAPTER 4

TSSWCB PROGRAMS FOR NONPOINT SOURCE POLLUTION MANAGEMENT



The Texas State Soil and Water Conservation Board (TSSWCB) administers and carries out Texas' soil and water conservation law, and coordinates Texas' soil and water conservation program with the Soil and Water Conservation Districts (SWCDs). The TSSWCB is the lead agency in Texas for the management of agricultural and silvicultural nonpoint source pollution, as designated under Title 7, Chapter 201, Section 201.026 of the Agriculture Code of Texas.

NPS pollution is caused by pollutants from a wide variety of society's land use activities. Pollutants (nutrients, pesticides, organics, and bacteria) that may result from agricultural or silvicultural activities can be reduced through practices which reduce surface runoff and erosion rates. Management solutions should be reasonable, voluntary approaches based on incentives, education, and technical assistance. Site-specific BMPs should be aimed at preventing and reducing impacts to water quality with the least possible infringement on private property rights. The TSSWCB's plan delineates the management of agricultural and silvicultural NPS pollution in Texas, discussed at two levels of management: the statewide program, and regional and watershed programs.

Statewide Program

Statewide activities are necessary for overall program guidance, problem identification, program criteria development, priority determination, and program coordination. The major elements of the comprehensive statewide program include:

- ! Monitoring
- ! Continuing assessment
- ! Prioritization
- ! Federal program consistency review
- ! Program coordination
- ! Management Program implementation
- ! Education
- ! Technical assistance
- ! Financial assistance
- ! Program evaluation

Information Education Department

As the agency responsible for coordinating the programs of the state's 216 SWCDs, and as the lead agency for the state's agricultural and silvicultural nonpoint source management program, the TSSWCB's information and education efforts focus on providing direct support to SWCDs as well as to the overall mission of the agency.

The primary goal of the Information/Education Department is to make agricultural producers aware of their potential contributions to the NPS pollution problem and to educate them on appropriate alternatives. In addition, public information and educational activities focus on new and innovative BMPs that can be implemented in agricultural and silvicultural operations to

prevent or abate NPS pollution. These programs support the overall objectives of the agency, and also focus on priority areas of concern as determined by the needs and demand's of the state's 216 SWCDs.

To accomplish the goals of the statewide public information outreach and technology transfer program, several information and educational methodologies are being employed to build public awareness of NPS pollution and of the alternative technologies being demonstrated to abate NPS pollution.

Examples of information and education methodologies:

- ! Provide Continuing Education Credits for training classes available to producers through local Districts (negotiations are underway)
- ! Plan and coordinate regional NPS pollution conferences
- ! Publish articles weekly in daily newspapers throughout Texas
- ! Publish feature articles in statewide and regional agricultural trade journals as well as national agricultural publications
- ! Develop and distribute radio and television news spots
- ! Develop and publish an educational/technical assistance newsletter

NPS Abatement Program Senate Bill 503

In 1993 the seventy-third Legislature passed Senate Bill 503 which specifically:

- ! Designates the TSSWCB as the lead agency to abate agricultural and silvicultural NPS pollution in Texas.
- ! Authorizes the establishment of a water quality management plan (WQMP) program through soil and water conservation districts in priority watersheds designated by the State Board.
- ! Sets up a complaint resolution process for agricultural and silvicultural NPS sources of pollution.
- ! Provides for cost share assistance in designated areas to install approved water quality Best Management Practices (BMPs).
- ! Amends the Water Code to grant certified Water Quality Management Plans (WQMPs) the same legal status as Texas Natural Resource Conservation Commission (TNRCC) point source pollution permits.

Senate Bill 503 has created a program that will provide agricultural and silvicultural producers an opportunity to comply with state water quality laws through traditional voluntary incentive-based programs.

Agricultural and silvicultural producers now have the opportunity to develop and implement site specific water quality management plans in cooperation with local Soil and Water Conservation Districts. Certified water quality management plans ensure farming or ranching operations are carried out in a manner consistent with state water quality goals.

Local SWCDs provide the technical assistance to develop the plan through agreements with USDA Natural Resources Conservation Service or the Soil and Water Conservation Board. After being approved by the district, the developed plan requires TSSWCB certification.

Regional and Watershed Programs

Regional and watershed programs are essential for delivering program services to specific sites and addressing individual water quality concerns in the most expedient and effective manner. The statewide program is concerned with achieving implementation of BMPs to prevent NPS pollution problems. In contrast, the regional and watershed programs are concerned with abating watershed-specific problems caused by agricultural and silvicultural activities. Regional programs are therefore a direct result of the priority determination, continuing assessment, and program development and implementation functions of the state program.

The program implementation process for regional and watershed programs involves problem identification, specification of load allocations, identification of BMPs, establishment of program and practice criteria, and best management practice implementation. The State Management Program, based on best available assessment data, identifies implementation priority areas within the state. Implementation procedures are described for different production operation types (animal holding facilities and feedlots, irrigated and non-irrigated cropland, grazing land, and silviculture), outlining the BMPs which are appropriate for each, the programs to be utilized, and the operator's role in the process.

Clean Water Act Section 319(h) Grant Program

In compliance with the Clean Water Act of 1987, the EPA provides Section 319(h) funding to the state of Texas to implement activities that result in demonstrated progress in achieving Congress' goal of controlling and abating nonpoint source (NPS) pollution. The availability of Section 319(h) grant funding presents a major opportunity for Texas to implement a management program that addresses the significant threat that NPS pollution poses to water quality in Texas. EPA's goal is to ensure that the Section 319(h) funds are directed toward effective, high-quality NPS projects that will achieve the best possible results in addressing NPS pollution. Demonstrated results in water quality improvement and protection through implementation of agricultural and silvicultural best management practices (BMPs) are vitally important.

National EPA guidance issued for FY97 updates and streamlines implementation of state nonpoint source programs. Consistent with this goal, EPA's role in the nonpoint source program will shift away from grants oversight and towards technical assistance and support. EPA's approach will be to work closely with the states to give them programmatic and technical support as they move into a more advanced and independent level of program implementation.

TSSWCB and EPA are directing 319(h) funds toward implementation and demonstration projects within the boundaries of impacted watersheds. Project eligibility has been determined by the most current 303(d) list of impacted water in the State of Texas.

Best Management Practices

A summary of agricultural and silvicultural BMPs used in Texas appears below. More Detailed descriptions of these BMPs can be found in Chapter 7 of this document.

Agricultural BMPs

- ! *Erosion and sediment control practices* include conservation cover, conservation cropping sequences, conservation tillage, contour farming, contour orchard, cover and

- green manure crops, critical area planting, crop residue use, delayed seedbed preparation, diversion, field borders, filter strips, grade stabilization structures, grassed waterways, grasses and legumes in rotation, land smoothing, mulching, contour strip cropping, sediment basins, terraces, water and sediment control basins, wetland and riparian zone protection, and close spaced crops.
- ! *Grazing management practices* include deferred grazing, planned grazing systems, proper grazing use, pasture and hayland management, proper water distribution, pipelines, ponds, troughs, well spring development, fencing, livestock exclusion, stream crossing, pasture and hayland planting, range seeding, critical area planting, brush and weed management, and prescribed burning.
 - ! *Animal water management/animal feeding facilities practices* include proper location of the livestock being concentrated, rotation of livestock in pasture operations, dikes, diversions grassed waterways, heavy use protection, lined waterways, roof runoff management, terraces, waste storage ponds, waste storage structures, and constructed wetlands. Organic material management includes use of compost, agronomic use of manure, organic material management in row crop agriculture, no-till farming, ridge-till farming and conservation tillage.
 - ! *Nutrient management practices* include matching fertilizer with soil and crop requirements, applying fertilizer in the most efficient manner, applying fertilizer when actually needed by the crop, and utilizing practices which minimize soil erosion.
 - ! *Pesticide management practices* include inventory of pest problems and site characteristics, use of pesticides with lower risk factors, records maintenance, lower use rates, recalibration of equipment, appropriate application, storage and disposal, and use of integrated pest management.
 - ! *Irrigation water management practices* include scheduling, proper slopes, proper stream size, proper furrow length, cultural practices, salinity control, efficient water application systems, field ditches, land leveling, efficient water transport, tailwater recovery, filter strips, surface drainage, subsurface drains, water table control, controlled drainage, and backflow prevention.

Silvicultural BMPs

Pre-harvest planning practices include appropriate planning of harvesting practices and road systems.

- ! *Streamside management area practices* include minimizing disturbances, limiting pesticide and fertilizer use, and applying harvesting restrictions.
- ! *Road construction practices* include turnouts, broad-based dip construction, pole culverts, outsloping, ditch construction, brush barriers, silt fences, riprap, filter strips, revegetating cutbanks, and proper debris disposal.
- ! *Road management practices* include blading and reshaping, keeping ditches clean, maintaining road surfaces, and revegetating roadsides.
- ! *Timber harvesting practices* include harvesting practices, landing practices, groundskidding practices, cable yarding practices, and petroleum management practices.
- ! *Site preparation practices* include proper use of equipment, haystack piling of slash, minimizing soil disturbance, and placement of slash away from drainages.

- ! *Regeneration practices* include hand planting erodible sites and planting with suitable soil conditions.
- ! *Fire management practices* include appropriate planning, minimizing fireline construction erosion potential, and constructing diversion ditches and cross ditches on firelines.
- ! *Other practices* include revegetation of disturbed areas, proper forest chemical management, and practices that protect forest wetlands and riparian areas.

Strategic Partnerships

Some of the strategic partners of the TSSWCB in addressing NPS issues are listed below. Details of the nonpoint source activities of these agencies can be found in Chapter 5.

- ! USDA Natural Resources Conservation Service, which provides technical assistance to land owners and operators on soil and water conservation matters through memoranda of understanding with soil and water conservation districts.
- ! USDA Farm Services Agency, which is the principal channel through which the federal government shares the cost of applying approved soil, water, woodland, and wildlife conservation practices with farmers and ranchers.
- ! USDA Agricultural Research Service administers basic, applied, and developmental research in the use and improvement of agricultural resources.
- ! Texas Agricultural Extension Service (TAEX) is a partnership between the USDA, Texas A&M University, and County Commissioner's Courts, and provides education and dissemination of information relating to agriculture, consumer sciences, community development, and youth. Water quality and conservation is one of six major program issues being addressed by county agents and specialists.
- ! Texas Agricultural Experiment Station (TAES) of Texas A&M University System is the state agricultural research agency, and programs are designed to provide the scientific base to develop the full agricultural potential of Texas and improve the utilization and conservation of natural resources.
- ! TNRCC is the policy-making and regulatory body that has primary responsibility for implementing the provisions of the Constitution and the laws of Texas relating to water.
- ! Texas Water Development Board administers the State's water financing programs and the federal construction grants program for municipal wastewater treatment facilities, and prepares and maintains a comprehensive State Water Plan.
- ! Texas Department of Agriculture is the State's lead agency for agricultural pesticide regulation.
- ! Texas Forest Service of the Texas A&M University System provides statewide leadership and professional assistance to assure that the State's forests and related resources are wisely used, nurtured, protected, and perpetuated.
- ! Texas General Land Office develops and obtains approval of the State's Federal Coastal Zone Management Program.
- ! Texas Forestry Association, a tax-exempt, non-profit organization, serves as the voice of the forest industry in eastern Texas, and provides information and training to both logger and landowner.

- ! Association of Texas Soil and Water Conservation Districts is a tax-exempt, non-profit organization which serves soil and water conservation districts and district directors, and provides information and training to district directors.
- ! National Association of Conservation Districts represents conservation district directors across the United States.
- ! Texas Institute for Applied Environmental Research, a part of the Texas A&M University System since 1993, uses cutting edge strategies and technologies for environmental research to assist developers and implementers of environmental policy.
- ! TSSWCB also cooperates with the Gulf of Mexico Program, the National Estuary Program, and the Texas Groundwater Protection Committee.

Funding

One of the major obstacles to the development and implementation of nonpoint source management programs is funding. As data become available and nonpoint source concerns are more adequately identified, programs and priorities will shift to address them. Without additional funding for nonpoint source management, any program shifts to nonpoint source priorities will only cut deeper into basic soil and water conservation programs and reduce their effectiveness.

TSSWCB nonpoint source programs will utilize existing information/education/demonstration capabilities to educate and inform the public. Technical assistance programs, both state and federal, will be used to assist in implementation of BMPs. Cost-share incentive programs will be utilized where applicable and available. Research organizations will be relied upon to provide needed research. Means will also be pursued, through cooperative efforts with other agencies or other avenues, to increase the level of water quality sampling for nonpoint source impacts. Cost share assistance for achieving water quality benefits is also available through Texas Senate Bill 503 Water Quality Management Plan Implementation funding, administered through the TSSWCB.

Authority

Texas Agriculture Code, Section 201.026 makes the TSSWCB responsible for planning, implementing, and managing programs and practices for abating agricultural and silvicultural nonpoint source pollution. State nonpoint source programs are also implemented under authority of the Federal Clean Water Act.

CHAPTER 5 OTHER STATE PROGRAMS FOR NPS MANAGEMENT



Texas Water Development Board

The Texas Water Development Board (TWDB) is responsible for long-term water planning and financing water-related development for the state. Its duties include the preparation and update of the State Water Plan, collection and maintenance of water data, and administration of various funds designed to help finance state and local water-related projects.

The waste water State Revolving Fund (SRF) of the Texas Water Development Board loans at interest below market rates to eligible political subdivisions for the construction, improvement, or expansion of sewage treatment and collection facilities, waste water recycling facilities, and nonpoint source pollution and storm water control projects. It is funded through a combination of federal grants and state bond funds. To be eligible for SRF financing, an applicant must be a political subdivision of the state with the authority to own and operate a sewage system. The fund has a capacity of approximately \$250,000,000 per year for waste water development projects.

The Research and Planning Fund provides resources for water research which addresses practical solutions to water-related problems of statewide significance. Projects are solicited annually through publication in the Texas Register. Water research projects related to NPS that are currently funded by the Board's Research and Planning Fund are as follows:

- ! Evaluation of Wetland/Aquatic Ecosystem on NPS Abatement; LCRA, Contractor
- ! Arroyo Colorado, Modeling Development; Tarleton Institute, Contractor

The Economically Distressed Areas Program provides financial assistance to furnish water supply and waste water services to economically distressed areas where the present facilities are inadequate to meet minimal residential needs. This program is currently funding systems in some East Texas counties and in the colonies in the Texas-Mexico border area, where faulty septic systems and pit privies have been causing NPS problems.

The TWDB collects data on the state's aquifers which include the occurrence, availability, quality, and quantity of ground water and the current and projected demands on ground-water resources. This is done through the statewide ground-water level measurement program, groundwater quality sampling program, and ground-water studies. The purpose of the ground-water quality sampling program is: 1) to monitor changes, if any, in the quality of ground water over time, and; 2) to establish, as accurately as possible, the baseline quality of ground water occurring naturally in the state's aquifers, and 3) for planning purposes. The ground-water quality monitoring program is accomplished in accordance with procedures established in the TWDB's Field Manual for Ground-Water Sampling, in supplemental samples analyzed on Hach instruments, and by obtaining data collected by other entities such as ground-water conservation districts and other state/federal agencies. Although the Board is not directly involved in monitoring for specific nonpoint source or point source pollution programs, other agencies depend on the Board's data for comparison purposes in their regulatory functions and nonpoint source programs. Since each sampling site is identified with latitude and longitude, data from any designated area, such as river basin, can be made available using GIS.

TWDB's water quality network is based, in areas of large ground-water use, on the sampling of wells and springs in major or minor aquifers with a density of one site per 50 square miles. In areas where there is small ground-water use and where major or minor aquifers exist, samples are collected at a density of one well per 125 square miles. Adjustments, if any, to minimum sampling requirements are made at the conclusion of each major or minor aquifer sampling based on the adequacy of sampling sites. While a county may have adequate water-quality data within its boundary for one aquifer, it may be deficient in another. Staff analyze water-quality data collected from the network as part of the overall aquifer evaluation and make these results available to other agencies and to the general public. TWDB staff will sample approximately 700 sites per fiscal year if funding continues. Outside sources typically contribute approximately 300 chemical analyses per fiscal year.

TWDB maintains the Texas Natural Resources Information System (TNRIS), which is a clearinghouse and referral center for information supplied by numerous state and federal agencies. TNRIS has water quality and stream flow data, earth science information, USGS maps, and census data. In addition, TNRIS houses an extensive library of aerial photography and satellite imagery and is the USGS map distribution center for Texas Government. TNRIS also maintains a digital cartography/GIS data catalog. This catalog describes existing digital map data so that GIS users can avoid having to redigitize source maps.

The TWDB's Bays and Estuaries Program has developed a methodology that employs the latest high-tech electronic instruments and computer models to make more reliable estimates of the quantities of fresh water that will be needed from streams and rivers to protect in-stream fish and wildlife habitats and the bays and estuaries, while also providing for other beneficial uses of the state's fresh water resources. As part of this modeling, nutrient budgets for all bays and estuaries will be developed from 1997 - 1999. Current figures show that estuaries receive 125% of nutrients needed. Studies suggest that some bays are light limited because of turbidity. From the nutrient loading data gathered to date, the program cannot establish that any of the bays are eutrophic, though there are some local eutrophication problems.

The Municipal Water Conservation staff promotes efficient use of water and xeriscaping to decrease polluted runoff from lawns and commercial landscapes.

The TWDB also provides matching grants to local conservation districts for the purchase of equipment used to promote, demonstrate, or evaluate more efficient agricultural practices. The Agriculture Loan Program provides funds to farmers for installing more efficient irrigation systems. The use of more efficient practices can reduce agricultural NPS loadings in surface and ground water.

The 1996 State Water Plan will include the following recommendations from the three-agency Coordinating Committee (TNRCC, TPWD, TWDB) regarding nonpoint source pollution control:

- ! The TWDB should initiate a nonpoint source pollution financing needs assessment in conjunction with other applicable state agencies.
- ! The EPA total maximum daily load approach which promotes the exchange of point source pollution credits for nonpoint source pollution credits should be evaluated by the TNRCC, TSSWCB, and TWDB. Point/nonpoint source trading is a strategy to achieve environmental goals, such as clean water, through non-traditional means, while utilizing a market-type incentive. For example, this approach could provide for less stringent reductions of nutrient discharges from waste water treatment facilities in a given watershed in exchange for funding the development and implementation of

- best management practices on farms and other areas that contribute significantly to nutrient pollution.
- ! The Texas nonpoint source assessment and management plans should be reviewed and updated as necessary by the TNRCC and TSSWCB. A comprehensive and adequately funded statewide assessment using local and federal data, along with the watershed-based Clean Rivers Program assessment results, is needed to reassess all types of nonpoint source problems. This will ensure that adequate steps are planned to address the susceptibility of the state's water resources to continued and future nonpoint source pollution. Updating and expanding the nonpoint source management plan should include: 1) specifying best management practices for implementation, based on existing data and technology; 2) coordinating public education and technology transfer efforts; and 3) expanding the knowledge base to provide for improved water quality standards and other regulatory decisions.
 - ! The preparation of rules pursuant to Section 26.177 of the Texas Water code, Water Pollution Control Duties of Cities, should be developed by the TNRCC with early public participation. The program should be coordinated with, and not duplicate, the federal requirements for storm water discharge, and the state's Clean Rivers Program. Governmental entities at all levels should work with the TNRCC and the TSSWCB to implement nonpoint source pollution best management practices in their jurisdictions. A consensus should be developed among governmental entities and private industry as to what minimum best management practices are appropriate for controlling nonpoint source pollution on a watershed basis in Texas.
 - ! The adequacy of funding mechanisms for new and existing special districts, or other political subdivisions with primary nonpoint source pollution control responsibilities should be reviewed.

Texas Parks and Wildlife Department

The Texas Parks and Wildlife Department (TPWD) is responsible for the development and protection of water-based recreational and wildlife resources. This department provides recreational facilities and enforces water safety as well as fish and game laws. TPWD's strategic plan is to focus on programs which affect habitat, in the belief that preservation and creation of appropriate habitat will result in the protection of water resources and fish and game. Goals and activities of this strategic plan include increasing acreage under management plans, increased effort in individual assistance and information for landowners, re-allocation of resources between public and private lands programs, and the redirection of some generic programs to land use management. Under this strategy, TPWD has several programs which impact nonpoint source management, which are summarized below.

Texas Wildscapes Program

The Texas Wildscapes Program helps prevent nonpoint source pollution through an ongoing project of the Nongame and Urban Wildlife Program. Initiated in January of 1994, Texas Wildscapes emphasizes providing the basics for good habitat: food, water, and cover. With approximately 95 % of Texas land use practices in the hands of private landowners, the importance of education toward a common bond is evident. Texas Wildscapes opens the door to communication with small and large landowners throughout the state.

Eighty-two percent of all Texans now live in nine metropolitan areas, according to recent census data. Most urban residents support conservation and the restoration and enhancement of wildlife habitat, but need practical information and assistance to make a positive impact. The Wildscapes Program provides educational materials for the Texas urban residential landowner in order to promote a better-educated population which is more supportive of wildlife and conservation issues, and which exercises landscaping best management practices for the prevention of nonpoint source pollution.

Texas Wildscapes is designed to encourage Texans to landscape with wildlife and the environment in mind. This program is similar to backyard habitat programs implemented by other private and state fish and wildlife agencies, but the Texas Wildscape Program is specifically tailored to the needs and ecology of Texas. The Wildscape Program is not limited just to backyards, but can be applied to community, rural, and corporate properties as well. The objectives of the Texas Wildscape Program are to:

- ! Introduce the concept of habitat.
- ! Increase public involvement and experience with the outdoors.
- ! Provide information on wildlife needs and landscaping with native plants.
- ! Reward participants.
- ! Improve habitat and environmental quality for wildlife and humanity.
- ! The Texas Wildscapes Program helps restore viable wildlife habitat in Texas and protects the state's natural resources by utilizing valuable tools to protect water supplies and avoid pressure on landfills. Texas Wildscapes is actively promoting:
 - ! The use of native plants whenever possible. Regional native plants are adapted to Texas and provide food and cover which wildlife require, have fewer pest problems, require less fertilizer, and most thrive with only natural rainfall.
 - ! Re-use of grass clippings and leaves, mulching, and composting.
 - ! Water conservation through xeriscaping, using native plants, and using common-sense watering.
 - ! Minimization of the use of pesticides and fertilizers through the use of native plants and implementation of low-impact pest management.
 - ! Wildscapes' program practices and recommendations minimize the environmental impact of urban development as highlighted here:
 - ! Fifty percent of the water used by homeowners goes to the landscape. Limiting turf areas, using native plants, and using compost mulch all reduce water waste.
 - ! Texas homeowners pour about four million pounds of pesticides on their lawns and gardens every year. Implementing low-impact pest management and using hardy pest-resistant native plants saves our air, water, and soil from unnecessary waste and contamination.

Texans spread about five million pounds of fertilizer on yards each year and; due to improper mix and waste, much of it ends up in our state's water supplies. Utilizing compost not only reduces the volume of yard waste which finds its way into landfills, but it also alleviates the need for fertilizer. Compost is a natural, nutrient-rich mulch and soil amendment which can be used in place of fertilizer.

The Nongame and Urban Program is currently overseeing the Texas Wildscapes Program with cooperation from the Texas Agriculture Extension Service, Soil Conservation Service, Texas Forest Service, The Nature Conservancy, Native Plant Society of Texas, Texas Natural Resource

Conservation Commission, and Cameron County Commissioner James Matz. These organizations and individuals share their respective resources with Texas Wildscapes and some offer programs concerning Texas Wildscapes.

The San Antonio Urban office has formed a cooperative committee which promotes Texas Wildscapes and sponsors programs and activities. This cooperative consists of Texas Parks and Wildlife, Bexar Audubon Society, San Antonio Native Plant Society, Texas Agriculture Extension Service, San Antonio Water Systems, San Antonio Coalition of Neighborhood Associations, San Antonio Master Gardeners and San Antonio Botanical Gardens.

Funding for the Wildscapes Program comes from the Nongame and Endangered Species Fund, participant sign-up fees, and the sales of nongame art prints and stamps. With the continued success of the Wildscapes Certification Program, Texas Wildscapes should become self-sustaining. The fifteen dollar charge for the information packet and voluntary monetary support from participants make this possible.

The benefits to the environment through Texas Wildscapes are many. The holistic approach of habitat restoration and conservation beautifies communities and makes them sustainable and livable for wildlife and humanity alike, naturally securing improved water and air quality and conserving landfills and water.

Private Lands Enhancement Program

Through this program, in effect since in 1973, TPWD provides technical assistance to persons who desire to include wildlife management considerations in present or future land use practices. On request, a biologist will schedule a personal meeting with the land manager and an inspection of the property. The land manager will be asked to define the various needs and uses of the property and to establish an objective for wildlife considerations. The biologist will provide recommendations which may include a written management plan. Many of the practices that are used in wildlife habitat management reduce nonpoint source impacts, as described in the Texas Wildscapes Program overview above.

Field biologists work with individual landowners on request to develop land management plans which use environmentally and economically sound land use practices. Implementation of the management plan is completely voluntary. Practices include reduction of livestock with better economic returns from fatter calves through grazing rotation and managing for increased grass cover. Filter strips in riparian areas are established, and grazing in these areas is controlled, with limited access coordinated with plant growth cycles. Upland erosion controls and establishment of vegetative cover reduce runoff and allow filtration. Strip removal practices for cedar are used because cedar dries up subsurface water. These practices combined lead to better infiltration, retaining more water on the land, and in some instances leading to the rejuvenation of natural springs. Many of these practices are demonstrated at TPWD's Kerr Wildlife Area demonstration project.

Proposition 11, which was passed by Texas voters in November of 1995 to amend the tax code, allows all landowners to make a revenue neutral switch from managing their land under an agricultural exemption to managing for wildlife habitat. Management plans are filed with the local County Appraiser. The Private Lands Program has a publication outlining sample management practices for small and large landowners, which is available on request. Technical assistance for developing and implementing a habitat management plan is available from TPWD, the Texas Agricultural Extension Service, the Natural Resource Conservation Service, university programs, and private consulting biologists and foresters.

Private Lands Initiative

A related program, the Private Lands Initiative provides challenge grants (25-50% cost share) to private landowners for habitat work prioritized to manage, conserve and restore wetlands, nontropical migratory birds, and endangered and threatened species. Cost-share is awarded on a competitive basis to projects meeting priority needs and demonstration potential that promotes landowner-to-landowner communication, the most effective conservation education technique.

Wetland Habitat Alliance of Texas

The Wetland Habitat Alliance of Texas program works to protect, restore, and enhance natural wetlands for 10-year periods. Assistance is available at up to 100% cost-share.

Texas General Land Office

The Texas General Land Office (GLO) is taking the lead in developing and obtaining approval of the state's federal Coastal Zone Management Program. The Texas Coastal Management Program (CMP), establishes a policy calling for the cooperation of state agencies and subdivisions of the state with authority to manage nonpoint source pollution in the development and implementation of a coordinated program to reduce nonpoint source pollution in coastal waters. The CMP NPS policy incorporates existing state laws, regulations, and programs which address nonpoint source pollution. This includes the adoption of the voluntary agricultural nonpoint source control program administered by the TSSWCB and the regulations governing underground storage tanks and on-site sewage disposal systems administered by the TNRCC. The Coastal Management Plan for the State of Texas was submitted during FY 1995. The Coastal Coordination Council, composed of the heads of the State's natural resource agencies, governs the process. Implementation projects under the plan are being funded by grants through the U.S. Department of Commerce, with cooperation from NOAA and the Federal Coastal Zone Program. In the first year of implementation, the GLO will pass through 90% of the grant dollars to local entities, with the State providing the match required under the grant program. The grant program starts out with a four-to-one federal-to-state or -local match in the first year, progressing to a one-to-one match by the fourth year. Workshops have been and will continue to be held in coastal areas with field offices and local governments to educate citizens about the Coastal Zone programs.

The state program must provide for the implementation, at a minimum, of management measures in conformity with guidance to be published under EPA leadership. Furthermore, the state program is required to contain "enforceable policies and mechanisms" to implement the management measures.

Programs to be developed by the states must also:

- ! Identify land uses impacting or threatening coastal water
- ! Identify critical coastal areas adjacent to coastal waters identified in 1) above
- ! Implement additional management measures on land uses identified in 1) and 2) above
Provide technical assistance to implement management measures
- ! Provide for public participation
- ! Establish mechanisms for improved coordination among state and local agencies
- ! Propose to modify state coastal zone boundaries as needed to protect coastal water quality.

The TSSWCB will develop the agricultural and silvicultural components of the Coastal Zone Management Plan nonpoint source program and will work with the GLO to attain proper implementation. The TNRCC will work with the GLO on the development and implementation of the remaining NPS components of the CZMP.

Under the Clean Vessel Act, the U.S. Fish and Wildlife Department has provided funds to Parks and Wildlife, as the lead agency for implementation of the act, to install sewage pump-out facilities at marinas in the state. Marinas in Clear Lake, South Padre, Corpus Christi, and Port Arthur have been chosen for a demonstration project in cooperation with the GLO. An educational component of the project is developed with the assistance of a NOAA Sea Grant to create maps with the location of pump-out facilities.

The GLO has initiated the Adopt-A-Beach program to focus public awareness on the problem of trash on public beaches, one segment of the nonpoint source problem. This all-volunteer program is patterned after TxDOT's successful Adopt-A-Highway program, and involves civic organizations, private companies, schools, youth groups, and individuals in cleaning Texas beaches and coastal waters each spring and fall. The program helps to educate citizens about the sources of marine debris and beach litter, and generates public support for state, national and international action to clean up beaches and coastal waters. Two clean-ups are conducted each year, in September and April. Results are published in the annual U.S. National Coastal Cleanup Results. Adopt-A-Beach is a model program for voluntary beach clean-ups around the country. Information from Texas cleanups was used in formulating dumping regulations under the Marpol International Law.

The clean-ups are promoted through several media, including advertisements, posters, brochures, and presentations at schools, rotary clubs, and other civic organizations. A coloring and activity book entitled Don't Mess with Texas Beaches illustrates the issues by showing a science class field trip to the beach and the things they learn about the problem of trash on the beach. A semi-annual newsletter, mailed two to three months before each clean-up, provides volunteers and adopters with information on the results of the last clean-up, plans for the upcoming clean-up, and educational articles. A contest is conducted each spring with school children around the state to create a poster which illustrates the importance of protecting our coastal waters. A black-and-white representation of the most recent winning poster by Jennifer Fischnar is shown here. The winner and the winner's class are flown to Padre Island for a science lesson on the beach; the trip is scheduled in conjunction with school ocean studies. Special presentations are held in the school of each finalist.



Sponsors are recruited to support the efforts of volunteers. These sponsors often provide food, drink, and festivities for the volunteers. Sponsors have also provided prizes and incentives for volunteers, such as financial support for the beach trip for the poster contest winner and her class. These public/private partnerships play an important role in the Adopt-A-Beach program.

Texas Department of Transportation

The Texas Department of Transportation (TxDOT) recognizes its responsibility in doing its part to preserve the quality of the waters in the state. Construction, maintenance, and the normal operation of our roadways can contribute to storm water nonpoint source pollution. For this

reason, TxDOT has taken steps to ensure that its programs and procedures are carried out in a way that preserves and protects the lakes, rivers, streams, coastal waters, and wetlands of Texas.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) establishes federal highway grant funds for projects which contribute to preserving the quality of the environment. In Texas, the Statewide Transportation Enhancement Program administered by the Texas Department of Transportation (TxDOT) reflects the spirit and intent of the federal ISTEA legislation. The state program provides funding for a broad range of transportation-related activities including bicycle and pedestrian facilities, scenic and landscaping programs, historic preservation, and water pollution control. Project proposals must meet certain eligibility requirements, including functional relation to the transportation system, proximity to the transportation system, or impact on the transportation system. There are ten categories of enhancement projects eligible for funding, including mitigation of water quality, acquisition of scenic easements, and scenic highway programs. Project proposals are evaluated by an interagency scoring committee that includes representatives from TxDOT, TNRCC, the General Land Office, the Texas Historical Commission, and Texas Parks and Wildlife. Evaluations are based upon the potential social, economic, and environmental benefits to be derived from the project. The Transportation Commission makes the final project funding award decisions.

TxDOT's storm water management program begins with communication and coordination. Coordination with other agencies, training, team work, and research are practices used to identify and address storm water problems associated with highway activities. For the most part, these practices are carried out through TxDOT's Environmental Affairs Division. Beginning during project development and continuing into construction and maintenance, TxDOT addresses water quality concerns through all aspects of its operations. TxDOT programs to address the problem of storm water pollution are described below.

TxDOT and TNRCC Coordination

TxDOT and the TNRCC have entered into an agreement for TNRCC to review TxDOT projects that could adversely affect water resources. The TNRCC employs a TxDOT liaison whose primary responsibility is to coordinate water quality matters between the two agencies.

Storm Water Management Task Force

The Storm Water Management Task Force was formed in response to increased emphasis on water quality issues. The task force was comprised of members of TxDOT and a representative of the TNRCC. The task force spearheaded proactive strategies and directions for the department to respond to water quality issues. The task force provided guidance to TxDOT on the National Pollutant Discharge Elimination System (NPDES) requirements and specifications for storm water management on transportation projects. The recommendations of the Task Force were used to develop many of the ongoing water quality management measures TxDOT uses in building and maintaining Texas roads.

Storm Water Guidance Manual

TxDOT provides uniform guidance to its personnel throughout the state with a manual entitled Storm Water Management for Construction Activities. With this manual, the engineer is able to develop a storm water management plan to fit the needs of the particular project. Storm water regulatory requirements in the areas of design, construction and maintenance will be met by using the measures in this document.

Storm Water Advisory Team

TxDOT created an interdisciplinary team to perform field reviews of various storm water pollution prevention plans across the state. The team visited construction projects in each highway district and formulated advice on how to improve storm water control practices. Insight was gained on what practices work best in a given environment, and problems were solved on a one-on-one basis. Results of the Team's work was summarized to show the progress of the department statewide.

Water Quality Training for TxDOT Personnel

The personnel involved in the program will include engineers, inspectors and others. Existing training programs have incorporated storm water management issues. Special meetings and workshops have been developed to address issues of major concern, while more informal training is tailored to directly address specific needs.

Vegetation Management

Vegetation management on the right-of-way plays a significant role in preserving and enhancing water quality. Well established vegetation can often prevent sediments and other pollutants from entering nearby waterways. TxDOT's roadside vegetation management program integrates the use of numerous tools in the establishment and control of roadside vegetation. The goal of the vegetation management program is three-fold: to maintain the right-of-way in an environmentally sensitive manner, ensure the safety of the traveling public, and protect our investment in the transportation system.

The vegetation management program encourages blending the area on the sides of the road with the surroundings using various levels of maintenance. The program encourages the preservation and propagation of native wildflowers, grasses, trees and shrubs, and encourages areas of wildlife habitat in select locations. Careful combination of mechanical and herbicide alternatives aids in the control of unwanted or unsafe vegetation. The department has developed guidelines for vegetative establishment in a document entitled *A Practical Guide to the Establishment of Vegetative Cover on Highway Rights-of-Way*. This guide was developed to help designers, construction inspectors, maintenance personnel, or anyone involved in the issue of establishing a permanent, warm-season perennial vegetative cover on the highway system.

Maintenance Environmental Task Force (METF)

TxDOT created the METF to study the environmental impact of department maintenance activities. The department wanted to be certain that maintenance methods and materials were having a minimal effect on the environment. The task force has studied all of the various maintenance activities to assess the impact of these activities on receiving waters. Of the 84 maintenance functions studied by the METF, the cutting of fire guards (tilled strips to prevent the spread of grass fires off the highway right-of-way), ditch cleaning operations, and stockpiled materials show the highest potential for creating water quality impacts. TxDOT will continue to carry out best management practices to control pollutants for these maintenance activities.

The possible negative impact on water quality caused by stockpiled materials has caused growing public concern. TxDOT responded by contracting with Southwestern Laboratories to analyze the runoff from these stockpiles. The results of these tests have revealed that the stockpiled materials don't release significant pollutants during a storm event.

Paint Removal

Sand blasting is used in the removal of paint from equipment and structures, chiefly bridges. Strict TxDOT requirements to contain and dispose of the paint and sand are currently being developed. Blast material will be tested for hazardous materials and disposed of properly. TxDOT is working with state and federal agencies in researching methods for converting the waste into reusable material such as concrete.

Utilities

Under existing laws, various utility firms and agencies such as power transmission, telephone, television cable, and gas have a legal right to install their lines along and across state highways. Utility construction along TxDOT drainage ways has a high potential for water quality impacts. The department conducts a permitting program to control the location, materials, and methods for installation to ensure environmentally sensitive practices.

Public Awareness and Education

Educating the general public is an important and integral aspect of a water quality management program. Many pollution problems can be avoided by having an informed populace willing to participate in improving water quality. TxDOT is committed to producing informational materials to let the public know what measures the department is taking and what the public can do to protect water quality, including brochures, an environmental newsletter, the "Earth Watch" column in Transportation News, and newspaper inserts. TxDOT will continue to create teams with other public and private organizations to provide public information workshops on improving and preserving water quality.

The department is in the process of providing education, public information, and other activities to facilitate the proper management and disposal of used oil. TxDOT has joined with the TNRCC and local agencies in producing a television public service announcement to encourage the proper disposal of waste oil and other chemicals under the theme of "you dump it, you drink it." TxDOT is also a partner in the Clean Texas 2000 program, a statewide effort led by the TNRCC. A media campaign was kicked off under the slogan, "Take Care of Texas. . . it's the only one we've got." The department is working to utilize existing TxDOT programs, such as the "Don't Mess with Texas" and Adopt-a-Highway programs, for more than just picking up trash. Adopt-a-Highway activities are expanding to include landscaping, tree planting, and using highway rights-of-way for native grasses and species habitat.

Research Projects

TxDOT, in cooperation with the Texas Transportation Institute, has constructed and is currently operating a field testing facility at Texas A&M University. The facility tests the performance of erosion control blankets used either on slopes or in drainage channels. The facility is also testing the performance of the various other types of erosion control practices. Data gathered from this facility are used to provide information to designers, construction inspectors, and maintenance personnel on approved products and the benefits and costs of each of the available control measures. The department publishes annual reports on the actual performance of the various materials.

Another study has been developed by TxDOT in cooperation with the Center for Water Resources Institute at the University of Texas. The study researches the effects of highway construction on rainfall runoff, considering traffic volume, surface conditions, rainfall intensity,

and other factors. The study will evaluate how well current methods are working, and what the effects are on the quality of nearby receiving streams, as well as research on how structural controls can best be designed. One part of this research involves a rainfall simulator on Loop 1 (Mopac) in Austin, that will be able to "create" nearly 100 rainfall events while controlling variables affecting runoff. The data will be compared to data from natural rainfall events to determine what pollutants are in highway runoff and what factors affect these pollutants.

TxDOT has committed itself to the goal of ensuring that its programs are environmentally sensitive. Part of this goal is the development of a program to protect the water resources of the state against impacts resulting from transportation activities. The measures mentioned here and other programs being developed, such as a procedure for identifying and determining the need for permanent runoff controls on highway projects, will collectively achieve TxDOT's goal in the area of water quality. TxDOT is striving to continually improve its practices to preserve, protect and enhance the water resources of the state.

Texas Department of Health

The Texas Department of Health (TDH) has two monitoring programs that are relevant to the identification of NPS pollution in the state. These programs collect water quality, fish tissue, and associated data as part of their effort to maintain safe seafood for public consumption. The shellfish program collects fecal coliform samples in Texas bays & estuaries on a regular basis. These data are collected frequently and are often associated with rainfall events, making it some of the best available data for assessing NPS pollution impacts. The edible fish program collects tissue samples for analysis of toxic contaminants. Both programs make an effort to determine the cause and source of the pollutants and provide important information about NPS impacts. The Seafood Safety Division publishes Fish Advisories and Bans, which provides information on potential health effects from chemical and organic contaminants in fish, information about areas under advisory or closure due to contaminants in fish, and maps indicating the location of areas under advisory or closure.

The TDH Bureau of Radiation Control (BRC), which regulates radioactive materials in Texas, monitors ground water for radionuclides on a routine basis at two facilities in Texas -- Pantex and the University of Texas System Interim Storage site. Intermittently, the BRC will sample groundwater as a result of an incident, complaint, or situation which leads the BRC to believe there may be ground-water contamination. The BRC cooperates in this area with the TNRCC, which regulates uranium recovery and radioactive waste disposal for the state.

Railroad Commission of Texas

The coal and uranium surface-mining industry in Texas is regulated through the Surface Mining and Reclamation Division (SMRD) of the Railroad Commission of Texas (RCT). The nonpoint source identified with this industry consists of the abandoned wells and exploration testholes. Stringent regulations, under the Texas Surface Coal Mining and Reclamation Act, the Texas Uranium Surface Mining and Reclamation Act, and the federal Surface Mining Control and Reclamation Act of 1977, control the plugging of abandoned wells and testholes. Mining permits require hydrology information, including ground-water information in operational plans, as well as monitoring plans for pre-mining and post-mining conditions. The industry is required to monitor

wells in the drainage area around plugged wells, and must submit quarterly reports on the condition of these wells to RCT. The permittee is required to mitigate undesirable effects during operation and those resulting from plugged wells and testholes. So far, the only measured water quality effect from plugged wells is a lowering of water levels in private wells. However, it takes years or tens of years before full saturation of plugged wells is achieved, highlighting the importance of continued monitoring. A field enforcement program directed at industry applicants and permittees monitors implementation of regulated practices. Monthly scheduled field inspections are conducted by two enforcement offices, with an additional office planned for the near future. Additional inspections may be scheduled in response to specific requests or citizen complaints. The primary performance indicators of compliance are the annual number of drilled and plugged wells and testholes; the number of inspections; and the number of violations. Educational efforts focus on the correct practices for drilling and plugging wells and testholes.

Petroleum activities are regulated through the Oil and Gas Division. This Division is responsible for protecting surface and ground water from activities related to the drilling, exploration, and production of oil, gas, and geothermal resources, the underground storage of hydrocarbons, and the solution mining of brine. The regulations of the Oil and Gas Division for well drilling, completion, and plugging focus on the protection of ground-water resources. The RCT administers the EPA-delegated Underground Injection Control Program under the Safe Drinking Water Act for Class II injection wells associated with oil and gas activities. The RCT regulates the handling, storage, treatment, and disposal of oil and gas wastes, and responds to spills from pipelines under its jurisdiction and to other emergencies related to the production and transportation of oil and gas.

The nonpoint sources identified with petroleum activities are those actions, whether accidental, willful, or negligent, that cause spills or discharges that may contribute to pollution of surface or ground water. Through a field enforcement program, district office staff and an emergency response team perform routine, unscheduled field inspections and complaint initiated inspections. Routine inspections are scheduled at the discretion of the district director and frequency of inspections are subject to such factors as the past compliance history and known problem areas. In addition, the district offices conduct sweeps that involve concentrating several inspectors in one area to inspect every oil and gas property in a short period. The RCT also responds to citizen complaints regarding alleged surface or ground-water contamination from oil and gas activities and to alleged unauthorized activities, which may endanger water quality. Complaints are responded to within 24 hours unless other arrangements are made with the complainant. Education, training, and technical assistance are offered through educational seminars and workshops. Applicants and permittees are informed about oil and gas rules and regulations which focus on environmental protection at "Water Protection" seminars. Workshops are held on oil and gas waste minimization and recycling. These seminars and workshops are held at various cities throughout the state which are in oil and gas producing areas. An average of five seminars and ten workshops are held annually. The RCT also acts as a clearinghouse for information on oil and gas waste minimization.

The Texas Groundwater Protection Committee

The TSSWCB was made a member of the Texas Groundwater Protection Committee in September of 1987 for the purpose of coordinating agricultural and silvicultural nonpoint source management programs. The TSSWCB will continue to participate on this committee and will use

it as a mechanism for coordinating groundwater aspects of the agricultural and silvicultural nonpoint source management program with members of the committee. Current membership includes:

- ! Texas Natural Resource Conservation Commission
- ! Texas Department of Health
- ! Texas Department of Agriculture
- ! Railroad Commission of Texas
- ! Texas Water Development Board
- ! Texas State Soil and Water Conservation Board
- ! Texas Agricultural Extension Service
- ! Texas Agricultural Experiment Station
- ! Bureau of Economic Geology, University of Texas

Texas Alliance of Groundwater Districts

The Alliance is the umbrella organization composed of ground-water conservation districts within the state. Its membership is restricted to ground-water conservation districts which have the powers and duties to manage ground water as defined in Chapter 36 of the Texas Water Code. The districts were created by the Legislature or by the Texas Natural Resource Conservation Commission with the purpose and responsibility of preserving and protecting ground water. The districts are local or regional in their jurisdiction and have, for the most part, elected boards of directors. Among their legislatively granted authorities is the power to monitor ground-water quality. A number of districts also have the authority to bring civil court proceedings for injunctive relief against an entity causing ground-water contamination.

Bureau of Economic Geology

The Bureau of Economic Geology is a research organization of The University of Texas at Austin and functions as the State Geological Survey. Extensive advisory, technical, and informational services relating to the geology and ground-water resources of Texas are provided by the Bureau. In addition, the Bureau conducts basic and applied research projects in energy and mineral resources and in hydrogeology, ground-water resources, and geochemistry. Some projects are conducted jointly with other units of the University as well as with state, federal, and local agencies, industry associates, and foreign companies.

U.S. Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS)

The mission of the Natural Resources Conservation Service is to provide technical assistance to landowners and operators on soil and water conservation matters through memoranda of understanding with soil and water conservation districts. Work is directed through local soil and water conservation districts in Texas, according to the terms of memoranda of understanding with each district. After an agricultural nonpoint source pollution problem is identified and best management programs are selected for the affected area, the NRCS will work with individual landholders to develop and implement plans to abate the problems. Adequate technical assistance

is essential in any voluntary effort designed to achieve implementation of best management practices and nonpoint source management programs.

The NRCS is a source of funding for some larger projects such as watershed protection and flood prevention projects and resource conservation and development projects, which can be directed toward nonpoint source management efforts. The NRCS has technical assistance funding programs, such as the Environmental Quality Incentive Program (EQIP), the Wetland Reserve Program, and the Conservation Reserve Program, which are structured to put water quality conservation practices on the ground. The TSSWCB will continue to work with the NRCS to designate areas for various special projects and activities.

USDA - Farm Services Agency (FSA)

The principal mission of the Farm Services Agency includes stabilizing farm income, helping farmers conserve land and water resources, providing credit to new or disadvantaged farmers and ranchers, and helping farm operations recover from the effects of disaster.

The FSA was set up when the USDA was reorganized in 1994, incorporating programs from agencies including the Agricultural Stabilization and Conservation Service and the Farmers Home Administration. Many of the FSA operated programs are funded through the Commodity Credit Corporation (CCC), a government owned and operated corporation established in 1933 to stabilize, support, and protect farm income and prices.

USDA - Agricultural Research Service

The Agriculture Research Service administers basic, applied, and developmental research in animal and plant protection and production, and the use and improvement of agriculture resources. They are also involved in research concerning human nutrition as well as the processing, storage, and distribution of agricultural products. Much of this research is carried out in cooperation with universities, extension centers, and private organizations. Research is carried out at various locations throughout the state, with each center's work generally focused on problems of the area. Research centers in Texas are located at Beaumont, Big Spring, Brownwood, Bushland, College Station, El Paso, Kerrville, Lubbock, Temple and Weslaco. Work sites are located near Riesel and Falcon Heights. The TSSWCB will coordinate research needs of agricultural nonpoint source management programs and will utilize pertinent information developed through the soil and water conservation and water quality research programs of the Agricultural Research Service.

Texas Agricultural Extension Service (TAEX)

The Texas Agricultural Extension Service is a partnership between the USDA, Texas A&M University, and County Commissioners Courts. The basic mission of the TAEX is education and dissemination of information relating to agriculture, home economics/consumer sciences, community development, and 4-H/youth. County Extension Agents deliver most of the educational programs of the Agricultural Extension Service. These county agents, supported by specialists based at College Station and 12 regional centers throughout Texas, provide technical

information and respond to individual problems and questions, conduct educational meetings, and establish and evaluate demonstrations to show the benefits of using practices based on the latest scientific research. They also provide educational information through radio and television programs, newspapers, newsletters, and bulletins. Water quality and conservation is one of six major program issues being addressed by agents and specialists on an interdisciplinary basis.

The Extension Service has the organizational framework and outreach capabilities to help implement the informational and educational programs that will be an essential part of any voluntary pollution abatement effort. The TSSWCB is currently working with the Extension Service to develop educational programs concerning agricultural nonpoint source pollution. The programs will address everything from general awareness of the problem to selection, installation, and evaluation of specific water quality problems. In addition, the Extension Service is responsible for training in relation to the state pesticide applicator certification program. The TSSWCB will work with the Extension Service to include nonpoint source water quality management education in that training.

The TSSWCB and the Texas A&M University System, including the Agricultural Extension Service, have a longstanding memorandum of understanding between the two entities.

Texas Agricultural Experiment Station (TAES)

The Texas Agricultural Experiment Station is the official state agricultural research agency in Texas. It is administered by the Board of Regents of the Texas A&M University System. The TAES cooperates with other state and federal agencies and colleges and universities in planning and conducting agricultural research. Programs of the TAES are designed to provide the scientific base to develop the full agricultural potential of Texas and improve the utilization and conservation of natural resources. The TAES is headquartered in College Station on the A&M University campus and has regional research centers at Weslaco, Beaumont, Bushland, Overton, Temple, San Angelo, Uvalde, Vernon, El Paso, Dallas, Corpus Christi, and Stephenville. The TSSWCB will coordinate research needs relative to nonpoint source management programs and will utilize pertinent information developed through soil and water conservation and water quality research programs of the TAES. During each fiscal year any needed program coordination mechanisms will be developed and implemented.

The TSSWCB and the Texas A&M University System, including the Agricultural Experiment Station, have a longstanding memorandum of understanding between the two entities.

Texas Department of Agriculture (TDA)

The Texas Department of Agriculture is the State's lead regulatory agency for agricultural pesticide regulation. The Texas Pesticide and Herbicide Laws grant TDA the authority to enforce the provisions of the law pertaining to the registration, distribution, and use of all agricultural pesticides. Through its Pesticide Division, TDA is responsible for licensing all agricultural pesticide applicators and the labeling, storage, sales, usage, and disposal of all pesticides. TDA also cooperates with other state agencies that have statutory pesticide responsibilities, such as the TNRCC, the Structural Pest Control Board, and the TDH. TDA is also responsible for the enforcement of federal pesticide laws under a cooperative agreement with the EPA.

The TDA cooperates with all agricultural producers and other users of pesticides to make certain that all pesticides are used safely and according to instructions. The Texas Pesticide Control Act requires that pesticides be stored in a manner that will reasonably ensure that human food, domestic and public water, pet foods, drugs, animal feeds, commercial fertilizers, seeds, or clothing will not be contaminated. The law also directs that pesticide containers be disposed of as directed on the label or by any other methods approved by the TDA. Any use of pesticides inconsistent with label directions is a violation of the law and may subject the user to penalties under federal and state law.

The Texas Department of Agriculture is responsible for developing and implementing the State of Texas Plan for Certification of Pesticide Applicators. All application equipment used by commercial applicators must be registered, and is subject to inspection at any reasonable time. All licensed applicators must maintain application records for two years. The TSSWCB will work with the TDA to provide appropriate nonpoint source educational materials to the state's certified pesticide applicators.

The TSSWCB will coordinate with the TDA if it is determined that misapplication, mishandling, or misuse of agricultural chemicals is contributing to a nonpoint source pollution problem.

Texas Forest Service (TFS)

The Texas Forest Service is a member of the Texas A&M University System with administrative offices in College Station and field offices in over 40 locations throughout the state. The mission of the TFS is to provide statewide leadership and professional assistance to assure that the state's forest, tree, and related natural resources are wisely used, nurtured, protected, and perpetuated for the benefit of all Texans.

The TFS resource development program provides professional assistance to non-industrial private landowners, including services such as development of forest management plans, assistance in implementation of reforestation and timber stand improvement practices, prescribed burning, fireline plowing, and other services. It administers several state and federal cost share programs which promote reforestation and stewardship. Emphasis is placed on developing the state's timber resource in an environmentally sound manner to meet present and future needs for timber and other benefits. A water quality program, funded in part through a TSSWCB administered CWA Section 319 grant, promotes and monitors the use of voluntary best management practices in forestry operations throughout East Texas.

The agency also operates wildfire and pest control programs to reduce resource losses to insects, disease, and fire. Other agency programs include tree genetics, wood utilization, windbreaks, and urban and community forestry.

The TSSWCB will coordinate silvicultural nonpoint source management activities with the Texas Forest Service to insure that their programs, expertise and responsibilities are a part of the State Management Program.

Texas Forestry Association (TFA)

The Texas Forestry Association is a tax-exempt, non-profit organization which serves as the voice of the forest industry in eastern Texas. Within the TFA, information and training are provided for both the logger and the landowner through the work of various committees.

The TFA provides an excellent avenue for reaching those who own and manage forest resources and those employed in the forest industry. Members of TFA are committed to carrying out programs in water quality, education, and the continued production of forest resources.

Association of Texas Soil and Water Conservation Districts (ATSWCD)

The Association of Texas Soil and Water Conservation Districts is a tax-exempt, non-profit organization which serves soil and water conservation districts and district directors within Texas. The Association provides information and training for those individuals elected to serve as district directors and provides information to those who work closely with districts.

The ATSWCD provides an excellent opportunity for reaching district directors and those landowners and operators who have signed agreements to be district cooperators. The districts within Texas contribute separate funds to the Association which are designated specifically for a public information and education program.

National Association of Conservation Districts (NACD)

The National Association of Conservation Districts is a non-profit organization which represents 3000 conservation districts and all conservation district directors across the United States. NACD pools district and state experience and maintains relationships with organizations and government agencies.

NACD provides the opportunity to work with agricultural and silvicultural leaders across the nation and share information. NACD is committed to assisting districts in carrying out their role in conserving and developing land, water, forests, wildlife, and related sources for the benefit of all.

Gulf of Mexico Program (GOMP)

The TSSWCB is represented on the following subcommittees which were set up to advise the Citizens Advisory Committee for the Gulf of Mexico Program:

- ! Toxics and Pesticides
- ! Freshwater Inflow
- ! Nutrient Enrichment
- ! Public Education
- ! Data Information and Transfer

Through these subcommittees, the nonpoint source management program will be coordinated with the Gulf of Mexico Program.

Estuary Program

The TSSWCB and district directors represent the districts on the appropriate committees for the Estuary Program when possible. Through this mechanism, the agricultural and silvicultural nonpoint source management program will be coordinated with the Estuary Program in Texas.

Texas Institute for Applied Environmental Research (TIAER)

The Texas Institute for Applied Environmental Research was established as part of the Texas A&M System in 1992. The first mandate in its enabling legislation is to conduct applied research on environmental issues that have public policy implications. The legislation also calls for TIAER to provide national leadership on emerging environmental policy and to provide a setting for environmental studies on the interface between government and the private sector. Establishing interdisciplinary programs or partnerships to develop and implement new policies, technologies, strategies, and relationships is another TIAER mandate.

The TIAER goal is to impact state and national environmental policy. A principal that is fundamental to this goal is that improvements in the environment are best accomplished not by simply conducting scientific research, but by using research results to formulate policy recommendations that will actually be implemented by government and other institutions. TIAER seeks to use cutting-edge strategies and technologies to assist developers and implementers of environmental policy. Partnerships with other universities and state agencies are integral aspects of Institute work. These partnerships build on the strengths of each entity to produce an effective, efficient program.

TIAER's environmental science program has been actively directed to agricultural nonpoint source issues since the inception of the Institute. A technical staff of biologists, hydrologists, chemists, engineers, field technicians, and computer analysts is involved in the monitoring and analysis of data concerning groundwater, surface water, and odor. TIAER is accumulating and evaluating data from an extensive network of nearly 40 surface water monitoring sites in the North Bosque River watershed. Twenty-six of the sites are equipped with instrumentation for automated water sampling and continuous water level sampling. Biologists perform routine macroinvertebrate sampling and identification according to the rapid bioassessment protocol. All water samples are analyzed in the TIAER analytical laboratory, which is equipped to perform water sample analyses under EPA approved procedures for suspended solids, inorganic and organic forms of nitrogen and phosphorus, biochemical oxygen demand, fecal coliform, total organic carbon, and certain pesticides and heavy metals. The computer system at TIAER consists of a work station platform with numerous PCS, a plotter, a digitizer, and the GRASS geographic information system. TIAER recently expanded its capabilities in odor monitoring with the acquisition of a dynamic forced-choice triangular olfactometer.

CHAPTER 6

REGIONAL AND LOCAL PROGRAMS



The descriptions of regional and local NPS programs in this chapter were provided in response to the TNRCC's survey of NPS programs and BMPs being implemented in Texas. (See Chapter One, "Intergovernmental Coordination and Public Participation.")

River and Regional Authorities

Brazos River Authority (BRA)

The Brazos River Authority administers a Household Hazardous Waste Collection Program as part of the Clean Rivers Program (CRP).

The BRA conducts two-day training sessions on water quality monitoring for cities, universities, and other entities. The sessions are taught by the Authority in cooperation with the CRP.

The Authority is conducting quarterly monitoring at approximately 33 stations throughout the basin, and monthly monitoring at three different watersheds to provide data which will identify and define water quality. Based on those data, evaluations of NPS impacts will be made.

The Authority is conducting several monitoring projects within specific subwatersheds to document identified NPS impacts. Some of these projects include the lower Brazos River basin (Segment 1201), Sulfur Creek in the Lampasas River watershed, Deadmans Creek in the Clear Fork watershed, and Lake Somerville (Segment 1211).

The BRA is conducting two Clean Lakes Program studies -- one at Lake Pat Cleburne and the other at Oyster Creek. Both studies have identified NPS as a major impact on water quality.

Canadian River Municipal Water Authority (CRMWA)

The Lake Meredith Salinity Control Project is a program dealing with the chloride inflow to the Canadian River in New Mexico. This project has been authorized by Congress and is being jointly funded by the federal government, the State of Texas through the TWDB, and by the CRMWA. The Bureau of Reclamation is handling the investigation, design, and construction management. Their share is expected to be around \$3 million. The State of Texas is matching all federal expenses up to \$3 million. The CRMWA is providing funding for the balance of the project. The CRMWA share must be at least one third of the project costs.

TNRCC, under the Clean Water Act, is sponsoring the Lake Meredith Lakeshore Cleanup. The National Park Service, Texas Parks and Wildlife, Texas Land Commission, CRMWA, and others will also participate in the activities. CRMWA is proud of the excellent coordination that makes this such a good program.

Gulf Coast Waste Disposal Authority

Technical assistance regarding EPA's Storm Water Management for Industrial Activities is offered for developing pollution prevention plans and best management practices. In-house education and training is provided to Authority employees.

Lower Colorado River Authority

The Lower Colorado River Authority (LCRA) has several programs for nonpoint source pollution management.

LCRA Public Education/Involvement

“Pointless Pollution” is a video produced by LCRA, narrated by Walter Cronkite, aired on PBS and distributed nationally. The 27-minute video explains the nonpoint source pollution concept taking a look at the problems of nonpoint source pollution throughout the United States with an emphasis on problems in Central Texas.

Get to the Point! is a water quality program developed for middle-school students in grades 7-8. The two-unit program deals with nonpoint source pollution (NPS), the major cause of pollution in our nation’s rivers and lakes. The curriculum uses hands-on activities and multi-media resources to teach students about the causes of NPS pollution, how the pollution enters our water resources, its effects, and strategies for its abatement. LCRA introduced this program during the 1992-93 school year through a series of training workshops. The program was received well and is growing in number of requests by schools throughout the State.

Major Rivers is a Texas water education program for 4th grade students. The hero of this two-week, ten-lesson unit is “Major Rivers,” a Texas cowboy who, with his horse Aquifer, focuses on the geography of major Texas rivers and aquifers, the hydrologic cycle, a typical water distribution system, major water uses and effective methods of water conservation. The program is correlated to help teachers satisfy Texas Essential Elements for Science and Social Studies. The program was developed in 1989 specifically for schools within LCRA’s 10-county statutory district. A state wide version of “Major Rivers” was developed and is currently in use in approximately 60-75% of elementary schools throughout Texas.

Colorado River Watch Network is an award winning environmental education and data collection program using student and citizen volunteers to monitor water quality in the Colorado River throughout Central Texas. The Network has grown from a handful of students in 1988 to an estimated 500 participants and 60 active sites throughout the Colorado River basin. The goals of the program are to 1) promote “hands-on” education about water quality and the environment to students and citizens; 2) to complement and assist the LCRA with its professional water quality monitoring efforts; 3) to promote water quality protection; and 4) to promote environmental stewardship through community outreach. To increase communication within the network, the LCRA sponsors training workshops, picnics and student symposiums.

LCRA Regulatory Programs

As part of its water quality protection effort, LCRA, through its enabling legislation, has the authority to adopt and implement ordinances and/or rules protecting the surface and ground water in the 10-county statutory district. Even though LCRA prefers to protect water quality through public education and awareness, LCRA recognizes that sometimes that is not enough. As a result, LCRA has adopted rules and ordinances to protect and enhance water quality. Some of those initiatives are:

Lake Travis Nonpoint Source Pollution Control Ordinance and the Upper Highland Lakes Nonpoint Source Pollution Control Ordinance. LCRA is the first river authority in Texas to adopt ordinances to regulate nonpoint source pollution generated by new development. The two ordinances are implemented in the Travis County, and Burnet and Llano Counties respectively. The innovative ordinances target a percentage of three indicator pollutants (total suspended solids, total phosphorus, and oil and grease) for removal through one or more “best management practices.” LCRA has compiled a Technical Manual to assist the land owner/developer to achieve the required removal levels for a proposed development.

Litter and Illegal Dumping Ordinance. The ordinance was adopted in November 1992 and applies to the entire 10-county area. It prohibits any dumping that causes or threatens to cause

pollution in the Colorado River or its three main tributaries (the Llano, the San Saba, and the Pedernales Rivers) and the Highland Lakes. It establishes a water quality zone on the banks of the river and the shoreline of the Highland Lakes. Within that water quality zone, dumping or the presence of existing dumps is illegal.

On-site Wastewater Facilities Program. This program, initiated in 1971, regulates the installation and operation of on-site sewage disposal systems within a 2,200-foot water quality zone around the Highland Lakes. The program provides plan review and inspections for new construction and repairs of old systems. LCRA also requires a thorough inspection during the sale of residential and commercial properties to ensure the system is working properly.

LCRA Pollution Prevention Programs

Household Hazardous Waste Collection events are held within the LCRA district in cooperation with the TNRCC, disposal companies, and counties. These collection events target rural counties. LCRA has had a tremendous response from citizens where these events are held. This program has also initiated an intensive public education campaign targeting elementary school children. Characters like Baron Waste and Steely Can and his Recyclin' Band entertain and teach children about the effects of household hazardous wastes on the environment through a workbook. The workbook has been distributed to all elementary schools in the 10-county district.

Used Oil Recycling Program is a cooperative effort with the TNRCC to set up used oil collection centers in rural areas and participating marinas, help supplement equipment needs at existing facilities, and raise public awareness of proper disposal techniques. This program is designed to make used oil recycling easy for everyone in the participating counties and cities, particularly rural residents. Facilities in 12 counties include 29 sites currently in operation.

Pollution Complaint Hotline. LCRA maintains a 1-800 pollution complaint hotline where citizens can call 24 hours a day and register a complaint or report suspected pollution problems anywhere within the 10-county statutory district or service area. If LCRA does not have jurisdiction over the area where the complaint or report has been logged, LCRA contacts and coordinates with the appropriate, responsible state agency, primarily the TNRCC.

LCRA Agricultural Programs

Creekside Conservation Program began in 1990 and is designed to coordinate with landowners and soil conservation professionals to prevent soil erosion on farm and ranch land in the Colorado River watershed. The primary objective of the program is to prevent soil erosion from occurring. In doing so, several steps have been taken to identify which sub-watersheds have the greatest potential for soil erosion. With that information in hand, demonstration projects have been implemented in Llano, Blanco and San Saba counties. The demonstration projects are successful in that they have shown participants that revegetation with native grasses and recontouring the land has virtually eliminated the erosion problems on the properties.

Texas Country Clean-ups is a cooperative effort whereby the LCRA assists the TNRCC in collecting empty pesticide containers, used oil, used oil filters and tires for recycling. Collection sites are targeted throughout the Colorado River basin, primarily in rural, farming/ranching communities. This program enables farmers and ranchers to properly dispose of their pesticide and herbicide containers that would not be allowed in a municipal landfill without threat to the environment.

Agricultural Amnesty Day is a cooperative effort with the TNRCC in setting aside a day for farmers and ranchers to bring to a central collection point all chemicals, primarily unwanted pesticides which may be laying around in storage on farms and ranches. This may include

chemicals which have been banned by federal law. Agricultural Amnesty Day allows the farmer/rancher to bring in the chemicals without fear of penalty and have them disposed of properly.

Nonpoint Source Pollution Technical Studies

Lake Travis/Sandy Creek Nonpoint Source Pollution Study. A cooperative effort between the LCRA and the US Geological Survey quantifying the effects of nonpoint source pollution from various land uses and developments on the water quality and biological productivity of a multi-purpose reservoir, Lake Travis. The Sandy Creek arm of Lake Travis was chosen because its land use patterns are representative of the Lake Travis watershed, its hydrodynamic characteristics are typical of the larger reservoir, and its smaller size allows more rapid and measurable response to nonpoint source pollutant loadings. The results of this study could be applied to water bodies with similar characteristics nationwide.

Innovative Best Management Practice Study. LCRA in cooperation with Travis County has installed an innovative best management practice at McGreggor Park located on Lake Travis. The innovative BMP is being used to filter stormwater runoff from the park's five-acre parking lot. Typical runoff from parking lots carry sediment, oil and grease, heavy metals and nutrients. The BMP at McGreggor Park is a peat sand filter. Stormwater is carried through the peat/sand which filters out the sediment. Pollutants attached to the sediment are retained in the sand. Mixed with the sand is a special type of peat moss. The carbon in the peat behaves similarly to activated carbon in a typical water filter. The peat removes pollutants that are dissolved in the runoff. Finally, grasses planted in the peat/sand mixture remove the nutrients retained in the filter much in the way a lawn uses fertilizer. Monitoring of this BMP will begin in late summer to allow for the native grasses to become established.

Highway 620 Wetland BMP. A cooperative effort between the LCRA and the Texas Department of Transportation (TxDOT) which will provide data from the treatment and analysis of a wet-pond/aquatic eco-system BMP. TxDOT has constructed a four-lane bridge over Lake Austin on RR 620, diverting traffic from Mansfield Dam. A detention/retention pond has been constructed where runoff from the bridge is diverted during rains. The pond is designed to hold the rainfall runoff for an extended period to allow filtration before it seeps into the groundwater and eventually Lake Austin. Monitoring stations will provide information on pollutants going into the pond, what is filtered in the wet-pond and what levels of pollutants come out of the wet-pond before entering Lake Austin. The pond also serves as a feasibility model for ponding stormwater treatment systems in semi-arid environments.

Upper Colorado River Authority (UCRA)

The UCRA is working on implementation projects with the aid of CWA 319(h) funds and TxDOT Enhancement funds. They are also working in partnership with the City of San Angelo on development of a Master Plan identifying structural and non-structural controls. The Master Plan provides a ranked listing of control measures appropriate for implementation.

Upper Neches River Municipal Water Authority (UNRMWA)

The Upper Neches River Municipal Water Authority Enabling Legislation empowers the Authority to preserve and protect water of the Neches River Basin in Smith, Henderson, Anderson, and Cherokee Counties for beneficial uses, i.e., water supply, industrial development, fish and wildlife propagation and irrigation. The Authority utilizes educational, training, and

technical assistance available through regulatory agencies, professional associations, and financial institutions.

The Authority currently performs baseline water quality monitoring at sampling points in its reservoir (Lake Palestine), all tributary streams, and Neches River downstream 20 miles. Monitoring includes measurement for physical and bacteriological quality.

The Authority has accepted delegation as Designated Representative for administering a water quality order (OSSF) program on marginal lands to Lake Palestine. Inspectors use this activity as an opportunity to perform reconnaissance of the watershed for nonpoint pollutants.

The Authority uses Penal Resolutions, the Texas Health and Safety Code, and the Texas Water Code as appropriate enforcement tools for violators when alternative methods fail.

The Authority will be moving toward a more formal and more comprehensive Watershed Protection Program. It is envisioned that program will include strategic water quality monitoring, and collaboration with municipal and county governments and major industry in the Neches River Watershed. The program will also include collaboration with agricultural and silvicultural activities in watershed.

Activities will be expanded to include the Neches River Basin in Smith, Henderson, Anderson, and Cherokee Counties. This program is scheduled for funding in the 1997-98 fiscal year.

Programs are funded by member cities and customer entities and operating income from service fees. Monitoring of the River Basin for the Clean Rivers Program is contracted to another agency. No known federal funding sources are available.

Cities

City of Austin

The city of Austin conducts several programs for nonpoint source management.

Storm Sewer Discharge Pollution Prevention (Community and Business Education/Permits)

Component 1 - Inspections & Permitting

Inspections and permitting of specific commercial and industrial businesses within the City of Austin limits are conducted to ensure compliance with City Codes which protect water quality. Inspectors locate, verify and monitor plumbing connections to the City storm sewer system and receiving waterways to prevent illegal discharges of commercial and industrial wastes. Examples of regulated businesses and typical waste products include:

- ! Readymix Concrete Companies - gravel, sand, concrete dispersing agents, concrete hardening compounds.
- ! Chemical Manufacturing and Storage - could include any type of chemical
- ! Auto Salvage - waste oil, used batteries, fuels, antifreeze, scrap metal and used parts, oil filters
- ! Commercial Cleaners (auto detailers, carpet cleaners, mobile pressure washers) - cleaning agents, oil and grease, sediment dirt and residue

Inspectors make sure the discharges meet City, State and Federal discharge standards for protection of water quality and related natural resources.

Component 2 - Technical Assistance and Outreach Program

Staff provide technical assistance and guidance to other City departments for pollution problems found during inspections of City operations. A significant amount of time is spent in this area because the majority of City departments do not have staff expertise regarding waste disposal, BMP's, and site pollution assessments. They rely heavily on the Environmental and Conservation Services Department (ECSD) to guide them through the regulations. Some recent examples of staff activity include:

- ! review of the new Bergstrom Airport construction plans for permissible operations and guidance on BMP's for tenants on operations such as airport de-icing and aircraft washing
- ! review of Solid Waste Services operations at Bergstrom and guidance regarding compliance with City Code
- ! periodic site inspection upon request of the Real Estate Division of Public Works in preparation for property transfer.

Community education is a vital part of this program. Educational materials are developed and provided to operators of industrial and commercial businesses to guide them in their daily operations towards protection of the environment and often public health and safety as well. In addition, program staff give frequent presentations to community groups, business organizations, and business' staff.

Component 3 - East Austin Initiative

One staff member contributes efforts to the East Austin Environmental Initiative which originated as a council directive and began in the fall of 1993. The goal of the initiative is to improve the quality of life and the environment in the eastern portion of Austin. East Austin commercial and industrial operations are targeted for inspection to ensure compliance with City, State and Federal environmental regulations. Community education efforts are concentrated in East Austin to educate both neighborhoods and businesses. The initiative team serves as a central point of contact for citizens to voice their concerns and obtain information related to business activities in their area. Environmental issues that have been brought to the forefront by the increase in environmental activism and awareness in the eastern region of the City include the former East Austin tank farms, the lead contamination/human exposure allegations from radiator repair shops in the area, and the Holly Power Plant. East Austin Environmental Initiative is also a component in the Emergency Spills and Complaint Response and Water Quality Assessment Programs.

Emergency Spills and Pollution Complaint Response

Component 1 - Response

Program investigators respond to hazardous and non-hazardous material spills as well as citizen pollution complaints within the City of Austin limits, the five-mile extra-territorial jurisdiction, and within the City's water supply watersheds. The investigators typically receive calls through The ECSD 24-Hour Environmental Hotline and can respond 24 hours a day, seven days a week by rotating the on-call duty. Spill calls require rapid response due to the high probability that they will adversely affect public health, safety, or the environment. Emergency spill calls are also referred to ECSD investigators by the Austin Fire Department (AFD) or the

Water and Wastewater Department (W/WW) Dispatchers. AFD arrives to secure the spill scene for protection of public health and safety. ECSD investigators are dispatched to the scene and advise on how to clean the spill to least impact the environment; assess the area for potential environmental impact; determine the responsible party to ensure proper clean-up; and, guide the responsible party in disposing of the waste material. Legal action is taken against violators, such as repeat offenders and those who intentionally disregard environmental laws.

Component 2 - Technical Assistance and Outreach

Program staff provide technical assistance and guidance to other City Departments during spills and subsequent remediations that occur on City Department properties. A significant amount of time is spent in this area because the majority of City Departments do not have staff expertise regarding remediation protocol, waste disposal, BMPs, and site assessments. They rely heavily on ECSD to walk them through the regulations. Recent examples include:

- ! instructing the Parks and Recreation Department (PARD) regarding remediation of petroleum contaminated soil found at the Zilker Park Train tunnel.
- ! instructing Public Works regarding remediation of petroleum contaminated soil on private property alleged to have come from City workers/trucks during an on-going nearby CIP project.

Staff also provide technical assistance to the community as a whole on issues of concern which may affect large segments of the population or large areas of Austin. Some recent examples include:

- ! working with the Texas Department of Transportation, the TNRCC, the U.S. Fish and Wildlife and private citizens to develop solutions to pollution problems created by construction of the US Highway 290 expansion.
- ! reporting to Council on environmental, public safety, and regulatory issues concerning the proposed change in use of a petroleum pipeline in South Austin.

Community education plays a major role in helping prevent pollution. Educational materials are developed and provided to operators of industrial and commercial businesses which guide them in their daily operations towards protection of the environment. Examples include:

- ! Environmental Hotline refrigerator magnets and brochures with the 24-Hour Environmental Hotline phone number on it for the public to call in the event of an environmental emergency
- ! a guide explaining common water quality pollutants and their sources
- ! posters explaining proper ways to handle, store and dispose of wastes
- ! lists of service companies that dispose of particular kinds of wastes
- ! lists of waste oil and other recyclable materials drop-off stations for citizens to dispose of them free of charge

Federal Water Quality Permit Compliance Program

Federal Water Quality Permit Compliance Program was established to administer the city's activities which assure compliance with EPA's Municipal Stormwater National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES permit is a Federal Clean Water Act requirement for cities with populations of 100,000 or greater. The Clean Water Act established two basic requirements for these permits:

- ! Effectively prohibit non-stormwater discharges into the municipal separate storm sewer system
- ! Require controls to reduce the discharge of pollutants in stormwater to the maximum extent practicable (MEP)

The municipal separate storm sewer system is the network of pipes, channels, streets, and other structures that convey stormwater runoff to streams, lakes, and rivers. Studies conducted by the EPA and, locally, by the City of Austin and other entities, have documented the significant impact that stormwater runoff can have on water quality. For example, the EPA has estimated that stormwater represents 33% of the source of impairment of rivers and 44% for lakes in this country. The stormwater NPDES regulations were developed in response to these findings. Locally, stormwater is the primary source of pollution in Austin's creeks, lakes, and rivers and the City has been proactive in attempting to prevent and control stormwater problems. Many of the programs the City has instituted on its own serve to meet NPDES permit requirements.

The prohibition against non-stormwater discharges addresses the concern that toxic pollutants may enter streams and lakes as a result of illegal dumping or illicit connections that drain waste waters to the storm sewer system instead of the sanitary sewer system, a common problem in older commercial and industrial areas. The MEP standard is a treatment standard somewhat analogous to standards applied to wastewater treatment plant discharges.

The permit will be issued after completion of a two-part application sequence. These applications provide an assessment of what pollution problems exist or are anticipated and propose possible solutions to solve these problems. Upon satisfactory review and approval of the applications, the EPA Region VI office will issue Austin's permit. The City is currently negotiating final permit conditions with the Region VI office. It is anticipated that the permit will be issued by the 2nd quarter of FY 95-96 with renewal anticipated every five years thereafter.

The permit will require the City to:

- ! Demonstrate adequate legal authority to control stormwater discharges, prohibit non-stormwater discharges, and conduct monitoring and inspections required under the permit (ordinances, legal agreements, contracts)
- ! Conduct wet and dry weather monitoring to locate pollutant sources, quantify pollutant levels, and evaluate the effectiveness of controls
- ! Implement programs to control runoff pollution from residential and commercial development (compliance inspection for development ordinances, master planning, training, public education and IPM activities)
- ! Implement programs to detect and remove non-stormwater discharges (ordinance prohibiting non-stormwater discharges, dry weather screening, spill response activities)
- ! Implement programs to monitor and control industrial discharges (regulatory compliance, inspection and monitoring activities)

- ! Implement programs to control construction site runoff (regulatory compliance and inspection activities, educational and training activities)
- ! Submit annual reports describing the status of programs and activities implemented under the permit and proposing any changes to permit conditions

The permit coverage area will be the Austin City limits. The NPDES permit program will apply not only to all activities subject to City of Austin programs and regulations but also to any publicly owned or operated storm sewer system located within the permit area, e.g., the Texas Department of Transportation, the University of Texas, the State of Texas, Capital Metro, Travis County, etc. At present only the University of Texas is applying for coverage as a co-permittee with the City of Austin.

Section 402(p) of the federal Clean Water Act, as amended in 1987, requires certain industrial activities and cities with populations of 100,000 or greater to secure coverage under the NPDES permit program. The final NPDES rule was published on November 16, 1990 in the Code of Federal Register (40 CFR Parts 122, 123, and 124).

Water Quality Assessments for Creeks, Town Lake, and Edwards Aquifer

The goal of ECSD's water quality assessment program is to obtain information about the state of Austin's creeks, Town Lake, and the Edwards Aquifer and use this information to focus the city's efforts toward protection and restoration of these water resources. The assessments performed under this program are designed to diagnose the water quality conditions, identify pollution sources, recommend solutions to pollution problems, and track effectiveness of water quality protection efforts. Individual components to the assessment program are as follows:

- ! Town Lake Assessment
- ! Edwards Aquifer, Barton Springs, and Other Groundwater Assessments
- ! Creek Assessments and City-Wide Master Plan Needs Assessment
- ! Citizen Monitoring
- ! East Austin Initiative Assessment
- ! US Geological Survey (USGS) Cooperative Monitoring
- ! Salamander Inventory and Associated Biological Monitoring
- ! Council Requested Studies

The objectives, description, and history of the program components are discussed below.

Component 1 - Town Lake Assessment

Assessment of Town Lake by ECSD has the following objectives:

- ! Characterize the current health of the lake and suitability as a source of drinking water.
- ! Sample sufficiently over time to determine if City efforts are maintaining or improving water quality.
- ! Sample sufficiently over time to use a predictive water quantity and quality model to focus water quality control efforts.
- ! Model various watershed development paths and BMPs to determine the most cost effective method of reducing algae blooms.

- ! Sample sediment and fish tissue sufficiently to determine if fish can be safely consumed.
- ! Monitor effectiveness of Town Lake litter abatement programs.

Water quality samples are collected from Town Lake and data are used to determine seasonal and long-range trends in water quality. The data are also used to understand the environmental conditions responsible for algae blooms in Town Lake which affect taste and odor of drinking water and increase the cost to the city of water treatment (coagulant chemical usage and activated carbon regeneration). The sampling is also used to model Town Lake responses to development and water quality protection programs. Sediment sampling and data analysis is conducted every three years to measure contaminants in the sediment, particularly heavy metals and organic pesticides. Fish tissue is also collected and analyzed triennially in joint efforts with LCRA to determine whether pesticide contamination of Town Lake fish is still at levels which warrant the current ban on consumption of Town Lake fish. A survey of the topography of the bottom of Town Lake has also been conducted to determine Town Lake sedimentation rates. Accumulation of sediments may degrade Town Lake for aquatic life, recreational, and power plant cooling water purposes and could result in the need expensive dredging operations to remediate the damage.

As part of the performance measures for the Town Lake assessment program, the Visual Index of Pollution (VIP) was established in order to document the amount of floating trash in Town Lake. The VIP is a photometric index which uses photos taken quarterly at the same 70 sites to assess changes in trash accumulation over time. An increase or decrease in the amount of trash in Town Lake will indicate the usefulness of several methods of trash abatement currently used by the City, such as trash booms, inlet filters, and public education. A ten percent reduction in the amount of trash in Town Lake per year is the goal established for these trash abatement programs.

In order to better understand the flow of water through Town Lake and the impacts of different factors on its water quality, ECSD is applying an EPA computer model to the water flow and water quality in Town Lake. This model will help ECSD better predict the impacts of different City strategies to improve water quality in the lake.

The initial Town Lake monitoring was funded by the City of Austin, and performed by the USGS in 1975. Additional City monitoring was initiated in 1991. Results of both monitoring programs have been documented in several critical reports on Town Lake. All of these studies draw upon the Town Lake assessment program data as a basis for analysis, decision-making, policy recommendations, and retrofit alternatives. An update to these studies is currently under development by ECSD staff.

Component 2 - Edwards Aquifer, Barton Springs, and Other Groundwater Assessments

Sampling of Barton Springs and other springs is conducted to:

- ! Identify and quantify the impact of urbanization on ground water quality and quantity for both base flow and storm flow to determine the best way to minimize impacts through ordinance requirements
- ! Identify the minimum-cost monitoring which can be used to show the extent of aquifer pollution and determine if programs under City jurisdiction can reduce it
- ! Identify the effects of local wastewater disposal systems on ground water quality to determine the best way to minimize the effects through ordinance revision.

- ! Quantify the watershed influences on Barton Springs flow and water quality to find the best way to control them
- ! Apply a model of groundwater flow and quality to the Edwards Aquifer in order to determine the most cost effective methods for protection of groundwater drinking water supplies and the recreational resource of Barton Springs.

In order to better understand and predict the flow and quality of Austin's groundwater, ECSD along with the University of Texas and the Center for Research and Water Resources is developing a computer model to simulate the quantity and quality of the aquifer, springs and other forms of groundwater. This project will result in a tool for predicting ground water quality impacts of various development scenarios.

Office of Environmental Resource Management (predecessor to ECSD) in the City of Austin Planning Department began monitoring Barton Springs in August 1981 in cooperation with the USGS. The initial program consisted of weekly sampling of Barton Springs and periodic sampling of five wells in the Austin area to monitor trends in physical, chemical, and bacteriological properties of the water. Beginning in 1985, the well sampling program was expanded to include more wells and sampling following large rain events (recharge events). The USGS Cooperative program initiated groundwater assessment funded by the City of Austin in FY 1985-86. Upon creation of the Department of Environmental Protection, more coordinated groundwater assessments were initiated by City staff. In 1991, ECSD began the present monitoring program with the associated assessments of springs and water wells. The model development for the Edwards Aquifer was initiated through an interlocal agreement with the CRWR in 1994.

Currently, the Austin Travis County Health Department, with assistance from Parks and Recreation Department, samples Barton Springs twice weekly and following rains of greater than 1 inch for coliform and streptococcus bacteria. This sampling is not duplicated by ECSD quarterly sampling for a more extensive suite of parameters or USGS/COA yearly sampling for a comprehensive suite of water chemical parameters.

Component 3 - Creek Assessments and City-Wide Masterplan Needs Assessment

The objectives of the creek assessment program are as follows:

- ! Characterize the current conditions in each of Austin's creek watersheds
- ! Prioritize the creek watersheds by current water quantity and quality conditions
- ! Obtain information necessary to predict future conditions in the creeks

The creek assessment program is designed to provide an unbiased method to prioritize watersheds for building water quality controls through the city-wide master plan. The Masterplan prioritization is based on current conditions, future conditions, and the available options for making improvements. An Environmental Integrity Index was developed to assess current conditions in each watershed. The index rates creeks regarding recreational, biological, water quality, stream erosion, and aesthetic indicators which can be measured in the field. Biological protocols have been developed which are meaningful tools in assessing the health of Austin's creeks. In 1994, ECSD began development of an Environmental Integrity Index which will provide a single, publicly accessible statistic for gauging the health of Austin's creeks.

Component 4 - Citizen Monitoring

The objectives of the Citizen Monitoring program are to:

- ! Educate the public concerning their influence on water quality in the Austin area.
- ! Provide supplemental data on the water quality of selected critical water bodies.
- ! Provide a method for youth and young adults to learn water quality monitoring techniques and become stakeholders in the City efforts toward water quality protection.

The two citizen monitoring programs currently funded in part by ECSD are the Water Watchdogs and the Austin Youth at Risk River Watch Program. The Water Resources Evaluation section (WRE) has organized citizen volunteers, the Water Watchdogs water quality monitors, to supplement WRE's regular data gathering efforts and to help increase the public awareness about fundamentals of water quality. Each semester dozens of volunteers are trained by WRE staff and supervised during their water quality monitoring field and lab work. These volunteers are from local colleges including St. Edwards, UT, Huston-Tillotson, Concordia Lutheran, and three campuses of Austin Community College. Several localized water quality problems have been discovered by trained citizen monitors, both during official monitoring events, and by the monitors on their own. ECSD also provides funding for junior and senior high school students identified as academically at risk. The program improves the science and math skills of academically "at risk" students by linking them with academically successful student mentors and training them in water quality issues and monitoring techniques.

Component 5 - East Austin Initiative Monitoring

The objective of this program component is to determine the relative level of storm water pollution in the East Austin watersheds. ECSD is currently measuring the quality of storm water discharges from four sites of different land-use types and development conditions in East Austin. Data will be used to determine what types of water quality controls will be most effective in the area.

Component 6 - US Geological Survey (USGS) Cooperative Monitoring

The objective of the USGS cooperative monitoring program is to obtain data to assess the quality of baseflow and storm flow from a number of Austin creeks in the most cost-effective manner by joint funding with USGS. The data will be used to run storm water, baseflow, and aquifer models for flow and water quality which can then be used to make projections based on development scenarios and ordinance revisions. The data will also be used to track changes in water quality in the Austin area in response to the protection efforts of the City. Currently, the USGS monitors stormwater and baseflow at 14 permanent stations along various city creeks. Also, the USGS conducts a lake survey at eight sites along Lake Austin and Town Lake, and monitors ground water at 27 wells and springs.

Component 7 - Biological Monitoring and Associated Salamander Inventory

The objectives of biological monitoring and the salamander inventory include the following:

- ! Develop data in support of U.S. Fish and Wildlife Service (USFWS) efforts to protect endangered species as directed by City Council
- ! Protect and enhance salamander habitat in Barton Springs Pool

- ! Support captive breeding programs for population enhancement of the species
- ! Encourage public knowledge of the status of the salamander population and the efforts toward protection.

WRE biologists conduct monthly surveys of the size and range of Barton Springs salamander populations that have been jeopardized by nonpoint source pollution. Routine monitoring of the ecology and biota of the springs provides necessary information to track natural and artificial fluctuations in population distributions and ranges. Additionally, it provides a long-term tracking method to monitor the effectiveness of restoration efforts and non-toxic maintenance procedures. Staff have implemented revegetation projects in Barton Springs pool to improve water quality, stabilize sediments and increase salamander habitat.

A major chlorine event in September 1992 produced a significant fish kill in Barton Springs pool. Subsequently, ECSD biologists developed a cost effective method to routinely monitor salamander, plant and invertebrate populations in targeted springs. In April 1994, the City Council unanimously passed a resolution supporting USFWS in their proposed listing of the Barton Springs salamander as an endangered species. A Barton Springs salamander action plan and a habitat management plan for Barton Springs Pool were developed. Salamander specimens have been transferred to the Dallas aquarium for their captive breeding program. The City and the Texas Parks and Wildlife Department have collaborated in assembling an Aquatic Biological Advisory Team of national experts to assist the City in developing protective measures for the salamander.

Component 8 - Council Requested Studies or Activities

Objectives of Council directed studies are varied with the issue of concern which prompted the request for study. The following studies are examples of recent projects which were directed by council resolutions:

- ! Bull Creek Watershed Assessment and regional development study which included monitoring of springs, wells, and stream flow in the Bull Creek Watershed. Findings resulted in significant revisions to the Comprehensive Watersheds Ordinance.
- ! McKinney Falls Water Quality Assessment which included investigation of the water quality in the swimming area to determine if it could be re-opened. The Falls have subsequently been reopened for swimming.
- ! Barton Creek Watershed Study which includes a monitoring program for pools in the creek to assess the impact of on-site wastewater systems and land use on creek water quality.
- ! 1995 Baseflow and Water Quality Assessment for Blunn Creek which included a survey of the creek, modeling to predict changes in flow due to development, and estimates of pollutant loadings to the creek.
- ! The 1994 Hazardous Materials Water Contamination Risk Study in conjunction with the SOS ordinance to quantify this threat to Austin's waters.
- ! Lawsuits filed against the City challenging Austin's environmental protection ordinances have required ECSD staff to provide technical support to legal and frequently provide expert witness testimony during trials.

Water Quality Planning and Control Implementation

Nationwide, there is growing recognition that protecting our creeks, rivers and lakes from pollution requires a wide array of protection strategies, artfully and efficiently applied. Because non-point source pollution results from so many different sources and comes in so many different forms (nutrients, toxics, sediment, etc.), solutions must be developed which specifically target local problems as well as the source of these pollutants. Although prevention of pollution through source control is known to be a cost-effective strategy in general, some types of pollution cannot be prevented and must be controlled via pollutant capture and treatment. For example, the pollutants generated by automobiles generally cannot be prevented and must be captured and removed from stormwater before it is released into waterways. ECSD's Water Quality Planning and Control Implementation Program has adopted a Masterplanning process to develop and implement pollutant control strategies. The planning, mapping, engineering, construction and education functions which comprise the program are described below.

Component 1 - Watershed Masterplanning

A masterplanning approach was developed by ECSD as a process to:

- ! Assess water quality condition in individual watersheds
- ! Receive input from watershed residents regarding water quality concerns and priorities
- ! Inventory potential sites to construct water quality control structures
- ! Evaluate the potential for water quality improvement from structural controls as well as nonstructural pollution prevention programs
- ! Develop watershed protection plans with information from the above
- ! Prioritize schedule and implement selected projects and programs from watershed protection plans
- ! Monitor and document the effectiveness of protection plans.

Water quality masterplans have been completed for three urban and one non-urban watershed and selected projects from the masterplans are in the design stage. A comprehensive masterplanning process is now underway which will incorporate water quality, erosion control, and flood control initiatives into one Drainage Utility masterplanning process.

Component 2 - Geographic Information System

The city uses GIS to expand the water quality program's ability to visually communicate and share data with other City departments and the community. A Geographic Information System linked to databases is being developed to provide information and technical support for masterplan development.

Component 3 - Structural Controls

Implementation of structural water quality control facilities is a program component established in the 1992 Drainage Utility Business Plan to meet desired pollutant reduction goals. These control structures may consist of engineered and constructed filters, chambers, basins or ponds which are designed to treat stormwater runoff by settling, filtration, floatation, absorption and/or biological processes. Such structures are required by ordinance in newly developing watersheds. In previously developed areas, flood control structures may be adapted to provide water quality treatment of polluted runoff, or physical limitations may require more innovative

retrofits such as inlet filter devices or treatment chambers below ground. If developers select to pay into the Urban Watershed Structural Control Fund rather than providing on-site treatment, accumulated fees may be used to construct regional treatment ponds.

Component 4 - Pollution Prevention Education

Community Education - The public education component seeks to prevent pollution by informing the public and private sector on issues related to water quality and nonpoint source pollution. Efforts focus on reducing pollution due to lawn maintenance, household and automotive toxics dumping, and littering. Various methods are used to communicate with the public including radio, television, billboards, print media, and neighborhood workshops. Aspects of this program have won both local and national awards.

Earth Camp - Outreach to Austin's youth is an integral part of the public education component. ECSD sponsors a yearly week-long day camp for Austin's youth. Earth Camp offers environmental education to over 600 targeted elementary school youth in a hands-on outdoor setting. Children are taught basic environmental skills on topics such as recycling and pollution prevention with the hope of fostering a life-long environmental awareness.

Integrated Pest Management (IPM) - Integrated pest management is a process that can reduce the use of toxic pesticides, herbicides, and fungicides. In Austin, pesticides are routinely detected in fish and sediment samples taken from Town Lake and its contributing creeks. There has been a ban on fish consumption in Town Lake since 1990 due to unsafe levels of pesticides in fish. IPM activities are focused on the development of an Integrated Pest Management program for the City, outreach programs for primary pesticide and lawn chemical user groups. The IPM coordinator is also responsible for reviewing and approving IPM plans submitted by developers as required by city ordinance or restrictive covenant.

Component 5 - Pollution Control Effectiveness Monitoring

In order to determine the effectiveness of water quality control methods, selected control methods are monitored and evaluated for their design adequacy and pollution reduction efficiency. The efficiency with which a control method removes pollutants is compared with construction and maintenance costs to determine the most cost-effective controls. This evaluation will allow selection of the best control method based on pollutants of concern, opportunity limitations and available funding. Water quality control methods currently being monitored include wet ponds, sand filtration ponds, sedimentation/filtration ponds, bioactivated filtration ponds, inlet filtration devices and oil grit separators. The results of the monitoring efforts are essential to city-wide watershed action plans and the Drainage Utility masterplan.

Environmental Impact Assessments

The function of ECSD's Environmental Impact Assessment program is to review the consequences of public and private infrastructure and development projects as well as State, City, and local regulations, policies, or actions potentially affecting City of Austin water quality. These reviews attempt to quantify the potential environmental impact of the proposed project, plan, or policy and recommend changes to reduce or mitigate its impact. Individual components to the assessment program are as follows:

- ! Austin Transportation Study Review
- ! Capital Improvement Project Review
- ! Water Pollution Abatement Plan Review

- ! Permit Application Review Committee
- ! Intergovernmental Review and Coordination

Brief objectives of the program components are discussed below.

Component 1 - Austin Transportation Study Review

The objective of this program component is to review the transportation recommendations of the ATS and rate their potential impact to the City of Austin's water resources. Recently, the ATS work was revised into the Austin Metropolitan Area Transportation Plan (AMATP), a long-range transportation plan required by federal law that looks to the year 2020. The AMATP incorporates the Intermodal Surface Transportation Efficiency Act (ISTEA), signed into federal law in 1991. ISTEA focuses priority on overall mobility, environmental and community goals rather than on capital investment. ECSD staff rate the environmental sensitivity of each roadway segment by addressing potential impacts to geologic features, biological resources, water quality, historic/archeological resources, noise, and potential land use effects.

Component 2 - Capital Improvement Project Review

The objective of this program component is to review the CIP plans of the City of Austin for potential environmental impact and make recommendations on mitigation measures as appropriate.

When a CIP project is in the design phase, notice of its status is sent with an Environmental Data Sheet from the CIP project manager to ECSD. Staff conduct a limited assessment of the project from information supplied with the Data Sheet and any design reports or plans available from the project manager. Written comments are supplied which determine whether a complete Environmental Assessment is required by ordinance or a limited assessment is recommended to mitigate potential environmental impacts to sensitive areas such as wetlands or recharge features. The City of Austin Land Development Code Section 13-7-28 (Rev. January 1992) requires a formal Environmental Assessment for all developments located partially or wholly within Water Supply Suburban and Water Supply Rural watersheds.

Component 3 - Water Pollution Abatement Plan (WPAP) Review

The objective of this program component is to protect the interests of the City of Austin by providing technical review of WPAPs and Applications for Sewerage Collection Systems (SCS) in the Austin area required by the Edwards Aquifer Rules 30 TAC 313.21 promulgated by the TNRCC.

ECSD staff review the plans for consistency with COA rules for protection of Critical Environmental features associated with karst geology, specifically recharge features such as caves and sinkholes. Staff checks the mitigation efforts presented in the plan in order to determine if they are technically adequate. The Edwards Aquifer Rules initially did not apply to Travis County. Additional rules, promulgated to be effective in October 1990, included Travis County portions of the Edwards Aquifer.

Component 4 - Permit Application Review Committee

The objective of this program component is to reduce water quality impacts to the city's drinking water supply resulting from TNRCC permitted disposal of wastewater effluent via direct discharge to streams/rivers, irrigation, or subsurface disposal.

PARC is an interdepartmental committee comprised of members from several City departments. The committee is coordinated through ECSD who coordinates City efforts to negotiate permit conditions with TNRCC and applicants.

Component 5 - Intergovernmental Review and Coordination

This program component is designed to review state and federal regulations and planning documents which may impact the environment of the City of Austin. This program requires that ECSD staff respond to requests for comment on proposed regulations and planning documents submitted to the City by the TNRCC, TxDOT, LCRA, EPA, or other regulatory bodies with overlapping jurisdiction. Recent examples include:

- ! Review and comment on LCRA's water quality ordinance for Lake Travis
- ! Review and contest LCRA's proposed changes to instream flow policy of water releases to the Austin area from upstream reservoirs
- ! Review and comment on triennial State Surface Water Quality Standards
- ! Review and comment on proposed or existing special protective regulations such as Outstanding Natural Resource Water designation for Barton Creek and the Edwards Aquifer Rules revisions proposed by TNRCC.

In addition, the City coordinates the Joint Water Quality Database which includes water quality monitoring data from several governmental entities including TNRCC, USGS, LCRA, BSEACD, and the City of Austin. Data are also supplied to the State for the TNRCC Nonpoint Source Inventory.

City of Fort Worth

Fort Worth Water Department

The following NPS Programs are ongoing:

- ! Federal Clean Lakes program
- ! City reservoir management ordinance
- ! City watershed management ordinance
- ! City development ordinance

City of Houston

Water Quality Control Branch

The City of Houston has developed a proposed Watershed Management Plan for the Lake Houston watershed. This plan closely follows requirements for NPDES storm water controls proposed by EPA. Implementation of the elements of the plan are tied closely to requirements for plan approval for new development, as required by the Storm Water Engineering group.

City of Lubbock

The City of Lubbock carries out the following NPS programs:

- ! Industrial Waste Monitoring and Pretreatment Program
- ! Keep Lubbock Beautiful

- ! Water Environment Assoc. - South Plains Chapter
- ! Senate Bill 818 Program

Lubbock participates in numerous preventive programs to ensure that their activities do not create problems downstream. These include Waste Oil Collection, Household Hazardous Waste Collection, Annual Lake Clean-up, Wellhead Protection Program, UST Program, Texas Watch, Industrial Waste Monitoring Program, and City-wide Trash Clean-up.

City of San Angelo

The City of San Angelo has recently completed a comprehensive Drainage Masterplan which addresses water quality issues and prioritizes implementation projects to guide the City's future activities. Additionally, the City of San Angelo carries out the following NPS programs:

- ! Local ordinances for storm water regulation
- ! State and federal financial assistance for construction projects.
- ! Extension service & TNRCC training programs for public education

Water Control and Improvement Districts

Dallas County Water Control and Improvement District #6

The recharge of the Trinity aquifer is largely prevented by a slurry wall installed north of and adjacent to the Meadowlake residential area by a large wastewater plant. Potable drinking water used by the residents for washing and sanitary sewer needs is discharged to septic tanks and aids in the recharge of the aquifer.

Currently, pumped water used for sanitary sewer needs goes back to the septic tanks. The septic tank water flows into the aquifer which is pumped back to the domestic user. This continuous recirculation without recharge leads to the high levels of ground water contamination. Additionally, wastes from outdoor privies and unpermitted feed lots leach into the aquifer which is pumped into the contaminated recirculation flow. Plugging private wells is a BMP that will help protect the aquifer in this area. The eventual removal of septic tanks and construction of a sanitary sewer collection system will require long-range planning for this community.

Tarrant County Water Control and Improvement District #1

Tarrant County WCID #1 has ongoing activities in these areas:

- ! Cooperative agreements with NRCS for cost-sharing of watershed management projects.
- ! Liaison with state, city and federal authorities to enforce their rules that protect lakes (i.e., illegal dumping, 404 dredging, stormwater discharges).
- ! Enforcement of our General Ordinance that regulates onboard toilet facilities, septic systems (waste control order), and illegal discharges to the lakes.

County Health Districts

Galveston County Health District, Pollution Control

Galveston County Health District assures integrity of storm sewer systems principally through monitoring and investigative activities.

- ! Mapping sanitary sewer overflows
- ! Public outreach to modify behaviors
- ! Drafting a model NPS Pollution Prevention Ordinance
- ! Sponsoring a household hazardous waste collection day
- ! Monitoring of impacted waters.

Soil and Water Conservation Districts

Soil & Water Conservation District Local Boards

Soil and Water Conservation District local boards carry out the following NPS programs:

- ! Technical assistance to agriculture producers through local Soil & Water Conservation Districts with USDA- NRCS.
- ! Senate Bill 503 Water Quality Management Planning

CHAPTER 7

BEST MANAGEMENT PRACTICES



Best Management Practices (BMPs) are those practices determined to be the most efficient, practical, and cost-effective measures identified to guide a particular activity or address a particular problem. There are numerous BMPs utilized in Texas to address nonpoint source pollution. This chapter shows urban and other non-agricultural BMPs used for land development, highways/ roads/bridges, urban surface runoff, petroleum activities, on-site wastewater systems, dredging, flow regulation, and spills. Agricultural BMPs described in this chapter include erosion and sediment control practices, management system practices, water supply practices, livestock access limitation, vegetative stabilization, scheduling, efficient water application, utilization of runoff and tailwater, drainage water management, and backflow prevention. Silvicultural BMPs include general forestry practices, timber harvesting practices, site preparation and forest regeneration, fire management, and wetlands protection.

The TNRCC Nonpoint Source Program solicited information from state, regional, and local agencies, and from the Texas branches of federal agencies, to compile the list of BMPs used in Texas to manage urban, non-agricultural, non-silvicultural NPS pollution. The third column under each urban BMP type, titled “User,” indicates which agencies said in the survey that they use the listed BMP. This information is included so that agencies interested in implementing new BMPs can readily identify other agencies that are successfully implementing the practices. Agencies not listed in the “User” column may also be implementing the practices shown.

Land Development BMPs

BMP	Description/Purpose	User
NPS Pollution Control Ordinances	Regulates nonpoint source pollution generated by new development.	LCRA, TNRCC Edwards Aquifer Protection Program
Technical Manual	Assists the land owner/developer to achieve the required removal levels of target pollutants for development.	LCRA, TNRCC Groundwater
Development Plans that protect water quality	Provide technical assistance to commercial developers/regional offices to enforce compliance with Chapter 313 rules.	TNRCC Groundwater
Creekside Conservation Erosion Program	Identifies subwatersheds with the greatest potential for erosion. Targets for the implementation of demonstration programs.	LCRA
Demonstration Projects	Eliminates erosion problems by revegetation and recontouring of properties identified as having erosion problems.	LCRA

BMP	Description/Purpose	User
Structural Controls of Known Effectiveness for Protection of Edwards Aquifer	Provide technical assistance on evaluated data from existing structural storm water control BMPs with quantifiable effectiveness.	TNRCC Groundwater
Nonpoint Source Pollution Studies	Quantifies the effects of NPS pollution from various land uses and developments on the water quality and biological productivity of a multipurpose reservoir. Results could be applied to water bodies with similar characteristics nationwide.	LCRA, TNRCC Groundwater
Enabling Legislation & Rules	Provides authority to preserve and protect water for its identified beneficial use, i.e., water supply, industrial development, fish and wildlife propagation and irrigation.	River Authorities, TNRCC
Technical Assistance	Provides technical assistance and guidance for pollution problems found during inspections of city operations.	City of Austin, TNRCC
Edwards Aquifer Protection WPAPs	Provide proper recharge feature identification and control measure specifications during WPAP review and approval. Provide follow-up investigations to assure compliance.	TNRCC - Field Operations, Edwards Aquifer Protection Program
Business Education	Provides guidance to operators of industrial and commercial businesses in their daily operations towards protection of the environment. Uses a handbook of BMPs, posters, handouts, training videos and a 24-hour Environmental Hotline.	City of Austin
Community Education	Maintains public awareness of environmental concerns and increases environmental activism. Frequent presentations are given to community groups, business organizations and business' staff. Seminars held to educate city department operators and private sector business employees. Program is promoted on television, radio talk shows, and in local newspaper.	City of Austin, TNRCC
Creek Assessment Program	Provides an unbiased method to prioritize watersheds for building water quality controls.	City of Austin
Watershed Protection Plan	Evaluates the potential for water quality improvement from structural controls and non-structural pollution prevention programs.	City of Austin
Geographic Information Systems	A computer-based system used to store and manipulate geographic information.	City of Austin, TNRCC

BMP	Description/Purpose	User
Capital Improvement Project Review	Reviews capital improvement plans for potential environmental impacts and makes recommendations on mitigation measures.	City of Austin
Internal Governmental Review and Coordination	Reviews state and federal regulations and planning documents which may impact the environment. Provides assistance to state and federal environmental agencies by responding to information and analysis requests.	City of Austin, TNRCC
Land Development Codes	Provides for a formal environmental assessment for all developments.	City of Austin
Land Use Planning	Reduces the pollutants in storm water runoff by using a comprehensive planning process to control or prevent certain land use activities in areas where water quality is sensitive to development. Applicable to all types of land use and represent one of the most effective pollution prevention practices.	City of Fort Worth, City of Austin
Recontouring	Provides erosion and flood control by changing the shape of the land.	LCRA
Water Pollution Abatement Plans	Plans to prevent stormwater pollution during and after construction for new development over the Edwards Aquifer	TNRCC Edwards Program

Highways, Roads, and Bridges BMPs

BMP	Description/Purpose	User
Litter and Illegal Dumping Ordinance	Prohibits dumping that causes or threatens to cause pollution to river or lakes. Establishes water quality zone on the banks of the river.	LCRA
Environmental Impact Assessments	Reviews the consequences of public and private infrastructure and development projects as well as state, city and local regulations, policies, or actions potentially affecting water quality.	City of Austin, TNRCC Groundwater
Transportation Study Review	Reviews transportation recommendations and rates their potential impacts to water resources.	City of Austin
Internal Governmental Review and Coordination	Reviews state and federal regulations and planning documents which may impact the environment and provides assistance to state and federal environmental agencies through responding to information and analysis requests.	City of Austin

BMP	Description/Purpose	User
Storm Water Pollution Prevention Plans (SW3P)	<p>Developed for any project where soil-disturbing activities will occur. Should describe and ensure the implementation of practices which will be used to reduce the pollutants in storm water associated with the construction site, to include:</p> <ul style="list-style-type: none"> ! a description of the nature of the construction activity and the intended sequence of major activities which disturb soils. ! a site map indicating drainage patterns, an outline of areas which are not to be disturbed, the location of major structural and nonstructural controls identified in the plan, the location of areas where stabilization practices are expected to occur, surface waters (including wetlands), and locations where storm water is discharged to a surface water. ! limits of construction and disturbed areas. ! stabilization practices. ! structural practices. ! other controls, such as waste disposal, hazardous and sanitary wastes, and off-site vehicle tracking of sediments. ! a description of the procedures to ensure the timely maintenance and inspection, of erosion and sediment control measures and other protective measures identified in the site plan. 	TxDOT
Project Sequencing and Phasing	<p>Items to consider when planning the sequence and phasing of highway construction operations:</p> <ul style="list-style-type: none"> ! Sustain a manageable area of construction activities, e.g., limiting the contractor to the area of erodible soil exposed at any given time. ! Complete and employ permanent structures, controls, and stabilized areas as soon as practical for use as erosion and sedimentation control measures for the remaining construction operations. For example, grade and revegetate ditches early on in the project so they can assist in reducing the effects of erosion from the site. ! Maintain the maximum amount of existing vegetation as practical to assist in the control and minimize the exposed erodible area. For example, do not clear or grub an area until work is necessary. 	TxDOT

BMP	Description/Purpose	User
Project Sequencing and Phasing (continued)	<ul style="list-style-type: none"> ! Limit the types of construction operations, including access and hauling, allowed in certain areas of the project that may be more susceptible to erosion. For example, do not allow unlimited vehicle crossing of streams: provide a temporary crossing at a single location and only when access is necessary rather than just a convenience. ! Plan and designate areas that are not to be disturbed at all, or even at which phase in the project the area is to be disturbed. This can include limiting the type of access or operation in a given area. 	
Stabilization Practices	<p>Preserving existing vegetation or revegetating disturbed soil as soon as possible during construction is one of the most important and cost effective erosion control measures. A vegetative cover reduces erosion potential by shielding the soil surface from the direct impact of the rainfall, improves soil's water storage capacity, slows the runoff allowing sediment to settle out, and holds the soil in place. Vegetative covers may consist of grass, trees, mulch, straw, or retention blankets. The following are BMP's to be considered for stabilization practices.</p> <ul style="list-style-type: none"> ! Existing vegetation should be preserved as much as practicable. Areas not to be disturbed should be indicated on SW3P plans. ! Disturbed areas will be minimized to the extent practicable by staging construction operations. ! As required by the General Permit, disturbed areas on which construction activity has ceased (temporarily or permanently) and which will be exposed for more than 21 days shall be stabilized within 14 days. Areas receiving less than 20 inches of annual rainfall should be stabilized as soon as practicable and only to pre-project conditions. 	TxDOT
Temporary Seeding	<p>Establish temporary vegetative cover</p> <p>Advantages:</p> <ul style="list-style-type: none"> ! Inexpensive and easy to perform ! Reduce number of other controls required and maintenance costs <p>Disadvantages:</p> <ul style="list-style-type: none"> ! Depends heavily on location, season and rainfall ! Requires protection from construction activities once seeded 	TxDOT

BMP	Description/Purpose	User
Mulching	<p>Used to increase infiltration, decrease runoff and protect soil surface from raindrops. Application rate very important. Can be used in conjunction with soil tackifiers or binders.</p> <p>Advantages:</p> <ul style="list-style-type: none"> ! Provides immediate and effective protection to soils ! Retains moisture which can reduce need for watering ! Inexpensive and easy to perform ! Requires no removal because of natural deterioration <p>Disadvantages:</p> <ul style="list-style-type: none"> ! May delay germination of some seeds because of the cover 	TxDOT
Vegetative Buffers	<p>Strip of dense vegetation used to prevent erosion and promote sedimentation of eroded material.</p> <p>Advantages:</p> <ul style="list-style-type: none"> ! Can be inexpensive, especially if created from existing vegetation ! Water quality, aesthetic, and habitat benefits <p>Disadvantages:</p> <ul style="list-style-type: none"> ! Not feasible if land is not available ! Requires plant growth before it is effective 	TxDOT
Blankets	<p>Retains soil until vegetation becomes established.</p> <p>Advantages:</p> <ul style="list-style-type: none"> ! Provides quick and effective protection until vegetation is established ! design methods available for channel liners ! Good protection to final graded slopes > 3:1 <p>Disadvantages:</p> <ul style="list-style-type: none"> ! If not properly selected, designed, or installed effectiveness is reduced ! Can be costly on some applications - e.g., temporary installations 	TxDOT
Preserving Natural Vegetation	<p>Provide natural buffer zones and limit disturbed area.</p> <p>Advantages:</p> <ul style="list-style-type: none"> ! Can handle higher quantities of runoff than seeded areas ! Increases filtering capacity due to denser root structure ! Water quality, aesthetic, and habitat benefits ! Natural areas do not warrant pollution control devices thereby reducing the cost of control measures <p>Disadvantages:</p> <ul style="list-style-type: none"> ! Requires substantial planning to protect areas 	TxDOT

BMP	Description/Purpose	User
Structural Control Practices	<p>The use of structural control measures during construction activities protects the quality of the receiving waters by preventing sediments from moving offsite, reducing the erosive forces of runoff, diverting storm runoff away from exposed areas, and conveying runoff. The following structural practices are recommended for construction sites:</p> <ul style="list-style-type: none"> ! Diversion, Interceptor and Perimeter Dikes, ! Interceptor and Perimeter Swales, ! Stone Outlet Structures, ! Rock, Brush, and Sandbag Filter Dams, ! Sediment Control Fences (Silt Fence), ! Stabilized Construction Exits, ! Sediment Traps, and ! Sediment Basins. 	TxDOT
Diversion Dike	<ul style="list-style-type: none"> ! Diverts offsite runoff away from disturbed areas ! Diverts sediment-laden runoff to stabilized areas or devices ! Can often be constructed easily and may even result indirectly from the excavation and embankment operations. 	TxDOT
Interceptor Dike	<ul style="list-style-type: none"> ! Intercepts offsite runoff from entering disturbed areas ! Intercepts sediment-laden runoff from disturbed areas ! Can often be constructed easily and may even result indirectly from the excavation and embankment operations. 	TxDOT
Perimeter Dike	<ul style="list-style-type: none"> ! Either intercepts or diverts runoff along the perimeter of the site to stabilized areas or away from disturbed areas ! Can often be constructed easily and may even result indirectly from the excavation and embankment operations. 	TxDOT
Interceptor Swale	<ul style="list-style-type: none"> ! Intercept offsite flow from entering the disturbed areas ! Intercepts sediment-laden runoff from leaving the site ! Can often be constructed easily and may even result indirectly from the excavation and embankment operations. 	TxDOT

BMP	Description/Purpose	User
Sandbag Berm	<ul style="list-style-type: none"> ! In-channel to create an in-system sediment traps ! To form diversion channels to route offsite flow through disturbed areas, Especially functional at existing drainage crossings ! Good in-channel uses because of integrity of the rock structure ! Can assist in maximizing volume of stored runoff as dams in ditches ! Creates a non-erosive slope when used as diversion devices. 	TxDOT
Rock Filter Dam	<ul style="list-style-type: none"> ! In channel to create in-system storage for sediment-laden runoff to allow sediment to settle and filter through ! Along perimeter where other permanent controls are insufficient ! Outlet to sediment trap ! Good in-channel uses because of integrity of the rock structure ! Can assist in maximizing volume of stored runoff as dams in ditches 	TxDOT
Controlling offsite tracking of sediments	<ul style="list-style-type: none"> ! A stabilized construction exit and construction road are very effective methods for reducing offsite tracking of mud, dirt and rocks. ! Paved streets adjacent to the site should be swept to remove any excess mud, dirt, or rock tracked from the site. ! Deliveries or other traffic should be scheduled at a time when personnel are available to provide cleanup if it is required. 	TxDOT
Stabilized Construction Exit	<ul style="list-style-type: none"> ! Control offsite tracking of sediment from vehicles leaving construction site ! Good housekeeping practice allows for controlled access to the site if located and inspected properly. 	TxDOT

BMP	Description/Purpose	User
Sediment Control Fence	<ul style="list-style-type: none"> ! Perimeter control for erosive slopes ! In ditches (small and low flows only) to trap and store sediment-laden runoff before leaving the disturbed areas ! Often easy to install and effective if utilized properly. Very in-effective if not properly installed or selected incorrectly. ! Used for small drainage areas subject to overland flow or can be used in conjunction with rock or sandbags when used in areas subject to concentrated flow. 	TxDOT
Sediment Trap	<ul style="list-style-type: none"> ! Provide temporary storage for sediment-laden runoff to allow for settling of the suspended sediment ! Often easy to construct in ditches and is effective if properly sized and maintained. Used on smaller drainage areas and volumes than a basin is used for. 	TxDOT
Sediment Basin	<ul style="list-style-type: none"> ! Provide temporary storage for sediment-laden runoff to allow for settling of the suspended sediment ! Provides control of sediment runoff for large drainage areas. 	TxDOT
Construction Site Housekeeping Practices	<p>Good housekeeping practices reduce the possibility of accidental spills, improve the response time if there is a spill, and reduce safety hazards as well.</p> <ul style="list-style-type: none"> ! Neat and orderly storage of any chemicals, pesticides, fertilizers, fuels, etc., that are being stored at the site. ! Regular garbage, rubbish, construction waste, and sanitary waste disposal. ! Prompt cleanup of any spills of liquid or dry materials that have occurred. ! Prompt cleanup of sediments that have been tracked by vehicles or have been transported by wind or storm water about the site or onto nearby roadways. ! Controlling the dumping of excess concrete and concrete wash water on the site. 	TxDOT
Sandblasting	<p>Sandblasting grits, which consist of both the spent sand and the particles of paint and dirt removed from the surface, are hazardous waste if they were used to clean old structures where lead, cadmium, or chrome based paints were used. They should not be washed into the storm drain or sanitary sewer. A licensed waste management or transport and disposal firm should be contacted to dispose of this type of used grit.</p>	TxDOT

BMP	Description/Purpose	User
Proper Disposal of Construction Wastes	<p>The following steps will help ensure proper disposal of construction wastes.</p> <ul style="list-style-type: none"> ! Select a designated waste collection area onsite. ! Provide an adequate number of containers with lids or covers that can be placed over the container prior to rainfall. ! When possible, locate containers in a covered area. ! Arrange for waste collection before containers overflow. ! If a container does spill, provide cleanup immediately. ! Plan for additional containers and more frequent pickups during the demolition phase of construction. 	
Proper Disposal of Construction Wastes (continued)	<ul style="list-style-type: none"> ! Verify that construction waste is collected, removed, and disposed of only at authorized disposal areas. ! Check the local solid waste management agency for specific guidance. 	TxDOT
Truck washing	<p>Concrete trucks should not be washed out onsite unless sufficient area has been made available to fully contain the wash water. The wash water must be prevented from entering any storm drainage system or waterway.</p>	TxDOT
Control of Contaminated Soils	<p>A State or local solid waste regulatory agency should be contacted concerning information and procedures necessary to treat or dispose of contaminated soils.</p>	TxDOT
Proper Disposal of Hazardous Materials	<ul style="list-style-type: none"> ! Check with local waste management authorities to determine what the requirements are for disposing of hazardous materials. ! Use all of the product before disposing of the container. ! Do not remove the original product label from the container, it contains important information. ! If surplus products must be discarded, do not mix products together unless specifically recommended by the manufacturer. ! The correct method of disposal varies with the product used. Follow the manufacture's recommended method, which is often found on the label. 	TxDOT

BMP	Description/Purpose	User
Proper treatment and disposal of sanitary or septic wastes	<p>Depending upon the facilities that will be used onsite, this may require one or more of the following:</p> <ul style="list-style-type: none"> ! Domestic waste haulers should be contracted to regularly remove the sanitary and septic wastes and to maintain the facilities in good working order. This will prevent overloading of the system which could allow discharges to storm water runoff. ! Wastes should be treated to an appropriate level before discharging. ! Facilities should be properly hooked into the sanitary sewer system to prevent illicit discharges. 	
Proper treatment and disposal of sanitary or septic wastes (continued)	<ul style="list-style-type: none"> ! Untreated, raw sewage or septage should never be discharged or buried onsite. 	TxDOT
Spill Control Plans	<p>Include measures to:</p> <ul style="list-style-type: none"> ! Stop the source of the spill. ! Contain the spill. ! Clean up the spill. ! Dispose of materials contaminated by the spill. ! Identify and train personnel responsible for spill prevention and control. 	TxDOT
Spill Prevention and Response Plan	<ul style="list-style-type: none"> ! Store and handle materials to prevent spills. <ul style="list-style-type: none"> P Tightly seal containers. P Make sure all containers are clearly labeled. P Stack containers neatly and securely. ! Reduce storm water contact if there is a spill. <ul style="list-style-type: none"> P Have cleanup procedures clearly posted. P Have cleanup materials readily available. P Contain any liquid. P Stop the source of the spill. P Cover spill with absorbent material such as kitty litter or sawdust. ! Dispose of contaminated materials according to manufacture's instructions or according to State or local requirements. ! Identify personnel responsible for responding to a spill of toxic or hazardous materials. <ul style="list-style-type: none"> P Provide personnel spill response training. P Post names of spill response personnel. 	TxDOT

BMP	Description/Purpose	User
Spill Prevention and Response Plan (continued)	<p>! Keep the spill area well ventilated.</p> <p>! If necessary, use a private firm that specializes in spill cleanup.</p>	

Urban Surface Runoff BMPs

BMP	Description/Purpose	User
Training Session	Provides training to volunteer monitors.	LCRA
Clean Lakes Programs	Identifies NPS as a major impact on water quality from watersheds draining into lakes. Develops feasibility study of mitigation strategies.	LCRA, City of Fort Worth and Brazos River Authority
Water Quality Monitoring	Monitoring stations throughout the basin and watersheds to provide water quality data. Document identified NPS impacts.	LCRA, TNRCC, City of Lubbock
Updated NPS Assessment Report and Management Program	Directs NPS program activities from best available information. Collection of additional water quality data. Compiles appropriate management strategies to address new data and priorities.	TNRCC - NPS Program
Storm Water Runoff Filter	Filters pollutants from storm water runoff which comes from parking lot runoff. Prevents pollutants from entering groundwater and adjacent streams.	LCRA, Travis County
Detention/Retention Pond	Large pond with controlled outflow which allows sediment to settle out of runoff. Filters runoff before it seeps into the groundwater and surface water bodies.	LCRA, City of Houston, City of San Angelo, Upper Colorado River Authority, Texas Department of Transportation
Baseline Water Quality Monitoring	Determines baseline water quality standards at different sampling points. Monitoring includes measurement for physical and bacteriological quality. Provides opportunity to perform reconnaissance of watershed for nonpoint pollutants.	Upper Neches River Municipal Water Authority, TNRCC
Penal Resolutions	An enforcement tool for violators when alternative methods fail based in Texas Health and Safety Code and Texas Water Code.	Upper Neches River Municipal Water Authority
Federal Water Quality Permit Compliance Program	Effectively prohibits non-stormwater discharges into the municipal separate storm sewer system. Requires controls to reduce the discharge of pollutants in storm water to the maximum extent practicable.	City of Austin

BMP	Description/Purpose	User
Water Quality Assessments	Diagnoses the water quality conditions, identifies pollution sources, recommends solutions to pollution problems, and tracks effectiveness of water quality protection efforts.	City of Austin, TNRCC
Total Maximum Daily Load Analyses	Assess priority water bodies not meeting standards. Allocate pollutant loadings. Develop and implement action plans to restore and protect water quality.	TNRCC, Basin Steering Committees
Environmental Integrity Index	Rates creeks regarding recreational, biological, water quality, stream erosion, and aesthetic indicators.	City of Austin
Citizen Monitoring Groups	Provides water quality data by training citizen groups to monitor nutrients, turbidity and other indicators of water quality problems. Also increases public awareness about the fundamentals of water quality. Addresses improving the science and math skills of academically at risk students by linking them with academically successful citizen and student mentors and training them in water quality issues and monitoring techniques.	City of Austin, TNRCC, LCRA, City of Lubbock, City of Harlingen, City of Beaumont, City of Fort Worth
Storm Water Discharge Monitoring	Determines the relative level of storm water pollution.	City of Austin, TNRCC Groundwater
USGS Cooperative Monitoring	Obtains data to assess the quality of base flow and storm flow from surface water. Is used to apply storm water, base flow, and aquifer models for flow and water quality which can be used to make projections based on development scenarios and ordinance revisions.	City of Austin, U.S. Geological Survey
Biological Monitoring and Salamander Inventory	Develops data in support of U.S. Fish and Wildlife Service efforts to protect endangered species. Protects and enhances salamander habitat, supports captive breeding programs for population enhancement of the species and encourages public knowledge of the salamander status.	City of Austin
Pollution Prevention Education	Prevents pollution by informing the public and private sector on issues related to water quality and nonpoint source pollution by means of radio, television, billboards, print media, and neighborhood workshops.	City of Austin, City of Fort Worth, TNRCC, Galveston Bay Estuary Program
Earth Camp	Offers environmental education to targeted elementary school youth in a hands-on outdoor setting by teaching basic environmental skills on topics such as recycling and pollution prevention.	City of Austin, TNRCC Groundwater

BMP	Description/Purpose	User
Pollution Control Effectiveness Monitoring	Determines the effectiveness of water quality control methods by monitoring and evaluating selected control methods for their design adequacy and pollution reduction efficiency.	City of Austin, TNRCC Groundwater
Internal Governmental Review and Coordination	Reviews state and federal regulations and planning documents which may impact the environment and provides assistance to state and federal environmental agencies through responding to information and analysis requests.	City of Austin
Water Quality Database	Stores water quality data from several governmental agencies.	City of Austin, TNRCC TNRCC Groundwater
Lakeshore Cleanup	Provides volunteer efforts to clean up litter and debris from the lakeshore.	Canadian River Municipal Water Authority, TNRCC, National Park Service, Texas Parks and Wildlife, Texas Land Commission, City of Lubbock
Video	Explains the nonpoint source pollution concept, regionally and nationally.	LCRA
Water Quality Program for Middle School Students	Uses hands-on activities and multi-media resources to teach students about the causes of NPS pollution, how the pollution enters water resources, its effects, and strategies for its abatement.	LCRA, TNRCC Groundwater
Water Education Program for 4th Grade Students	Teaches students about the hydrologic cycle, the geography of rivers and aquifers, a typical water distribution system, major water uses and effective methods of water conservation.	LCRA, TNRCC Groundwater
Environmental Education and Data Collection Program	Uses students and citizen volunteers to monitor water quality, to promote water quality protection and to promote environmental stewardship through community outreach.	City of San Angelo, Texas and the Upper Colorado River Authority, TNRCC Groundwater
Dry Detention Pond	A basin that is dry between storms. During a storm the basin fills and an outlet placed at the bottom is sized to release the water slowly to provide time for sediments to settle to the bottom.	City of San Angelo, City of Houston, Upper Colorado River Authority, City of Fort Worth

BMP	Description/Purpose	User
Gabion Filter Dam	An embankment of stone encased in wire that provides filtration by detaining runoff long enough for sediment to settle while still allowing for diffused flow of runoff.	City of San Angelo, Texas, Upper Colorado River Authority
Storm Water Bypass Piping	Provides transportation of effluent to a constructed dry pond.	City of San Angelo, Texas, Upper Colorado River Authority
Public Education	Informs citizens of the impacts of nonpoint source pollution by the use of posters, public service announcements, utility bill stuffers, public advertisements and inlet stenciling.	City of San Angelo, Upper Colorado River Authority, Tarrant County WCID #1, TNRCC, Galveston County Health District
Educational Seminars and Speakers	Informs and educates students, citizens and organizations on nonpoint sources issues including: proper use of lawn and garden chemicals, proper disposal of containers and other household hazardous wastes.	City of San Angelo, Upper Colorado River Authority, Tarrant County WCID #1, TNRCC
Citizen Monitoring Programs	Optimizes the efforts of neighborhood watch organizations and other homeowner associations to minimize the nonpoint source pollution caused by illegal dumping of oil, trash, yard litter and other substances.	City of San Angelo, Upper Colorado River Authority
Structural Controls	May consist of: engineered and constructed filters, chambers, basins or ponds which are designed to retain storm water runoff by settling, filtration, floatation, absorption and/or biological processes. Designed to prevent entry of polluted runoff into receiving water bodies.	City of Austin, City Fort Worth
Technical Guidance Manual	Assists developers and regulators in selection and maintenance of urban storm water BMPs to reduce NPS loadings.	TNRCC - Groundwater
Concentrated Feedlots	Surveillance program in Lake Worth watershed. Enforces state requirements and takes remedial action as needed.	City of Fort Worth
Enabling Legislation	Provides authority over resource management including water supply development, water conservation and water pollution control.	Upper Colorado River Authority
Wellhead Protection	Identifies wellhead protection areas and enacts local ordinances as needed.	City of Lubbock, TNRCC TNRCC Groundwater

BMP	Description/Purpose	User
Trash Cleanup Event	Volunteer events to clean up litter; raises public awareness of nonpoint source pollution.	City of Lubbock, Tarrant County WCID #1
Plug Private Wells	Reduces/prevents NPS pollutants in ground water from water pumped for sanitary sewer needs, which in turn goes to septic tanks which flow into the aquifer.	Dallas County WCID #6
Remove Outdoor Privies	Replace outdoor privies with in-house toilets and septic tanks to reduce ground water contamination from leachate.	Dallas County WCID #6
Monitor Storm Sewer Systems	Ensure integrity of storm sewer systems.	Galveston County Health District
NPS Pollution Prevention Ordinance	All cities within county do not currently fall under NPDES program; encourage all cities incorporate NPS activities of NPDES program into local city ordinances.	Galveston County Health District
Water Pollution Control General Ordinance	Controls activities with pollution potential on WCID lakes and property.	Tarrant County WCID #1
Enforce Water Pollution Control General Ordinance	Violations of General Ordinance are Class C Misdemeanors, subject to fines from \$10 - \$500 for each 24 hour period of the violation.	Tarrant County WCID #1
Monitor Impacted Waters	Targeted monitoring of outfall of storm drain systems into water bodies; identify cross connections with sanitary sewer systems causing problems, using maps of sanitary sewer and storm drain systems.	Galveston County Health District
Automotive Shop Waste Practices	Have developed booklet of BMPs for auto shops to prevent NPS pollution for use in District auto shops and private shops.	Galveston County Health District
Small Business Training	Catalog types of small business in watershed, identify potential for NPS pollutants. On-site review and technical assistance, written recommendations. Develop handbook for small businesses.	Galveston County Health District
Reservoir and Watershed Models	Pinpoints critical areas for BMP development.	Tarrant County WCID #1
Visual Index of Pollution	A photometric index which uses photos taken quarterly of the same site to assess changes in trash accumulation over time.	City of Austin

BMP	Description/Purpose	User
Educational Programs for CAFO Owners	Makes operators aware of the potential for pollution and its effect on ground water quality.	TNRCC
Geographic Information System	Develop GIS data, maps, and analysis tools for NPS problems	TNRCC Groundwater
Galveston Bay BMP Performance Document	Provide technical assistance to targeted audience through inventory of evaluated nps controls.	Galveston Bay Estuary Program
Inventory of Abandoned Water Wells	Provides a list of owners to advise of current rules and regulations.	TNRCC

Petroleum Activities BMPs

BMP	Description/ Purpose	User
Used Oil Collection Centers	Makes used oil recycling convenient and easy for resident. Raises public awareness of proper disposal techniques.	LCRA, City of Fort Worth
Educational, Training and Technical Assistance	Informs applicants and permittees about oil and gas rules and regulations which focus on environmental protection through seminars and workshops.	Railroad Commission of Texas, TNRCC Groundwater
Field Inspections	Provides discretionary inspection of oil and gas property to enforce compliance. Also responds to citizen complaints.	Railroad Commission of Texas
Underground Storage Tank Program	Grant funded program to notify owners of underground storage tanks about funds available for remediation, esp. from leaking.	City of Lubbock
Well and Testhole Inspections	Provides thorough inspections of surface mining activities to indicate compliance to regulations.	Railroad Commission of Texas
Plugging Wells and Testholes	Provides protection from potential surface and subsurface water contamination.	Railroad Commission of Texas
Educational Program	Educates industry applicants and permittees in the drilling and plugging of wells/testholes.	Railroad Commission of Texas, TNRCC Groundwater
Drilling Wells and Testholes	Creates accessibility to test groundwater for contaminants.	Railroad Commission of Texas

BMP	Description/ Purpose	User
Water Protection Seminars	Informs oil and gas operators and other interested person of Commission rules and procedures relating to water protection.	TNRCC, TNRCC Groundwater
State of Texas Oil and Hazardous Substances Spill Contingency Plans	Includes the procedures for notification of federal and state agencies, recommended immediate clean-up response, and coordination with other agencies having jurisdiction.	TNRCC
24-Hour Emergency Number Service	Makes the appropriate contact to dispatch to reported spill for prompt mitigation.	TNRCC
Technical Assistance	Provide recommendations to oil and gas industry on depth of useable ground water	TNRCC Groundwater
Assessment and Regulatory/Technical Assistance	Identify areas of the state with NPS problems related to oil and gas fields, provide technical recommendations to water well drillers for protection of useable quality aquifers from contamination	TNRCC Groundwater
UST Registration Data Base	Provides information on the location of registered underground storage tanks	TNRCC

On-site Wastewater Systems BMPs

BMP	Description/Purpose	User
Properly Designed and Operated On-site Systems	Provide minimum standards, technical assistance, and administrative oversight for local governments which administer permitting functions. Perform compliance inspections to assure adherence to standards.	TNRCC - Field Operations
Plan Reviews and/or Inspections	Reviews plans for on-site sewage disposal and provides inspections for new construction and repairs of old systems.	LCRA,
Sale Inspections	Provides inspections to document properly working system for sale of residential or commercial property.	LCRA
Inspections and Permitting for Wastewater Discharge	Conducts inspections and permitting of specific commercial and industrial businesses to ensure compliance with City Codes which protect water quality. Inspectors locate, verify and monitor plumbing connections to the city storm sewer system and receiving waterways to prevent illegal discharges of commercial and industrial wastes.	City of Austin

BMP	Description/Purpose	User
Pretreatment of Wastewater Discharge	Removes pollutants, such as petroleum, prior to discharge to prevent groundwater contamination	City of Austin
Water Pollution Abatement Plan Review	Reviews Water Pollution Abatement Plans and Applications for Sewage Collections systems for technically adequate mitigation plans.	City of Austin
Permit Application Review Committee	Conducts initial permit reviews, providing expert testimony at public hearings and coordinating permit conditions and assisting attorneys with preparation of legal materials to reduce water quality impacts to drinking water supply resulting from the disposal of waste water effluent.	City of Austin
Septic Systems Management	Control program for systems in Lake Worth watershed. Enforcement of state requirements. Transfer of land ownership require upgrade, if necessary, to existing state requirements.	City of Fort Worth
Community Wastewater System Controls	Monthly surveillance of certain pollutants in the Lake Worth watershed. Remedial action taken as needed.	City of Fort Worth
Sanitary Sewer Facilities Planning	Updating facilities plan as part of overall wet weather management program to prevent sanitary sewer overflows.	City of Fort Worth
Minimum Lot Size Zoning Restrictions	Minimum lot size required for development activities where OSSFs will be installed.	City of Fort Worth
Mapping Sanitary Sewer Overflows	Identifies illegal connections or other problems for remedial action.	Galveston County Health District
Enforcement of Septic System permits	Review applications, inspect finished installation, issue operation license.	Tarrant County WCID #1
Boat septic system inspection	Under General Ordinance, all boats with enclosed cabins or on-board toilet facilities must be inspected every 2 years to ensure that they do not have marine heads capable of pumping sewage overboard. Boats must display inspection sticker (similar to automobile inspection sticker) for easy identification by lake patrols.	Tarrant County WCID #1
Literature	Informs owners of OSDS of proper operation and maintenance procedures.	TNRCC
Inventory of Class V Sewage Disposal Wells		TNRCC

BMP	Description/Purpose	User
Inventory of Collection System Components		TNRCC
Historical Data of Maintenance Files		TNRCC
Evaluation of Hydrologic Conditions	Identify areas with potential or existing NPS pollution in order to implement BMPs to reduce NPS pollution	TNRCC Groundwater
Evaluation of Hydraulic Conditions	Provides technical assistance on application rates based on the textural analysis of the soil	TNRCC
Leak and Defect Identification	Provides data on circumstances that threaten water quality by effluent that short-circuit soil treatment by breaks in substrate. Also inspect tanks, lined evapotranspiration beds	TNRCC
Report Condition of System	Provides final inspection before they are covered up to licensing authority to assure compliance with standards	TNRCC
Regulatory Newsletter	<i>Texas On-Site Insights</i> is published quarterly by the Texas Water Resources Institute, and funded by the On-Site Wastewater Treatment Council of which TNRCC is a member.	TNRCC
Structural Integrity Evaluation	Inspections to confirm condition of tanks, integrity of tank walls, ability to withstand water tight tests	TNRCC

Dredging and Hydrological Modification BMPs

BMP	Description/Purpose	User
Section 401 Certification Recommendations	Special conditions for certification may be applied to prevent Section 404 permit activities from impacting water quality and violating Texas surface water quality standards.	TNRCC
Wetlands Certification	Any development resulting in the removal of wetlands must present a plan for remediating the loss of functional wetlands, and use of best management practices is required for certification.	Railroad Commission, TNRCC
Water Rights Permit Review	Reviews water rights/use permit applications for potential NPS threats and impact on downstream water rights, instream uses, bays and estuaries and wetlands. Sets conditions on permits as needed to protect against NPS impacts	TNRCC

Flow Regulation BMPs

BMP	Description/Purpose	User
Salinity Control Structures	Controls chloride inflow into rivers.	Canadian River Municipal Water Authority
Computer Models	Provides a better understanding and predicts the flow and quality of ground water and surface water.	City of Austin
Internal Governmental Review and Coordination	Reviews state and federal regulations and planning documents which may impact the environment and provides assistance to state and federal environmental agencies through responding to information and analysis requests.	City of Austin
Interceptor Swales (Grassy Swales)	Routes flows around areas of disturbance. Grass lined swales effectively filters both sediment and other pollutants while reducing velocity.	City of Houston

Spills BMPs

BMP	Description/Purpose	User
Proper Storage and Removal of Chemical and Oil Products	Properly stored products to prevent unlikely spills.	Gulf Coast Waste Disposal Authority
Monitor Vendor and On-site Visitors	Provides assurance that products are handled properly.	Gulf Coast Waste Disposal Authority
Plant Inspections	Provides thorough inspections to ensure that proper disposal methods are followed.	Gulf Coast Waste Disposal Authority
Ground Maintenance	Controls areas of erosion to provide required security and proper flow to the storm water discharge points.	Gulf Coast Waste Disposal Authority
Household Hazardous Waste Disposal	Provides a method of safe disposal of household hazardous wastes by such means of: permanent collection centers, periodic collection centers, mobile collection centers, curbside collection or a combination of methods.	City of Fort Worth, City of Lubbock, Galveston County Health District, LCRA, TNRCC, City of Austin
Public Education Program and Workbook	Teaches elementary aged children about the effects of household hazardous wastes on the environment.	LCRA

BMP	Description/Purpose	User
Pollution Complaint Hotline	Gives citizens a way of reporting suspected pollution problems. If LCRA does not have jurisdiction over the area, the appropriate entities are contacted and to report the citizen complaint.	LCRA
Collection Sites in Rural Communities	Collects empty pesticide containers, used oil, used oil filters and tires for recycling. Enables farmers and ranchers to properly dispose of pesticide and herbicide containers which are not allowed in a municipal landfill.	LCRA, TNRCC
Agricultural Amnesty Day	Allows the farmer/rancher to bring in the chemicals without fear of penalty and dispose of them properly without threat to the environment.	LCRA, TNRCC
Environmental Initiative	Serves as a central point of contact for citizens to voice their concerns and obtain information related to business activities in their area.	City of Austin
Technical Assistance	Provides technical assistance and guidance during spills and subsequent remediations.	City of Austin, TNRCC
24-Hour Environmental Hotline and Environmental Response	Responds to hazardous and non-hazardous material spills and citizen pollution complaints. Provides advice on how to clean the spill to least impact the environment, assess the area for potential environmental impact, determine the responsible party to ensure proper clean-up and guide the responsible party in disposing of the waste material.	City of Austin
Community Education	Provides educational materials such as: an environmental hotline refrigerator magnet, lists of services, lists of waste drop off stations, brochures, posters, public notices of problems sites, flyers for apartment managers and a water quality pollutant guide. These materials will aid in the education of operators of commercial/industrial business to guide them in their daily duties towards protection of the environment and public health and safety.	City of Austin
Integrated Pest Management	A process that can reduce the use of toxic pesticides, herbicides, and fungicides used to control pests.	City of Austin, TNRCC
Household Hazardous Waste Collection	Provides convenient and easy way for citizens to dispose of household hazardous wastes.	Brazos River Authority
Storm Drain Stenciling	Stenciling of the storm drain system (inlets, catch basins, channels and creeks) with prohibitive language/graphic icons discourages the illegal dumping of unwanted materials into storm drains.	City of Fort Worth

BMP	Description/Purpose	User
Industrial Waste Monitoring Program	Provides spill response for chemical spills or sanitary sewer overflows. Perform containment and cleanup work, notify proper state and federal authorities. Conducts lab sampling if spills reach receiving waters.	City of Lubbock
Underground Storage Tank Program	Works with State program to identify and remediate leaking underground storage tanks. Work with contractors to strip groundwater of contaminants and discharge treated water to sanitary sewer system. Inspects new placements for proper installation. Contracts for cleanup of contaminated soils.	City of Lubbock
State of Texas Oil and Hazardous Substances Spill Contingency Plans	Includes the procedures for notification of federal and state agencies, recommended immediate clean-up response, and coordination with other agencies having jurisdiction.	TNRCC
Public Education	Informs public, local government and service organizations of regulations and procedures for the drilling of Class V injection wells through seminars.	TNRCC Groundwater
Site-specific Assessment of Class V Injection Wells	Includes an investigation of the potential impact to a shallow aquifer system and takes into consideration wastewater characteristics, hydrogeological conditions of the proposed site, and any existing and/or potential ground water use in the area.	TNRCC
Regulations	Ensures that Class V injection wells be drilled by a licensed driller to prevent ground water contamination. Includes minimum standards for drilling.	TNRCC

Land Disposal BMPs

BMP	Description/Purpose	User
Proper Design and Operation of Sludge Use Facilities	Provide technical assistance and oversight through inspections of designs, construction and operation of Beneficial Sludge Use sites.	TNRCC - Field Operations, Beneficial Sludge and Biosolids Use Program
Waste Management Plans	Provide technical assistance through review of plans for non-permitted animal feeding operations.	TNRCC - Agriculture Section
Education/Outreach	Provide technical assistance to producer groups/organizations on water quality protection	TNRCC - Agriculture Section

Agriculture: Erosion and Sediment Control BMPs

BMP	Description/Purpose
Conservation Cover	The practice of conservation cover entails the establishment and maintenance of perennial vegetative cover on land retired from agricultural production.
Conservation Cropping Sequence	This practice is an adapted sequence of crops designed to provide adequate organic residue for maintenance or improvement of soil tilth. This practice is applicable on all cropland or other lands where agricultural crops are grown.
Conservation Tillage	Conservation tillage minimizes soil disturbance by limiting the number of field operations. Properly managed conservation tillage systems provide soil cover, retard deterioration of soil structure, reduce soil compaction and formation of tillage pans, improve soil aeration, permeability and tilth and reduce soil loss. Conservation tillage includes such systems as minimum tillage, reduced tillage, non-tillage, slot plant, chemical fallow and zero tillage.
Contour Farming	Contour farming is a supporting practice in which land preparation, planting and cultivating are carried out on the contour. When contour farming is used in conjunction with terraces or diversions, all operations are performed parallel to the established grades of the terraces or diversions. Contour farming reduces erosion by slowing the movement of excess rainfall from the field. Slower velocities of runoff water reduce soil detachment and increase opportunity for infiltration.
Contour Orchard and Other Fruit Area	Contour orchard and other fruit area involves planting orchards, vineyards, or small fruits so that all cultural operations are done on the contour.
Cover and Green Manure Crops	Cover and green manure crops include close-graining grasses, legumes, or small grains used primarily for summer or winter soil cover. They are then plowed under prior to maturity for soil improvement. Cover and green manure crops commonly grown in Texas are clover, vetch, winter peas, singletary peas, barley, oats, rye, wheat, triticale, ryegrass, alyce clover, sweet sorghum, grain sorghum (broadcast), summer pease and guar. Cover crops are applicable on all cropland, which does not have adequate cover during a critical erosion period such as early spring.
Critical Area Treatment	Critical area treatment is the practice by which critically eroding areas are stabilized by grading, shaping, and filling. Permanent vegetation is then established to prevent future erosion.
Crop Residue Management	Crop residue management is the utilization of crop residues to help maintain good soil structure. If residues are managed properly and left on or near the surface of the soil during the critical erosion periods, they can be an effective deterrent to soil erosion.

BMP	Description/Purpose
Delayed Seedbed Preparation	Any cropping system in which all of the crop residue and volunteer vegetation are maintained on the soil surface until approximately 3 weeks before the succeeding crop is planted, thus shortening the bare seedbed period on fields during critical erosion periods, is considered a delayed seedbed preparation practice.
Diversion	A diversion is a channel with a supporting ridge or berm on the downhill side. It is constructed across a slope to intercept runoff at critical or unstable points and convey it at non-erosive velocities to a suitably protected outlet. Diversions are designed specifically for diverting runoff with no regard to formability.
Field Border	A field border is a strip of dense vegetation established along the edges of a field. Field borders act as filter strips and remove soil particles from the runoff water as it passes through the dense vegetation. Although they will not help to control erosion in the field, field borders are effective in keeping pollutants out of runoff and out of streams.
Filter Strip	Filter strips are areas of vegetation used to remove sediment and other pollutants from runoff or waste water by filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization. This practice is applied on cropland at the lower edge of fields or above terraces and diversions. Filter strips can also be used on fields adjacent to streams, ponds, and lakes as well as areas requiring filter strips as part of a waste management system to treat polluted runoff or wastewater.
Grade Stabilization Structure	A grade stabilization structure consists of an embankment or mechanical impedance designed to stabilize the grade and control channel erosion, prevent the formation of advanced gullies, and reduce the potential for environmental pollution hazards.
Grassed Waterway	A waterway is a lined or unlined earth channel designed to convey runoff at nonerosive velocities from a field, diversion, terrace, or other structure to a suitable outlet. Waterways are an integral part of a terrace system, because they provide a stable outlet for runoff.
Grasses and Legumes in Rotation	Grasses and legumes are usually managed so those adequate amounts of residue are returned to the soil for soil improvement. The dense cover provided by grasses and legumes results in negligible soil loss while the crop is growing.
Land Forming	The intent of land forming is to provide a uniform surface so water concentration will not occur and infiltration will exceed runoff, thus precluding loss of sediment to streams, lakes, and other water bodies. This practice of land forming involves operations ordinarily classed as rough grading and does not normally involve surveys or land leveling techniques. The practice is used to give land a more uniform surface.

BMP	Description/Purpose
Mulching	Mulching is the practice of applying residue not produced on site to the soil surface to act as a protective cover. Some mulches may be plowed under later to improve soil structure.
Contour Strip Cropping/ Field Strip Cropping	This highly useful practice provides natural vegetative barriers to sediment movement off cropped landscapes. Strip cropping consists of growing a crop in alternating strips with a different crop. Strips of high-density crops such as grasses and close growing crops may be alternated with other crops such as low-density row crops.
Sediment Retention Basin	Sediment Retention Basins are small version of farm ponds used where a criteria for a farm pond is not met. These basins trap debris and sediment prior to their entry into a stream or lake. The basins, used properly and cleaned periodically, provide a useful function as a first-line defense against sediment movement into bodies of water. Sediment basins are constructed to collect and store debris or sediment.
Terrace	Terraces are earth embankments, channels, or combinations of ridges and channels constructed across the slope of rolling land to control runoff and reduce erosion. Terraces are constructed to: reduce slope length; reduce erosion; reduce sediment content in runoff water; intercept and conduct surface runoff at a nonerosive velocity to a stable outlet; retain runoff for moisture conservation, prevent development of gullies; and reform the land surface.
Water and Sediment Control Basin	A water and sediment control basin is an earthen embankment or a combination ridge and channel generally constructed across the slope and minor watercourses to form a sediment trap and water detention basin.
Wetland and Riparian Zone Protection	This practice involves protecting from adverse effects wetlands and riparian areas that are serving a significant NPS abatement function and maintaining this function while protecting the other existing functions of these wetlands and riparian areas as measured by characteristics such as vegetative composition and cover, hydrology of surface water and ground water, geochemistry of the substrate, and species composition.
Close Spaced Crops	Close spaced crops are row crops planted in rows spaced thirty inches or less apart, or crops such as small grain which are drilled or broadcast.

Agriculture: Management System BMPs

BMP	Description/Purpose
Deferred Grazing	Deferred grazing is the practice of delaying grazing or resting grazing land during crucial periods of time. Deferred grazing is used to increase plant vigor and allow desirable plants time to reseed.
Planned Grazing System (Brush Management/Planned Grazing System/Prescribed Burning used together)	A planned grazing system will provide uniform grazing and prevent depletion of the soil cover by overgrazing. Rest periods during the growing season allow the plants to regain vigor, reproduce and develop proper root systems.
Proper Grazing Use/Proper Woodland Grazing	Proper grazing use is the management of grazing intensity. Most pastures or ranges will have certain areas preferred by animals for grazing because of topography, water supply, forage quality or other factors. These key areas are where overgrazing will lead to plant depletion if not properly managed.
Pasture and Hayland Management	Pasture and hayland management entails planned management applied to the production of forage plants. The practice encompasses proper grazing and/or harvesting, proper fertilization, and proper weed control.

Agriculture: Water Supply BMPs

BMP	Description/Purpose
Proper Water Distribution	Proper water distribution is the practice of providing adequate watering facilities at strategic locations throughout a pasture to promote a uniform grazing distribution. Proper water distribution is essential to planned grazing systems.
Pipeline	Pipeline is installed for conveying water for livestock or for recreation. Pipelines may decrease sediment, nutrient, organic, and bacteria pollution from livestock. Pipelines may afford the opportunity for alternative water sources other than streams and lakes, possibly keeping the animals away from the stream or impoundment.
Pond	Ponds are water impoundment made by constructing a dam or an embankment or by excavation of a pit or dugout. Ponds may trap nutrients and sediment which wash into the basin.
Trough or Tank	A trough or tank, with needed devices for water control and wastewater disposal, installed to provide drinking water for livestock.
Well	A well is constructed or improved to provide water for irrigation, livestock, wildlife, or recreation.

BMP	Description/Purpose
Spring Development	Springs and seeps are improved by excavating, cleaning, capping, or providing collection and storage facilities.

Agriculture: Livestock Access Limitation BMPs

BMP	Description/Purpose
Fencing	Fencing is a supporting practice used to control or limit the movement of livestock. Acting as barriers to livestock movement, fences are used to divide land for planned grazing systems, to exclude livestock from areas being deferred, and to protect critical areas which livestock would damage.
Livestock Exclusion	Livestock exclusion is the practice of excluding livestock from an area not intended for grazing.
Stream Crossing	A stream crossing provides a stabilized area to provide access across a stream for livestock and farm machinery.

Agriculture: Vegetative Stabilization BMPs

BMP	Description/Purpose
Pasture and Hayland Planting	Pasture and hayland planting is used to establish or re-establish vegetative cover to renovate depleted stands of grasses on land used for pasture and hay production. Pasture and hayland planting works to control soil loss by providing good stands of protective vegetative cover on the soil surface.
Range Seeding	Range seeding entails re-establishing vegetative cover on rangeland with precipitation and soils conducive to successful vegetative establishment. Range seeding increases the stand of desirable vegetation, which improves productivity and aids in reducing erosion and runoff.
Brush and Weed Management (Brush Management/Planned Grazing System/Prescribed Burning used together)	Brush management helps control the distribution, numbers, and species of brush. Brush control can be accomplished by mechanical, chemical and biological methods, or by controlled burning. The practice aids in restoring and improving vegetative cover by reducing competition for nutrients, water, and sunlight brought about by dense stands of brush. The amount and distribution of brush to be manipulated is dependent on the type and use of the land.

BMP	Description/Purpose
Prescribed Burning (Brush Management/Planned Grazing System/Prescribed Burning used together)	Applying fire to predetermined areas under conditions that the intensity and spread of the fire are controlled is prescribed burning and is used on woodland, rangeland, native pasture, wildlife areas, or native hay meadows to control undesirable vegetation, prepare sites for planting or seeding and to control plant disease. Prescribed burning is also used to reduce wildfire hazards, improve wildlife habitat, improve forage production and quality, and to facilitate distribution of grazing and browsing animals.
Proper Location of Livestock Concentrations	Open lot animal concentrations, when properly located with respect to streams, will not normally cause water quality problems. Filtration through grass and biological reduction enroute to the stream will diminish concentrations of suspended particles and organic matter even further. Proper location of livestock concentrations is applicable to new facilities where there is a choice of location and to other facilities when changing location is the only or most feasible way to meet water quality requirements.
Dikes	Dikes are embankments constructed of earth or other suitable materials to protect land against overflow or to regulate water.
Heavy Use Protection	This practice protects heavily used areas by establishing vegetative cover, by surfacing with suitable materials, or by installing needed structures.
Lined Waterway or Outlet	This is a waterway or outlet having an erosion-resistant covering to allow for movement of water with time so that sediment which may be suspended can be removed from the water.
Roof Runoff Management	Management of rainfall runoff from roofs of barns, feeding facilities, or dairies, which may come in contact with nutrient-rich or pathologically-active bacteria and carry these pollutants to near by streams.
Waste Storage Pond	A waste storage pond is an impoundment made by excavation or earth fill for temporary storage of animal or other agricultural wastes.
Waste Storage Structure	Waste storage structures are fabricated for temporary storage of animal wastes or other organic agricultural wastes prior to land application.
Waste Treatment Lagoon	A waste treatment lagoon is an impoundment made by excavation or earth fill for biological treatment of animal or other agricultural wastes.
Application of Manure and/or Runoff to Agricultural Land	At the present time, agronomic land application of manures, liquid waste, and runoff is the only method of dealing with animal bisolid removal from a farm, feedlot, or dairy.

BMP	Description/Purpose
Waste Utilization	Waste utilization is the use of agricultural wastes or other wastes on land in an environmentally acceptable manner while maintaining or improving soil and plant resources.
Composting Facility	Composting facilities provide for the biological stabilization of waste organic material. The purpose is to treat waste organic material biologically by producing a humus-like material that can be recycled as a soil amendment and fertilizer substitute or otherwise utilized in compliance with all laws, rules, and regulations.
Constructed Wetland	Constructed wetland is an aquatic ecosystem with rooted emergent hydrophytes designed and managed to treat agricultural wastewater.
Fertilize According to Soil and Crop Requirements	Determine the nutrient requirements of the crop to be planted and analyze the nutrient levels in the soil prior to applying fertilizer.
Apply Each Fertilizer in the Most Efficient Manner	Chemical fertilizers exist in several forms of solids, liquids, and gases. Each form of fertilizer has its own unique characteristics and recommended methods of application. The diversity of fertilizer forms and application methods gives the farmer more flexibility in providing needed nutrients at optimum time periods during the course of crop production.
Apply Nitrogen and Other Critical Nutrients Near the Time Needed by the Crop	All nutrients, particularly nitrogen, should be applied at or near the time when needed most by crops. Nitrate, the form of nitrogen most often used by plants, is extremely soluble and tends to leach or be dissolved in runoff water at a relatively rapid pace.
Utilize Soil Conservation Practices to Minimize Soil Erosion	Soil conservation practices reduce runoff and erosion, and decrease the loss of plant nutrients dissolved in runoff or attached to sediment.
Inventory of Pest Problems, Cropping Patterns, Pesticide Usage	Inventory current and historical pest problems, cropping patterns, and use of pesticides for each field.
Consideration of Site Characteristics	Consider the soil and physical characteristics of the site including mixing, loading and storage areas for potential for the leaching and/or runoff of pesticides.
Usage of Pesticides with Lower Environmental Risk Factors	When pesticide applications are necessary and a choice of materials of equal efficacy exists, consider the persistence, toxicity, and runoff and leaching potential of products along with other factors, including current label requirements in making a selection.
Records Maintenance	Maintain records of application of restricted use pesticides (product name, amount, approximate date of application, and location of application of each such pesticide used) for a 2-year period after such use, pursuant to the requirements in section 1491 of the 1990 Farm Bill.

BMP	Description/Purpose
Usage of Lower Rates When Feasible	Use lower pesticide application rates than those called for by the label when the pest problem can be adequately controlled using such lower rates.
Recalibrate Equipment	Recalibrate spray equipment each spray season and use anti-backflow devices on hoses used for filling tank mixtures.
Pesticide Application, Storage, and Disposal	Read and follow the directions on the pesticide label. The pesticide label will specify the rate to be used under specific environmental conditions, the chemical characteristics as well as other precautionary statements. Many labels are currently including information on ways to avoid ground water contamination.
Integrated Pest Management (IPM)	Integrated Pest Management is a crop production program, in which a combination of pest control techniques such as pest resistant varieties, crop rotation to a non-host crop, cultural practices such as changes in planting time to escape pest damage, and biological control are used.

Agriculture: Scheduling BMPs

BMP	Description/Purpose
Irrigation Water Management	Irrigation water management is the practice of timing and regulating water applications in a way that will satisfy water requirements of a crop with efficient water distribution and without applying excessive amounts of water or causing excessive erosion.
Proper Slopes	Utilizing proper slopes to apply irrigation water by furrow irrigation methods will minimize soil loss and pollutant transport by return flows.
Proper Stream Size	The use of a proper stream size in furrow irrigation systems may prevent potential erosion which could cause water quality problems.
Proper Furrow Run Length	Utilizing proper furrow run length will indirectly minimize erosion from furrow irrigation systems.
Cultural Practices on Irrigated Land	Many cultural practices used to reduce erosion on non-irrigated fields may also be used on irrigated fields.

Agriculture: Efficient Water Application BMPs

BMP	Description/Purpose
Efficient Irrigation System (LEPA)	A low-pressure, precision application irrigation system for proper placement of water and chemigated inputs to a close proximity of the target plant so as to minimize, evaporation loss, runoff, and non-target movement of inputs.
Efficient Irrigation System Surface or Subsurface Drip	Use of drip irrigation technology on or below the soil surface for delivery of the proper amount of water for plant needs while reducing or eliminating runoff and leaching into the subsurface.
Irrigation Land Leveling	Reshaping the surface of land to be irrigated to planned grades. This practice reduces surface runoff and allow for proper infiltration water into plant root zone for uptake.

Agriculture: Utilization of Runoff and Tailwater BMPs

BMP	Description/Purpose
Irrigation System Tailwater Recovery for Container or Indoor Crops	The nursery industry will be encouraged to use tail water recovery systems consisting of designed drainage and a basin or pond (lined to prevent leaching) for the recovery of water from irrigation of container or indoor cropping systems.

Agriculture: Drainage Water Management BMPs

BMP	Description/Purpose
Drainage Management System for Groundwater Resource Protection	Subsurface drainage systems are necessary in specific situations where irrigation water which may contain nutrients and pesticides would come in contact with groundwater prior to the natural degradation of the polluting constituents. The subsurface drains will convey water to surface impoundments for reuse and allow natural degradation time.
Chemigation Safety	Backflow prevention devices will be recommended as a method to prevent the pollution of ground water sources which may be used for purposes other than agricultural irrigation. The proper use of these devices will be a part of the Tex-A-Syst pollution prevention program.

Agriculture: Backflow Prevention BMPs

BMP	Description/Purpose
Safety Devices in Chemigation System	The American Society of Agricultural Engineers recommends safety devices to prevent backflow when injecting liquid chemicals into irrigation systems. The process of supplying fertilizers, herbicides, insecticides, fungicides, nematicides, and other chemicals through irrigation systems is known as chemigation. A backflow prevention system will "prevent chemical backflow to the water source" in cases when the irrigation pump shuts down.

Silviculture: General Silvicultural BMPs

BMP	Description/Purpose
Harvesting practices	Potential water quality and habitat impacts should be considered when planning silvicultural harvest systems as even-aged (clearcut, seedtree, or shelterwood) or uneven-aged (group or individual selection). The yarding system, site preparation method, and consideration of pesticides that may be needed should also be addressed in preharvest planning. This practice includes determining the extent of road construction needed for each silvicultural harvest system and determining the potential impact from those roads.
Road system practices	Preplan skid trail and landing location on stable soils and avoid steep gradients, landslide-prone areas, high-erosion-hazard areas, and poor-drainage areas. Landings should not be located in Streamside Management Zones (SMZs). New roads and skid trails should not be located in SMZs, except at crossings. Existing roads and landings in the SMZ should be closed unless the construction of new, alternate roads and landings to access an area will cause greater water quality impacts than the use of existing roads.
Streamside Management Areas/Zones (SMZs)	The SMZ is an area with a minimum width of 50 feet, unless extreme site conditions require a greater width. Width of the SMZ will be determined by the land manager in conjunction with a forester from the NRCS or TFS. The SMZ provides a buffer zone between areas of timber harvest and the stream to minimize sediment transport.
Revegetation of disturbed areas	Use seed mixtures adapted to the site, and avoid the use of exotic species. Species should consist primarily of annuals to allow natural revegetation of native understory plants. Selected plants should have adequate soil-binding properties. The selection of appropriate grasses and legumes is important for vegetation establishment. Grasses vary according to climatic adaptability, soil chemistry, and growth characteristics. The use of native species is important and practical. Non-native species can destroy native vegetation, and often require increased maintenance and expense. In addition to selecting a seeding mixture, the seeding rate must be determined so that adequate soil protection can be achieved without the excess cost of

BMP	Description/Purpose
	overseeding.
Forest chemical management	For aerial spray applications maintain and mark a buffer area of at least 50 feet around all watercourses and water bodies to avoid drift or accidental application of chemicals directly to surface water. A wider buffer may be needed for major streams and lakes and for application of pesticides with high toxicity to aquatic life. A 100-foot buffer should be used for aerial applications and a 25-foot buffer used for ground spray. Aerial application methods require careful and precise marking of application areas to avoid accidental contamination of open waters. For specific applications such as hypo hatchet or wick application, buffer area widths may be reduced.
Forestry road construction and maintenance	Follow the design developed during preharvest planning to minimize erosion by properly timing and limiting ground disturbance operations. Construct bridges and install culverts during periods when stream flow is low. Avoid construction in stream areas during any fish migration or egg incubation periods.
Forestry road management	Blade and reshape the road to conserve existing surface material, and to retain the original, crowned, self-draining cross section.

Silviculture: Timber Harvesting BMPs

BMP	Description/Purpose
Harvesting Practices	To the extent possible, fell trees away from watercourses, and keep logging debris from the channel, except where debris placement is specifically prescribed for fish or wildlife habitat. Trees accidentally felled in a waterway should be removed as soon as possible.
Practices for Landings	Landings should not be larger than necessary to safely and efficiently store logs and load trucks. Install drainage and erosion control structures as necessary. Diversion ditches placed around the uphill side of landings minimize accumulation of water on the landing. Landings should have a slight slope to facilitate drainage. Also, adequate drainage on approach roads will prevent road drainage water from entering the landing area.
Groundskidding Practices	Skid uphill to log landings whenever possible. Skid with ends of logs raised to reduce rutting and gouging. This practice will disperse water on skid trails away from the landing.
Cable Yarding Practices	Use of cabling systems or other systems when groundskidding would expose excess mineral soil and induce erosion and sedimentation. Use high-lead cable or skyline cable systems on excessive slopes. To avoid soil disturbance from sidewash, use high-lead cable yarding on average-profile slopes of less than 15 percent.

BMP	Description/Purpose
Petroleum Management Practices	Service equipment where accidentally spilled fuel and oil cannot reach watercourses. During equipment maintenance, drain all petroleum products and radiator water into containers. Dispose of wastes and containers in accordance with required or proper waste disposal procedures. Waste oil, filters, grease cartridges, and other petroleum-contaminated materials should not be left as refuse in the forest.

Silviculture: Site Preparation and Forest Regeneration BMPs

BMP	Description/Purpose
Site Preparation Practices	Mechanical site preparation should not be applied on excessive slopes. On sloping terrain greater than 10 percent, or on highly erosive soils, operate mechanical site preparation equipment on the contour. Mechanical site preparation should not be conducted in SMZs. Construct beds along the contour. Avoid connecting beds to drainage ditches or other waterways.
Practices for Regeneration	Distribute seedlings evenly across the prepared site. Order seedlings well in advance of planting time to ensure their availability and delivery. Hand plant highly erodible sites, steep slopes, and lands adjacent to stream channels. Operate planting machines along the contour to avoid ditch formation. Soil conditions (slope, moisture conditions, etc.) should be suitable for adequate machine operation. Slits should be closed periodically to avoid channeling flow.

Silviculture: Fire Management BMPs

BMP	Description/Purpose
Prescribed Fire Practices	Carefully plan prescribed fires to adhere to weather, time of year, and fuel conditions that will help achieve the desired results and minimize impacts on water quality. Evaluate ground conditions to control the pattern and timing of the burn.
Wildfire Practices	To the extent possible avoid using fire-retardant chemicals in SMZs and over watercourses. Take appropriate measure to prevent their runoff into watercourses.

Silviculture: Wetlands Forest BMPs

BMP	Description/Purpose
Road Design and Construction Practices	Locate and construct forest roads according to the 15 mandatory road BMPs, as mandated by the CWA Amendments, to retain Section 404-exemption status. Improperly constructed and located forest roads may cause changes in hydrology, accelerate erosion, impair fisheries habitat, and destroy or damage existing stands of timber.
Harvesting Practices	Conduct forest harvesting according to preharvest planning designs and within designated harvest areas. Planning and close supervision of harvesting operations are needed to protect site integrity and enhance forest regeneration.
Site Preparation and Regeneration Practices	Select a regeneration method that meets the site characteristics and management objectives. Choice of regeneration method has a major influence on the stand composition and structure and on the silvicultural practices that will be applied over the life of the stand.
Chemicals Management Practices	Apply herbicides by injection or application in pellet form to individual stems. For chemical and aerial fertilizer applications, mark and maintain a buffer area of at least 50 feet around all surface water to avoid drift or accidental direct application. Avoid application of pesticides with high toxicity to aquatic life, especially aerial applications.

CHAPTER 8 MILESTONE SCHEDULES



The TNRCC and the TSSWCB implement water quality management programs on both the statewide and regional watershed levels. Watershed-level programs are instituted as warranted by local circumstances. The specific milestone commitments of the state’s nonpoint source management program are presented in this chapter. An overview of commitments by functional activity is also presented to show how the program areas work together to achieve nonpoint source management goals.

Statewide commitments are followed by watershed-specific programs for the TNRCC and the TSSWCB. Commitments of other state agencies are shown under the agency’s name. The commitment of the TSSWCB and the TNRCC to increased coordination of nonpoint source management activities for the state is reflected in shared milestones.

Overview of Statewide Program Commitments

The following table summarizes statewide management activities of the TNRCC, the TSSWCB, and other state agencies to address nonpoint source pollution.

Functional Activity	State Programs & Practices*
<p>Monitoring, Assessment, and Planning</p> <p>The state will conduct assessment activities necessary to establish water quality standards, determine standards compliance, establish water quality trends, and establish management requirements for nonpoint sources. The state will prioritize impaired waters, and develop total maximum daily load (TMDL) models and watershed action plans for impaired waters based on these assessments.</p>	<p>Program Coordination Program administration and technical support Emergency Response Planning Water Quality Management Plans Water Quality Protection Zones Surface Water Quality Monitoring Clean Rivers Program Texas Watch Water Quality Modeling Public Drinking Water Monitoring TNRCC Basin Coordinators NPS Program Groundwater Assessment Fish consumption safety monitoring (TDH) Water quality assessment (TPWD, TWDB)</p>

Functional Activity**State Programs
& Practices*****Regulatory Programs**

The state will establish regulatory controls for nonpoint sources of pollution where appropriate. State programs establish minimum technical or performance requirements where water quality is adversely affected, monitor compliance, and take enforcement actions where necessary. In addition, §26.177 of the Texas Water Code authorizes the TNRCC to require cities with populations of 10,000 or greater to implement their own regulatory programs for controlling NPS sources within their extraterritorial jurisdictions whenever these impact water quality. The state will also ensure that programs and agencies that use CWA §319 funds will complete projects in a timely manner and use proper quality control measures.

Water Quality Standards
 Pollution Control Duties of Cities
 (TWC §26.177)
 Hydrologic modification
 Water rights permits
 Occupational Certification
 401 Certification
 On-site sewage facility certification
 Used Oil Recycling
 Storage Tank Cleanups
 Hazardous Spills Cleanups
 Emergency Spill Response
 Field Operations Compliance Inspections
 TNRCC Contract Management
 Mining Industry Regulations (RCT)
 Petroleum Industry Regulations (RCT)

Nonregulatory Programs

The state will conduct educational activities to inform regional and local governments and the general public about the nature of nonpoint source pollution, about specific NPS-impaired water bodies, and about management alternatives for controlling nonpoint source pollution. The state will conduct technical and financial assistance programs which encourage the voluntary implementation of best management practices for controlling nonpoint source pollution.

Watershed Management Outreach
 Basin Steering Committees
 NPS Program Outreach
 Groundwater NPS Program Outreach
 SB 503 Cost-Share Program for
 Agricultural Producers
 Sustainable Forestry
 Technical and financial assistance
 through the §319 grant program
 Clean Cities 2000
 Clean Texas 2000
 Clean Texas Reporter
 On-site sewage facility technical
 assistance
 Hazardous Materials Cleanups
 Surface Casing Program
 Environmental Education
 Wellhead Protection
 Source Water Protection
 Lake and River Cleanups
 Complaint Resolution Process (SB 503)

Functional Activity	State Programs & Practices*
Nonregulatory Programs (continued)	Beach Cleanups (GLO) Highway Construction Stormwater Controls (TxDOT) Roadside Vegetation Practices (TxDOT) Land management technical assistance and incentives (TPWD)

*All programs listed are TNRCC or TSSWCB activities unless otherwise specified.

Overview of Watershed-Specific Program Commitments

The TNRCC and the TSSWCB are committed to working with Basin Steering Committees, in the appropriate phases of the watershed management cycle, to identify and implement nonpoint source management practices in NPS-impaired segments on the Section 303(d) list. Practices will be chosen in cooperation with local stakeholders and the implementing agency, and will be based on sound scientific information. The TNRCC and the TSSWCB believe that basing implementation measures on sound science will result in a significant increase in water quality improvement returns compared to traditional NPS demonstration projects. The appropriate watersheds in each basin will be selected through a joint effort of the Basin Steering Committee, the TNRCC, and the TSSWCB. The degree of local support for implementing NPS pollution controls will be a factor in choosing watersheds for implementation.

The schedules, based on the 1998 CWA 303(d) list, for developing and implementing watershed action plans in priority watersheds in Basin Planning Groups B and C is presented in Figures 8-1 and 8-2. The TNRCC is committed to ensuring that the action plans adopted for the priority watersheds are implemented in a timely and effective manner. The TNRCC and the TSSWCB will utilize available mechanisms to facilitate the implementation of watershed management plans through existing regulatory and non-regulatory programs. Financial assistance for local communities to support the implementation of watershed management plans will be sought from all potential federal, state, and local funding sources. Federal funds awarded to the state under Section 319 will be made available as financial assistance to local communities to support the implementation of watershed action plans.

The TNRCC and the TSSWCB will be implementing nonpoint source pollution BMPs in watersheds within the following basins: the Sabine, Brazos, Neches, Trinity, Colorado, San Antonio, Cypress, and Rio Grande Rivers. Other project areas include the San Jacinto-Brazos Coastal Basin, Corpus Christi and Galveston Bays, and the Seymour, Ogallala, and Edwards Aquifers. These projects are summarized in Table 8-1.

Figure 8-1. TNRCC 1998 Schedule for TMDL Candidates in Basin Group B (24 Segments*)

Strategy	Project Lead	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	
			A			A *					A *			
Load Allocation (metals, legacy pollutants)	TMDL Team			4 projects, 5 segments 1) cadmium & lead: 804; 2) lead & dissolved oxygen: 822; 3) cadmium & lead: 824; 4) lead & dissolved oxygen: 831, 833										
				Legacy pollutant statewide project	1 project, 8 segments 805, 806, 806-A, 806-B, 829, 829-A, 841, 841-A									
Targeted Monitoring to assess impairment and support TMDL development or reevaluation	Surface Water Quality Monitoring Team			2 projects, 4 segments 1) dissolved oxygen, pH: 803; 2) dieldrin, toxicity: 806-A, 829-A, 841								2 projects, 2 segments 1) dissolved oxygen, TDS, chloride: 812; 2) dissolved oxygen: 814		
Implement results of Bacterial Indicator Study (fecal coliform)	TMDL Team			Bacterial Indicator Study in progress	1 project, 7 segments 802, 804, 805, 806, 810, 819, 841									
Source Water Protection (atrazine)	Water Utilities Division			4 projects, 5 segments atrazine: 1) 838; 2) 815, 816; 3) 836; 4) 821										

*Some segments have multiple impairments

* - For tracking purposes, TMDLs are considered completed when Technical Report, approved by TNRCC management, is submitted for technical approval to EPA Region 6.

A - updates to future CWA §303(d) list

Figure 8-2. TNRCC 1998 Schedule for TMDL Candidates in Basin Group C (43 segments*)

Strategy	Project Lead	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
			A	*			A	*				A	
Load Allocation (metals, dissolved oxygen, dioxin, legacy pollutants)	TMDL Team	3 projects, 7 segments 1) nickel: 1005, 1006, 1007; 2) dissolved oxygen: 1103, 1104; 3) dissolved oxygen: 1113, 1113-A											
						2 projects, 12 segments 1) toxicity: 1006-A, 1007-A; 2) dioxin: 1005, 1006, 1007, 2421, 2426, 2427, 2428, 2429, 2430, 2436							
										2 projects, 10 segments 1) copper: 1013; 2) mercury: 1001, 1002, 1005, 1006, 1007, 1012, 1013			
		Legacy pollutant statewide project		1 Project, 2 Segments 1) 1101, 1102									
Targeted Monitoring to assess impairment and support TMDL development or reevaluation (metals, dissolved oxygen, pH, TDS, fecal coliform, tri-butyl tin)	Surface Water Quality Monitoring Team/Water Quality Standards				10 projects, 10 segments 1) TDS, dissolved oxygen: 0902; 2) TDS, dissolved oxygen: 1009; 3) dissolved oxygen: 1008; 4) dissolved oxygen: 1110; 5) lead: 1016, 1017; 6) dissolved oxygen: 1016; 7) dissolved oxygen, pH: 0704; 8) dissolved oxygen: 0704; 9) dissolved oxygen: 2437; 10) tri-butyl tin: 2425								
										5 projects, 10 segments 1) mercury: 1111; 2) mercury: 2422, 2423, 2424, 2439; 3) copper: 2424, 2439; 4) sulfates, toxicity: 0702-A; 5) fecal coliform - 2426, 2429			
										1 project, 6 segments 1) oyster waters: 2421, 2422, 2423, 2424, 2432, 2439			
Implement results of Bacterial Indicator Study (fecal coliform)	TMDL Team			Bacterial Indicator Study in progress		1 project, 21 segments 1) 0901, 0902, 1001, 1007-A, 1008, 1009, 1013, 1014, 1016, 1017, 1101, 1102, 1103, 1104, 1108, 1109, 1110, 1113, 1113-A							

*Some segments have multiple impairments

A - updates to future CWA §303(d) list for Basin Group C

* - For tracking purposes, TMDLs are considered completed when Technical Report, approved by TNRCC management, is submitted for technical approval to EPA Region 6.

Table 8-1. Summary of Watershed Projects

Watershed	Agency/Program	Description
Neches-Trinity, Trinity-San Jacinto, and San Jacinto-Brazos Coastal Basins	TNRCC/Galveston Bay Estuary Program	Prevention and remediation activities to protect and restore the Galveston Bay Estuary System from point and nonpoint source pollution impacts
San Antonio-Nueces and Nueces-Rio Grande Coastal Basins	Coastal Bend Bays and Estuaries Program	Prevention and remediation activities to protect and restore the Corpus Christi Bay System from point and nonpoint source pollution impacts
Brazos and Sabine Basins Erath, Hamilton, Johnson, Bosque, Comanche, Hopkins, Rains, and Wood counties	TNRCC/Dairy Outreach Program and TSSWCB	Conduct an educational program for agricultural producers to prevent and remediate NPS pollution from improper management of animal wastes.
Edwards Aquifer, Austin and San Antonio Regions	TNRCC/Edwards Aquifer Protection Program	Establish best management practices for development over the Edwards Aquifer recharge and contributing zones. Require the submittal of water quality protection plans for new developments.
Neches, Sabine, San Jacinto	TNRCC Field Operations/ On-Site Sewage Facilities remediation	Provide technical assistance on the proper maintenance and installation of on-site sewage facilities. Conduct inspections to ensure compliance with permits controlling these facilities.
Trinity and San Jacinto	TNRCC Field Operations/ Beneficial Sludge and Biosolids Program	Provide technical assistance on the proper use of sludge and biosolids for beneficial uses. Conduct inspections to ensure compliance with permits controlling application of these materials.
Rio Grande/Arroyo Colorado Watershed	TNRCC and TSSWCB	Develop a watershed action plan to address standards noncompliance due to several constituents, some from nonpoint sources.
San Antonio River/Salado Creek Watershed	TNRCC and TSSWCB	Develop a watershed action plan to address standards noncompliance due to several constituents, some from nonpoint sources.

Watershed	Agency/Program	Description
Cypress Creek/Lake O' the Pines and Big Cypress Creek Watersheds	TNRCC and TSSWCB	Develop a watershed action plan to address standards noncompliance due to several constituents, some from nonpoint sources.
Brazos River/North Bosque River Watershed	TNRCC and TSSWCB	Develop a watershed action plan to address standards noncompliance due to several constituents, some from nonpoint sources.
Colorado River/E.V. Spence Reservoir Watershed	TNRCC and TSSWCB	Develop a watershed action plan to address standards noncompliance due to several constituents, some from nonpoint sources.
Trinity River/Fort Worth Watershed	TNRCC and TSSWCB	Develop a watershed action plan to address standards noncompliance due to several constituents, some from nonpoint sources.
San Jacinto-Brazos Coastal Basin/Armand Bayou Watershed	TNRCC and TSSWCB	Develop a watershed action plan to address standards noncompliance due to several constituents, some from nonpoint sources.
Texas Coastal Basins	General Land Office/ Beach Cleanup Program	Volunteers remove floatable nonpoint source pollution and other trash from Texas beaches. In addition to cleaning the beaches, this program educates Texans about types and sources of water pollution.

TNRCC Statewide Schedules

Overall Water Quality Program

STRATEGY: Develop plans to ensure an adequate, affordable supply of clean water by monitoring and assessing water quality and availability.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Percent of Texas surface water meeting or exceeding water quality standards.	84%	84%	84%		
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of surface water assessments	68	49	66		
Number of ground water assessments	92	92	92		
The Watershed Management Team will implement the Basin Management Cycle in one watershed per year.		x	x	x	x
The TNRCC will identify impaired and threatened waters and the causes of impairment.	x	x	x	x	x
The TNRCC will revise the FY 96 303(d) list within target basins annually and update the report on a five-year cycle.	x	x	x	x	x
The TNRCC will conduct Total Maximum Daily Loads evaluations consistent with the 303(d) list.	x	x	x	x	x
The TNRCC will identify and initiate stakeholder subcommittees to participate in TMDL development for targeted watersheds.		x	x		
The TNRCC will identify and initiate a TMDL advisory committee to assist in selecting candidates for future TMDL development.			x	x	x
The TNRCC will coordinate and participate in at least two stakeholder subcommittee meetings in priority watersheds in Group E basins.		2 watersheds	2 watersheds		
The TNRCC will coordinate and participate in at least two stakeholder subcommittee meetings per watershed in priority watersheds in Group A and/or B basins.			3 watersheds	3 watersheds	
The TNRCC will distribute a minimum of 10,000 informational brochures, evenly apportioned to priority watersheds in Group E, A, and B basins, which promote watershed management and request participation of interested parties in the development of a watershed action plan.	2000	8000			
The TNRCC will conduct public presentations around the state to promote participation in the development of watershed action plans and the implementation of nonpoint source management strategies and controls.		4	4	4	4

OUTPUT MEASURES	1997	1998	1999	2000	2001
The TNRCC will assist and participate with basin steering committees in the determination of specific water quality parameters which will be addressed through the TMDL process in priority watersheds in Group E basins.		2 water-sheds			
The TNRCC will assist and participate with basin steering committees in the determination of specific water quality parameters which will be addressed through the TMDL process in priority watersheds in Group A and/or B basins.			3 water-sheds	3 water-sheds	
The TNRCC will review and approve monitoring plans and associated quality assurance plans for data collection in priority watersheds to support TMDL development in Group E and Group A basins.		2 water-sheds	2 water-sheds		
The TNRCC will assist in the identification of appropriate NPS management strategies suitable for immediate implementation in priority watersheds in Group E basins.			2 water-sheds	2 water-sheds	
The TNRCC will assist in the identification of appropriate NPS management strategies suitable for immediate implementation in priority watersheds in Group A basins.				3 water-sheds	
The TNRCC will assist in the identification of appropriate NPS management strategies suitable for immediate implementation in priority watersheds in Group B basins.					3 water-sheds
The TNRCC will review and approve the outputs of water quality models (baseline conditions and preliminary loading analysis scenarios) for specific parameters in priority watersheds in Group E basins.		2 water-sheds	2 water-sheds		

Nonpoint Source Program

(Grant management, planning, outreach, and technical assistance)

<p>! NPS Grant Administration ! NPS Assessment & Management Program Update</p>
<p>STRATEGY: The TNRCC is committed to maintaining an up-to-date and accurate NPS Assessment Report and Management Program to serve as the foundation of the Nonpoint Source Program. There is a need to continually incorporate new assessment information available into the documents to characterize all high priority problem areas across the state, and thereby have the opportunity to target potentially changing priorities with appropriate management strategies. Preparing updates to both documents as needed provides a necessary tool to keep the NPS program focused on the highest priority problems in the state. The support of 319(h) grant funds are required to provide adequate resources necessary to administer grant funds under the 319(h) program in an efficient and fiscally responsible manner.</p>

OUTCOME MEASURES					
An effective and efficient NPS Program which strives to implement the watershed approach, pollution prevention principles, addresses priority water bodies/problems, includes a balanced approach between statewide and local priorities, and strives for environmental accomplishments (loading reductions and WQ improvement). Success of the program relies heavily upon partnerships with other responsible players across the state to bring additional resources to bear on identified priority problems. Varied outreach efforts will be undertaken to encourage the widest participation possible. Over the next 5 years, program goal is to address 10 priority water quality issues (5 statewide, 5 local).					
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of Assessment Report and Management Program updates developed in accordance with the State and Federal Relationship section of the annual TNRCC/EPA Performance Partnership Agreement, and in accordance with the appropriate Federal Nonpoint Source Guidance.	1 each (as needed)	1 each (as needed)	1 each (as needed)	1 each (as needed)	1 each (as needed)
Number of NPS grants administered in accordance with the State and Federal Relationship section of the annual TNRCC/EPA Performance Partnership Agreement, and in accordance with appropriate Federal Nonpoint Source Guidance.	1	1	1	1	1
The NPS Program will lead rulemaking for Section 26.177 of the Texas Water Code.		100%			
Number of water pollution control and abatement plans and technical assistance efforts provided to cities	0	0	5	5	5
Number of technical assistance efforts, including NPS workshops, technical guidance documents, public education activities, and technology transfer efforts.	21	16	16	16	16

Surface Water Quality Monitoring Program

(Monitoring, data coordination, and assessment)

STRATEGY: Ensure an adequate, affordable supply of clean water by monitoring and assessing water quality.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Percent of Texas surface water meeting or exceeding water quality standards	84%	84%	84%		
OUTPUT MEASURES	1997	1998	1999	2000	2001
The Surface Water Quality Monitoring Program Team will develop a strategic monitoring plan to address NPS-impacted segments on the state's §303(d) list.	x				
The Surface Water Quality Monitoring Program Team will develop expertise and standard operating procedures for nonpoint source assessments.	x	x	x		
The Surface Water Quality Monitoring Program Team will conduct NPS assessments in watersheds identified for targeted monitoring through the watershed management process.				x	x
The Surface Water Quality Monitoring Program Team will develop an invertebrate community index for Texas streams	x				

Texas Watch Program

(Monitoring and outreach)

STRATEGY:						
Ensure an adequate, affordable supply of clean water by monitoring and assessing water quality.						
OUTCOME MEASURES		1997	1998	1999	2000	2001
Percentage of Texas surface water meeting or exceeding water quality standards		84%	84%	84%		
OUTPUT MEASURES		1997	1998	1999	2000	2001
Texas Watch and its partners will identify areas where management measures are needed by coordinating monitoring on 600 sites. (Number of sites →)		150	150	150	150	150
Texas Watch and its partners will improve water quality by educating 5,000 citizens about management of nonpoint source pollution by coordinating educational workshops, producing newsletters, and maintaining a web page. (Number of citizens reached →)		1000	1000	1000	1000	1000
Texas Watch and its partners will coordinate 15 community action projects over 5 years to prevent and remediate pollution through stream bank re-vegetation projects, watershed surveys, and storm drain stenciling.		3	3	3	3	3

Clean Rivers Program

(Monitoring and assessment, data coordination, planning, contract management)

STRATEGY:						
Coordinate state and regional monitoring and assessment. Coordinate water quality management data and provide oversight for regional water quality management partners. Coordinate basin steering committees for the purpose of developing and implementing watershed action plans to meet water quality objectives.						
OUTCOME MEASURES						
Protection of surface water quality and identification of impaired surface waters.						
OUTPUT MEASURES		1997	1998	1999	2000	2001
Collection of water quality data by contracted planning agencies and local governments		x	x	x	x	x
Coordinate targeted assessments by contracted planning agencies and local governments to fill identified data gaps		x	x	x	x	x

Water Quality Modeling and 401 Certification

STRATEGY: Perform complete and timely reviews of applications, with a focus to address NPS impacts, for permits to utilize the state's water resources or to discharge to the state's waterways. Water bodies have a limited ability to assimilate pollutants received from nonpoint and point sources. In order to maintain water quality standards designated for water bodies throughout the state, recommendations must be made through the permit process to ensure flow levels, waste load and total maximum daily load allocations, and wetlands protection necessary to protect water quality.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Reduce sediment loading to water bodies with §404 permit actions where recommendations are implemented.	70%	70%	70%	70%	70%
TMDL load recommendations developed for 303d list water bodies sufficient to maintain designated use.	1	1	1	1	1
Percent of water resource permit applications reviewed within established time frames.	100%	100%	100%		
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of applications to address water quality impacts reviewed.	1211	1226	1214		
Number of permit actions reviewed through 401 Water Quality Certification process. Recommendations for BMPs for sediment loss prevention will be made as appropriate.	57	57	57	57	57
Number of permits tracked in database to monitor the permit process of 401 certification of CWA §404 wetland permits. Recommendations for NPS BMPs will be made as appropriate. This database will be used towards the development and prioritization of TMDLs.	150	150	150	150	150

Ground-Water Assessment

(Monitoring, assessment, technical assistance, and planning)

STRATEGY: Develop recommendations to ensure the non-degradation of ground-water resources through targeted monitoring and assessment. Limited assessment of ground-water problems has led to the determination that ground water is affected by numerous point and nonpoint sources of pollution. Impacts of land use activities of noted importance include nitrate contamination, urban run-off, oil and gas extraction, mining and quarrying, and land disposal. Public education efforts and technology transfer events provide citizens with the opportunity to become self-sufficient in protecting their water resources, and can have a very cost-effective benefit on the environment as best management practices are implemented.
OUTCOMES: The primary outcome of the program is the prevention of degradation and reduction of NPS loadings of ground water in order to prevent pollution in a prioritized fashion. A statewide ranking serves as the state prioritization list for determining which aquifers are in the most serious need of NPS pollution prevention activities. Management activities best suited to achieving the eventual outcome of non-degradation are assessment of ground water conditions to acquire more direct data, and the sharing of data and other information with the public through appropriate public education, and technology transfer events.

OUTCOME MEASURES	1997	1998	1999	2000	2001
Remove or decrease, by an overall 50%, the pollutants that would otherwise be introduced into the ground-water environment through potentially water-quality degrading public activities.	10%	10%	10%	10%	10%
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of technical assistance measures, including TEX-A-Syst; wellhead protection, and public education activities; technical guidance documents, and technology transfer events in targeted aquifers; and support for the Texas Groundwater Protection Committee.	27	27	27	27	27
Monitoring and assessment measures, including assessments of ground-water conditions in targeted aquifers, GIS products, ground-water monitoring for baseline and water quality improvement, and updates of the NPS assessment report and management program.	34	34	34	34	34

Water Rights Permit Program

(Permit review)

STRATEGY: Perform complete and timely review of applications, with a focus to address NPS impacts, for permits to utilize the state's water resources. In order to maintain water quality standards for water bodies throughout the state, recommendations must be made through the water rights permit process to ensure adequate flow levels, and protection of wetlands. Future field assessment efforts are contingent upon additional funding.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Maintain greater than minimum required water quality standards for approximately 1,000 stream miles annually on a statewide basis by setting streamflow restrictions above base water quality protection levels in water right permit reviews.	x	x	x	x	x
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of applications to address water rights impacts reviewed (state measure).	450	450	450		
Number of water rights/water use permit applications reviewed and conditioned for potential NPS threats and impacts on downstream water rights, instream uses, bays and estuaries, and wetlands.	50	50	50	50	50
Number of field assessments performed to develop stream or reach-specific instream flow levels to maintain attainable aquatic life uses.	1	1	1	1	1

Water Utilities Program

(Public water supply protection and delivery)

STRATEGY: Ensure the delivery of safe drinking water to all citizens through monitoring and oversight of drinking water sources consistent with the requirements of the Safe Drinking Water Act.					
OUTCOME MEASURES					
	1997	1998	1999	2000	2001
Percent of Texas population served by public water systems which meet primary drinking water standards.	87%	90%	92%		
Percent of Texas population served by public water systems, using vulnerable sources, protected by a source water protection program.	10%	25%	35%		
Percent of Texas population served by public water systems protected by a program which prevents connection between potable and non-potable water sources.	40%	60%	70%		
OUTPUT MEASURES					
	1997	1998	1999	2000	2001
Number of drinking water samples collected.	17,486	17,486	17,486		
The Source Water Protection Program will implement a pilot project with the City of Marlin for the protection of public drinking water supplies from surface water contamination.	x	x	x		
The TNRCC will prepare a Wellhead Protection report to be submitted to EPA on a five-year cycle.					x
The Wellhead Protection Program will work with 20-25 communities per year to implement wellhead protection plans.	x	x			
The Wellhead Protection Program will work with the City of Lubbock to plug abandoned wells located during their development of a wellhead protection plan.	x	x			

Surface Casing

(Permit review, technical assistance)

STRATEGY: Provide recommendations to the public and to state agencies for protection of ground water during oil and gas operations. Provide technical assistance to the oil and gas industry on ground-water protection depths for construction or plugging of oil and gas wells. Research oil- and gas-related pollution complaints and administer the Class V injection well regulatory program.					
OUTCOME MEASURES					
Protection of ground water during oil and gas operations.					
OUTPUT MEASURES					
	1997	1998	1999	2000	2001
Number of recommendations issued for specific sites.	17,500	17,500	18,000	18,000	18,000
Number of recommendations issued for Class II injection wells.	350	350	350	350	350

OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of area recommendations issued for seismic programs.	60	75	75	80	80

Pollution Prevention and Recycling

(Outreach, education, and technical assistance)

STRATEGY: Promote voluntary pollution prevention and recycling through a combination of technical assistance and public education, and by organizing and promoting voluntary prevention initiatives.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Percent decrease in the toxic releases in Texas from the 1992 level.	16%	19%	22%		
Percent decrease in the toxic releases in Texas from the 1992 level per capita.	21%	28%	29%		
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of on-site technical assistance visits	70	67	67		
Number of presentations and workshops on pollution prevention and waste minimization conducted	128	115	115		
Number of governmental entities, industries, businesses, and institutions participating in voluntary reduction programs (state measure)	1,745	2,360	2,655		
The <i>Clean Texas Reporter</i> will cover nonpoint source topics in its series of environmental segments for television news broadcasts.	x	x	x		
Clean Texas 2000 will promote storm drain stenciling and distribute mylar stencils and the <i>Storm Drain Stenciling Manual</i> .	x	x			
The Community Recycling and Composting Program will distribute Master Composter Manuals to cities.	x				
The Cleanups Program will conduct four regional collections annually (empty pesticide containers, household hazardous waste, banned pesticides, recyclables, used oil and filters, tires).	x				
The Education Assistance Section will conduct teacher training programs on NPS issues at state universities.	x	x	x	x	x
The Public Information and Publications Division will distribute NPS and other water-related publications throughout the state.	x	x	x	x	x

Automotive Waste Management and Recycling

(Pollution prevention, technical assistance, and outreach)

STRATEGY: Promote the recycling of used oil through regulatory oversight, technical assistance, and the use of recognized recycling mechanisms.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Promote the reduction of nonpoint source pollution to ground and surface waters from the improper disposal of used oil and used oil filters by 25%.	5%	5%	5%	5%	5%
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of quarts of used oil diverted from landfills and properly handled	7.5M	7.5M	7.5M		
Increase participation of public and private sector organizations and companies as used oil collection centers.	30%				
Increase participation of public and private sector organizations and companies as used oil filter collection centers.	20%				
Increased collection of used oil by collection centers from approximately 5 million gallons/year to 6.5 million gallons/year	x				
Increased collection of used oil filters by collection centers from approximately 3.8 million filters/year to 4.5 million filters/year	x				
Continued campaign to increase public awareness of the need for used oil and used oil filter recycling and the locations of used oil and used oil filter collection centers	x				
Award of \$4 million in new grants for used oil recycling activities, with priority being given to unserved or under served areas	x				
Expanding the markets for the processing and recycling of the used oil and used oil filters collected	x				

Illegal Disposal Abatement Program

(Pollution prevention, technical assistance)

OUTPUT MEASURES	1997	1998	1999	2000	2001
Establish benchmark funding resource possibilities for pilot projects at the local and regional government scale.	x				
Provide technical assistance and “match-making” services to local and regional governments with limited resources in areas with the greatest reported illegal dumping problems in order to promote sustainable long-term self-help solutions.	x				
Develop initial model programs based on the results of pilot projects; promote usage of models in other areas with illegal dumping problems.	x				

OUTPUT MEASURES	1997	1998	1999	2000	2001
Expand possible funding resources for additional pilot projects, and for the implementation of model waste management programs at the local and regional government scale.	x				

Storage Tank Cleanup

(Remediation)

STRATEGY: Provide prompt and appropriate reimbursement to contractors and owners for the cost of remediating sites contaminated by leaking storage tanks.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Percent of leaking petroleum storage tank sites cleaned up	55%	60%	65%		
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of emergency response actions at petroleum storage tank sites	30	30	30		
Number of petroleum storage tank cleanups completed	1,500	2,000	2,500		

Hazardous Materials Cleanup

(Remediation)

STRATEGY: Aggressively pursue the investigation, design and cleanup of federal and state superfund sites; and facilitate voluntary cleanup activities at other sites and respond immediately to spills which threaten human health and the environment.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Percent of superfund sites cleaned up	4%	5%	6%		
Percent of voluntary and brownfield cleanup properties made available for commercial/industrial redevelopment, community, or other economic use	100%	100%	100%		
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of emergency response cleanups completed	2,500	2,500	2,500		
Number of superfund remedial actions completed	7	8	7		
Number of voluntary and brownfield cleanups completed	25	25	25		
The Emergency Response and Assessment Section will establish a Statewide Emergency Response Contract to reduce mobilization time.	x				
The Emergency Response and Assessment Section will develop an Agency-wide Unified Command System to streamline responses.	x	x			

Field Inspections and Complaint Response

STRATEGY: Promote compliance with environmental laws and regulations by conducting field inspections and responding to citizen complaints.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Percent of inspected water facilities in compliance	92%	92%	92%		
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of water rights site inspections	33,600	33,650	33,650		
Number of industrial and hazardous waste facilities inspected	1,100	1,100	1,100		
Number of spill cleanup inspections	800	800	800		
The On-Site Wastewater Program will develop a state management plan for on-site wastewater treatment and disposal.	x				
The Occupational Certification Section will review certification applications for landscape irrigation system installers, water well drillers, water pump installers, and on-site sewage facility installers.	x	x	x	x	x
The Occupational Certification Section will maintain the certifications for landscape irrigators and installers, water well drillers, water well pump installers, and on-site sewage facility installers.	x	x	x	x	x
The Edwards Aquifer Program will inspect permitted development for compliance with WPAPs.	x	x	x	x	x

TSSWCB Statewide Schedules

The Senate Bill 503 and Clean Water Act §319(h) Water Quality Management Program

(Statewide)

STRATEGY: The Senate Bill 503 program officially began in September of 1993 which authorized the establishment of a water quality management plan (WQMP) program to be administered by Soil and Water Conservation Districts (SWCDs). Since that time this program has certified approximately 2,500 WQMPs. All approved WQMPs must meet technical guidelines as identified in the <i>USDA NRCS Field Office Technical Guide</i> . This program will continue to be utilized in priority and non-priority areas throughout the state to reduce or prevent NPS pollution. In addition, in many priority areas the S.B 503 funds and the CWA §319(h) funds will be utilized together to bring water bodies that have been impaired by agricultural or silvicultural operations into compliance.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Provide financial assistance to Soil and Water Conservation Districts (SWCDs) for the implementation of Water Quality Management Plans to reduce NPS pollution.	x	x	x	x	x

OUTPUT MEASURES	1997	1998	1999	2000	2001
Allocate all S.B. 503 dollars for WQMP implementation. Projected goals for number of certifications →	600	600	600	600	600
Review and update rules as needed for the S.B. 503 cost-share program.	x	x	x	x	x
Review and update established criteria as needed for the development of WQMPs.	x	x	x	x	x
Agricultural/silvicultural nonpoint source site-specific areas will be evaluated because of potential problems.	x	x	x	x	x
TSSWCB will review, approve/disapprove, and fund proposals submitted for federal assistance under the CWA §319(h) program.	x	x	x	x	x

Coordination with Federal, State and Local Programs

(Statewide)

STRATEGY: Texas has an array of programs in place throughout the state that have been established to reduce or prevent NPS pollution. These programs will be necessary to identify NPS pollution problems, prioritize NPS problems, develop pollution prevention strategies, develop educational programs, provide technical and financial assistance, and overall guidance. Coordination with these programs is necessary to most effectively identify NPS pollution problems and develop and implement watershed action plans to remediate the problems.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Coordinate with State Programs to most effectively address NPS pollution.	x	x	x	x	x
OUTPUT MEASURES	1997	1998	1999	2000	2001
The TSSWCB will coordinate on an as needed basis with Soil and Water Conservation Districts, Texas Forest Service, Texas Agricultural Extension Service, Texas Agricultural Experiment Station, Texas Parks and Wildlife, Texas Department of Agriculture, USDA Natural Resources Conservation Service, and the U.S. Environmental Protection Agency during the development of TMDLs.	x	x	x	x	x
The TSSWCB will coordinate quarterly with representatives from the Office of Water Resource Management at TNRCC to implement the strategy and outcome and output measures listed on page 8-8 and 8-9.	x	x	x	x	x
The TSSWCB will coordinate quarterly with representatives with the Coastal Bend Bays Estuary Program to complete the output measures listed on page 8-32.	x	x	x	x	x
The TSSWCB will coordinate quarterly with representatives from the Galveston Bay Estuary Program to complete the outcome and output measures listed on page 8-33.	x	x	x	x	x
The TSSWCB will coordinate on an as needed basis with representatives from the Texas Watch Program in support of surface water quality monitoring and the TMDL development process.	x	x	x	x	x

OUTPUT MEASURES	1997	1998	1999	2000	2001
The TSSWCB will coordinate quarterly with the TNRCC Clean Rivers Program to coordinate state and regional monitoring assessment.	x	x	x	x	x
The TSSWCB will coordinate with the TNRCC Water Utilities Division Source Water Protection Program for the protection of public drinking water supplies from surface water contamination.	x	x	x	x	x
The TSSWCB will coordinate annually with the TNRCC Pollution Prevention and Recycling Cleanups Program in order for Texas' rural residents to have opportunities to properly dispose of empty pesticide containers, household hazardous waste, banned pesticides, recyclables, used oil filters, tires, etc.)	x	x	x	x	x
The TSSWCB will coordinate semi-annually with the TNRCC Agriculture Section to educate dairy producers in the Dairy Outreach Program Areas (DOPAs) in the state on BMPs they can voluntarily implement to reduce NPS pollution.	x	x	x	x	x
The TSSWCB will coordinate on an as needed basis with the TNRCC Office of Compliance and Enforcement to properly handle citizen complaints.	x	x	x	x	x
The TSSWCB will coordinate on an as needed basis with the Groundwater Assessment Section at TNRCC to discuss ground water degradation that may be caused by agricultural and/or silvicultural NPS pollution.	x	x	x	x	x

NPS Pollution Emergency Response

(Statewide)

STRATEGY:					
As the lead agency for the prevention and reduction in agricultural and silvicultural NPS pollution, the TSSWCB must remain on the forefront of addressing any new NPS water quality problems that may not be connected to the development of TMDLs in priority watersheds. It is therefore the goal of the TSSWCB to begin allocating some §319(h) funds into an emergency response category. This money will be utilized in situations such as the findings of pesticide/herbicide problems in public drinking water supplies and NPS pollution caused from natural disasters.					
Although a small percentage of future §319(h) dollars will be allocated towards emergency response, this money will not actually be spent until a procedural plan has been developed to remediate the problem and EPA approval has been received.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
The TSSWCB will effectively address all emergency water quality problems throughout the state caused by agricultural or silvicultural operations		x	x	x	x
OUTPUT MEASURES	1997	1998	1999	2000	2001
The TSSWCB will keep abreast of emergency problems around the state caused by agricultural and/or silvicultural NPS pollution.		x	x	x	x

OUTPUT MEASURES	1997	1998	1999	2000	2001
Once a problem(s) is identified, the TSSWCB will coordinate closely with the necessary entities to develop a plan to address the problem(s).		X	X	X	X
The developed plan will be sent to EPA for approval before any §319(h) funds are expended to remediate the problem(s).		X	X	X	X

Administrative and Technical Support

(Statewide)

STRATEGY: TSSWCB is committed to technology transfer, technical support, administrative support, and cooperation between agencies and programs for the prevention of NPS pollution					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Provide support for the NPS pollution prevention program throughout the state for pollution prevention projects. To provide support and technical expertise through cooperation between agencies and programs.	X	X	X	X	X
OUTPUT MEASURES	1997	1998	1999	2000	2001
Investigate 100% of the complaints received related to agriculture/silviculture (NPS)	X	X	X	X	X
Present one statewide NPS conference per year and evaluate effectiveness of NPS conference.	X	X	X	X	X
Review and update a list of priority watersheds for the state.		X	X	X	X
Review and update a Quality Assurance Management Plan (QAMP)	X	X	X	X	X
Coordinate with CWA §319 cooperators in writing Quality Assurance Project Plans for all projects involving monitoring	X	X	X	X	X
Issue CWA §319 project development guidance to interested parties annually	X	X	X	X	X
Review and update membership with the Agricultural/Silvicultural Advisory Committee	X	X	X	X	X
Meet two times annually with the Agricultural/Silvicultural Advisory Committee		X	X	X	X
Coordinate information/education technology productions with all project cooperators annually	X	X	X	X	X
Maintain electronic communication with cooperator entities	X	X	X	X	X
Coordinate the Nonpoint Source Management Program with other statewide NPS cooperator entities		X	X	X	X
Continue to implement and evaluate TEX*A*Syst as needed		X	X	X	X
Establish and implement ECO*A*Syst		X	X	X	X
Coordinate with SWCDs annually regarding water quality issues	X	X	X	X	X

OUTPUT MEASURES	1997	1998	1999	2000	2001
Conduct new project orientation with cooperators prior to funding		X	X	X	X
Develop project coordinator handbook (invoices, reports, etc.)		X	X	X	X
Perform Federal Consistency review of federal programs related to NPS as needed		X	X	X	X
Conduct Soil and Water Conservation District Director workshop annually with part of training dedicated to NPS education	X	X	X	X	X
Update Nonpoint Source Pollution Program for the State of Texas as needed		X	X	X	X
Coordinate with TNRCC in implementing goals of Safe Drinking Water Act		X	X	X	X
Determine the extent of BMP adoption necessary to positively affect water quality		X	X	X	X
Coordinate watershed and microwatershed monitoring and modeling for agricultural/silvicultural NPS pollution	X	X	X	X	X
Utilize data derived from monitoring and modeling to support NPS pollution abatement and prevention activities in priority watersheds.		X	X	X	X
Require training details for Statewide Management staff	X	X	X	X	X
Coordinate with state agencies for NPS pollution abatement pursuant to Senate Bill 1.	X	X	X	X	X
Further incorporate geographic information systems into NPS pollution planning and abatement.	X	X	X	X	X
Meet reporting requirements for GRTS/Lotus Notes on 319(h) activities	X	X	X	X	X
Meet reporting requirements for MBE/WBE on 319(h) activities	X	X	X	X	X
Meet reporting requirements for Civil Rights on 319(h) activities	X	X	X	X	X
Meet reporting requirements for Legislative Budget Board on 319(h) activities	X	X	X	X	X
Meet reporting requirements for the Texas Review and Comment System on 319(h) activities	X	X	X	X	X
Implement system-level BMPs for CAFO	X	X	X	X	X
Implement system-level BMPs for new crop production	X	X	X	X	X
Implement technology transfer in information education for Precision Agriculture/Agriculture Information System for water quality	X	X	X	X	X
Implement rangeland system BMPs for water quality enhancement	X	X	X	X	X

OUTPUT MEASURES	1997	1998	1999	2000	2001
Coordinate basin-wide NPS pollution programs among state agencies and basin steering committees		X	X	X	X
Present at least one regional NPS pollution conference in the river basin group scheduled for TMDL implementation the following year		X	X	X	X
Administer the agricultural water conservation loan program to local SWCD for the purpose of water conservation and water quality enhancement		X	X	X	X
Coordinate with TWDB reservoir sediment loading program on an annual basis to help determine nonpoint source problem areas.		X	X	X	X
Coordinate with Texas Geographic Information Council for geographic water quality references.		X	X	X	X
Coordinate with the Ground Water Protection Committee on ground water quality four times annually		X	X	X	X
Coordinate with the agricultural chemical subcommittee meeting four times annually on pesticide related water quality issues		X	X	X	X
Implement the agricultural/silvicultural nonpoint source pollution in the state management plan for pesticides in groundwater.		X	X	X	X
Coordinate with TNRCCs Texas Country Clean up program with local SWCDs		X	X	X	X
Coordinate with local steering committee for TMDL implementation		X	X	X	X

NPS Pollution Silviculture Response

(Statewide)

STRATEGY:					
As the lead agency for the prevention and reduction in agricultural and silvicultural NPS pollution, the TSSWCB must remain on the forefront of addressing any new NPS water quality problems. It is therefore the goal of the TSSWCB to allocate §319(h) funds to silviculture issues and activities within the state.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
The TSSWCB will work with Texas Forest Service and other entities involved in silvicultural operations		X	X	X	X
OUTPUT MEASURES	1997	1998	1999	2000	2001
Broaden the use of sustainable forestry through technology transfer and information education.		X	X	X	X
Promote prompt reforestation of harvest areas through information, education, technology transfer and demonstrations.		X	X	X	X

OUTPUT MEASURES	1997	1998	1999	2000	2001
Protect the water quality in streams, lakes, and other waterbodies by establishing riparian protection measures based on soil type, terrain, vegetation, and other applicable factors, and by using Best Management Practices in all forest management operations.		X	X	X	X
Promote prudent use of forest chemicals to ensure water quality benefits		X	X	X	X
Broaden the practice of sustainable forestry by further involving nonindustrial landowners, loggers, consulting foresters and company employees who are active in wood procurement and landowner assistance programs for water quality benefits.		X	X	X	X

Watershed Project Schedules, TNRCC and TSSWCB

Surface Water Atrazine Action Plan

(Central Texas)

STRATEGY: During 1997, Atrazine detections were noted in nine waterbodies in Central Texas. These waterbodies included Aquilla Lake, Joe Pool Lake, Bardwell Lake, Marlin Lake, Lake Waxahachie, Lake Tawakoni, Lake Lavon, Richland Chambers Reservoir, and Big Creek. Currently, Aquilla Lake is the only waterbody where Atrazine samples have exceeded the MCL. The TSSWCB will work closely with the State Surface Water Protection Committee to develop and implement the agricultural component of the Atrazine Action Plan for these waterbodies.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Develop and implement the agricultural component of the Atrazine Action Plan for the nine waterbodies listed above to prevent further Atrazine contamination and to remediate the existing Atrazine problems.		X	X	X	X
OUTPUT MEASURES	1997	1998	1999	2000	2001
Attend all State Surface Water Protection Committee meetings.		X	X	X	X
Identify key watersheds supplying water to the distributions systems in question.		X	X	X	X
Develop Local Action Committees for each waterbody to involve local stakeholders in the Atrazine Action Plan.		X	X	X	X
In the key watersheds, identify large acreage producers for initial contacts. Meet with the growers, on farm, to discuss the Atrazine issue, BMP's that may fit the operation, alternative chemicals, and document the decisions in the conservation plan.		X	X	X	X
Fund BMP installation as needed through programs such as EQIP, Buffer Initiative, Senate Bill 503, and others.		X	X	X	X

Dairy Outreach Program

STRATEGY:

Five counties in the Brazos River Basin (Erath, Hamilton, Johnson, Bosque, and Comanche) and three counties of the Sabine River Basin (Hopkins, Rains and Wood) contain large concentrations of dairies, and have been designated as Dairy Outreach Program Areas (DOPAs). Inadequate animal waste management practices have contributed to high levels of nonpoint source pollution loading to surface streams in those regions. Surface water contaminants include nutrients as well as fecal coliforms.

OUTCOMES:

Dairies and other concentrated animal feeding operations (CAFOs) are regulated by TNRCC. Under Subchapter K regulations that became effective in July 1995, CAFO operators in the DOPAs can either file an application and obtain written authorization, or register the facility prior to beginning operations, complete an eight-hour course on animal waste management within 12 months followed by an additional eight hours of training in animal waste management in each subsequent 24-month period, and have an independent audit every five years.

The purpose of this project would be to develop educational materials for regulated and non-regulated facilities, and conduct an annual training program as an educational and training strategy to improve surface water quality in the DOPAs. Primary emphasis is on dairy producers, however training manuals on animal waste management would be developed for poultry as well as swine facilities.

OUTCOME MEASURES	1997	1998	1999	2000	2001
Percent of producers trained in effective pollution prevention techniques for animal waste management		20%	60%	60%	60%
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of technical assistance activities, including workshops, conferences, technical assistance workgroup meetings, and informal training sessions.	4	4	4	4	4
Develop Comprehensive Training Manuals for Dairy, Feedlots, Poultry and Swine facilities	1	1			
Conduct Annual Continuing Education Training for Dairy Producers		3	3	3	3
Conduct Annual Continuing Education Training Course for Feedlot, Poultry and Swine Facilities		3	3	3	3

Technical and Financial Assistance to SWCDs through §319 Program (Priority Watersheds)

STRATEGY:

Since the 503 program has worked so effectively throughout the state in implementing BMPs to reduce NPS pollution, it is the intent of the TSSWCB to utilize CWA §319(h) funds to supplement 503 funds in targeted, priority watersheds to comprehensively address all agricultural and silvicultural NPS water quality problems in a timely manner.

OUTCOME MEASURES	1997	1998	1999	2000	2001
Provide financial assistance to SWCDs in targeted subwatersheds for the implementation of WQMPs to reduce NPS pollution.	x	x	x	x	x

OUTPUT MEASURES	1997	1998	1999	2000	2001
Coordinate with SWCD, NRCS and TSSWCB Regional Office personnel to most efficiently provide technical and financial assist to the landowners in the targeted areas.	x	x	x	x	x
Implement 100 WQMPs in the Arroyo Colorado Watershed.			x	x	x
Implement 10 WQMPs in the Running Creek Watershed.			x	x	x
Implement 35 WQMPs in the North Bosque River Watershed.				x	x
Implement 100 WQMPs in the Big Cypress Creek Watershed.				x	x
Implement 50 WQMPs in the Trinity River Watershed.					x

Coastal Bend Bays and Estuaries Program

(Watershed-specific assessment, planning, and implementation)

STRATEGIES:					
To formulate and implement the Coastal Bend Bays Plan to protect the estuaries in the San Antonio-Nueces, the Nueces, and the Rio Grande- Nueces coastal basins.					
Provide a medium and forum for the provision of technical assistance, technology transfer and information sharing among Coast Bend Bays stakeholders involved in nonpoint source pollution activities, including local and county governments, citizens, industry and various state agencies. Urban nonpoint source pollution objectives are to: identify urban nonpoint sources and determine pollutant loads and the fate of pollutant loads; determine need for additional environmentally protective regulations or non-regulatory authorities needed by local governments; investigate land development policies and practices for consistency with known effective BMPs; determine if atmospheric sources contribute to urban nonpoint source pollution; and educate urban residents on recommended household and yard management practices.					
OUTPUT MEASURES	1997	1998	1999	2000	2001
The Coastal Bend Bays and Estuaries Program will complete the Coastal Bend Bays Plan.	x	x			
The Coastal Bend Bays and Estuaries Program will undertake three implementation/demonstration projects related to the control of agricultural and urban nonpoint source runoff.	x	x	x		
The Coastal Bend Bays and Estuaries Program will assess the relationship between agricultural loadings and Brown Tide events in Baffin Bay and the Laguna Madre estuary system.	x	x	x	x	x
The Coastal Bend Bays and Estuaries Program will characterize septic system problems in the Nueces Coastal Basins and develop a plan for remediation.	x	x	x	x	x
The Coastal Bend Bays and Estuaries Program will develop a total constituent loadings model for the Nueces Coastal Basin.	x	x	x	x	x

Galveston Bay Estuary Program

(Watershed-specific assessment, planning, and implementation)

STRATEGIES:					
<p>To reduce and eventually eliminate harm from nonpoint sources of pollution entering Galveston Bay, including toxic contaminants, nutrients, pathogens, sediment, and oxygen-demanding substances.</p> <p>Provide a medium and forum for the provision of technical assistance, technology transfer and information sharing among Galveston Bay stakeholders involved in nonpoint source pollution activities, including local and county governments, citizens, industry and various state agencies. The objectives are to: establish the regulatory framework for NPS control throughout urban areas in the immediate Galveston Bay watershed; reduce NPS loading from new development using technology-based management practices; reduce erosion from construction sites to the maximum extent practicable; limit migration of toxics and nutrients from construction sites; and achieve zero discharge from marinas to surface waters. Accomplishment of objectives measured by the amount of action taken toward implementing the management initiatives outlined below.</p>					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Implement storm water management programs for 50% of the local municipalities in the bay watershed.	10%	10%	10%	10%	10%
Perform Pilot projects to develop NPS Best Management Practices.	5	5	5	10	10
Establish residential load reduction programs for 50% of the urban areas.	10%	10%	10%	10%	10%
Reduce by 50% the number of malfunctioning shoreline septic tanks.	10%	10%	10%	10%	10%
Establish Roadway Planning for 50% of the watershed to minimize NPS effects.	10%	10%	10%	10%	10%
Adopt regional construction standards for NPS reduction and implement toxics and nutrient control practices for 50% of the watershed.	10%	10%	10%	10%	10%
Encourage sewage pumpout, storage and provisions for treatment for 50% of the marinas.	10%	10%	10%	10%	10%
OUTPUT MEASURES	1997	1998	1999	2000	2001
Number of technical assistance activities, including workshops, on-site conferences, technical assistance workgroup meetings, training sessions and guidance documents.	10	25	25	25	25
Evaluation measures of implementation activities in the bay watershed and the state of the bay and its tributaries. (Bay/Bayou Barometer and Implementation Status Reports)	4	4	4	4	4
The Galveston Bay Estuary Program will compile a Galveston Bay BMP performance document to inventory NPS control techniques which have been evaluated.			x	x	x
Galveston Bay Estuary Program will maintain and publish its own inventory of NPS concerns in the bay watershed.		x	x	x	x
The Galveston Bay Estuary Program will conduct a bay-wide septic system and geologic survey for use in regulation and management of septic NPS pollution.	x	x	x	x	x

Beneficial Sludge/Biosolids Use Program, On-Site Sewage Facility Program, Edwards Aquifer Protection Program

(Pollution prevention, technical assistance, outreach, and compliance enforcement)

STRATEGY:					
Promote compliance with environmental laws and regulations by conducting field inspections and responding to citizen inquiries for technical assistance.					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Reduce, by 25% over 5 years, the occurrence of pathogens, priority organics and metals resulting from contaminated run-off from sludge sites that improperly treat and/or stabilize sludge, or improperly or over apply sludge to agricultural land.	5%	5%	5%	5%	5%
Reduce, by 30% over 5 years, the occurrence of pathogens, organics and nutrients in contaminated storm water run-off from improperly specified or functioning on-site sewage facilities.	6%	6%	6%	6%	6%
Reduce, by 10% over 5 years, the number and quantity of contaminants reaching the Edwards Aquifer through natural and un-natural geologic recharge features.	2%	2%	2%	2%	2%
OUTPUT MEASURES	1997	1998	1999	2000	2001
The <i>Beneficial Sludge/Biosolids Use Program</i> will conduct on-site inspections in selected basins in North Central Texas (Dallas/Ft. Worth) and Southwest Texas (Houston area) to assess the compliance with permit limits which control site application rates, frequency and the types/amounts of sludge allowed to be applied.	75	60	60	60	60
The <i>Beneficial Sludge/Biosolids Use Program</i> will provide technical assistance to achieve compliance with permit limits.	50	48	48	48	48
Conduct technical assistance consultations with designers, installers and local permitting authorities desiring to utilize non-conventional OSSFs in selected basins in Southeast Texas (Beaumont/Port Arthur and Houston).	180	180	180	180	180
Conduct OSSF initial inspections and follow-up inspections in the southeast target area.	120	120	120	120	120
The OSSF Program will review plans for new OSSFs and provide technical assistance and oversight for delegated local governments in the southeast target area.	240	240	240	240	240
Expand compliance and conduct follow-up investigations throughout the entire recharge zone to include all five counties in the Edwards Aquifer Recharge Zone.	120	120	120	120	120
The Edwards Aquifer Protection Program will review WPAPs for entities wishing to construct or develop property over the Edwards Aquifer Recharge Zone.	45	45	45	45	45
The Edwards Aquifer Program will provide technical assistance to entities interested in and/or inquiring about new construction or property development over the Edwards Aquifer Recharge Zone.	240	240	240	240	240

The Armand Bayou Tidal Watershed Project

(Watershed-specific assessment, planning, and implementation)

STRATEGY: Armand Bayou Tidal, Segment 1113

Occasional low dissolved oxygen measurements in the upper portions of the tidal reaches of the segment have raised concern that aquatic life use is sometimes not supported. Rapid urban growth in the watershed may increase stress on the Armand Bayou system in the near future.

The goal of this effort is to analyze probable causes of periodic low dissolved oxygen concentrations, and to develop and implement a watershed action plan which will involve the participation of local governmental or non-governmental organizations and other watershed stakeholders. The water quality goal is to assure that the segment moves toward full attainment of the beneficial use for aquatic life. The process will result in an equitable, science-based, and fully implementable watershed action plan for the resolution of water quality impairments related to aquatic life identified for the Armand Bayou Tidal segment and protection of future water quality.

OUTCOME MEASURES	1997	1998	1999	2000	2001
Improve water quality in the Armand Bayou Tidal segment by the development of a watershed action plan designed to satisfy the TMDL requirement of section 303(d) of the Clean Water Act.		x	x		
Improve water quality in the Armand Bayou Tidal segment by the development of a watershed action plan designed to satisfy the TMDL requirement of section 303(d) of the Clean Water Act.		x	x		
Reduce loadings through the implementation of specific actions, specified in a watershed action plan, which will bring the Armand Bayou Tidal Segment into compliance with the water quality standards established by the State of Texas.				x	x
Reduce loadings of agricultural pollutants through the implementation of WQMPs which will help bring the Armand Bayou Tidal Segment into compliance with the water quality standards established by the State of Texas.				x	x
OUTPUT MEASURES	1997	1998	1999	2000	2001
Facilitate committee meetings involving outreach and negotiation. (Number of meetings per year →)		2	3		
Produce a mathematical model of acceptable loadings.		80%	20%		
Develop an approved, detailed action plan which establishes overall goals and objectives, a time table for implementation, and a list of expected results.		25%	75%		
Determine the extent to which agricultural and/or silvicultural pollutants are components in the load allocation of the TMDL. Other outcome and output measures will be contingent on this task.		x			
Utilize an economically feasible mathematical model to help determine acceptable agricultural NPS loadings.			100%		
Develop a detailed action plan for agricultural/silvicultural components in conjunction with federal, state, and local entities which establishes overall goals and objectives, a time table for implementation, and a list of expected results.			50%	50%	

OUTCOME MEASURES	1997	1998	1999	2000	2001
Implement agricultural/silvicultural components watershed action plan and verification monitoring.				33%	33%
Implement urban/other components of watershed action plan, including negotiated solution strategies, and verification monitoring.				10%	10%

Arroyo Colorado Watershed Project

(Watershed-specific assessment, planning, and implementation)

STRATEGY: Arroyo Colorado, Segment 2201 and Segment 2202

Water quality in the Arroyo Colorado does not meet state standards for several constituents including dissolved oxygen, fecal coliform bacteria, and several organic chemicals in water, sediment, and fish tissue. As a consequence, the Arroyo Colorado has consistently been included in the list of impaired water bodies for the State of Texas (§303(d) list). The TNRCC is currently conducting a statewide study to address the fecal coliform issue. Segments listed as impaired due to elevated levels of fecal coliform will be re-evaluated following the completion of this study.

The goal of this effort is to develop and implement a watershed action plan which will involve the participation of local governmental and non-governmental organizations, other watershed stakeholders, and the services of private consultants/contractors. The desired water quality goal is to assure that the segments move toward full attainment of their beneficial uses of aquatic life and fish consumption. The process will result in an equitable, science-based, and fully implementable watershed action plan for the resolution of water quality impairments related to aquatic life and fish consumption identified for the Arroyo Colorado.

OUTCOME MEASURES	1997	1998	1999	2000	2001
Improve water quality in the Arroyo Colorado and associated water bodies by the development of a watershed action plan designed to satisfy the TMDL requirement of section 303(d) of the Clean Water Act.	x	x	x	x	
Reduce loadings through the implementation of specific actions and practices, specified in a watershed action plan, which will bring the Arroyo Colorado into compliance with the water quality standards established by the State of Texas.				x	x
Reduce loadings of agricultural pollutants through the implementation of WQMPs which will help bring the Arroyo Colorado into compliance with the water quality standards established by the State of Texas.			x	x	x
OUTPUT MEASURES	1997	1998	1999	2000	2001
Facilitate committee meetings involving outreach and negotiation. (Number of meetings per year →)	2	5	6	6	4
Produce a mathematical model of acceptable loading.		10%	80%	10%	
Utilize an economically feasible mathematical model to help determine the acceptable agricultural NPS loadings.		100%			
Develop an approved, detailed action plan which establishes overall goals and objectives, load allocations, strategy for load allocation, time table for implementation, and a list of expected results.		5%	10%	85%	

OUTCOME MEASURES	1997	1998	1999	2000	2001
Determine the extent to which agricultural and/or silviculture pollutants are components in the load allocation of the TMDL. Other outcome and output measures will be contingent on this task.	x				
Develop a detailed action plan for agricultural/silvicultural pollutant reduction in conjunction with federal, state, and local entities which establishes overall goals and objectives, a time table for implementation, and a list of expected results.		100%			
Implement agricultural/silvicultural watershed action plan and verification monitoring.			33%	33%	33%
Implement urban/other watershed action plan, including negotiated solution strategies, best management practices, and verification monitoring.				10%	50%

Big Cypress Creek Watershed Project

(Watershed-specific assessment, planning, and implementation)

STRATEGY: Lake O' the Pines, Segment 0403, and Big Cypress Creek, Segment 0404					
<p>Contact recreation use is only partially supported in the Big Cypress Creek watershed project area due to elevated levels of fecal coliform bacteria. The TNRCC is currently conducting a statewide study to address the fecal coliform issue. Segments listed as impaired due to elevated levels of fecal coliform will be re-evaluated following the completion of this study. In addition, dissolved oxygen concentrations and elevated levels of nutrients are a concern throughout the segment, and elevated concentrations of selenium in sediment are also a concern in the lower mile of Big Cypress Creek. High aquatic life use is only partially supported in a portion of Lake O' the Pines due to elevated levels of dissolved zinc.</p> <p>The goal of this effort is to develop and implement a watershed action plan which will involve the participation of local governmental and non-governmental organizations, other watershed stakeholders, and the services of private consultants/contractors. The water quality goal is to assure that these segments move toward full attainment of the beneficial uses of aquatic life and fish consumption. The process will result in an equitable, science-based, and fully implementable watershed action plan for the resolution of water quality impairments related to aquatic life and fish consumption identified for the Big Cypress Creek below Lake Bob Sandlin and Lake O' the Pines. This project will be supported with §319(h) grant funds.</p>					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Improve water quality in the Big Cypress Creek /Lake O' the Pines segments through the development of a watershed action plan designed to satisfy the TMDL requirement of Section 303(d) of the Clean Water Act.		x	x	x	
Reduce loadings through the implementation of specific actions and practices, specified in a watershed action plan, which will bring the Big Cypress Creek /Lake O' the Pines segments into compliance with the water quality standards established by the State of Texas.				x	x
Reduce loadings of agricultural pollutants through the implementation of WQMPs which will help bring the Big Cypress Creek/ Lake O' the Pines segments into compliance with the water quality standards established by the State of Texas.			x	x	x

OUTPUT MEASURES	1997	1998	1999	2000	2001
Facilitate committee meetings involving outreach and negotiation. (Number of meetings per year →)		3	4	4	2
Produce a mathematical model of acceptable loadings.		10%	60%	30%	
Utilize an economically feasible mathematical model to help determine the acceptable agricultural and silvicultural NPS loadings.		10%	90%		
Develop an approved, detailed action plan which establishes overall goals and objectives, load allocations, strategy for load allocation, time table for implementation, and a list of expected results.		10%	40%	50%	
Develop a detailed action plan for agricultural/silvicultural pollutant reduction in conjunction with federal, state and local entities which establishes overall goals and objectives, a time table for implementation, and a list of expected results.		10%	90%		
Implement agricultural/silvicultural components of watershed action plan, and verification monitoring.				33%	33%
Implement urban/other components of watershed action plan, including negotiated solution strategies, best management practices, and verification monitoring.				10%	10%

E.V. Spence Reservoir Watershed Project

(Watershed-specific assessment, planning, and implementation)

<p>STRATEGY: E.V. Spence Reservoir and Colorado River above E.V. Spence, Segment 1411 and Segment 1412</p> <p>Average levels of sulfate and total dissolved solids in E.V. Spence Reservoir exceed state criteria for Segment 1411. Chloride concentrations in the reservoir sometimes limit its public water supply use. Elevated levels of chloride primarily originate from oil field brine seepage in the watershed of Beals Creek, a tributary of the Colorado River below Lake J.B. Thomas Segment 1412, upstream of E. V. Spence Reservoir.</p> <p>The goal of this effort is to develop and implement a watershed action plan which will involve the participation of local governmental and non-governmental organizations, other watershed stakeholders, and the services of private consultants/contractors. The water quality goal is to assure that the segments move toward full attainment of the beneficial use of public water supply. The process will result in an equitable, science-based, and fully implementable watershed action plan for the resolution of water quality impairments related to public water supply identified for the E.V. Spence Reservoir. This project will be supported with §319(h) grant funds.</p>					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Improve water quality in the E.V. Spence Reservoir and associated water bodies by the development of a watershed action plan designed to satisfy the TMDL requirement of section 303(d) of the Clean Water Act.		x	x		
Reduce loadings through the implementation of specific actions and practices, specified in a watershed action plan, which will bring the E.V. Spence Reservoir into compliance with the water quality standards established by the State of Texas.			x	x	x
Reduce loadings of agricultural pollutants through the implementation of WQMPs which will help bring the E. V. Spence				x	x

Reservoir into compliance with the water quality standards established by the State of Texas.					
OUTPUT MEASURES	1997	1998	1999	2000	2001
The first step of this strategy will be to determine if agriculture pollutants will be components in the load allocation for the TMDL. All other agriculture/silviculture output and outcome measures are contingent on this task.	x				
Facilitate committee meetings involving outreach and negotiation. (Number of meetings per year →)		2	2	1	1
Produce a technical analysis of mineral loadings.		30%	70%		
Utilize an economically feasible mathematical model to help determine acceptable agricultural NPS loadings.		30%	70%		
Develop a detailed action plan for agricultural/silvicultural pollutant reduction in conjunction with federal, state, and local entities which establishes overall goals and objectives, a time table for implementation, and a list of expected results.		10%	90%		
Develop an approved, detailed action plan which establishes overall goals and objectives, strategy for water quality management, time table for implementation, and a list of expected results.		10%	90%		
Implement agriculture/silviculture watershed action plan and verification monitoring				33%	33%

The North Bosque River Watershed Project

(Watershed-specific assessment, planning, and implementation)

STRATEGY: North Bosque River, Segment 1255 and Segment 1226					
<p>Due to elevated fecal coliform levels the designated use of contact recreation is not supported throughout the North Bosque River. The TNRCC is currently conducting a statewide study to address the fecal coliform issue. Segments listed as impaired due to elevated levels of fecal coliform will be reevaluated following the completion of this study. In addition, excessive nutrient levels also occur in several portions of the segment. Nutrients and fecal coliform bacteria enter the North Bosque River and its tributaries as non-point source loadings which are considered to be the most serious threats to the segment.</p> <p>The goal of this effort is to develop and implement a watershed action plan which will involve the participation of local governmental and non-governmental organizations, other watershed stakeholders, and the services of private consultants/contractors. The water quality goal is to assure that the segments move toward full attainment of the beneficial use for aquatic life, and into compliance with applicable stream criteria for nutrients. The process will result in an equitable, science-based, and fully implementable watershed action plan for the resolution of water quality impairments identified for the North Bosque River.</p>					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Improve water quality in the North Bosque River and associated water bodies by the development of a watershed action plan designed to further reduce loadings and satisfy the TMDL requirement of section 303(d) of the Clean Water Act.			x	x	x

Reduce agricultural and other loadings through the implementation of specific actions and practices which will help bring the water quality in the North Bosque River in compliance with the water quality standards established by the State of Texas.			x	x	x
OUTPUT MEASURES	1997	1998	1999	2000	2001
Facilitate committee meetings involving outreach and negotiation. (Number of meetings per year →)	2	2	4	4	4
Produce a mathematical model of acceptable loadings.		25%	50%	25%	
Develop an approved, detailed action plan which establishes overall goals and objectives, load allocations, strategy for load allocation, time table for implementation, and a list of expected results.			25%	50%	25%
Implement water quality management plans, including negotiated solution strategies, best management practices, and verification monitoring.				10%	10%

Salado Creek Watershed Project (Bexar County)

(Watershed-specific assessment, planning, and implementation)

STRATEGY: Salado Creek, Segment 1910 (Bexar County)					
<p>Aquatic life is not supported in a two-mile reach of Salado Creek and is only partially supported in a five-mile reach of the segment due to depressed dissolved oxygen. The lower 35 miles of Salado Creek do not support aquatic life due to elevated concentrations of diazinon and contact recreation is not supported in the lower half of the segment due to elevated levels of fecal coliform bacteria. The TNRCC is currently conducting a statewide study to address the fecal coliform issue. Segments listed as impaired due to elevated levels of fecal coliform will be re-evaluated following the completion of this study. Nutrient concentrations exceed state screening criteria for most of the segment and elevated levels of arsenic, cadmium, copper, and lead also occur in sediment.</p> <p>The goal of this project is to develop and implement a watershed action plan which will involve the participation of local governmental and non-governmental organizations, other watershed stakeholders, and the services of private consultants/contractors. The water quality goal is to assure that the segment moves toward full attainment of its beneficial use for aquatic life. The process will result in an equitable, science-based, and fully implementable watershed action plan for the resolution of water quality impairments related to aquatic life identified for Salado Creek. This project will be supported with §319(h) grant funds.</p>					
OUTCOME MEASURES	1997	1998	1999	2000	2001
Improve water quality in Salado Creek and associated water bodies by the development of a watershed action plan designed to satisfy the TMDL requirement of section 303(d) of the Clean Water Act.		x	x	x	x
Reduce loadings through the implementation of specific actions and practices, specified in a watershed action plan, which will bring Salado Creek into compliance with the water quality standards established by the State of Texas.			x	x	x
OUTPUT MEASURES	1997	1998	1999	2000	2001
Facilitate committee meetings involving outreach and negotiation. (Number of meetings per year →)		2	2	2	2
Produce a mathematical model of acceptable loading.		10%	80%	10%	

OUTPUT MEASURES	1997	1998	1999	2000	2001
Develop an approved, detailed action plan which establishes overall goals and objectives, load allocations, strategy for load allocation, time table for implementation, and a list of expected results					

Trinity River-Ft. Worth Watershed Project

(Watershed-specific assessment, planning, and implementation)

STRATEGY: West Fork Trinity River below Lake Worth, Segment 0806, Clear Fork Trinity River below Benbrook Lake, Segment 0829, Clear Fork Trinity River below Lake Weatherford, Segment 0831, Lower West Fork Trinity River, Segment 0841

Contact recreation use is only partially supported in the Trinity River-Ft. Worth watershed project area due to elevated levels of fecal coliform bacteria. The TNRCC is currently conducting a statewide study to address the fecal coliform issue. Segments listed as impaired due to elevated levels of fecal coliform will be re-evaluated following the completion of this study. Nonsupport of aquatic life uses is evidenced by fish consumption advisories issued throughout the project area for chlordane, PCBs, dieldrin, selenium, and DDE in fish tissue. In addition, depressed dissolved oxygen concentrations are a concern in the upper 8 miles of the Clear Fork Trinity River below Lake Weatherford.

The goal of this effort is to develop and implement a watershed action plan which will involve the participation of local governmental and non-governmental organizations, other watershed stakeholders, and the services of private consultants/contractors. The water quality goal is to assure that these segments move toward full attainment of the beneficial uses for aquatic life and fish consumption. The process will result in an equitable, science-based, and fully implementable watershed action plan for the resolution of water quality impairments related to aquatic life and fish consumption identified for the Trinity River-Ft. Worth watershed project area. This project will be supported with §319(h) grant funds.

OUTCOME MEASURES	1997	1998	1999	2000	2001
Improve water quality in the Trinity River-Ft. Worth segments through development of a watershed action plan designed to satisfy the TMDL requirement of section 303(d) of the Clean Water Act.		x	x	x	
Reduce loadings through the implementation of specific actions and practices, specified in a watershed action plan, which will bring the Trinity River-Ft. Worth segments into compliance with the water quality standards established by the State of Texas.				x	x
Reduce loadings of agricultural pollutants through the implementation of WQMPs which will bring the Trinity River Ft. Worth segments into compliance with the water quality standards established by the State of Texas.				x	x
OUTPUT MEASURES	1997	1998	1999	2000	2001
Facilitate committee meetings involving outreach and negotiation (Number of meetings per year→)		2	3	4	1
Produce a mathematical model of acceptable loadings.			40%	60%	
Develop a detailed action plan in conjunction with federal, state and local entities which establishes overall goals and objectives, a time table for implementation, and a list of		10%	10%	80%	

OUTPUT MEASURES	1997	1998	1999	2000	2001
expected results.					
Implement watershed action plan and verification monitoring.				10%	10%

Other State Agency Schedules

Goals for other state agencies for nonpoint source management are shown below.

Texas Water Development Board

GOALS	1997	1998	1999	2000	2001
The Bays and Estuaries Program will develop nutrient budgets for all bays and estuaries between 1996 and 1999.	x	x	x		

General Land Office

GOALS	1997	1998	1999	2000	2001
The General Land Office will organize Texas Beach Cleanups twice annually.	x	x	x	x	x
The General Land Office will publish Cleanup results annually.	x	x	x	x	x

Texas Department of Transportation

GOALS	1997	1998	1999	2000	2001
TxDOT will manage road construction projects using BMPs to protect water quality.	x	x	x	x	x
TxDOT will manage roadside vegetation for control of roadway runoff.	x	x	x	x	x
TxDOT will conduct a permitting program for the location and construction of utility lines along and across state highways.	x	x	x	x	x

Texas Parks and Wildlife Department

GOALS	1997	1998	1999	2000	2001
TPWD will promote environmentally sound land management in urban areas through the Texas Wildscapes Program	x	x	x	x	x
TPWD will promote environmentally sound land management in rural areas through the Private Lands Enhancement Program	x	x	x	x	x
TPWD will provide incentives for environmentally sound land management in rural areas under the Private Lands Initiative	x	x	x	x	x

GOALS	1997	1998	1999	2000	2001
TPWD will provide technical assistance for the protection of wetlands habitat through the Wetland Habitat Alliance of Texas program.	x	x	x	x	x

Texas Department of Health

GOALS	1997	1998	1999	2000	2001
The Texas Department of Health will assess water quality for the support of seafood production and publish advisories and bans for waters from which it is unsafe to consume fish.	x	x	x	x	x

Railroad Commission of Texas

GOALS	1997	1998	1999	2000	2001
The Railroad Commission will regulate threats to water quality from coal and uranium surface mining.	x	x	x	x	x
The Railroad Commission will regulate threats to water quality from oil and gas industry activities.	x	x	x	x	x

Texas Forest Service

GOALS	1997	1998	1999	2000	2001
Semiannual meetings of the Wetland/BMP Coordinating Committee	x	x			

APPENDIXES



APPENDIX A

CERTIFICATION OF AUTHORITY



Robert J. Huston, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
John M. Baker, *Commissioner*
Jeffrey A. Saitas, *Executive Director*



TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

GENERAL COUNSEL'S CERTIFICATION

The State of Texas, through the Texas Natural Resource Conservation Commission (Commission or TNRCC), is currently in the process of seeking full approval for its *Texas Nonpoint Source Pollution Assessment Report and Management Program* ("NPS Program"). The EPA has given full technical approval to the NPS program.

In accordance with Section 319(b)(2)(D) of the Clean Water Act, each management program proposed for implementation must include:

A certification of the attorney general of the State or States (or the chief attorney of any State water pollution control agency which has independent legal counsel) that the laws of the State or States, as the case may be, provide adequate authority to implement such management program or, if there is not such adequate authority, a list of such additional authorities as will be necessary to implement such management program . . . 33 U.S.C. § 1329 (b)(2)(D).

Following a review of the referenced 1999 NPS Program, the General Counsel certifies, under Section 319(b)(2)(D) of the Clean Water Act, that the laws of the State of Texas provide adequate authority to implement the NPS Program, as more specifically described below.

Relevant Legal Authority

The TNRCC is the State agency given primary responsibility for implementing the Constitution and laws of the State relating to water. *See*, TEX WATER CODE (TWC) ANN. § 5.012. Specifically, the Commission has general jurisdiction over the State's water quality program, including:

- ! the issuance of permits;
- ! the enforcement of water quality rules, standards, orders and permits; and
- ! water quality planning. *See*, TEX WATER CODE ANN. § 5.013.

The Commission also has the power to adopt rules, whether specifically authorized or implied by the Code or other law, necessary and convenient to the exercise of its jurisdiction and powers. *See*, TEXAS WATER CODE § 5.103.

The Commission administers the provisions of Chapter 26 of the TEX WATER CODE ANN., which pertains to water quality control. Chapter 26 requires that the Commission establish the level of quality to be maintained in the waters in the State. Waste discharges or impending waste discharges covered by the provisions of Chapter 26 of the Code are subject to reasonable rules or orders adopted or issued by the Commission in the public interest. The Commission has also been given the powers and duties specifically prescribed by Chapter 26 of the Code and all other powers necessary or convenient to carry out those statutory responsibilities. *See*, TEX WATER CODE ANN. § 26.011.

For purposes of Chapter 26 of the Code, "Discharge" is broadly defined to include depositing, conducting, draining, emitting, throwing, running, allowing to seep, or otherwise releasing or disposing of, or allowing, permitting, or suffering any of these acts or omissions. *See*, TEX WATER CODE ANN. § 26.011(20). "Waste" is broadly defined to include sewage, industrial waste, municipal waste, recreational waste, agricultural waste, or other waste, as defined in Section 26.001 of the Texas Water Code. *See* TEX WATER CODE ANN. §26.011(6). "Other waste" includes garbage, refuse, decayed wood, sawdust, shavings, bark, sand, lime, cinders, ashes, offal, oil, tar, dyestuffs, acids, chemicals, salt water, or any other substance, other than sewage, industrial waste, municipal waste, recreational waste, or agricultural waste. *See* TEX WATER CODE ANN. § 26.001(12).

Under Chapter 26 of the TWC, the Commission is authorized to issue orders and make determinations necessary to effectuate the purposes of the Code. A person who violates Chapter 26 of the TWC, or a rule or order adopted by the Commission, may be assessed a civil administrative penalty in an amount not to exceed \$10,000 a day. *See*, TEX WATER CODE ANN. § 26.136. Similar authority to issue orders and assess administrative penalties for violations associated with improper management of solid and hazardous waste can be found in the Texas Health and Safety Code. Additionally, the Executive Director may institute district court proceedings through the Office of the Attorney General to compel compliance with the provisions of the Code or the rules, orders, permits, or other decisions of the Commission. *See*, TEX WATER CODE ANN. § 26.016.

The Executive Director is required to prepare and develop a general, comprehensive plan for the control of water quality in the State, which shall be used as a flexible guide by the Commission. *See*, TEX WATER CODE ANN. § 26.012. Additionally, the Commission is required to:

- ! encourage voluntary cooperation by the people, cities, industries, associations, agricultural interests, and representatives of other interests in preserving the greatest possible utility of water in the State;
- ! encourage the formation and organization of cooperative groups, associations, cities, industries, and other water users for the purpose of providing a medium to discuss and formulate plans for attainment of water quality control;
- ! establish policies and procedures for securing close cooperation among State agencies that have water quality control functions; and
- ! cooperate with the governments of the United States and other states and with official or unofficial agencies and organizations with respect to water quality control matters.

See, TEX WATER CODE ANN. § 26.017.

The Commission is the principal authority in the State on matters relating to the quality of water in the State. The executive director of the Commission has the responsibility for establishing a water quality

sampling and monitoring program for the State. All other State agencies engaged in water quality or water pollution control activities are statutorily required to coordinate those activities with the Commission. *See*, TEX WATER CODE ANN. §26.127. The Commission is also required to establish water quality standards for water in the State and is authorized to amend such standards from time to time. The Commission is the sole and exclusive authority for setting water quality standards. *See*, TEX WATER CODE ANN. § 26.023.

Every city in the State having a population of 10,000 or more inhabitants is required to establish a water pollution control and abatement program to address land development and urban surface runoff. Cities with a population of less than 10,000 may choose to establish a water pollution control and abatement program. The water pollution control and abatement program must encompass the entire city, and may include areas within its extraterritorial jurisdiction. Current law mandates that the required water pollution control and abatement programs must be submitted to the Commission for review and approval. *See*, TEX WATER CODE ANN. § 26.177. Further, the Commission is required to hold annual hearings in counties that include particularly sensitive areas, such as the Edwards Aquifer, to receive evidence on actions the Commission should take to protect the aquifer from pollution. *See*, TEX WATER CODE ANN. § 26.047. Under this authority, the Commission has developed rules which regulate development activities over the Edwards Aquifer. *See*, 30 TAC Chapter 213.

The TNRCC has broad authority over the location, design, construction, installation, and proper functioning of on-site sewage disposal systems, *see*, TEXAS HEALTH & SAFETY CODE § 366.011, and is required to adopt rules that encourage the use of economically feasible alternative techniques and technologies. *See*, TEXAS HEALTH & SAFETY CODE § 366.012. The TNRCC is also vested with broad authority to enforce Chapter 366 of the Code, and to issue necessary emergency orders. *See*, TEXAS HEALTH & SAFETY CODE §§ 366.016.

Texas Department of Transportation

The Texas Department of Transportation (TxDOT) is the primary agency in the State responsible for highway, road, and bridge construction. As described in the 1999 NPS Program, TxDOT's approach in addressing nonpoint source pollution is to limit impacts to receiving waters through implementation of highway design specifications. TxDOT has been conferred broad authority by the legislature. *See*, TEX. TRANSPORTATION CODE, Chapter 201. TxDOT and the TNRCC have entered into an agreement with regard to the assessment of water quality impacts resulting from certain transportation projects. 30 TAC §305.521.

Texas Railroad Commission

The Texas Railroad Commission is solely responsible for the control and disposition of waste and the abatement and prevention of surface and subsurface water pollution resulting from activities associated with the exploration, development, and production of oil and gas or geothermal resources, including:

- ! activities associated with the drilling of injection water source wells which penetrate the base of useable quality water;
- ! activities associated with the drilling of cathodic protection holes associated with the cathodic protection of wells and pipelines subject to the jurisdiction of the Railroad Commission of Texas;

- ! activities associated with gasoline plants, natural gas or natural gas liquids processing plants, pressure maintenance plants, or repressurizing plants;
- ! activities associated with any underground natural gas storage facility,
- ! activities associated with any underground hydrocarbon storage facility; and
- ! activities associated with the storage, handling, reclamation, gathering, transportation, or distribution of oil or gas before refining.

See, TEX WATER CODE ANN. § 26.131 . To prevent pollution of streams and public bodies of surface water of the State, the Railroad Commission is mandated to adopt and enforce rules relating to the drilling of exploratory wells and oil and gas wells. *See*, Texas Natural Resources Code § 91.101.

Texas Parks and Wildlife Department

The Texas Parks and Wildlife Department is authorized to regulate the use of Department lands for oil, gas, and other mineral recovery and associated activities as the Department considers reasonable and necessary to protect the surface estate. *See*, TEXAS PARKS & WILDLIFE CODE § 11.071.

Wetlands

The United States Army Corps of Engineers is the principle authority for all dredging operations affecting bays and estuaries of Texas. While EPA has designated the Corps as the implementing agency under Section 404 of the Clean Water Act, the TNRCC is responsible for completing Section 401 Water Quality Certifications. The Commission has enacted regulations using this authority, and a project with an unacceptable impact to state waters may not be permitted if the Commission denies certification. *See*, 30 Texas Administrative Code Chapter 279.

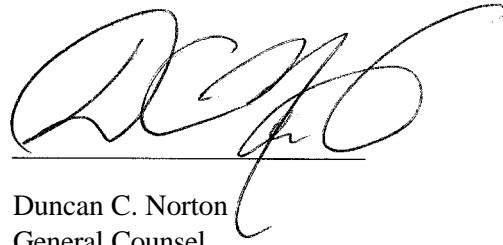
Spill Response

The *Texas Oil and Hazardous Substances Spill Prevention and Control Act* provides that it is the policy of the State to prevent the spill or discharge of hazardous substances into waters in the State and to cause the removal of any such spills and discharges without undue delay. *See*, TEX WATER CODE ANN. §§ 26.261 - .267. Under the Act, the Commission shall be the lead agency in spill response matters, shall conduct spill response for the State, and shall otherwise administer the provisions of the Act. The Commission has also been designated by the Governor as the State's lead agency for Superfund activities and as the State's representative to the federal Regional Response Team in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act*, 42U.S.C. §§ 9601- 9675; the *Water Pollution Prevention and Control Act*, 33 U.S.C. §§ 12511387; and the *National Oil and Hazardous Substances Pollution Contingency Plan*, 40 CFR Part 300. Under the authority of the *Solid Waste Disposal Act*, the Commission additionally has broad removal authorities with respect to the cleanup of a release or threatened release of hazardous substances at a facility on the State registry. TEXAS HEALTH AND SAFETY CODE Chapter 361.

Funding Mechanisms

The Executive Director, with the approval of the Commission, may execute agreements with the United States Environmental Protection Agency or any other federal agency that administers programs providing federal cooperation, assistance, grants, or loans for research, development, investigation, training, planning,

studies, programming, and construction related to methods, procedures, and facilities for the collection, treatment, and disposal of waste and other water quality control activities. The Commission is authorized to accept federal funds for these purposes and for other purposes consistent with the objectives of Chapter 26 of the TWC and may use the funds as prescribed by law or as provided by agreement.

A handwritten signature in black ink, appearing to read "D. Norton", is written over a horizontal line. The signature is fluid and cursive.

Duncan C. Norton
General Counsel
Texas Natural Resource Conservation Commission



OFFICE OF THE ATTORNEY GENERAL • STATE OF TEXAS
JOHN CORNYN

September 16, 1999

Mr. Robert Buckley, Executive Director
Texas State Soil & Water Conservation Board
P.O. Box 658
311 North 5th Street
Temple, Texas 76503

Re: Statewide Agriculture/Silvicultural Nonpoint Source Management Program

Dear Mr. Buckley:

I have reviewed the above referenced management program, which is located on the Internet at http://www.tnrcc.state.tx.us/water/quality/data/wmt/nps_ind.html. I have also reviewed Chapters 201 and 203 of the Texas Agriculture Code ("Code").

As you know, the Board's statutory authority is contained in Chapters 201 and 203 of the Code. Sections 201.026 of the Code gives the Board specific authority to "plan, implement, and manage programs and practices for abating agricultural and silvicultural nonpoint source pollution." Texas law therefore provides adequate authority for the Board to promulgate and implement the Statewide Agriculture/Silvicultural Nonpoint Source Management Program.

Please let me know if I can assist you further.

Very truly yours,

George Noelke
Assistant Attorney General
Administrative Law Division

APPENDIX B FEDERAL CONSISTENCY



Section 319(b)(2)(F) calls for each State Management Program to contain an identification of federal financial assistance programs and federal development projects for which the state will review individual assistance applications or development projects for their effect on water quality, to determine whether such activities would be consistent with the State Management Program. The Texas Review and Comment System (TRACS) will be utilized to fulfill this requirement. Consistency review of urban, non-agricultural, non-silvicultural programs is the responsibility of the TNRCC. Consistency of agricultural and silvicultural programs is reviewed by the TSSWCB.

TNRCC Review of Federal Assistance Programs

This list of Federal Assistance programs was developed from the *1995 Catalog of Federal Domestic Assistance* for potential use by the TNRCC in the development and administration of its NPS Management Program. Some of these programs may be reviewed by the TNRCC for consistency with its NPS Management Program. Any federal programs which the State identifies as inconsistent with its management program will be brought to the attention of the EPA. No inconsistent programs have been identified at this time.

Department of Commerce

Economic Development Administration

- 11.300 Economic Development - Grants and Loans for Public Works and Infrastructure Development
- 11.302 Economic Development - Support for Planning Organizations
- 11.304 Economic Development - Public Works Impact Program
- 11.307 Special Economic Development and Adjustment Assistance Program - Long Term Economic Deterioration

National Oceanic and Atmospheric Administration

- 11.405 Anadromous and Fish Conservation Act Program
- 11.407 Interjurisdictional Fisheries Act of 1986
- 11.415 Fisheries Obligation Guarantee Program
- 11.417 Sea Grant Support
- 11.419 Coastal Zone Management Program Administration Awards
- 11.420 Coastal Zone Management Estuarine Research Reserves
- 11.426 Financial Assistance for Ocean Resources Conservation and Assessment Program
- 11.427 Fisheries Development and Utilization - Research and Demonstration Grants and Cooperative Agreements Program
- 11.429 Marine Sanctuary Program
- 11.441 Regional Fishery Management Councils

Department of Defense**Department of the Army, Office of the Chief of Engineers**

- 12.100 Aquatic Plant Control
- 12.101 Beach Erosion Control Projects
- 12.104 Flood Plan Management Services
- 12.105 Protection of Essential Highways, Highway Approaches and Public Works
- 12.106 Flood Control Projects
- 12.107 Navigation Projects
- 12.108 Snagging and Clearing for Flood Control
- 12.109 Protection, Clearing and Straightening Channels
- 12.110 Planning Assistance to States
- 12.114 Collaborative Research and Development

Office of the Assistant Secretary

- 12.612 Community Base Reuse Plans
- 12.613 Growth Management Planning Assistance

Department of Housing and Urban Development**Housing - Federal Housing Commission**

- 14.112 Mortgage Insurance for Construction or Substantial Rehabilitation of Condominium Projects
- 14.117 Mortgage Insurance - Homes
- 14.126 Mortgage Insurance - Cooperative Projects
- 14.127 Mortgage Insurance - Manufactured Home Parks

Community Planning and Development

- 14.218 Community Development Block Grants/Entitlement Grants
- 14.219 Community Development Block Grants/Small Cities Program

Public and Indian Housing

- 14.862 Indian Community Development Block Grant Program

Department of the Interior**Bureau of Land Management**

- 15.214 Non-sale Disposal of Mineral Material
- 15.225 Recreation Resource Management

Office of Surface Mining Reclamation and Enforcement

- 15.250 Regulation of Surface Coal Mining and Surface Effects of Underground Coal
- 15.252 Abandoned Mine Land Reclamation Program

United States Fish and Wildlife Service

- 15.600 Anadromous Fish Conservation
- 15.605 Sport Fish Restoration
- 15.611 Wildlife Restoration

- 15.614 Coastal Wetlands Planning, Protection and Restoration Act
- 15.618 Administrative Grants for Federal Aid in Sport Fish and Wildlife Restoration

Geological Survey

- 15.805 Assistance to State Water Resources Research Institutes
- 15.806 National Water Resources Research Program
- 15.808 Geological Survey - Research and Data Acquisition

National Park Service

- 15.916 Outdoor Recreation - Acquisition, Development and Planning
- 15.919 Urban Park and Recreation Recovery Program

Department of Transportation**United State Coast Guard**

- 20.007 Bridge Alteration

Federal Aviation Administration

- 20.106 Airport Improvement Program

Federal Highway Administration

- 20.205 Highway Planning and Construction
- 20.219 National Recreational Trails Funding Program

Federal Railroad Administration

- 20.312 High Speed Ground Transportation

Federal Transit Administration

- 20.500 Federal Transit Capital Improvement Grants
- 20.507 Federal Transit Capital and Operating Assistance Formula Grants
- 20.509 Public Transportation for Non-urbanized Areas

Maritime Administration

- 20.801 Development and Promotion of Ports and Intermodal Transportation
- 20.812 Construction Reserve Fund

General Services Administration

- 39.002 Disposal of Federal Surplus Real Property

Small Business Administration

- 59.012 Small Business Loans
- 59.013 Local Development Company Loans

Environmental Protection Agency**Office of Air and Radiation**

66.001 Air Pollution Control Program Grants

Office of Water

66.419 Water Pollution Control - State and Interstate Program Support
66.433 State Underground Water Source Protection
66.435 Water Pollution Control - Lake Restoration Cooperative Agreements
66.438 Construction Management Assistance
66.454 Water Quality Management Planning
66.456 National Estuary Program
66.458 Capitalization Grants for State Revolving Fund
66.460 Nonpoint Source Implementation Grants
66.461 Wetlands Protection - State Development Grants
66.463 National Pollutant Discharge Elimination System Related State Program Grants

Office of Research and Development

66.500 Environmental Protection - Consolidated Research
66.502 Pesticides Control Program
66.505 Water Pollution Control - Research, Development and Implementation
66.506 Safe Drinking Water Research and Demonstration
66.507 Toxic Substances Research

Office of Administration

66.600 Environmental Protection Consolidated Grants Program Support

Office of Enforcement and Compliance Assurance

66.700 Consolidated Pesticide Compliance Monitoring Program
Cooperative Agreements
66.708 Pollution Prevention Grants Program

Office of Solid Waste and Emergency Response

66.805 Leaking Underground Storage Tanks Program
66.807 Superfund Innovative Technology Evaluation Program

Office of Environmental Education

66.951 Environmental Education Grants

Department of Energy

81.065 Nuclear Waste Disposal Siting
81.104 Technology Development for Environmental Management

TNRCC Review of Federal Development Projects

The following is a list of the types of plans and development projects that are initiated and managed by Federal agencies which may impact on the State's nonpoint source management program. Not all of the activities listed below will be eligible for Section 319 federal consistency reviews pursuant to Executive Order 12372.

USDA, Forest Service

- Forest Plans
- Resource Area Analyses
- Integrated Resource Management Plans
- Timber Activities/Sales
- Range Activities
- Chemicals/Pesticides
- Area Analysis/Cumulative Impacts Analysis
- Recreation Development
- Transportation Plans
- Soil and Water Management
- Water Uses and Development
- Soil and Water Improvement Projects
- Public Water Supply Watershed Management
- Hydrologic Modification
- Wetlands Protection
- Rise to the Future/Fisheries Program
- Riparian Management Programs
- Minerals Exploration and Development
- Fuels Management
- Applications for Permits to Drill
- Oil and Gas Leasing/Reclamation Plans
- Hydropower Licensing Activity in Coordination with Federal Energy Regulatory Commission (FERC)/Special Use Permitting
- ORV (Off-road Vehicles) Activities
- D-J/W-B Activities (Dingall-Johnson and Wallop-Breoux fish and game)
- Fire Protection
- Soil and Water Monitoring Program
- Challenge Grant Program (fisheries)
- Allotment Management Planning and Administration
- Road Construction and Maintenance
- Watershed Condition Program
- Municipal Watershed Management Program
- Floodplain Modifications

USDA, Natural Resources Conservation Service/Farm Service Agency

- Small Watershed Program

Department of the Interior, Bureau of Land Management

Watershed Projects
Mineral Exploration and Development
Coal, Oil and Gas Leasing
Coal Reclamation
ORV Activities
Timber Activities
Grazing Allotment/Grazing Management
Chemicals/Pesticides
Area Analysis/Cumulative Impacts
Public Watershed Management
Wetlands Protection
Riparian Management Plans
Hydrologic Modification
Transportation Plans
ACEC Plans

Department of the Interior, Bureau of Reclamation

Irrigation development

Department of the Interior, Fish and Wildlife Service

Management of National Wildlife refuges and proposed acquisitions

Department of the Interior, Surface Mining Reclamation and Enforcement

Regulation of coal mining and reclamation of abandoned mine lands

Department of Defense, Defense Installations

Land Management Plans
Waste Management Plans
Re-vegetation Plans
Location, design and acquisition of new or expanded defense installations
Plans, procedures and facilities for handling or storage use zones
Establishment of impact, compatibility or restricted use zones

Department of Defense, Corps of Engineers

Dredging
Channel Improvement
Breakwaters
Other navigational works
Erosion control structures
Beach replenishment
Dams or flood control works
Ice management practices
Land acquisition for spoil disposal or other purposes
Selection of open water disposal sites

Department of Transportation, Federal Aviation Administration

Location, design, construction, maintenance and demolition of Federal aids to air navigation

Department of Transportation, U.S. Coast Guard

Location, design, construction, or enlargement of Coast Guard stations, bases, and lighthouses

Location, placement, or removal of navigation devices which are not part of the routine operations under the Aids to Navigation Program

Expansion, abandonment, designation of anchorages, lighting areas, or shipping lanes and ice management practices and activities

General Services Administration

Acquisition, location, and design of proposed Federal government property or buildings, whether leased or owned by the Federal government

TSSWCB Review of Federal Assistance Programs and Federal Development Project

The Texas Review and Comment System will be utilized to fulfill the federal consistency requirement for the TSSWCB NPS program. Under this system, the Governor's Office coordinates the review of federal assistance activities with state agencies. Those activities currently reviewed by the TSSWCB include all programs involving agriculture, natural resources, and water quality. In addition, the following list of programs is identified for review by the TSSWCB.

Environmental Protection Agency

- a. Source Water Protection
- b. Clean Lakes Cooperative Agreements
- c. Comprehensive Estuarine Management
- d. Environmental Protection Consolidated Grants Program Support
- e. Pesticide Enforcement Program
- f. Nonpoint Source Programs

Natural Resources Conservation Service (U.S. Department of Agriculture)

- a. Resource Conservation and Development
- b. Soil and Water Conservation
- c. Watershed Protection and Flood Prevention
- d. River Basin Surveys and Investigations
- e. Rural Abandoned Mine Program
- f. Emergency Conservation Program
- g. Environmental Quality Incentive Program
- h. Conservation Reserve Program
- i. PL-566 (Small Watersheds)

- j. Rural Clean Water Project
- k. Water Quality Incentive Program
- l. Wetland Reserve Program

Forest Service (U.S. Department of Agriculture)

- a. Forestry Incentives Program
- b. Forestry Stewardship Program
- c. Forest Plans
- d. Forestry Research
- e. Cooperative Forestry Assistance
- f. Resource Area Analyses
- g. Integrated Resource Management Programs
- h. Timber Activities/Sales
- I. Range Activities
- j. Chemicals/Pesticides
- k. Area Analysis/Cumulative Impacts Analysis
- l. Transportation Plans
- m. Watershed Management
- n. Water Development
- o. Watershed Rehabilitation Projects
- p. Hydrologic Modification
- q. Wetlands Protection
- r. Riparian Management Plans
- s. SMZ Activities/(stream-side impact zone)

Extension Service (U.S. Department of Agriculture)

- a. Educational efforts
- b. Best Management Practice Demonstration
- c. Water Quality Incentive Program
- d. Technical Information
- e. Best Management Practice Evaluation

Farm Service Agency (U.S. Department of Agriculture)

- a. Water Bank Program
- b. Conservation Reserve Program
- c. Water Quality Incentive Program

Rural Economic Community Development (U.S. Department of Agriculture)

- a. Resource Conservation and Development Loans
- b. Soil and Water Loans
- c. Watershed Protection and Flood Prevention Loans

Corps of Engineers (U.S. Department of Defense)

- a. Beach Erosion Control Projects
- b. Flood Plains Management Services

- c. Flood Control Projects
- d. Snagging and Clearing for Flood Control
- e. Colorado River Salinity Control

Fish and Wildlife Service (U.S. Department of Interior)

- a. Fish Restoration
- b. Wildlife Restoration
- c. Management of National Wildlife refuges and proposed acquisitions (including wetlands)

Bureau of Land Management (U.S. Department of Interior)

- a. Watershed Projects
- b. Timber Activities
- c. Grazing Allotment/Grazing Management
- d. Chemicals/Pesticides
- e. Area Impacts/Cumulative Impacts
- f. Wetland Protection
- g. Riparian Management Plans
- h. Hydrologic Modification
- i. Watershed Activity Plans

Bureau of Reclamation (U.S. Department of Interior)

- a. Abandoned Mine Reclamation Program
- b. Small Reclamation Projects
- c. Irrigation Development

National Parks Service (U.S. Department of Interior)

National Park and Seashore Management and proposed acquisitions

Geological Survey (U.S. Department of Interior)

Mapping services and water quality monitoring assistance

APPENDIX C FUNDING



Funding sources available to support programs related to nonpoint source pollution include:

Federal

- ! CWA Section 104(b)(3)
- ! CWA Section 106 Funds
- ! CWA Section 319(h) Grant Funds
- ! CWA Section 604(b) Funds
- ! FIFRA Funds
- ! Safe Drinking Water Act Grant Funds
- ! AmeriCorps Grant Funds
- ! Solid Waste Disposal Act, Section 8001
- ! Superfund
- ! Nongame and Endangered Species Fund

State

- ! State General Revenue Funds
- ! Wastewater Discharge Permit Fees
- ! Water Rights Permit Fees
- ! State Revolving Fund
- ! Texas Water Development Board Loan Programs and Development Funds
- ! Fund 1532, Clean Rivers Program Funds
- ! General Land Office Oil Spill Fund
- ! OSSF Permit and License Fees
- ! Fund 0270, Solid Waste Tipping Fees
- ! Fund 5500, State Hazardous and Solid Waste Remediation Fees
- ! Solid Waste Fund
- ! Fund 4680, Texas Irrigators Fund
- ! Fund 0790, Water Well Drillers
- ! Texas Conservation Fund
- ! Wildscapes Fees and Poster and Stamp Sales
- ! River Authority Funds

Specific Funding for TNRCC Programs

The Nonpoint Source Program Team is funded by Clean Water Act Section 319(h) and by State General Revenue Funds.

The Clean Rivers Program is supported by fees from wastewater discharge permits and water rights permits. Federal funding for Water Quality Management Plans is provided by EPA through a 1% reserve of annual allocated funds to the TWDB for State Revolving Fund (SRF) loans. Of this amount, 40% is passed through to the seven designated area regional planning agencies. Funding for the current Continuing Planning Process comes from Federal FY 1994 604(b) grant funds and State General Revenue.

Standards development and implementation and wetlands certification are funded by Section 106 of the Clean Water Act and by State general revenue funds.

The ongoing activities of the Surface Water Quality Monitoring Team are funded by Section 106 and State General Revenue funds.

Water Quality Modeling is funded by Clean Water Act 604(b) funds and State General Revenue.

State General Revenue funds support the Ecosystem Research Team (water rights permits and wetland certification).

The Texas Watch Program (volunteer monitoring) is funded by Clean Water Act Section 319(h) and Section 106 grants, and State General Revenue.

The Ground-water Protection Team is funded from Section 106 ground water funds, FIFRA funds, and State General Revenue.

The Galveston Bay Estuary Program receives funding from the General Land Office Oil Spill Fund, State General Revenues, and Clean Water Act Section 104(b)(3). The Program will be seeking Section 319(h) funding for NPS demonstration projects.

Funding for the Corpus Christi Bay National Estuary Program comes from Clean Water Act Sections 104(b)(3) and 320 funds and State General Revenues.

Funding for the Source Water Protection Program will be sought from the EPA under the Safe Drinking Water Act.

Funding for the Wellhead Protection Program comes from Clean Water Act Section 319(h) grants for FY 95 and FY 96, State General Revenues, and an El Paso AmeriCorps Grant.

Funding for the Small Towns Environmental Program comes from State General Revenues. Due to public interest in STEP, the program is attempting to secure funds to designate a permanent, full time employee to coordinate STEP projects.

Funding for Agriculture Section NPS programs through 1997 comes from Clean Water Act Section 319(h) grants and State General Revenue. The program is seeking funding beyond 1997 through a TSSWCB agricultural Section 319(h) grant.

Funding for the On-Site Sewage Facilities program in the TNRCC was initially provided from general revenue; however, legislation has since provided for the following methods of funding for continued program operations:

- ! Fees may be collected for all OSSF permits issued by TNRCC. The fees collected by the authorized agents are not controlled by the TNRCC and vary between entities.
- ! OSSF installers are required to pay a fee to obtain a license, and a yearly renewal fee to maintain the license.

Clean Texas 2000 funds come from Fund 0270, solid waste tipping fees, and CWA Section 319(h) grants.

The programs of the Community Recycling and Composting Team are funded by landfill shipping fees. The program will be seeking Section 319(h) funds for compost training workshops.

Country Cleanups and the Lake and River Cleanup are funded from the Solid Waste Fund. Fund 5500, from hazardous waste generation fees, provide for the Agricultural Waste Pesticide Program and the Household Hazardous Waste Program.

The Used Oil Program is funded by revenues in the Used Oil Recycling Fund. In addition to this funding, the TNRCC may apply for, request, solicit, contract for, receive and accept gifts,

grants, donations and other assistance from any source to carry out its powers and duties under this program.

Funding for the Emergency Response Program, the Superfund Site Discovery and Assessment Team, and the Natural Resource Damage Assessment Team comes from Fund 5500, State Hazardous and the Solid Waste Remediation Fee Fund.

The Illegal Disposal Program is funded under the Solid Waste Disposal Act, Section 8001, and with State General Revenue.

Occupational Certification Program funding comes from the following areas:

- ! Landscape Irrigation: Fund 4680
- ! On-site Sewage Facility Installation: General Revenue Fund 0010
- ! Water Well Drilling: Fund 0790
- ! Water Pump Installation: Fund 0790

Funding for the Edwards Aquifer Program comes from State funds supplemented by 319 grant funding.

TSSWCB Sources of Federal and Other Assistance and Funding

In Texas, planning, implementing, and managing programs and practices for the abatement of agricultural and silvicultural nonpoint source pollution is the responsibility of the State Soil and Water Conservation Board. However, other organizations and their programs play major roles. Likewise, because funding for nonpoint source control programs has not received the same priority as that for point sources, efforts in Texas tend to rely on cooperation and coordination to make use of existing resources where possible. It is the purpose of this section to identify those programs and resources used in Texas to address agricultural and silvicultural nonpoint source pollution. Although other organizations and their programs play major roles in the state's implementation and management of programs and practices for the abatement of agricultural and silvicultural nonpoint source pollution, that in no way allows those other agencies access to private land without the prior knowledge and consent of the owner (unless the agencies already have that authority by statute).

One of the major obstacles to the development and implementation of nonpoint source management programs is funding. As data become available and nonpoint source concerns are more adequately identified, programs and priorities will shift to address them. Without additional funding for nonpoint source management, any program shifts to nonpoint source priorities will only cut deeper into basic soil and water conservation programs and reduce their effectiveness.

Nonpoint source management programs will utilize existing information, education, and demonstration capabilities to educate and inform farmers, ranchers, and other producers of the potential for nonpoint source pollution to occur as a result of agricultural or silvicultural activities. Technical assistance programs, both state and federal, will be used to assist in the implementation of best management practices contained in nonpoint source management programs. Cost-share incentive programs will be utilized where applicable and available to provide incentives for installation of best management practices. Research organizations will be relied upon to provide needed research to advance the effectiveness of nonpoint source management programs and keep pace with advances in agricultural and silvicultural production methods.

Loan programs, where applicable, will help producers implement best management practices. Where necessary and desirable, new and innovative solutions will be sought to address problems that cannot be handled by existing programs. Means will also be pursued, through cooperative efforts with other agencies, to increase the level of water quality sampling in the state, particularly as it relates to agricultural and silvicultural activities and their impacts on the hydrologic cycle. Senate Bill 502 provides for coordination of assessment activities relative to agriculture and silviculture under the state's Clean Rivers Program.

Cost Share assistance for water quality benefits is also available through Texas Senate Bill 503 Water Quality Management Plan Implementation funding. This program is administered through the Texas State Soil and Water Conservation Board.

Additional state and federal fundings sources that will be explored are:

- ! *Coastal Service Centers* – The Coastal Services Center supports projects aimed at developing creative science-based solutions to coastal management issues that will allow maintenance or improvement of natural resources while also allowing for economic growth.
- ! *Coastal Zone Management Administration/Implementation Awards* – Funds are available to support projects in areas such as coastal wetlands management and protection; natural hazards management; public access improvements; reduction of marine debris; assessment of impacts of coastal growth and development; special area management planning; regional management issues; and demonstration projects with potential to improve coastal zone management.
- ! *Financial Assistance for Ocean Resources Conservation and Assessment Programs* – This project supports efforts to determine the long-term consequences of human activities which affect the coastal and marine environment; to assess the consequences of these activities in terms of ecological, economic, and social impacts upon human, physical, and biotic environments; and to define and evaluate management alternatives which minimize adverse consequences of human use of the coastal and marine environments and resources.
- ! *National Estuary Program* – NEP coordinates efforts to improve water quality and protect and restore coastal resources through the development of Comprehensive Conservation and Management Plans (CCMP).
- ! *Environmental Education Grants Program* – The purpose of the EEG is to provide financial support for projects which design, demonstrate or disseminate environmental education practices, methods, or techniques.
- ! *Environmental Justice Through Pollution Prevention Grant Program*
- ! *Fisheries Development and Utilization Research and Development Grants and Cooperative Agreements Program* – This program is intended to increase the Nation's wealth and quality of life through sustainable fisheries that support fishing industry jobs, safe and wholesome seafood, and recreational opportunities.
- ! *Cooperative Forestry Assistance Program* – These programs help to achieve ecosystem health and sustainability by improving wildlife habitat, conserving forest land, reforestation, improving soil and water quality, preventing and suppressing damaging insects and diseases, wildfire protection, expanding economies of rural communities, and improving urban environments.
- ! *Abandoned Mine Land Reclamation Program* – AMLR provides for the restoration of eligible lands and waters mined and abandoned or left inadequately restored.

- ! *Watershed Protection and Flood Prevention Program* – Projects include watershed protection, flood prevention, erosion and sediment control, water supply, water quality, fish and wildlife habitat enhancement wetlands creation and restoration, and public recreation in watersheds of 250,000 or fewer acres.
- ! *Surface Transportation Program* – Each State sets aside 10% of STP funds for transportation enhancements, which can include water-related projects, such as wetland mitigation and implementation of control technologies to prevent polluted highway runoff from reaching surface water bodies.
- ! *Capitalization Grants for Clean Water State Revolving Funds* – EPA awards grants to States to capitalize their clean Water State Revolving Funds (SFRs). Loans are increasingly used for other water quality management activities, including: (1) agricultural, silviculture, rural and urban runoff control; (2) estuary improvement projects; (3) wet weather flow control ...
- ! *Hardship Grants Program for Rural Communities* – In conjunction with the Clean Water State Revolving Fund (SRF), the hardship Grants Program provides funds to rural communities for wastewater projects.
- ! *Nonpoint Source Implementation Grants (319 Program)* – The 319 program provides formula grants to the States to implement nonpoint source projects and program sin accordance with Section 319 of the Clean Water Act.
- ! *Pollution Prevention Grants Program* – This grant program provides projects grants to States to implement pollution prevention projects.
- ! *Water Quality Cooperative Agreements* – Grants are provided to support the creation of unique and new approaches to meeting stormwater, combined sewer outflows, sludge, and pretreatment requirements as well as enhancing State capabilities.
- ! *Wetlands Reserve Program* – WRP provides landowners with financial incentives to enhance wetlands in exchange for retiring marginal agricultural land.
- ! *Wetlands Protection Development Grants* – The Wetlands Protection Development grants program provides financial assistance to States to support wetlands development or augmentation and enhancement of existing programs.

APPENDIX D

SUMMARY OF PUBLIC RESPONSES



Only two comment letters were received in response to the published draft of the *1999 Texas Nonpoint Source Assessment Report and Management Program*. One concerned a correction to a citation of applicable law. The second expressed several concerns about the state's nonpoint source management program and assessment methods. The comments expressed are summarized and the State's response is given. Following the summary of comments and response, both comment letters are produced in their entirety.

Summary of Public Comments and the State's Response

Comment Letter One, from Ms. Tina Amberboy

Summary of Comment	State's Response
The citation to Ag Code 201.016 in the first paragraph of the report should be to 201.026.	The State concurs with the correction offered in Ms. Amberboy's comment. The citation referring to Agricultural Code Section 201.016 has been changed to refer to Section 201.026.

Comment Letter Two, from Mr. Walter West

Summary of Comment	State's Response
The State is not fulfilling its obligations under the federal Clean Water Act to publish the NPS Assessment Report and Management Program at 18-month intervals. The last NPS Assessment Report and Management Program was approved by the EPA in 1992. Seven years is too long a period between assessments to provide a meaningful analysis of trends and progress.	The statute referenced in Mr. West's letter is Section 319(c) of the Clean Water Act, which details the administrative provisions for submission of required reports and management programs. The directive that "each report and management program shall be submitted to the Administrator during the 18-month period beginning on the date of the enactment of this section" was a time frame for states to meet for their initial submission of these documents after the statute's amendment in 1987. The law does not require that these documents be submitted every 18 months. Texas has negotiated an agreement with the EPA that the management program will undergo complete revision every five years to coincide with the

Summary of Comment	State's Response
<p>The document does not characterize the sources of pollution in water bodies that are not meeting standards. It does not identify specific pollutants or activities contributing to the NPS pollution and makes no attempt to identify the actual sources of NPS Pollution. Only general and broad categories of NPS sources are identified.</p>	<p>five-year basin management cycle, and that the state will update the assessment report annually on a schedule that coincides with the preparation of the Texas Water Quality Inventory [(305(b) report)]. Further, the EPA has agreed to accept the State's 303(d) List of impaired waters in fulfillment of the State's obligation under Section 319 of the CWA to assess waters impaired by nonpoint source pollution. Discussion of these commitments can be found on pages 1-9, 1-21, 1-35 and 3-2 of the Draft 1999 Texas Nonpoint Source Pollution Assessment Report and Management Program.</p>
<p>The document fails to identify tributary waters of Sam Rayburn that are impacted by nonpoint source pollution. Two tributary waters, Attoyac Bayou and the Angelina River were previously identified in <i>Texas Water Quality: A Summary of River Basin Assessments</i> as not supporting certain designated uses but are not identified in this NPS assessment.</p>	<p>For most water bodies, the TNRCC does not have an adequate monitoring and special study program to routinely identify the source of contaminants that cause impairments. When an impairment of water quality is identified with confidence, the water body is listed on the 303(d) List (which includes all waters identified as impaired by nonpoint sources of pollution) for a specific pollutant. The first step in restoring water quality is to further define the degree and extent of the impairment so a TMDL can be initiated. This step includes an identification of potential sources of the contaminant through monitoring. In effect, the 303(d) listing results in a prioritization for this more intense and costly monitoring.</p>
<p>The document fails to identify tributary waters of Sam Rayburn that are impacted by nonpoint source pollution. Two tributary waters, Attoyac Bayou and the Angelina River were previously identified in <i>Texas Water Quality: A Summary of River Basin Assessments</i> as not supporting certain designated uses but are not identified in this NPS assessment.</p>	<p>The document, <i>Texas Water Quality: A Summary of River Basin Assessments</i>, was prepared from the assessment performed in 1996 to produce the 1996 305(b) Inventory and the 1996 303(d) List. As discussed in the State's response immediately below, the method used for screening data and making determinations of standards attainment was revised in 1998 to improve confidence in the State's assessment of water quality. The Angelina River above Sam Rayburn Reservoir was removed from the 1998</p>

Summary of Comment	State's Response
<p>Silver concentrations that exceeded criterion for evaluating use support in Attoyac Bayou were identified in the <i>1996 State of Texas Water Quality Inventory</i>, yet Attoyac Bayou does not appear as an impaired water body in the <i>1999 Nonpoint Source Assessment Report and Management Program</i> or the <i>1999 303(d) List</i>. Discussion with TNRCC representatives discloses that the justification for omission of Rayburn tributaries from the list of impaired waters is based on quantity of samples acquired over a specific calendar time. This logic is flawed in two ways. If the samples are adequate to ascertain that the "Designated Uses" are not supported and the water quality is "Impaired" as above and as described in the enclosures references to official TNRCC documents, it is conspicuously inconsistent to omit them from the <i>Impaired Waters List 303d</i>.</p>	<p>303(d) List due to insufficient data for determining standards attainment related to dissolved oxygen and aluminum, and thus was not included in the <i>1999 Texas Nonpoint Source Assessment Report and Management Plan</i>. As discussed below, Attoyac Bayou was also delisted due to insufficient data.</p> <p>In the <i>1996 State of Texas Water Quality Inventory</i> [CWA 305(b) report], the high aquatic life use for Attoyac Bayou (Segment 0612) was reported as not supported due to elevated silver in water concentrations which exceeded the acute criterion. There was no mention in the <i>1996 Inventory</i> regarding aluminum in water concentrations. For the <i>1996 Inventory</i>, a minimum of four samples within a four-year period was required in order for a site to be considered for assessment. In cases where fewer than four samples were available, more than one exceedance of the acute criterion was required to indicate nonsupport of the aquatic life use. Only three silver-in-water samples from one site on Attoyac Bayou were available for assessment in 1996; however, two of the samples exceeded the acute criterion. Based on this very limited data, the aquatic life use for the Bayou was identified as not supported. One aluminum- in-water sample was collected from the bayou and although it exceeded the acute criterion, the aquatic life use was not assessed for this metal due to insufficient data. All of the metals-in-water data from Attoyac Bayou used in the <i>1996 Inventory</i> were collected by the United States Geological Survey (USGS).</p> <p>The <i>1996 303(d) List</i> was prepared after the <i>1996 Inventory</i> was finalized. The USGS informed the TNRCC between the dates the <i>1996 Inventory</i> was published and the <i>1996 303d List</i> was finalized that their metals-in-water data were not reliable due to sampling</p>

Summary of Comment	State's Response
<p>The draft document is not available through the TNRCC Publications Department as stated on the page facing the Table of Contents. Therefore, it is reasonable to interpret that the TNRCC has minimal interest in securing public comment on the document.</p>	<p>problems. The TNRCC decided not to use the USGS data for future assessments until the USGS metals-in-water sampling and analysis became reliable. The TNRCC subsequently deleted USGS metals-in-water data from their database. The aquatic life use impairment assigned to Attoyac Bayou, in the <i>1996 Inventory</i> was based on silver-in-water data supplied by the USGS. With the USGS silver-in-water data deleted from the TNRCC database, there were no other metals-in-water data to evaluate from Attoyac Bayou. The aquatic life use for Attoyac Bayou could no longer be assessed based on metals in water; therefore, the bayou was not placed on the 1996 303d List or the 1998 303d List.</p>
	<p>The draft publication included the standard TNRCC publication information page for purposes of internal review. It did not occur to us that inclusion of this page would be misleading, though now that it has been pointed out to us, we see that it is, and we apologize. The TNRCC will review its policy to include the standard publication information page in drafts that are offered for public comment.</p>
	<p>The TNRCC is interested in hearing the public's comments on its nonpoint source management program. Notice of the availability of the <i>1999 Nonpoint Source Assessment Report and Management Program</i> for public comment was advertised in the <i>Texas Register</i> and on the TNRCC's Web site. The report was made available for downloading on the Web, and was mailed within 24 hours to all persons who requested a print copy. The TNRCC and the TSSWCB made a presentation of the document at a meeting that included representatives of all the state agencies with responsibility for environmental protection and remediation.</p>

Summary of Comment	State's Response
	<p>The TNRCC and the TSSWCB will continue to explore ways to increase public participation in the state's nonpoint source pollution management program. We believe and hope that more and more stakeholders will become involved at all levels as the state pursues its watershed approach to water quality management.</p>

Comment Letters

Letter One, from Ms. Tina Amberboy

From: Tina Amberboy
 To: Valerie Robinson
 Date: 8/18/99
 Subject: NPS Pollution Assessment Report

FYI, I was reading your report this morning and wanted to let you know that I think your citation to Ag Code 201.016 in the first paragraph of the report should be to 201.026. Thanks.

Letter Two, from Mr. Walter West

Comments On 1999 Texas Non Point Source Pollution Assessment Report and Management Plan

Section 319 of the Clean Water Act specifies requirements for state non point source pollution programs. These requirements include provisions for the preparation of a non point source assessment report and management program submitted through the Governors office to the EPA. The statute and associated federal guidance specify that the states assessment report should identify waters that are impacted by non point source (NPS) pollution and characterize the sources that contribute to those impacts. The preceding is presented on page 1-19 of the *1999 Texas Non Point Source Pollution Assessment Report and Management Plan* draft currently being offered by The Texas Natural Resources Conservation Commission ("TNRCC) for public review and comment. Appendix I of the subject document also elaborates on the statute requirements and specifies that; "each report and management program shall be submitted to the Administrator during the 18 month period beginning on the date of the enactment of this section". The critique which follows will focus on this question. Does the document first offered for public comment on August 14, 1999 fulfill the specified requirements?

On page 12 of the *1999 Texas Non Point Source Pollution Assessment Report and Management Plan* draft it is reported the most recent NPS Assessment Report was approved in 1992. Thus seven years will have passed without the required NPS assessment. I am not a lawyer but it seems

obvious that this is a clear violation of the statute requiring submittal of NPS assessments for approval at 18month intervals. Legalities aside, a seven-year abstinence of NPS assessment and reporting makes any development of NPS trends impossible and for all practical purposes makes a mockery of the EPA requirement for assessment of NPS pollution.

In general the document provides an outline of the goals, objectives and actions the state proposes to pursue in management of water quality and NPS pollution. It does not identify some bodies of water that have been and are impacted by NPS pollution and makes no attempt to characterize the sources that are impacting the water bodies identified as not meeting standards - with the exception of the pie charts presented on pages 1-12 and 1-13. These pie charts only provide broad definition of pollution sources such as "urban run off, agriculture, unknown and other".

The information presented within the document can not be regarded as a characterization of the sources of the NPS pollution because the document makes no attempt to delineate specifics. It does not identify specific pollutants, or activities contributing to the NPS pollution and makes no attempt to identify the actual sources of NPS pollution. Only general and broad categories of NPS sources are identified. With the exception of the pie charts on page 1-15, which identify percentages of total statewide NPS pollutants by broadly definitive terms such as "sulfates, chlorides, organics", I believe that it is fair to conclude that this document could have been prepared without any water quality assessment data whatsoever. It appears to have been designed to avoid specific or conclusive identification of pollutant and polluters.

TNRCC should be aware that a major fish kill on Sam Rayburn reservoir occurred in the summer of 1998. Based on tournament records, the TPWD estimate of 1800 dead fish was grossly under estimated. No specific cause for this fish kill was identified. An outbreak of *Epistylus* infestations affecting approximately 50% of bass and crappie caught during late spring of 1999 also occurred on Sam Rayburn. Again no specific cause was identified. Respected fisheries biologists state that poor water quality will affect the immune system and general health of fish populations and diminish ability to ward off bacterial and other infestations.

The document fails to identify Sam Rayburn tributaries as waters that are impacted by NPS pollution. Pages 44 and 45 of *Texas Water Quality: A Summary of River Basin Assessments* delineates the Angelina River and Attoyac Bayou, which are tributaries to Sam Rayburn, as not supportive of designated use.

Possible concerns for elevated fecal coliform bacteria and nutrients are identified. Sam Rayburn reservoir proper is listed as not supporting designated uses because of concerns for dissolved minerals, and elevated Mercury levels in fish tissue. Contact recreation is not supported. Possible concerns for dissolved metals, nutrients, dissolved oxygen, and fecal coliform bacteria are also identified for Sam Rayburn reservoir. The *State of Texas Water Quality Inventory 96* establishes that field measurements of most of the thirteen parameters assessed in the water quality assessment exceeded standards or criteria. Several of these parameters exceeded standards for more than 20% of the total samples. The Water Quality Inventory document also assessed toxic substances in sediment. Numerous toxic pesticides including Chlordane, DDT, Dieldrin and Toxaphene were detected and the average of the six samples acquired exceeded screening values. See the enclosure. These substances were undoubtedly transported to the sediment of the reservoir by water flow from tributaries and ultimately must be attributed to NPS pollution in the

watershed of the reservoir and its tributaries. In view of these findings it is reasonable to expect to find information pertaining to NPS pollution of Rayburn and its tributaries but no mention of the tributaries is even made in the 1999 document called a NPS Assessment Report and no attempt is made to identify any sources of NPS pollution to Sam Rayburn Reservoir. The Impaired Waters List 303d also fails to identify any Rayburn Tributaries.

Based on the above it must be concluded that the document offered for public comment and review fails to identify waters that are impacted by NPS pollution as required by section 319 of the Clean Water Act. This is made more evident by review of page 45 of *A Poultry Operations Study SFR-65* in which we find the following. "Gross metals contamination of runoff et levels found by Moore and others (1998) and Han (1993), shortly after land application of poultry litter was not observed in this investigation." "However, in this study, metals were not sampled immediately after runoff events and monitoring other poultry litter applications was not targeted." In reference to the Attoyac Bayou, *The State of Texas Water Quality Inventory 96* states that Silver concentrations "have exceeded the acute criteria causing nonsupport of aquatic life in the middle portion of the segment" and aluminum levels have exceeded the "acute criteria" for all ten samples acquired. Obviously the EPA requirement for identification and characterization have not been met.

Discussion with a TNRCC representative discloses that the justification for omission of Rayburn tributaries from NPS assessment and omission from the Impaired Waters List is based on quantity of samples acquired over a specific calendar time. The logic is flawed in two ways. If the samples are adequate to ascertain that the "Designated Uses" are not supported and the water quality is "Impaired" as above and as described in the enclosures references to official TNRCC documents, it is conspicuously inconsistent to omit them from the *Impaired Waters List 303d*. Moreover when Designated Uses Include High Aquatic Life and Contact Recreation Use it seems non-sense to allow periodic deviation from criteria which protects the aquatic life and the public health. It isn't the mean, average or RMS values that destroy aquatic life or impairs public health. It only takes a single episodic event to have significant negative impact.

It should be noted that this document was first offered for public review on August 14, 1999 and comments are due by September 13, 1999. Since the draft document is not available through the TNRCC Publications Department as stated on the page facing the Table of Contents it seems fair to say that TNRCC interest in securing public comment and critique of the subject document is minimal. I have not determined if the document is available at the Texas State Library or other state depository libraries - as advertised.

In short the document offered for review does not fulfill the requirements of section 319 of the Clean Water Act. On page 5, Section 4 of the TNRCC document *1999 Clean Water Act List SFR-58/99*, it is stated that; "Non point source pollution is largely unregulated by state and federal water quality management programs". It is disturbingly evident that remedy of water problems having a significant impact on communities economically dependent upon recreational use of Texas streams and reservoirs are not being pursued effectively by TNRCC. Hopefully

TNRCC will recognize that these issues are critically important, consider the public interests, and actively pursue NPS pollution assessment and remedy.

Walter West
9/8/99

APPENDIX E

METHODOLOGY FOR SCREENING AND ASSESSING SURFACE AND FINISHED WATER QUALITY DATA



General Assessment Methodology

The Texas Natural Resource Conservation Commission (TNRCC) administers water quality management programs with the goal of protecting, maintaining, and restoring Texas water resources. The Texas Surface Water Quality Standards (TSWQS), adopted by the TNRCC on March 19, 1997, recognize the regional and geologic diversity of the state by dividing major river basins, bays, and estuaries into defined segments (referred to as classified segments). Appropriate water uses (aquatic life, contact recreation, oyster waters, etc.) are designated to each of the classified segments. Numerical criteria (concentrations) established in the TSWQS provide a quantitative basis for evaluating use support and managing point and nonpoint loadings in Texas surface waters. These criteria are used as maximum instream concentrations that may result from permitted discharges and nonpoint sources. The procedure for comparing instream water quality conditions to numerical criteria is specified in the TSWQS. For example, dissolved oxygen measurements monitored in a water body may be compared to numerical criteria to determine if the designated aquatic life use is supported.

Texas Drinking Water Standards (TDWS), adopted by the TNRCC on June 4, 1977 and revised on November 25, 1994, assure the safety of public water supplies. Numerical criteria established in the TDWS for finished water (after treatment) provide a quantitative basis for evaluating support of the public water supply use.

In most instances, this guidance describes how numerical criteria can be compared to instream conditions as specified in the TSWQS/TDWS. In many cases, however, sufficient monitoring data for exact comparisons to numerical criteria cannot be reasonably obtained. For example, fecal coliform criteria in the TSWQS are based on five measurements within 30-days and dissolved oxygen criteria are based in part on 24-hour averages. These conditions are not met by most monitoring efforts, which are based on “instantaneous” measurements at monthly or quarterly intervals. Compliance with the TSWQS/TDWS is therefore sometimes estimated from instream monitoring data using screening levels, which establish compliance targets that can be directly compared with monitoring data. Screening levels are intended to provide the best comparisons that can be reasonably attained with available data and numerical criteria in the TSWQS/TDWS.

Some of the numerical criteria in the TSWQS, such as water temperature, pH, chloride, sulfate, and total dissolved solids, are not associated with single specific uses. Instead, they were established in the TSWQS to ensure support of multiple uses, and as tools to identify and manage the influences of point and nonpoint sources of pollution.

Instream levels of nutrients and chlorophyll *a*, toxic substances in sediment, and toxic substances in fish tissue are useful in identifying water quality concerns and evaluating the causes of nonsupport of the narrative standards. Numerical criteria for these constituents have not been established in the TSWQS. Screening levels for these parameters were statistically developed from long-term monitoring data for this guidance. More recent monitoring data are compared to the screening levels to identify parameters and areas of concern.

The TSWQS also contain narrative criteria which apply to all waters of the state. Narrative criteria include general information such as existence of excessive aquatic plant growths, foaming of surface waters, taste and odor producing substances, eroding sediment, and toxic materials.

Narrative criteria are evaluated using numeric criteria if they are available. Other information consisting of water quality studies, existence of fish kills or contaminant spills, photographic evidence, local knowledge, and best professional judgment is also used to evaluate support of narrative criteria and associated designated uses.

To conduct the assessment, the most recent five years of surface water quality monitoring and finished drinking water data are assembled, ordered by parameter, and evaluated by analysts. In most cases, individual values for each parameter are compared to either numerical water quality criteria or screening levels, and the percentage of all values in exceedance is computed. The percent exceedance is then compared to categorical ranges (supporting, 0-10%; partially supporting, 11-25%; and not supporting, > 25%) to determine the degree of use support or criteria support. For those parameters where only narrative criteria have been established in the TSWQS, the same categorical ranges are used to identify water bodies with no concerns, potential concerns, or concerns for impairment. In a few cases where numeric criteria are established as averages (chloride, sulfate, and total dissolved solids criteria, chronic criteria for toxic substances, public drinking water criteria, and human health criteria), individual values for each parameter are summed and an average is computed. The average is then directly compared to criteria in the TSWQS/TDWS to determine the degree of use support or criteria support.

Sources of Data

Surface water quality monitoring (SWQM) data resident in the TNRCC Regulatory Activities and Compliance System (TRACS) database, finished drinking water quality data in the TNRCC's Water Utilities Division databases, Clean Rivers Program (CRP) databases, and/or other quality assured data may be considered for evaluation. In addition to SWQM data collected by the TNRCC, the TRACS database contains quality assured data from other state and federal agencies, river authorities, cities, and volunteer monitoring groups. SWQM data are collected at fixed stations during routine monitoring and from many other sites selected for special studies and intensive surveys. Finished drinking water data resident in the organic substances database of the TNRCC's Water Utilities Division are considered in assessment of the public water supply use. Inorganic substances in finished drinking water are not utilized in public water supply use assessment, since data are not readily available for analysis and elevated levels tend to be associated with groundwater sources rather than surface water. These data are collected under quality assurance plans that ensure data are of known and appropriate quality for assessment. Individual measurements, especially exceedances of the water quality criteria and screening levels, are reviewed by water quality analysts to determine if samples are representative and accurate.

Period of Record

All quality assured SWQM and finished water data collected during the most recent five-year period may be considered for assessment. Most monitoring groups collect data at fixed sites at recurring monthly or quarterly frequencies. In some cases, particularly for toxicants, samples may be collected annually at these sites.

Minimum Number of Samples

For all field measurements (dissolved oxygen, pH, and temperature) and routine water quality constituents (nutrients, fecal coliforms, chlorophyll *a*, dissolved solids, and salts) in surface water, at least nine samples over the five-year period of record are required for assessment. Monitoring sites with fewer than nine measurements/samples for any of the referenced parameters are not

considered for assessment. An exception can be made for streams or reaches of streams that are 25 miles or less in length and for reservoirs or estuarine waters, or portions of reservoirs or estuarine waters (5,210 acres or eight square miles or less, respectively), where water quality conditions are similar. For these water bodies or portions of water bodies, field measurements and water quality constituents collected at multiple sites may be aggregated to meet the nine sample minimum requirement. For all toxicants in water, sediment, fish tissue, or ambient water and sediment toxicity tests, at least five samples over the five-year period are required for assessment. Samples for toxicants and toxicity may also be aggregated as described above. In finished drinking water, an average of at least four samples is required for comparison to the primary and secondary standards. These minimum sample numbers were chosen to allow confidence in the assessment while making the best use of the limited monitoring data available.

Values Below Limits of Detection

Many individual values in SWQM and finished drinking water databases are reported as less than a minimum detection limit (nondetects). There is no generalized way to determine the true value for an individual nondetect in the range between zero and the reported minimum detection limit. For assessments, 50 percent of a minimum detection limit is computed for these nondetects and used for special reporting purposes. This is done to include as many individual data points in the analysis as possible and to indicate the level of monitoring effort. In many areas of the state, much of the nutrient and toxicant data for individual parameters are reported as nondetects. These occurrences in themselves are particularly noteworthy, because they may indicate levels are below those for concern. Values computed from 50 percent of minimum detection limits that exceed criteria or screening levels are not counted as exceedances. However, the 50 percent value reported for these nondetects is used in developing screening levels and in calculation of summary statistics (minimum, maximum, and mean).

An exception to the above guidance regarding nondetects is made when evaluating chronic toxicant and human health criteria for water. The criteria for these constituents are expressed as mean values. In these cases, the smaller of the following measurements is used in calculation of the mean: the 50 percent value reported for nondetects; or 50 percent of the chronic criterion/human health criterion.

Waters Covered in Assessments

All stream, reservoir, estuary, and oceanic sites with sufficient water quality data are to be included in an assessment. This includes sites within defined classified segments as specified in the TSWQS. Water quality data collected at sites off classified segments (unclassified waters) are also evaluated. The general criteria in the TSWQS pertaining to aquatic life use and dissolved oxygen criteria are applied to unclassified waters for assessment purposes unless site-specific criteria derived from receiving water assessments are available. Toxicant and other conventional criteria for unclassified waters are the same as those for the downstream classified segment.

Spatial Coverage

Water quality data are reviewed station by station within classified and unclassified waters to determine geographical extent of use and criteria support and water quality concerns. The geographic extent is estimated based on review of existing data, spatial distribution of monitoring sites having the required minimum number of samples, known sources of pollution, influence of tributaries and hydrological modifications, and best professional judgment of TNRCC/CRP

assessment personnel. Streams are measured in miles, reservoirs are measured in acres, and estuaries and oceans are measured in square miles. For large water bodies that have only one monitoring site, the data from that one station are not used to generate a monitored assessment for the entire reach or area. A single monitoring site is considered to be representative of no more than 25 miles in freshwater and tidal streams. A single monitoring site in reservoirs, estuaries, and oceans is considered representative of 25 percent of the total reservoir acres and estuary or ocean square miles, but not more than 5,120 acres or eight square miles. Major hydrological features, such as the confluence of a major tributary or an instream dam, may also limit the spatial extent of an assessment based on one station. The remaining area not covered by a single site will be reported as not assessed.

Assignment of Causes and Sources of Pollutants

Whenever possible, analysts link causes of pollution with their sources for the analysis. Causes are those pollutants and other stressors that contribute to actual nonsupport or partial support of designated uses in a water body (Table E-1). Stressors are factors or conditions (low dissolved oxygen, stream flow, siltation, habitat alterations, etc.) other than specific pollutants that cause nonsupport of uses. Activities, facilities, or conditions that contribute pollutants or stressors are sources that result in nonsupport of designated uses in a water body (Table E-2).

For each water body or portion of a water body where a designated use is partially supported or not supported, the cause(s) and source(s) are identified from available information (SWQM data, field observations, land use, CRP assessments, nonpoint source assessment reports, special studies, and intensive surveys).

Depth of Water Quality Measurements

Surface measurements (typically collected at a depth of one foot) of water temperature, chloride, sulfate, total dissolved solids, nutrients, chlorophyll *a*, fecal coliform, *E. coli*, enterococcus, and toxicants in water are utilized in an assessment. In the cases of dissolved oxygen and pH, measurements over the entire mixed surface layer are evaluated.

Determination of the Mixed Surface Layer

Monitoring personnel often make vertical field measurement profiles in deep freshwater streams that are generally mixed from the surface to the bottom. In these cases, all of the dissolved oxygen measurements made in the profile during each individual sampling event are averaged, and the mean compared to the criterion. Individual pH measurements made in the profile are compared to the minimum/maximum criteria. Only one exceedance is counted in cases where more than one pH measurement in the profile does not meet the minimum/maximum criteria.

Table E-1. List of Causes/Stressors

Code	Cause/Stressor	Code	Cause/Stressor
0000	Cause Unknown	1000	pH
0100	Unknown Toxicity	1100	Siltation
0200	Pesticides	1200	Organic Enrichment
0300	Priority Organics	1300	Salinity/TDS/Chloride/Sulfate
0400	Nonpriority Organics	1400	Thermal Modifications
0410	PCBs	1500	Flow Alterations
0420	Dioxins	1600	Habitat Alterations
0500	Metals	1700	Pathogens
	0510 Arsenic	1800	Radiation
	0520 Cadmium	1900	Oil and Grease
	0530 Copper	2000	Taste and Odor
	0540 Chromium	2100	Suspended Solids
	0550 Lead	2200	Noxious Aquatic Plants
	0560 Mercury	2400	Total Toxics
	0570 Selenium	2500	Turbidity
0600	Ammonia	2600	Exotic Species
0700	Chlorine	2800	Excessive Algal Growth
0800	Other Inorganics	2900	Inappropriate Littoral Vegetation
0900	Nutrients		
	0910 Phosphorus		
	0920 Nitrogen		
	0930 Other		

Table E-2. List of Sources

Code	Source Category
0100	Industrial Point Sources
	0110 Major Industrial Point Sources
	0120 Minor Industrial Point Sources
0200	Municipal Point Sources
	0210 Major Municipal Point Sources--dry and/or wet weather discharges
	0212 Major Municipal Point Sources--dry weather discharges
	0214 Major Municipal Point Sources--wet weather discharges
	0220 Minor Municipal Point Sources---dry and/or wet weather discharges
	0222 Minor Municipal Point Sources--dry weather discharges
	0224 Minor Municipal Point Sources--wet weather discharges
0400	Combined Sewer Overflow
0500	Collection System Failure
0900	Domestic Wastewater Lagoon
1000	Agriculture
	1050 Crop-Related Sources 1100 Non-irrigated Crop Production 1200 Irrigated Crop Production 1300 Speciality Crop Production (e.g., horticulture, citrus, nuts, fruits)
	1350 Grazing-Related Sources 1400 Pasture Grazing--riparian and/or upland 1410 Pasture Grazing--riparian 1420 Pasture Grazing--riparian and/or upland 1500 Range Grazing--riparian and/or upland 1510 Range Grazing--riparian 1520 Range Grazing--upland
	1600 Intensive Animal Feeding Operations 1620 Concentrated Animal Feeding Operations (CAFOs); permitted point sources 1640 Confined Animal Feeding Operations Nonpoint Sources 1700 Aquaculture
2000	Silviculture
	2100 Harvesting, Restoration, Residue Management 2200 Forest Management (e.g., pumped drainage, fertilization, pesticide application) 2300 Logging Road Construction/Maintenance 2400 Silvicultural Point Sources
3000	Construction

Code	Source Category
	3100 Highway/Road/Bridge Construction 3200 Land Development
4000	Urban Runoff/Storm Sewers
	4100 Non-industrial Permitted Sources 4200 Industrial Permitted Sources 4300 Other Urban Runoff 4400 Illicit Connections/Illegal Hook-ups/Dry Weather Flows 4500 Highway/Roadway/Bridge Runoff 4600 Erosion and Sedimentation
5000	Resources Extraction
	5100 Surface Mining 5200 Subsurface Mining 5300 Placer Mining 5400 Dredge Mining 5500 Petroleum Activities 5700 Mill Tailings 5800 Acid Mine Drainage 5900 Abandoned Mining 5950 Inactive Mining
6000	Land Disposal
	6100 Sludge 6200 Wastewater 6300 Landfills 6400 Industrial Land Treatment 6500 Onsite Wastewater Systems (septic tanks) 6600 Hazardous Waste 6700 Septage Disposal
7000	Hydromodification
	7100 Channelization 7200 Dredging 7300 Dam Construction 7350 Upstream Impoundment 7400 Flow Regulations/Modification
7550	Habitat Modification (other than hydromodification)
	7600 Removal of Riparian Vegetation 7700 Bank or Shoreline Modification/Destabilization 7800 Drainage/Filling or Wetlands
7900	Marinas and Recreation Boating
	7910 In-water Releases 7920 On-land Releases
8050	Erosion from Derelict Land
8100	Atmospheric Deposition

Code	Source Category
8200	Waste Storage/Storage Tank Leaks (above ground)
8250	Leaking Underground Storage Tanks
8300	Highway Maintenance and Runoff
8400	Spills (accidental)
8500	Contaminated Sediments
8520	Debris and Bottom Deposits
8530	Internal Nutrient Cycling (primary lakes)
8540	Sediment Re-suspension
8600	Natural Sources
8700	Recreation and Tourism Activities
	8710 Releases From Boats 8750 Golf Courses
8900	Salt Storage Sites
8910	Groundwater Loadings
8920	Groundwater Withdrawal
8950	Other
9000	Unknown Source
9050	Sources Outside State Jurisdiction or Borders

The mixed surface layer for tidally influenced water bodies is defined as the portion of the water column from the surface to the depth at which the specific conductance is 6,000 μmhos greater than the conductance at the surface. Dissolved oxygen and pH criteria apply to the entire mixed water column, or only to measurements made in the mixed surface layer if the water column is stratified.

For reservoirs, the mixed surface layer is defined as the portion of the water column from the surface to the depth at which water temperature is 0.5°C less than the water temperature at the surface. Dissolved oxygen and pH criteria apply to the entire mixed water column, or only to measurements made in the mixed surface layer if the water column is stratified.

Methodology for Screening and Assessing Use Support

Aquatic Life Use

Support of aquatic life uses is based on assessment of dissolved oxygen criteria, toxic substances in water criteria, and ambient water and sediment toxicity tests. Each set of criteria is evaluated independently of each other, and nonsupport of aquatic life uses results if any are not attained.

Dissolved Oxygen Criteria

An exceptional, high, intermediate, or limited aquatic life use is assigned to each classified water body in the TSWQS based on physical, chemical, and biological characteristics. Dissolved oxygen criteria (24-hour means) to protect these aquatic life uses for freshwater are 6.0, 5.0, 4.0, and 3.0 mg/L, respectively. Each of the aquatic life use dissolved oxygen criteria is 1 mg/L lower for tidally influenced water bodies due to differences between oxygen solubility in fresh and salt water. There is no limited use for tidally influenced waters. Unclassified perennial water bodies are presumed to have a high aquatic life use and corresponding dissolved oxygen criteria. The exception to this general rule is where site-specific aquatic life use and associated dissolved oxygen criteria have been assigned to a perennial unclassified water body through a receiving water assessment. Most of the dissolved oxygen data collected at fixed monitoring stations are instantaneous measurements, so direct comparison to the 24-hour criteria is not possible. Due to these data limitations, dissolved oxygen levels of 6.0, 5.0, 4.0, and 3.0 mg/L from the mixed surface layer are established in this guidance as single measurement minimum screening levels to evaluate support of respective exceptional, high, intermediate, and limited aquatic life uses. Dissolved oxygen measurements made during the day are considered representative of the 24-hour mean. Support of assigned aquatic life uses is based on ranges for the percent of exceedances among dissolved oxygen measurements specified in Table E-3.

Toxic Substances in Water Criteria

Support of the aquatic life use is also based on an evaluation of the prevalence and magnitude of toxic chemicals in water. The SWQM Database contains sufficient data for analysis of 12 metals and 132 organic substances (39 pesticides, 30 volatile organics, and 63 semivolatile organics). The TNRCC has developed water quality criteria in the TSWQS for the 12 metals, but for only 17 of the organic substances (Tables E-4 and E-5). Support of the aquatic life use, based on toxic chemicals in water, includes an evaluation of those metals and organic substances for which criteria have been developed.

Individual measurements of the 12 metals and 17 organic substances are compared against acute criteria established in the TSWQS (Tables E-4 and E-5). Selection of which set of criteria (freshwater or saltwater) to use in the comparison is based on the location of the station; for example, for a station located in tidally influenced water, the marine criteria are applicable. For several toxic substance parameters where the relationship of toxicity is defined as a function of pH or hardness, acute criteria are expressed as an equation based on this relationship. Appropriate pH and hardness values of long-term SWQM fixed station network data by basin (Table 2 in the TSWQS) are used to compute criteria during the initial screening. Where exceedances are identified, a secondary screening is conducted using segment-specific or site-specific data. If 30 or more ambient samples are available, pH and hardness values are ranked from the lowest to the

highest and the 15th percentiles are used to compute criteria for the entire segment or for a specific site. Segment-specific pH and hardness values that have been generated from long term monitoring data can be used in the secondary screening when less than 30 ambient samples are available (Table 6 in *Implementation of the TNRCC Standards via Permitting*, Report RG-194).

The TSWQS express the criterion for silver in the free ionic form. Silver data in the SWQM Database are reported as the dissolved fraction. The percentage of dissolved silver that is present in the free ionic form is calculated and compared to the criterion. Silver data collected from a variety of water bodies throughout the United States indicate that a correlation exists between the dissolved chloride concentration and the percent free ionic silver.

The TNRCC developed a regression equation (R^2 of 87 percent) that calculates the percentage of dissolved silver that is in the free ionic form. The following equation is used to determine what percentage of dissolved silver is in the free ionic form:

$$Y = \exp [\exp (1 / (0.6559 + 0.0044 (Cl)))]$$

where:

Y = percent of dissolved silver in the free ionic form

Cl = dissolved chloride

The percentage obtained from the above equation is then multiplied by the dissolved fraction to obtain the free ionic silver concentration. For this equation, chloride values are obtained from the TNRCC's SWQM database. The 50th percentile value of the dissolved chloride concentration for each basin is used unless sufficient chloride values are available within the water body. The degree of aquatic life use support is based on ranges for the percent of exceedances among toxicant measurements specified in Table E-3.

Support of the aquatic life use is also based on toxic substance chronic criteria. Selection of either freshwater or marine criteria for a given station is guided by the influence of tidal activity. Chronic criteria that are pH- or hardness-dependent are computed in the manner described above for acute criteria. For each parameter at each site, the mean of all values collected during a five-year period is compared against the chronic criterion to determine aquatic life use support. If the mean exceeds the criterion, the use is not supported (Table E-3).

Ambient Water and Sediment Toxicity Tests

Aquatic life use support is also evaluated based on ambient water and sediment toxicity tests. The TNRCC, in cooperation with EPA Region 6 and the CRP, routinely collect water and sediment samples for ambient toxicity testing to assess potential toxicity in water bodies, and to evaluate the effectiveness of implemented toxicity control measures. Water bodies that have shown recurrent ambient water or sediment toxicity are candidates for more intensive special studies to confirm the occurrence of toxic conditions or nonsupport of aquatic life uses, and to determine the causes and sources of the toxicity. The EPA Region 6 Laboratory conducts standard 7-day chronic toxicity tests on ambient water and sediment elutriates using *Ceriodaphnia dubia* (water flea) and *Pimephales promelas* (fathead minnow) in freshwater. For estuarine or saline waters and sediment a standard 9-day chronic toxicity test is conducted using *Cyprinodon variegatus* (Sheepshead minnow). In addition to this type of testing, the CRP also conducts short-term acute ambient water toxicity tests. Support of the aquatic life use using ambient water and sediment toxicity data is based on the occurrence of toxicity shown in Table E-3.

Table E-3. Framework for Evaluating Use Support

Use/Impact	Parameter/Criteria or Screening Levels	Fully Supporting	Partially Supporting	Not Supporting
Overall Use Support		All uses are fully supported if:	One or more uses are partially supported and remaining uses are fully supported if:	One or more uses are not supported if:
Aquatic Life Support	Dissolved Oxygen	0-10 % do not meet screening level.	11-25 % do not meet screening level.	>25 % do not meet screening level.
	Toxicants	For any individual parameter, 0-10% exceed acute criterion, and/or the mean does not exceed the chronic criterion.	For any individual parameter, 11-25% exceed acute criterion.	For any individual parameter, >25% exceed acute criterion, and/or the mean exceeds the chronic criterion.
	Ambient Water and Sediment Toxicity	If nine or fewer samples, no toxicity is observed in either acute or chronic tests compared to controls; or if more than nine samples, 0-10% have acute or chronic toxicity.	If nine or fewer samples, acute and/or chronic toxicity is observed in one or two separate samples; or if more than nine samples, 11-25% have acute or chronic toxicity.	If nine or fewer samples, acute and/or chronic toxicity is observed in three or more separate samples; or if more than nine samples, >25% have acute or chronic toxicity
Contact Recreation	Fecal coliform 400 colonies/ 100 mL or <i>E. coli</i> 252 colonies/100 mL	0-25% exceed screening level.	Partial support is not assessed for the contact recreation use.	>25% exceed screening level.

Use/Impact	Parameter/Criteria or Screening Levels	Fully Supporting	Partially Supporting	Not Supporting
Noncontact Recreation	Fecal coliform 400 colonies/100 mL or <i>E. coli</i> 252 colonies/100 mL or 4,000 fecal coliform colonies/100mL (Segment 2308 only)	0-25% exceed screening level.	Partial support is not assessed for the noncontact recreation use.	>25% exceed screening level.
Public Water Supply	Finished Water Primary Drinking Water Standards	No violation of the MCL.	Partial support is not assessed.	Violation of the MCL.
Fish Consumption	Consumption Advisories/Aquatic Life Closures	No fish/shellfish consumption advisories or aquatic life closures in effect.	Restricted-consumption advisory (limits on number or size of meals) in effect for general population or a subpopulation that could be at greater risk (e.g., pregnant women, children).	Aquatic life closure (no taking of aquatic life) in effect; fish/shellfish “no-consumption” advisory in effect for one or more species for the general population or subpopulation that could be at greater risk; or commerical fishing/shellfish harvesting ban in effect.
	Human Health Criteria for Water and Fish, Freshwater Fish Only and Saltwater Fish Only (toxic substances)	Mean does not exceed human health criteria.	Partial support is not assessed.	Mean exceeds human health criteria.
Oyster Waters	TDH Shellfish Maps	Area approved for growing and harvesting shellfish.	Area conditionally approved for the growing and harvesting of shellfish.	Area is restricted for the growing and harvesting of shellfish or prohibited due to water quality concerns.

Table E-4. Criteria for Specific Metals in Water for Protection of Aquatic Life

(All values listed or calculated in $\mu\text{g/L}$)

(Hardness concentrations are input as mg/L)

Parameter Code	Parameter	Freshwater Acute	Freshwater Chronic	Marine Acute	Marine Chronic
01106	Aluminum (d)	991	---	---	---
01000	Arsenic (d)	360	190	149	78
01025	Cadmium (d)	$e^{(1.128[\ln(\text{hardness})] - 1.6774)}$	$e^{(0.7852[\ln(\text{hardness})] - 3.490)}$	45.62	10.02
01030	Chromium (Tri)(d)	$e^{(0.8190)(\ln(\text{hardness})) + 3.688}$	$e^{(0.8190)(\ln(\text{hardness})) + 1.561}$	----	----
01040	Copper (d)	$e^{(0.9422[\ln(\text{hardness})] - 1.3844)}$	$e^{(0.8545[\ln(\text{hardness})] - 1.386)}$	16.27	4.37
00722	Cyanide (free)	45.78	10.69	5.6	5.6
01049	Lead (d)	$e^{(1.273 [\ln(\text{hardness})] - 1.460)}$	$e^{(1.273 [\ln(\text{hardness})] - 4.705)}$	140	5.6
71900	Mercury (t)	2.4	1.3	2.1	1.1
01065	Nickel (d)	$e^{(0.8460[\ln(\text{hardness})] + 3.3612)}$	$e^{(0.8460[\ln(\text{hardness})] + 1.1645)}$	119	13.2
01147	Selenium (t)	20	5	564	136
01075	Silver (d)(f)	0.92	----	2.3	----
01090	Zinc (d)	$e^{(0.8473[\ln(\text{hardness})] + 0.8604)}$	$e^{(0.8473[\ln(\text{hardness})] + 0.7614)}$	98	89

(d)Sdissolved fraction; (t)Stotal metal; (f)Scriteria corrected to free ionic form for individual samples.

Table E-5. Criteria in Water for Specific Organic Substances for Protection of Aquatic Life
 (All values listed or calculated in $\mu\text{g/L}$)

Parameter Code	Parameter	Freshwater Acute	Freshwater Chronic	Marine Acute	Marine Chronic
Pesticides					
39330	Aldrin	3.0	---	1.3	---
39350	Chlordane	2.4	0.0043	0.09	0.004
39370	DDT	1.1	0.0010	0.13	0.0010
39780	Dicofol (Kelthane)	59.3	19.8	---	---
39380	Dieldrin	2.5	0.0019	0.71	0.0019
39388	Endosulfan	0.22	0.056	0.034	0.0087
39390	Endrin	0.18	0.0023	0.037	0.0023
39782	gamma-Hexachlorocyclohexane	2.0	0.08	0.16	---
39410	Heptachlor	0.52	0.0038	0.053	0.0036
39530	Malathion	---	0.01	---	0.01
39480	Methoxychlor	---	0.03	---	0.03
39755	Mirex	---	0.03	---	0.03
39540	Parathion (ethyl)	0.065	0.013	---	---
39516	PCBs, total	2.0	0.014	10	0.03
39032	Pentachlorophenol	$e^{[1.005(\text{pH}) - 4.830]}$	$e^{[1.005(\text{pH}) - 5.290]}$	15.14	9.56
39400	Toxaphene	0.78	0.0002	0.21	0.0002
Semivolatile Organic Substances					
34461	Phenanthrene	30	30	7.7	4.6

Biological Monitoring

A more direct approach for assessment of the aquatic life use may be made by sampling biological communities and determining physical habitat quality. The TNRCC and Texas Parks and Wildlife Department are developing assessment methods for the use of indices of biological integrity for fish and macrobenthos communities and for indices of habitat quality in Texas. When the methods are fully developed, they will be incorporated into the screening and assessment guidance.

Contact Recreation Use

Contact recreation is a use that is assigned to all water bodies except in special cases. A designation of contact recreation is not a guarantee that the water is completely free of disease-causing organisms. A fecal coliform criterion of 200 colonies/100 mL (30-day, five-sample geometric mean) is assigned in the TSWQS to protect contact recreational uses. Similarly, an *E. coli* screening level of 126 colonies/100 mL (30-day, five sample geometric mean) may also protect the contact recreation use. Most of the fecal coliform and *E. coli* data collected at SWQM fixed stations are not collected at a frequency that would allow direct comparison to the criterion or screening level. For this guidance, a fecal coliform density of 400 colonies/100 mL and an *E. coli* density of 252 colonies/100 mL are established as screening levels, and support of the contact recreation use is based on ranges for the percent of exceedances among fecal coliform/*E. coli* samples specified in Table E-3. A method for determining support of the contact recreation use from more frequent (30-day, five samples) sampling is under development by the TNRCC/CRP/EPA staff.

Noncontact Recreation Use

A noncontact recreation use is assigned to water bodies where ship and barge traffic makes contact recreation unsafe (Segments 1005, 1701, 2437, 2438, 2484, and 2494). The noncontact recreation use for these water bodies is protected by the same fecal coliform/*E. coli* screening levels assigned to contact recreational waters (400/100 mL and 252/100 mL, respectively). The noncontact recreation use is also assigned to certain other water bodies. For example, fecal coliform densities are elevated and recurrent in Segment 2308 of the Rio Grande near El Paso, and they are caused by pollution that cannot be reasonably controlled. A criterion of 2,000 colonies/100 mL (30-day, five-sample geometric mean) is assigned in the TSWQS to protect the noncontact recreation use in this segment.

For this guidance, a fecal coliform density of 4,000/100 mL is established as a screening level for water bodies designated for noncontact recreation. Support of the noncontact recreation use is based on ranges for the percent of exceedances among fecal coliform/*E. coli* samples specified in Table E-3. Some water bodies (for example, Segments 1006 and 1007 of the Houston Ship Channel) are not assigned either contact or noncontact recreation uses due to local statutes which preclude recreational uses for safety reasons.

Public Water Supply Use

In the TSWQS, 219 segments are designated for the public supply use. The use for these water bodies is protected by the TDWS. The primary drinking water criteria for organic chemicals are shown in Table E-6 and criteria for inorganic chemicals are shown in Table E-7. The criteria apply to finished (after treatment) drinking water that is sampled at the point of entry to distribution systems. Public water supply use support is based on exceedance of maximum contaminant levels

(MCLs) for primary drinking water standards. An annual mean of samples (minimum of four) is computed and compared to the primary standards.

Fish Consumption Use

A fish consumption use is protected by the designation of human health criteria in the TSWQS. For each toxicant parameter at each site, the mean of all values collected during a five-year period is computed. The means are compared to human health criteria shown in Table E-8. Column A is used for freshwater bodies designated for public water supply. Column B is used for freshwaters which are not designated for public water supply, and ten times this level is used for unclassified perennial water bodies which are greater than third order streams. Column C is used for classified and unclassified marine water bodies. Selection of either freshwater (column B) or saltwater (column C) criteria for a given station is guided by the influence of tidal activity.

Water bodies were also assessed as not supporting the fish consumption use if they are listed by the Texas Department of Health (TDH) for aquatic life closures or “no-consumption” fish/shellfish advisories for the general population or a more vulnerable subpopulation (Table E-3).

Oyster Waters Use

The TDH has authority to administer the National Shellfish Sanitation Program for the state. This authority allows the TDH to classify shellfish growing areas and issue certificates for the interstate shipment of shellfish. The Texas Parks and Wildlife Department (TPWD) has the responsibility for enforcement of laws concerning harvesting of shellfish. The TDH annually publishes maps that depict the classification of shellfish growing areas in Texas estuaries. These maps do not provide the current status of shellfish growing areas. Status (open or closed) of shellfish growing areas is subject to change by the TDH at any time. These changes may be due to high rainfall and runoff, flooding, hurricanes and other extreme weather conditions, major spills, red tides, or the failure or inefficient operation of wastewater treatment facilities. Assessment of the oyster waters use is made using the TDH Seafood Safety Division *Classification of Shellfish Harvesting Area Maps*, dated November 1, 1997. Water bodies are classified as supporting, partially supporting, or not supporting according to the classification guidance provided in Table E-3. Water bodies that are classified as prohibited for reasons other than water quality impairment are reported as not assessed. The TDH classifies shellfish growing areas into one of four categories:

Approved Area

An approved area is a shellfish growing area approved by the TDH for growing and harvesting shellfish for direct marketing. The approved area is not subject to contamination from human and/or animal fecal matter in amounts that may present an actual or potential hazard to public health. The approved area is not contaminated with pathogenic organisms, poisonous substances, or marine biotoxins. The classification of an approved area is determined by a sanitary survey conducted by the TDH. An approved area meets criteria except under extreme conditions.

Conditionally Approved Area

A conditionally approved area is determined by the TDH to meet approved criteria for a predictable period. Events causing the degraded water quality must be predictable and definable

(river stage, wastewater treatment plant effluents, run-off conditions). A conditionally approved shellfish growing area is closed when the area does not meet the approved criteria.

Restricted Area

Restricted areas are shellfish growing areas with threatened poor water quality classified by the TDH from which shellfish may be harvested only if permitted and subjected to a suitable and effective cleansing process. The harvested shellfish must be cleaned by depuration (moved to processing plants for cleansing in clean water) or by relaying (moved to estuarine waters in a clean area).

Prohibited Area

A prohibited area is where there is no current sanitary survey, or where the sanitary survey or other monitoring program data indicate that fecal material, pathogenic microorganisms, poisonous or deleterious substances, marine toxins, or radionuclides may reach the area in excessive concentrations. The taking of shellfish for any human food purposes from such areas is prohibited. Shellfish from a prohibited area may not be taken for cleaning by depuration or relaying.

Threatened Water Bodies

As outlined in 40 CFR section 130.2(j) and in EPA guidance, states are required to identify water-quality limited segments “where it is known that water quality does not meet applicable water quality standards, and/or is *not expected to meet* applicable water quality standards.” Those water bodies *not expected to meet* applicable water quality standards are considered “threatened.” As a result, water bodies that are supporting their designated uses and have no exceedances of criteria may be categorized as threatened. A water body is considered threatened if:

- (1) Information provided by TNRCC’s Water Utilities Division indicates detections in treated water of organic chemicals that are above 50 percent of the maximum contaminant level (MCL) for primary drinking water standards. For water utility systems with nine or fewer samples, two or more must exceed 50 percent of the MCL for the associated water body to be considered threatened; for systems with more than nine samples, 11 percent or more of the samples must exceed 50 percent of the MCL. For a water body to be classified as threatened, individual organic substances may actually exceed the MCL (i.e., values are not restricted to the range between 50 percent of the MCL and the MCL). A water body is considered nonsupportive of the water supply use when the annual average (minimum of four samples) for organic substances exceeds the MCL (see Methodology for Screening and Assessing Use Support). These chemicals must also represent possible source water contaminants from a surface water source.
- (2) Human health (toxicants in water) criteria for consumption of fish are exceeded and available fish/shellfish tissue data have been evaluated by the TDH, through a risk assessment, indicating fish/shellfish are safe for consumption; or

Table E-6. Maximum Contaminant Levels for Organic Chemicals in Public Drinking Water Supplies

Contaminant	mg/L	Contaminant	mg/L
Alachlor	0.002	Ethylbenzene	0.7
Aldicarb	0.003	Ethylene dibromide (EDB)	0.00005
Aldicarb sulfone	0.002	Glyphosate	0.7
Alicarb sulfoxide	0.004	Heptachlor	0.0004
Atrazine	0.003	Heptachlor epoxide	0.0002
Benzene	0.005	Hexachlorobenzene	0.001
Benzo(a)pyrene	0.0002	Hexachlorocyclopentadiene	0.05
Carbofuran	0.04	Lindane	0.0002
Carbon tetrachloride	0.005	Methoxychlor	0.04
Chlordane	0.002	Monochlorobenzene	0.1
2,4-D	0.07	Oxamyl (vydate)	0.2
Dalapon	0.2	Pentachlorophenol	0.001
Dibromochloropropane (DBCP)	0.0002	Picloram	0.5
Di(2-ethylhexyl) adipate	0.4	Polychlorinated biphenyls (PCB)	0.0005
Di(2-ethylhexyl) phthalate	0.006	Simazine	0.004
o-Dichlorobenzene	0.6	Styrene	0.1
p-Dichlorobenzene	0.075	2,3,7,8-TCDD (Dioxin)	0.00000003
1,2-Dichloroethane	0.005	Tetrachloroethylene	0.005
1,1-Dichloroethylene	0.007	Toluene	1.0
cis-1,2-Dichloroethylene	0.07	Toxaphene	0.003
trans-1,2-Dichloroethylene	0.1	2,4,5-TP (Silvex)	0.05
Dichloromethane	0.005	1,2,4-Trichlorobenzene	0.07
1,2-Dichloropropane	0.005	1,1,1-Trichloroethane	0.2
Dinoseb	0.007	1,1,2-Trichloroethane	0.005
Diquat	0.02	Trichloroethylene	0.005
Endothall	0.1	Vinyl chloride	0.002
Endrin	0.002	Xylenes (total)	10.0

Table E-7. Maximum Contaminant Levels for Inorganic Chemicals in Public Drinking Water Supplies

Contaminant ¹	mg/L	Applicable System ²
Antimony	0.006	CN
Arsenic	0.05	CN
Asbestos	7 million fibers/liter (longer than 10 μ m)	CN
Barium	2.0	CN
Beryllium	0.004	CN
Cadmium	0.005	CN
Chromium	0.1	CN
Cyanide	0.2 (as free cyanide)	CN
Fluoride	4.0	C
Mercury	0.002	CN
Nickel	0.1	CN
Nitrate	10.0 (as nitrogen)	CNT
Nitrite	1.0 (as nitrogen)	CNT
Nitrate + Nitrite (total)	10.0 (as nitrogen)	CNT
Selenium	0.05	CN
Thallium	0.002	CN

¹ Dissolved fraction analyzed for metals

² C = Community; N = Non-transient, non-community; T = Transient, non-community

Table E-8. Human Health Criteria in Water

Parameter Code	Parameter	Column A	Column B	Column C
		Water and Fish $\mu\text{g/L}$	Freshwater Fish Only $\mu\text{g/L}$	Saltwater Fish Only $\mu\text{g/L}$
39330	Aldrin	0.0312	0.0327	0.0218
39337	Alpha hexachlorocyclohexane	0.645	0.997	0.665
01000	Arsenic (d)	50 ¹	----	----
01005	Barium (d)	2,000 ¹	----	----
34030	Benzene	5 ¹	312	208
39120	Benzidine ²	0.0011	0.0035	0.0023
34526	Benzo(a)anthracene	0.0011	0.0035	0.0023
34247	Benzo(a)pyrene	0.0261	0.0265	----
39338	Beta hexachlorocyclohexane	2.26	3.49	2.33
34268	Bis(chloromethyl)ether	0.0207	1.59	1.06
01025	Cadmium (d)	5 ¹	----	----
32102	Carbon tetrachloride	5 ¹	182	121
39350	Chlordane ³	0.0210	0.0213	0.0213
34301	Chlorobenzene	1,305	4,947	3,298
32106	Chloroform	----	12,130	8,087
01030	Chromium (d)	100 ¹	----	----
34320	Chrysene	0.0261	0.0265	----
79778	Cresols	4,049	46,667	31,111
00720	Cyanide (free) ⁴	200 ¹	----	----
39360	4',4'-DDD	0.297	0.299	0.199
39365	4',4'-DDE	0.0544	0.0545	0.0363
39370	4',4'-DDT	0.0527	0.0528	0.0352
39730	2,4-D	70 ¹	----	----
-----	Danitol	0.709	0.721	0.481
34306	Chlorodibromomethane	100 ¹	15,354	10,236
77651	1,2,-Dibromoethane	0.0518	1.15	0.769
39380	Dieldrin ²	0.0012	0.0012	0.0008
34571	<i>p</i> -Dichlorobenzene (1,4 Dichlorobenzene)	75 ¹	----	----

APPENDIX E GUIDANCE FOR SCREENING AND ASSESSING SURFACE AND FINISHED WATER QUALITY DATA

Parameter Code	Parameter	Column A	Column B	Column C
		Water and Fish µg/L	Freshwater Fish Only µg/L	Saltwater Fish Only µg/L
34531	1,2-Dichloroethane	5 ¹	1,794	1,196
34501	1,1-Dichloroethylene	7 ¹	87.4	58.3
39780	Dicofol	0.215	0.217	0.144
-----	Dioxins/Furans (TCDD Equivalents) ² Equivalency Compound Factors 2,3,7,8 TCDD 1.0 1,2,3,7,8 PeCDD 0.5 2,3,7,8 HxCDD's 0.1 2,3,7,8 TCDF 0.1 1,2,3,7,8 PeCDF 0.05 2,3,4,7,8 PeCDF 0.5 2,3,7,8 HxCDF's 0.1	0.0000010	0.0000010	0.0000007
39390	Endrin	2 ¹	----	----
00951	Fluoride (mg/L)	4.0 ¹	----	----
39782	Gamma hexachlorocyclohexane (Lindane)	0.2 ¹	16.0	10.7
39410	Heptachlor ²	0.0177	0.0181	0.0120
39420	Heptachlor epoxide	0.2 ¹	7.39	4.92
39700	Hexachlorobenzene	0.0129	0.0129	0.0086
34391	Hexachlorobutadiene	9.34	11.2	7.48
34396	Hexachloroethane	84.4	94.1	62.7
88813	Hexachlorophene	0.0531	0.0532	0.0355
01049	Lead (d)	5	25	3.85
71900	Mercury ⁴	0.0122	0.0122	0.0250
39480	Methoxychlor	40 ¹	----	----
81595	Methyl ethyl ketone	4,411	886,667	591,111
39755	Mirex	0.0171	0.0189	0.0126
00620	Nitrate-nitrogen (mg/L)	10.0 ¹	----	----
34447	Nitrobenzene	41.8	721	481
73611	N-Nitrosodiethylamine	0.0382	7.68	5.12

Parameter Code	Parameter	Column A	Column B	Column C
		Water and Fish $\mu\text{g/L}$	Freshwater Fish Only $\mu\text{g/L}$	Saltwater Fish Only $\mu\text{g/L}$
73609	<i>N</i> -Nitroso-di- <i>n</i> -Butylamine	1.84	13.5	8.98
39516	PCBs (Polychlorinated Biphenyls) ⁵	0.0013	0.0013	0.0009
77793	Pentachlorobenzene	1.09	1.11	0.739
39032	Pentachlorophenol	129	136	90.5
77045	Pyridine	88.1	13,333	8,889
01147	Selenium (d)	50 ¹	----	----
77734	1,2,4,5-Tetrachlorobenzene	1.43	1.52	1.01
34475	Tetrachloroethylene	5 ¹	1832	1221
39400	Toxaphene ²	0.0440	0.0445	0.0297
39760	2,4,5-TP (Silvex)	50 ¹	----	----
77687	2,4,5-Trichlorophenol	2,767	4,021	2,681
39180	Trichloroethylene	5 ¹	----	----
34506	1,1,1-Trichloroethane	200 ¹	----	----
82080	TTHM (Sum of total trihalomethanes)	100 ¹	----	----
32101	bromodichloromethane			
34306	dibromochloromethane			
32104	tribromomethane			
32106	(bromoform)			
	trichloromethane			
	(chloroform)			
39175	Vinyl Chloride	2 ¹	94.5	63.0

¹ Based on Maximum Contaminant Levels (MCLs) specified in 30 TAC §290 (relating to Water Hygiene).

² Calculations based on measured bioconcentration factors with no lipid correction factor applied.

³ Calculations based on USEPA action levels in fish tissue.

⁴ Compliance will be determined using the analytical method for cyanide amenable to chlorination or weak-acid dissociable cyanide.

⁵ Calculated as the sum of seven PCB congeners: 1016, 1221, 1232, 1242, 1254, 1248, and 1260.

(d) Indicates the criteria are for the dissolved fraction in water. All other criteria are for total recoverable concentrations.

- (3) Other reliable, available data and information indicate an apparent declining water quality trend (i.e., water quality conditions have deteriorated, compared to earlier assessments, but the waters still support uses). The information must demonstrate that in the next two to four years, uses or criteria will not be supported unless additional pollution controls are implemented. Threatened water bodies, in this context, are those where specific pollutants are identified and documented as probable contributors to nonsupport of uses and/or criteria in the future.

For future 305(b) assessments, the TNRCC/CRP will continue to identify additional sources of available data and information which could be used to determine whether a water body's uses are threatened. Links to other TNRCC program areas (e.g., source water protection) will be strengthened, and greater use will be made of data and information from other agencies (Texas State Soil and Water Conservation Board, Texas Water Development Board, Texas Parks and Wildlife, Texas Department of Health, and federal agencies).

Methodology for Screening and Assessing Water Quality Concerns

Water quality criteria for nutrients and chlorophyll *a* in water have not been developed for Texas by the TNRCC. The EPA is developing procedures to generate criteria for selected toxicants in sediment; however, they have targeted only a few parameters, and the criteria have not been adopted. Criteria for toxicants in fish tissue have also not been developed. In the absence of established criteria, the TNRCC/CRP developed screening levels for these three water quality indicator groups in order to identify areas where elevated levels may constitute cause for concern. The screening levels do not represent adopted state criteria and should not be considered as such. Waters are classified as having no concerns, potential concerns, or concerns based on comparisons of water quality data to screening levels and application of rating criteria (Table E-9). The geographical extent of concern within each water body follows the same basis as that for determining use support. Waterbodies with concerns and potential concerns are candidates for further evaluation to determine if the narrative criteria in the TSWQS are violated.

Nutrients and Chlorophyll *a* Screening Levels

The screening levels listed for nutrients and chlorophyll *a* in Table E-9 were statistically derived from long-term SWQM monitoring data (September 1, 1985-August 31, 1995). The 85th percentile values for each parameter in freshwater streams, tidal streams, reservoirs, and estuaries are shown in Table E-9. Determination of the level of concern for each water body is determined by ranges for the percent of exceedances among nutrient and chlorophyll *a* measurements shown in Table E-9.

Sediment Quality Screening Levels

Screening levels for toxicants in sediment were statistically derived by the TNRCC from long-term SWQM data (September 1985-August 1995). The SWQM Database was first screened for specific metals and organic substances with at least 25 observations statewide within four types of water bodies: freshwater streams, reservoirs, tidally influenced streams, and estuaries. This screen resulted in the selection of 12 specific metals and 131 specific organic substances (38 pesticides, 30 volatile organics, and 63 semivolatile organics). The 85th percentile values for each parameter

in the four different water body types are shown in Tables E-10 and E-11. Determination of the level of concern for each water body is determined by ranges for the percent of exceedances among sediment levels as shown in Table E-9.

Fish Tissue Screening Levels

The screening levels for concentrations of toxicants in fish tissue were developed from human health criteria in the TSWQS. TDH screening levels were used for arsenic, cadmium, chromium, copper, and selenium. TDH screening levels for these metals are slightly lower than the levels used to issue consumption advisories.

The human health criteria in the standards are expressed as allowable concentrations of toxicants in surface waters. This allowable concentration in water is determined by calculating an allowable concentration in fish tissue and then dividing by the bioaccumulation factor for that particular toxicant. The formulas for deriving human health criteria were developed by the EPA. The following procedures and assumptions were used to calculate allowable fish tissue concentrations.

$$\text{For noncarcinogens: } \text{RTC} = \frac{\text{RFD} \times \text{WT}}{\text{FC}}$$

$$\text{For carcinogens: } \text{RTC} = \frac{(\text{RL})/q1^* \times \text{WT}}{\text{FC}}$$

Definitions:

RTC = Reference Tissue Concentration (as mg of toxicant/kg of fish tissue), which is the allowable concentration of the toxicant in edible fish tissue.

RFD = Reference Dose (as mg of toxicant/kg human body weight/day), which is the allowable exposure of the toxicant (through ingestion of fish) on a daily basis. Reference doses were obtained from the USEPA Integrated Risk Information System (IRIS), which is an updated computer database for assessing human health effects of toxicants.

WT = Weight of an average human adult (70 kg).

FC = Average amount of fish consumed per person (as kg of fish per day). This amount was 0.010 kg/day for freshwaters, and 0.015 kg/day for marine waters.

RL = Risk level for carcinogens (= 1/100,000). This is the potential risk of cancer for each person exposed at the allowable dose over a 70-year period.

q1* = Cancer potency slope factor (as the reciprocal of mg/kg/day). This factor is the relationship (slope) of cancer risk and dose, and it is indicative of a chemical's potential to cause cancer in humans. Values for q1* are extrapolated from data on cancer rates in laboratory animals that are exposed at very high dose rates. The q1* values were obtained from the EPA IRIS database.

Additional procedures and assumptions:

- (1) The ratio of average body weights was used to convert data on laboratory test animals to human scale. When the weight of test animals was not specified, the average weights were considered to be 0.35 kg for rats, 0.03 kg for mice, and 70 kg for humans.
- (2) If the concentration of a substance in fish tissue used for these calculations was greater than the applicable U.S. Food and Drug Administration Action Level for edible fish and shellfish tissue, then the acceptable concentration in fish tissue was lowered to the Action Level for calculation of criteria.

Using this approach, screening levels were developed for two metals and 31 organic substances (Tables E-12 and E-13). Screening levels developed by the TDH are used for the other five metals. Five years of data are screened using these levels. Support of the fish consumption use is based on ranges for the percent of exceedances among toxicants specified in Table E-9.

Public Water Supply Concerns

All finished water samples (minimum of four) collected over the most recent five-year period are used to compute a mean to compare to the secondary standards in the TDWS. Secondary MCLs that are evaluated are limited to chloride (300 mg/L), sulfate (300 mg/L), and total dissolved solids (1,000 mg/L). These criteria were developed to ensure that water supply utilities can treat and deliver water that is free of objectionable tastes and odor, for reasonable costs, to consumers.

Public water supply concerns are also evaluated in surface water bodies that are designated for the public water supply use in the TSWQS by comparing chloride, sulfate, and total dissolved solids data to the secondary drinking water criteria. Samples (minimum of nine) from all sites within a water body are averaged for the comparisons.

Table E-9. Framework for Identifying Water Quality Concerns for Evaluating Pollution Impacts

Category	Parameter/Screening Levels	No Concern	Potential Concern	Concern
Nutrients Freshwater Streams	NH ₃ -N - 0.3 mg/L NO ₂ -N + NO ₃ -N - 3.1 mg/L OP - 1.4 mg/L TP - 1.6 mg/L Chl <i>a</i> - 16.5 ug/L	For any one parameter, 0-10% of values exceed the screening level.	For any one parameter, 11-25% of values exceed the screening level.	For any one parameter, more than 25% of values exceed the screening level.
	Reservoirs			
Saltwater Tidal Streams	NH ₃ -N - 0.72 mg/L NO ₂ -N + NO ₃ -N - 1.86 mg/L OP - 1.25 mg/L TP - 1.72 mg/L Chl <i>a</i> - 23.0 ug/L	For any one parameter, 0-10% of values exceed the screening level.	For any one parameter, 11-25% of values exceed the screening level.	For any one parameter, more than 25% of values exceed the screening level.
Estuaries	NH ₃ -N - 0.15 mg/L NO ₂ -N + NO ₃ -N - 0.3 mg/L OP - 0.24 mg/L TP - 0.3 mg/L Chl <i>a</i> - 15.2 ug/L	For any one parameter, 0-10% of values exceed the screening level.	For any one parameter, 11-25% of values exceed the screening level.	For any one parameter, more than 25% of values exceed the screening level.
Toxicants in Sediment	12 Metals and 131 Organic Substances (85th Percentiles; see Tables E-10 and E-11)	For any one parameter, 0-10% of values exceed the screening level.	For any one parameter, 11-25% of values exceed the screening level.	For any one parameter, more than 25% of values exceed the screening level.
Toxicants in Fish Tissue	7 Metals and 31 Organic Substances (85th Percentiles; see Tables E-12 and E-13)	For any one parameter, 0-10% of values exceed the screening level.	For any one parameter, 11-25% of values exceed the screening level.	For any one parameter, more than 25% of values exceed the screening level.

Category	Parameter/Screening Levels	No Concern	Potential Concern	Concern
Public Water Supply	Finished Water Secondary Drinking Water Standards	Mean does not exceed criteria.	Partial support is not assessed.	Mean exceeds criteria.
	Surface Water Secondary Drinking Water Standards	Mean does not exceed criteria.	Partial support is not assessed.	Mean exceeds criteria.

Table E-10. Screening Levels for Metals in Sediment
(All values in mg/kg dry weight)

Parameter Code	Parameter	Type of Water Body			
		Freshwater Stream	Tidal Stream	Reservoir	Estuary
01003	Arsenic	6.9	5.7	17.6	6.9
01008	Barium	189.0	290.0	287.0	397.0
01028	Cadmium	1.024	1.000	2.000	0.830
01029	Chromium	20.0	45.0	34.0	29.0
01043	Copper	19.2	38.5	33.0	24.0
01052	Lead	40.0	96.0	61.5	32.0
01053	Manganese	490.0	490.0	1210.0	630.0
71921	Mercury	0.115	0.240	0.160	0.324
01068	Nickel	15.0	20.0	25.2	18.0
01148	Selenium	1.30	1.30	1.73	1.70
01078	Silver	1.6	1.6	1.6	1.6
01093	Zinc	83.0	191.0	120.0	110.0

Table E-11. Screening Levels for Organic Substances in Sediment
(All values in $\mu\text{g}/\text{kg}$ dry weight)

Parameter Code	Parameter	Type of Water Body			
		Freshwater Stream	Tidal Stream	Reservoir	Estuary
Pesticides					
39731	2,4-D	33.0	33.5	25.0	47.0
39741	2,4,5-T	7.0	6.7	5.0	9.0
39761	2,4,5-TP (silvex)	5.5	5.5	5.0	9.5
39333	Aldrin	0.63	0.9	0.56	0.8
39076	<i>alpha</i> -Hexachlorocyclohexane	0.80	1.00	1.25	0.95
46290	<i>beta</i> -Hexachlorocyclohexane	4.8	8.8	----	2.01
46292	<i>delta</i> -Hexachlorocyclohexane	4.8	6.1	----	1.5
39783	<i>gamma</i> -Hexachlorocyclohexane (lindane)	0.65	1.05	1.25	0.65
39351	Chlordane, total	7.5	17.8	7.5	6.0
81404	Chloropyrifos (dursban)	5.0	----	----	5.0
39363	DDD, total	3.0	3.0	3.8	3.0
39365	DDE, total	7.55	2.2	5.0	1.5
39373	DDT, total	4.0	4.02	3.0	3.0
82400	Demeton	100.0	----	----	----
39571	Diazinon	3.3	5.0	6.86	3.55
79799	Dicofol (kelthane)	25.0	----	----	25.0
39383	Dieldrin	1.0	1.45	1.0	1.0
39389	Endosulfan	6.05	9.3	14.5	3.0
34354	Endosulfan sulfate	4.05	22.10	7.50	3.75
39393	Endrin	1.5	1.5	1.5	1.5
39581	Guthion	25.0	----	----	53.0
39413	Heptachlor	0.5	0.65	0.75	0.45
39423	Heptachlor epoxide	0.65	1.0	0.73	0.9
39701	Hexachlorobenzene	0.5	1.77	0.91	0.5
39531	Malathion	2.9	3.35	2.50	3.68
39481	Methoxychlor	5.0	5.0	5.0	5.0

Parameter Code	Parameter	Type of Water Body			
		Freshwater Stream	Tidal Stream	Reservoir	Estuary
79800	Mirex	2.0	----	----	3.85
39541	Parathion	3.0	1.70	1.6	2.00
39514	PCB-1016	25.0	36.5	108.0	30.0
39491	PCB-1221	25.0	36.5	199.5	35.0
39495	PCB-1232	25.0	36.5	108.0	30.0
39499	PCB-1242	25.0	36.5	199.5	30.0
39503	PCB-1248	25.0	36.5	108.0	35.0
39507	PCB-1254	25.0	36.5	108.0	30.0
39511	PCB-1260	25.0	72.0	108.0	35.0
39519	PCB, total	10.0	31.0	10.0	10.0
39118	Pentachlorobenzene	0.55	0.9	1.25	0.6
39403	Toxaphene	29.0	33.5	25.0	44.5
Volatile Organic Substances					
34218	Acrylonitrile	1250.0	2250.0	----	2250.0
34237	Benzene	300.0	450.0	----	400.0
34290	Bromoform	300.0	500.0	----	400.0
88802	Bromomethane	500.0	1100.0	----	1000.0
34299	Carbon tetrachloride	300.0	450.0	----	400.0
34304	Chlorobenzene	300.0	500.0	----	400.0
34309	Chlorodibromomethane	300.0	450.0	----	400.0
34314	Chloroethane	600.0	1100.0	----	1000.0
34579	2-Chloroethyl vinyl ether	1850.0	4350.0	----	3910.0
34318	Chloroform	390.0	450.0	----	400.0
88835	Chloromethane	500.0	1100.0	----	1000.0
34330	Dichlorobromomethane	250.0	450.0	----	400.0
88805	1,2-Dibromomethane	235.0	----	----	450.0
34499	1,1-Dichloroethane	300.0	450.0	----	400.0
34534	1,2-Dichloroethane	300.0	450.0	----	400.0
34504	1,1-Dichloroethylene	250.0	500.0	----	450.0

Parameter Code	Parameter	Type of Water Body			
		Freshwater Stream	Tidal Stream	Reservoir	Estuary
34549	1,2-trans-Dichloroethylene	285.0	450.0	----	450.0
34544	1,2-Dichloropropane	300.0	450.0	----	400.0
34702	cis-1,3-Dichloropropylene	285.0	450.0	----	400.0
34697	trans-1,3-Dichloropropylene	285.0	450.0	----	400.0
34374	Ethylbenzene	300.0	500.0	----	400.0
34426	Methylene chloride	435.0	550.0	----	465.0
34478	Tetrachloroethylene	285.0	550.0	----	400.0
34519	1,1,2,2-tetrachloroethane	300.0	500.0	----	400.0
34483	Toluene	400.0	500.0	----	400.0
34509	1,1,1-trichloroethane	285.0	450.0	----	400.0
34514	1,1,2-trichloroethane	285.0	435.0	----	400.0
34487	Trichloroethylene	250.0	500.0	----	400.0
45510	Xylenes, total	700.0	1300.0	----	1150.0
34495	Vinyl chloride	600.0	1100.0	----	1000.0
Semivolatile Organic Substances					
34208	Acenaphthene	670.0	1000.0	----	750.0
34203	Acenaphthylene	670.0	1000.0	----	750.0
34223	Anthracene	660.0	1000.0	----	800.0
39121	Benzidine	1150.0	1150.0	----	900.0
34529	Benzo(a)anthracene	670.0	1000.0	----	750.0
34250	Benzo(a)pyrene	670.0	1150.0	----	750.0
34233	Benzo(b)fluoranthene	670.0	1500.0	----	810.0
34524	Benzo(ghi)perylene	670.0	1000.0	----	750.0
34245	Benzo(k)fluoranthene	670.0	1150.0	----	750.0
34639	4-Bromophenyl phenyl ether	670.0	1000.0	----	750.0
88811	Cresols, total	670.0	----	----	900.0
34281	Bis(2-chloroethoxy)methane	670.0	1000.0	----	750.0
34276	Bis(2-chloroethyl)ether	670.0	1000.0	----	750.0
34286	Bis(2-chloroisopropyl)ether	670.0	1000.0	----	750.0

Parameter Code	Parameter	Type of Water Body			
		Freshwater Stream	Tidal Stream	Reservoir	Estuary
34584	2-Chloronaphthalene	670.0	1000.0	----	750.0
34589	2-Chlorophenol	1150.0	1950.0	----	1500.0
34644	4-Chlorophenyl phenyl ether	660.0	1000.0	----	750.0
34323	Chrysene	670.0	1200.0	----	750.0
34559	Dibenz(a,h)anthracene	670.0	1000.0	----	750.0
34295	n-Butyl benzyl phthalate	683.0	1000.0	----	750.0
39112	Di-n-butyl phthalate	700.0	850.0	1045.0	750.0
34599	Di-n-octyl phthalate	670.0	1000.0	----	750.0
34539	1,2-Dichlorobenzene	500.0	1000.0	----	750.0
34569	1,3-Dichlorobenzene	500.0	1000.0	----	750.0
34574	1,4-Dichlorobenzene	543.0	1000.0	----	715.0
34634	3,3'-Dichlorobenzidine	1100.0	1000.0	----	750.0
34604	2,4-Dichlorophenol	1207.5	1950.0	----	1500.0
34339	Diethyl phthalate	670.0	1000.0	----	750.0
34609	2,4-Dimethylphenol	1150.0	1950.0	----	1500.0
34344	Dimethyl phthalate	660.0	1150.0	----	750.0
34660	4,6-Dinitro-o-cresol	2050.0	3850.0	----	3000.0
34619	2,4-Dinitrophenol	2475.0	3850.0	----	3000.0
34614	2,4-Dinitrotoluene	670.0	1000.0	----	750.0
34629	2,6-Dinitrotoluene	670.0	1000.0	----	750.0
34349	1,2-Diphenylhydrazine	683.0	1000.0	----	900.0
39102	Bis(2-Ethylhexyl)phthalate	750.0	1170.0	1000.0	750.0
34379	Fluoranthene	670.0	1709.0	----	750.0
34384	Fluorene	660.0	1000.0	----	750.0
39705	Hexachlorobutadiene	500.0	1000.0	----	750.0
34389	Hexachlorocyclopentadiene	660.0	1150.0	----	750.0
34399	Hexachloroethane	660.0	1000.0	----	750.0
73120	Hexachlorophene	450.0	----	----	885.0
34406	Indeno(1,2,3-cd)pyrene	670.0	1000.0	----	750.0

Parameter Code	Parameter	Type of Water Body			
		Freshwater Stream	Tidal Stream	Reservoir	Estuary
34411	Isophorone	670.0	1000.0	----	750.0
34455	3-Methyl-4-chlorophenol	975.0	1950.0	----	1500.0
34445	Naphthalene	500.0	1000.0	----	750.0
34450	Nitrobenzene	670.0	1000.0	----	750.0
34594	2-Nitrophenol	1150.0	1950.0	----	1500.0
34649	4-Nitrophenol	2475.0	3850.0	----	3000.0
88817	N-Nitrosodiethylamine	450.0	----	----	750.0
34441	N-Nitrosodimethylamine	750.0	1150.0	----	750.0
73159	N-Nitrosodi-n-butylamine	450.0	----	----	750.0
34431	N-Nitrosodi-n-propylamine	670.0	1000.0	----	750.0
34436	N-Nitrosodiphenylamine	670.0	1000.0	----	750.0
39061	Pentachlorophenol	1450.0	1650.0	2.5	1800.0
34464	Phenanthrene	660.0	1000.0	----	750.0
34695	Phenol	1150.0	1950.0	----	1500.0
34472	Pyrene	670.0	1700.0	----	880.0
88823	Pyridine	450.0	----	----	750.0
88826	1,2,4,5-tetrachlorobenzene	450.0	----	----	750.0
34554	1,2,4-trichlorobenzene	450.0	1000.0	----	750.0
78401	2,4,5-trichlorophenol	1200.0	1950.0	----	1650.0
34624	2,4,6-trichlorophenol	1150.0	1950.0	----	1500.0

Table E-12. Screening Levels for Metals in Tissue

(All values listed as mg/kg Wet Weight)

Parameter Code	Parameter	Freshwater	Saltwater
01004	Arsenic *	3.0	3.0
71940	Cadmium *	0.5	0.5
71939	Chromium *	100.0	100.0
71937	Copper *	40.0	40.0
71936	Lead	1.25	8.333
71930	Mercury	1.0	1.0
01149	Selenium *	2.0	2.0

* Texas Department of Health screening level

Table E-13. Screening Levels for Organic Substances in Tissue

(All Values in mg/kg Wet Weight)

Parameter Code	Parameter	Freshwater	Saltwater
Pesticides			
34680	Aldrin	0.1360	0.0904
39074	<i>alpha</i> -Hexachlorocyclohexane	0.3660	0.2440
34258	<i>beta</i> -Hexachlorocyclohexane	1.2810	0.8540
39075	<i>gamma</i> -Hexachlorocyclohexane (lindane)	5.8520	3.9010
34682	Chlordane	0.3000	0.3000
81897	DDD	9.6060	6.4040
81896	DDE	5.4500	3.6340
39376	DDT	5.2770	3.5180
85684	Dicofol (Kelthane)	5.239	3.493
39406	Dieldrin	0.0570	0.0379
34687	Heptachlor	0.2020	0.1350
34686	Heptachlor epoxide	0.2530	0.1690
34688	Hexachlorobenzene	0.6090	0.4060
81645	Mirex	0.0355	0.0236
39515	PCBs	0.1340	0.0891
85679	Pentachlorobenzene	14.1870	9.4580

Parameter Code	Parameter	Freshwater	Saltwater
34691	Toxaphene	0.8270	0.5520
Semivolatile Organic Substances			
34241	Benzidine	0.0003	0.0002
34530	Benzo(a)anthracene	0.3150	----
34251	Benzo(a)pyrene	0.3150	----
88812	Cresols, total	886.667	591.111
34324	Chrysene	0.3150	----
34395	Hexachlorobutadiene	11.140	7.427
34400	Hexachloroethane	164.6670	109.7780
88815	Hexachlorophene	5.3200	3.5470
34451	Nitrobenzene	8.8670	5.9110
88818	N-Nitrosodiethylamine	0.0077	0.0051
88821	N-Nitrosodi-n-butylamine	0.4270	0.2850
39060	Pentachlorophenol	532.0000	354.6670
88824	Pyridine	17.7330	11.8220
88827	1,2,4,5-Tetrachlorobenzene	5.3200	3.5470

Methodology for Screening and Assessing Water Temperature, pH, Chloride, Sulfate, Total Dissolved Solids, and Enterococcus Criteria

Water quality criteria for several constituents are established in the TSWQS to safeguard general water quality, rather than for protection of a specific use. Water temperature, pH, chloride, sulfate, total dissolved solids, and enterococcus bacteria are the parameters in this grouping. Enterococcus criteria are assigned only to two Houston Ship Channel segments. Specific criteria for each of the other parameters are assigned to each classified segment in the TSWQS based on physical, chemical, and biological characteristics (Table E-14).

Water temperature and pH are field measurements that are made at each site. Data from a five-year period are compared to specific segment criteria in order to determine compliance. Only surface water temperature values are evaluated. Values of pH are evaluated over the mixed surface layer. The degree of criteria support is based on ranges for the percent of exceedances among dissolved oxygen and pH measurements specified in Table E-14.

Chloride, sulfate, and total dissolved solids criteria in the TSWQS represent annual averages of all values that were collected when streamflow exceeded the seven-day, two-year low-flow value established for each segment. Due to infrequent monitoring and absence of stream flow

information at many sites, all of the chloride, sulfate, and total dissolved solids values measured during the five-year period are averaged for all sites within the water body and compared to the criterion for each parameter. For cases where total dissolved solids was not measured, a value is calculated by multiplying specific conductance measured at the surface by a factor of 0.65. The chloride, sulfate, and total dissolved solids criteria are not supported if the average value exceeds the criteria (Table E-14).

An enterococcus bacterial screening level (500 colonies/100 mL) is established for two Houston Ship Channel (Segments 1006 and 1007) to provide indication of contamination rather than protection of a recreational use. Due to heavy ship and barge traffic on the Houston Ship Channel, local statutes have been enacted to discourage any kind of water-based recreation. The degree of criteria support is based on ranges for the percent of exceedances of enterococcus samples specified in Table E-14.

Table E-14. Framework for Evaluating Water Temperature, pH, Chloride, Sulfate, Total Dissolved Solids and Enterococcus Criteria

Parameter	Units/Criteria	Fully Supporting	Partially Supporting	Not Supporting
Water temperature	°C, segment-specific	0-10% exceed criterion	11-25% exceed criterion	> 25% exceed criterion
pH	Standard units, segment-specific	0-10% do not meet criteria	11-25% do not meet criteria	> 25% do not meet criteria
Chloride	mg/L, segment-specific	Segment average less than criterion	Partial support is not assessed	Segment average exceeds criterion
Sulfate	mg/L, segment-specific	Segment average less than criterion	Partial support is not assessed	Segment average exceeds criterion
Total dissolved solids	mg/L, segment-specific	Segment average less than criterion	Partial support is not assessed	Segment average exceeds criterion
Enterococcus bacteria	500 colonies/100 mL	0-10% exceed criterion	11-25% exceed criterion	>25% exceed criterion

Methodology for Screening and Assessing Narrative Criteria

In addition to numeric criteria and screening levels, designated uses are also protected by narrative criteria. Narrative criteria include:

- (1) Concentrations of taste and odor producing substances;
- (2) Floating debris and suspended solids;
- (3) Settleable solids (eroding sediment);
- (4) Surface waters shall be maintained in an aesthetically attractive condition;
- (5) Waste discharges which cause substantial and persistent changes from ambient conditions or turbidity or color;
- (6) Foaming of a persistent nature;
- (7) Oil, grease, or related residue which produce a visible film of oil or globules of grease on the water surface;
- (8) Surface waters shall not be toxic to man from ingestion of water, consumption of aquatic organisms, or contact with the skin, or to terrestrial or aquatic life;
and
- (9) Nutrients from permitted discharges or other controllable sources shall not cause excessive growth of aquatic vegetation which impairs an existing, attainable, or designated use.

The analysis and determination of narrative criteria support is inherently less objective and consistent than that for numeric criteria. Therefore, narrative standards are assessed using narrative criteria for which associated numeric data exist (e.g., excessive aquatic plant growths associated with instream nutrient concentrations). All water bodies with nutrient, contaminated sediment, contaminated fish tissue, and public water supply concerns identified by screening numeric criteria are automatically evaluated to determine if they also fail to support narrative criteria.

Additional information is solicited from CRP partners, TNRCC central and regional office staffs, and other basin stakeholders to document conditions that may contribute to nonsupport of narrative criteria. The information about nonsupport of narrative criteria is used to strengthen or validate water quality concerns identified using numeric screening techniques. Such information may consist of water quality studies, existence of fish kills or contaminant spills, photographic evidence, local knowledge, and best professional judgment. Ambient water and sediment toxicity tests are used to determine support of the narrative criterion that surface waters shall not be toxic to aquatic life (see also aquatic life use in Table E-3). These tests are also used in determining support of designated aquatic life uses.

APPENDIX F

NPS IMPAIRED SURFACE WATERS



Methodology for Determination of NPS Impacts to Surface Water

A segment ranking process was utilized by the State to establish priority surface water bodies with nonpoint source water quality impairments. This process ranked stream, river, reservoir and bay segments which do not maintain standards and will require additional nonpoint source control measures. With the concurrence of the Texas State Soil and Water Conservation Board, the methodology used to develop the NPS Assessment list was the same process used by TNRCC to compile the list of segments prioritized for remedial or protective measures as required by Section §303(d)(1)(A) of the Clean Water Act and Title 40, Part §130.7 of the Code of Federal Regulations. This segment ranking procedure was designed to build upon the TNRCC basin- or watershed-oriented management approach as discussed more fully in Chapter 3. All existing and available water quality-related data and information from the TNRCC Surface Water Quality Monitoring (SWQM) database were used to develop a list of surface water quality segments which were not fully or partially supporting their designated use. The water quality-related data and information were compiled in the *State of Texas Water Quality Inventory, 305(b) Report, 13th Edition, 1996*. This report includes water quality data from the TNRCC's Surface Water Monitoring Program, the TNRCC's Nonpoint Source Program, the U.S. Geological Survey Water Quality Network, data collected by River Authorities, the Texas Department of Health coastal monitoring program, and local knowledge of water quality conditions. Next, undesignated water bodies in the watershed were considered along with each designated segment. The complete list of designated and undesignated water bodies was annotated using text from the 305(b) Report and whether each water body was in nonsupport or partial support of designated use(s), or exceeded numerical criteria from the Water Quality Standards. When multiple levels of impairment were applicable to a segment, only the most severe level was indicated. Segments that were supporting all designated uses and meeting all numeric criteria were removed from the initial list of all segments. The content of the resulting first cut list was based on computer analyses of the available database, using screening methods detailed in the 305(b) Report. A final cut list was then created by reviewing the first cut list and applying additional information and best professional judgement. Segment-specific water quality status tables included in the 305(b) Report were the primary basis for the review, along with more detailed data records and the observations or interpretations of staff familiar with the segments. The review was performed by TNRCC staff involved in water quality data collection and analyses, and the water quality planning program. The following criteria were used during the review to remove water bodies and develop the final list.

1. A limited data set of fecal coliform, dissolved oxygen, or other measurements was used to develop the previous assessment of the water body, but upon review and use of new and available information the previous assessment is no longer an accurate description of the water quality.
2. Control programs or procedures are in place to address the cause of impairment.

- a.) Controls to address the specific cause and source of impairment are in place through the TNRCC's wastewater permitting program. For the impairment of aquatic life use from silver contamination, see the TNRCC Implementation Procedures. Other contaminants are controlled through specific requirements for permitted wastewater discharges to the water body.
- b.) Fish consumption advisories have been issued to control health risk to individuals that may consume fish from contaminated water. These are described in detail in the Texas Department of Health fish consumption advisories. Sources of contamination are controlled through wastewater permits or local NPS initiatives, or are considered uncontrollable at this time.

In addition to identifying and prioritizing those water bodies not meeting standards, the State is also required to establish *total maximum daily loads* or TMDLs for all surface water quality segments on the 303(d) list. A TMDL is a tool for implementing State water quality standards and is based on the relationship between pollution sources and in-stream water quality conditions. A TMDL can be defined as the sum of the individual waste load allocations for point sources plus the sum of load allocations for nonpoint sources plus a margin of safety. TMDLs establish the maximum allowable loadings or other quantifiable parameters for a water body and thereby provide a basis for the State to establish water quality-based controls or best management practices. TMDLs can span a wide range of watershed sizes and complexity. They are typically quantitative, model-based, focused on attaining water quality standards and address all possible sources of a stressor. The TMDL concept can apply to any type of chemical, physical or biological pollutant or other stressor affecting a water body. TMDLs will play an increasing role in the future management and control of NPS in the State of Texas. Each TMDL includes an implementation plan, formulated in conjunction with local stakeholders, which describes the anticipated control actions necessary for a water body to meet its designated uses and a schedule when these activities will be implemented. Water bodies on the State of Texas 303(d) list have been assigned a priority (High/Medium/Low/Threatened) for TMDL development. These categories were developed to allow flexibility in implementing a watershed-based cycle of planning and TMDL development. Each year, water quality segments within one of the five basin groups will be targeted for TMDL development, based on these assigned priorities. Water bodies designated as threatened may be targeted for additional monitoring to determine whether TMDL development is needed.

Table F-1. Surface Water NPS List, Source Codes

1000 Agriculture	2000 Silviculture
1100 Nonirrigated crop production 1200 Irrigated crop production 1400 Pasture land 1500 Rangeland 1510 Riparian grazing 1640 Concentrated animal feeding operations 1800 Off-farm animal holding/mgmt areas	2000 Silviculture
3000 Construction	4000 Urban Runoff/Storm Sewers
3100 Highway/road/bridge 3200 Land development	4200 Industrial permitted urban runoff 4300 Other urban runoff

5000 Resource Extraction	6000 Land Disposal
5100 Surface mining 5200 Subsurface mining 5500 Petroleum activities	6100 Sludge 6200 Wastewater 6300 Landfills 6500 On-site wastewater systems 6600 Hazardous waste
7000 Hydromodification	8000 Other-NPS
7400 Flow regulation/modification 7700 Streambank modification 7900 Marina(s)	8200 Waste storage/storage tank leaks 8300 Highway maintenance & runoff 8400 Spills 8600 Natural 8700 Recreational activities 8800 Upstream impoundment 8920 Ground-water withdrawal
9000 Unknown	

Table F-2. NPS Impaired Surface Waters
(from the 1998 CWA §303(d) List)

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
0103	Canadian River above Lake Meredith	116 miles	entire segment	ns/cr	bacteria	1500		A	L
0205	Red River below Pease River	25 miles	entire segment	ns/cr	bacteria	9000	*	A	L
0207	Prairie Dog Town Fork Red River	25 miles	upper portion of segment	ns/cr	bacteria	1510		A	L
0211	Little Wichita River	25 miles	entire segment	ns/al	Low DO	1510		A	M
0221	Middle Fork Pease River	66 miles	entire segment	cn/al	TDS	8600		A	L
0228	Mackenzie Reservoir	896 acres	entire segment	cn/pws	TDS	8600		A	L
				cn/al	sulfate	8600		A	L
0229	Upper Prairie Dog Town Fork Red River	41 miles	upper portion of segment	ns/al	Low DO	9000	*	A	L
0302	Wright Patman Lake	5,000 acres	upper end of reservoir near Highway 8	ns/al	Low DO	1640	*	A	L

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
0303	Sulphur/ South Sulphur River	25 miles	lower portion of segment	ps/al	Low DO	9000	*	A	M
		25 miles	upper portion of segment	ps/al	cadmium	9000	*	A	M
		50 miles	lower portion of segment	ns/al	aluminum	9000	*	A	M
0303-A	Big Creek Lake	100 acres	entire lake	t/pws	atrazine	9000		A	T
0401	Caddo Lake	26,800 acres	entire lake	ns/fc	mercury	9000	*	A	M
		5,120 acres	upper portion of lake	ps/al	mercury	9000	*	A	M
		5,120 acres	middle portion of lake	ns/al	zinc	9000	*	A	M
0402	Big Cypress Creek Below Lake O' Pines	63 miles	entire segment	ns/fc	mercury	9000		A	M
0403	Lake O' the Pines	18,707 acres	entire lake	ps/al	zinc	1800	*	A	M
0404	Big Cypress Creek below Lake Bob Sandlin	55 miles	entire segment	ns/fc	low DO	1800	*	A	H
				ps/al	selenium	1800	*	A	H
0406	Black Bayou	24 miles	entire segment	ns/al	Low DO	1800	*	A	L
0409	Little Cypress Creek	25 miles	entire segment	ns/al	cadmium, lead	4000	*	A	M
0503	Sabine River below Toledo Reservoir	25 miles	lower portion of segment	ns/al	lead	6500	*	A	M
				ns/cr	bacteria	6500	*	A	M
0504	Toledo Bend Reservoir	122 miles	entire segment	ns/fc	mercury	9000	*	A	M
0505	Sabine River above Toledo Reservoir	5,020 acres and 1,240 acres	Martin Creek Reservoir & Brandy Branch Reservoir	ns/fc	selenium	4300	*	A	M
		25 miles	lower portion of segment	ns/al	lead	4300	*	A	M
0507	Lake Tawakoni	36,700 acres	entire reservoir	t/pws	atrazine	9000		A	T

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
0508	Adams Bayou Tidal	8 miles	entire segment	ns/al	low DO	6500	*	A	L
				ns/cr	bacteria	6500	*	A	L
0513	Big Cow Creek	25 miles	lower portion of segment	ps/al	aluminum	9000	*	A	M
0603	B.A. Steinhagen Reservoir	13,700 acres	entire reservoir	ns/fc	mercury	9000		A	M
0610	Sam Rayburn Reservoir	114,409 acres	entire reservoir	ns/cr	bacteria	9000	*	A	M
				ns/fc	Metals	9000	*	A	M
				ns/al	Low DO	9000	*	A	M
0701	Taylor Bayou above Tidal	25 miles	lower portion of segment	ns/al	Low DO	8600, 9000	*	C	L
0702-A	Alligator Bayou	3.75 miles	entire segment	ns/al	ambient toxicity	9000	*	C	L
				cn/hwh	sulfates	9000	*	C	L
0704	Hillebrandt Bayou	14 miles	entire segment	ps/al	Low DO	9000	*	C	L
0802	Trinity River below Lake Livingston	25 miles	lower portion of segment	ps/cr	bacteria	9000	*	B	L
0803	Lake Livingston	40,960 acres	17 locations throughout reservoir	ns/al	Low DO	4000	*	B	M
0804	Trinity River above Lake Livingston	25 miles	25 miles centering on SH 7	ns/al	cadmium, lead	4000	*	B	L
		25 miles	upper portion of segment	ns/cr	bacteria	4000	*	B	L
0805	Upper Trinity River	100 miles	entire segment	ns/cr	bacteria	4000	*	B	M
		19 miles	upper portion of segment	ns/fc	chlordanes	4000, 9000	*	B	M
0806	West Fork Trinity below Lake Worth	17 miles	5 miles upstream to 12 miles downstream of Beach St.	ps/cr	bacteria	4000		B	M

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
		22 miles	lower portion of segment	ns/fc	chlordanne	4000		B	M
0806-A	Fosdic Lake (Ft. Worth)	6 acres	entire reservoir	ns/fc	chlordanne, dieldrin, DDE, PCBs	4000		B	M
0806-B	Echo Lake (Ft. Worth)	17 acres	entire reservoir	ns/fc	PCBs	4000		B	M
0810	West Fork Trinity River below Bridgeport	25 miles	lower portion of segment	ns/cr	bacteria	9000	*	B	L
0812	West Fork Trinity River above Bridgeport Reservoir	25 miles	lower 25 miles of segment	ns/al	Low DO	9000	*	B	M
				cn/al	chloride, TDS	9000	*	B	M
0814	Chambers Creek	16.5 miles	Upstream of confluence with Cummins Creek	ps/al	Low DO	9000	*	B	L
0815	Bardwell Reservoir	3,570 acres	entire reservoir	ns/pws	atrazine	9000		B	T
0816	Lake Waxahachie	690 acres	entire reservoir	ns/pws	atrazine	9000		B	T
0819	East Fork Trinity River	14 miles	lower 14 miles of segment	ns/cr	bacteria	4000	*	B	M
0821	Lake Lavon	21,400 acres	entire reservoir	ns/pws	atrazine	9000		B	T
0822	Elm Fork Trinity below Lewisville	15 miles	Upper 25 miles of segment	ps/al	Low DO	8800	*	B	M
				ns/fc	lead	9000	*	B	M
				ns/al	lead	9000	*	B	M
0824	Elm Fork Trinity River above Ray Roberts	8 miles	lower 8 miles of segment	ps/al	cadmium	9000		B	M
0829	Clear Fork Trinity Riv below Benbrook	1 mile	lower 1 miles of segment	ns/fc	chlordanne	4000		B	M

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
0829-A	Lake Como (Ft. Worth)	15 acres	entire reservoir	ns/fc	chlordan, dieldrin, DDE,PCBs	4000		B	M
0831	Clear Fork Trinity River below Lake Weatherford	3.3 miles	lower 3.3 miles of segment	ns/al	lead	9000	*	B	M
		15.7 miles	upper 15.7 miles of segment	ps/al	low DO	9000	*	B	M
0833	Clear Fork Trinity River above Lake Weatherford	9 miles	entire segment	ps/al	low DO	9000		B	L
0836	Richland-Chambers Reservoir	44,752 acres	entire reservoir	ns/pws	atrazine	9000		B	T
0838	Joe Pool Lake	7,470 acres	entire reservoir	ns/al	TDS, sulfates	9000		B	T
				ns/pws	atrazine	9000		B	T
0841	Lower West Fork Trinity River	27 miles	entire segment	ps/al	water and sediment toxicity	4000	*	B	M
		21 miles	lower 21 miles of segment	ns/cr	bacteria	4000	*	B	M
		27 miles	entire segment	ns/fc	chlordan	4000	*	B	M
0841-A	Mountain Creek Lake	2,710 acres	entire reservoir	ns/fc	PCBs	4000		B	M
0901	Cedar Bayou Tidal	19 miles	lower 19 miles of segment	ns/cr	bacteria	9000	*	C	M
0902	Cedar Bayou above Tidal	25 miles	entire segment	ps/al	Low DO	9000	*	C	M
				cn/al	TDS	9000	*	C	M
				ns/cr	bacteria	9000	*	C	M
1001	San Jacinto River Tidal	17 miles	entire segment	ns/cr	bacteria	9000	*	C	M
				ns/fc	mercury	9000	*	C	M
1002	Lake Houston	5,120 acres	lower third of lake near dam	ns/fc	mercury	9000		C	M

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
1005	Houston Ship Channel/San Jacinto River Tidal	12 miles	entire segment	ns/fc	mercury, nickel	9000	*	C	M
1006	Houston Ship Channel	6 miles	entire segment	ns/fc	dioxin	9000	*	C	M
1006-A	Patrick Bayou	3 miles	entire segment	ns/al	copper	4000	*	C	H
				cn/al	water/sediment toxicity, temperature	4000	*	C	H
1007	Houston Ship Channel/ Buffalo Bayou	14 miles	entire segment	ns/fc	mercury	9000	*	C	M
				ns/cr	bacteria	4000	*	C	M
1007-A	Vince's Bayou	3 miles	entire segment	ns/cr	bacteria	4000	*	C	M
				cp/al	ambient toxicity	4000	*	C	M
1008	Spring Creek	69 miles	entire segment	ns/cr	bacteria	4000	*	C	M
		34.5 miles	upper portion of segment	ns/al	Low DO	4000	*	C	M
1009	Cypress Creek	53 miles	entire segment	ns/cr	bacteria	4000	*	C	M
1012	Lake Conroe	5020 acres	near dam	ns/fc	mercury	9000		C	T
1013	Buffalo Bayou Tidal	4 miles	entire segment	ns/cr	bacteria	4000		C	M
				ns/fc	mercury	9000		C	M
1014	Buffalo Bayou above Tidal	24 miles	entire segment	ns/fc	bacteria	4000	*	C	L
1016	Greens Bayou above Tidal	24 miles	entire segment	ns/al	lead	9000	*	C	M
				ns/cr	bacteria	4000	*	C	M
1017	White Oak Bayou above Tidal	23 miles	entire segment	ns/cr	bacteria	4000	*	C	M
				ns/al	lead	9000	*	C	M
1101	Clear Creek Tidal	12 miles	entire segment	ns/cr	bacteria	4000	*	C	M
		8.3 miles	upstream of	ns/fc	di/trichlo-	4000	*	C	M

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
1102	Clear Creek above Tidal	25 miles	lower 25 miles of segment	ns/cr	bacteria	4000	*	C	L
		30 miles	entire segment	ns/fc	di/trichloro-ethane, chlordane, carbon disulf	4000	*	C	L
1103	Dickinson Bayou Tidal	15 miles	entire segment	ns/cr	bacteria	4000	*	C	M
		8 miles	IH45 SE of Dickinson to 1 mile upstream of SH6	ps/al	Low DO	4000	*	C	M
1104	Dickinson Bayou above Tidal	7 miles	entire segment	ns/cr	bacteria	9000		C	L
1108	Chocolate Bayou above Tidal	22 miles	entire segment	ns/cr	bacteria	9000		C	L
1109	Oyster Creek Tidal	25 miles	entire segment	ns/cr	bacteria	9000		C	M
1110	Oyster Creek above Tidal	25 miles	lower 25 miles SW of Angleton	ns/al	Low DO	4000		C	M
				ns/cr	bacteria	4000		C	M
1111	Old Brazos River Channel Tidal	6 miles	entire segment	ns/fc	mercury	9000	*	C	M
1113	Armand Bayou Tidal	2 miles	upper 2 miles of segment	ns/al	Low DO	9000	*	C	M
		8 miles	entire segment	ns/cr	bacteria	9000	*	C	M
1113-A	Armand Bayou above Tidal	3 miles	entire segment	ns/al	Low DO	9000	*	C	L
				ns/cr	bacteria	9000	*	C	L
1202	Brazos River below Navasota River	199 miles	entire segment	ns/cr	bacteria	9000	*	D	L
1213	Little River	25 miles	entire segment	ns/cr	bacteria	9000	*	D	L
1218	Nolan Creek	29 miles	entire segment	ns/cr	bacteria	9000	*	D	M
1221	Leon River below Proctor Lake	118 miles	entire segment	ns/cr	bacteria	1640	*	D	M

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
1226	North Bosque River	75 miles	upper portion:SH 6 & Iredale; lower portion:Near Clifton	ns/cr	nitrate/nitrite, ortho & total phosphorus	1640		D	L
		103 miles	entire segment	ns/cr	bacteria	1640		D	L
1233	Hubbard Creek Reservoir	15,245 acres	entire reservoir	ns/al	sulfates	9000		D	L
1240	White River Lake	1,805 acres	entire reservoir	ps/al	TDS	9000		D	L
1242	Brazos River below Lake Whitney	25 miles	Marlin to the FM 979 crossing east of Cameron	ns/cr	bacteria	4000		D	M
1242-A	Marlin City Lake System	200 acres	entire reservoir	ns/pws	atrazine	1000		D	T
1245	Upper Oyster Creek	15 miles	TDC Jester Unit to Stafford Run confluence	ns/al	Low DO	7400, 4000	*	D	M
1254	Aquilla Lake	3,280 acres	entire reservoir	ns/pws	atrazine, alachlor	1000		D	H
1255	Upper North Bosque River	13 miles	Upstream of Stephenville	ns/al	low DO	1640		D	L
				cn/al	nitrogen, phosphorus	1640		D	L
				ns/cr	bacteria	1640		D	L
				ps/al	chloride, sulfate, TDS	1640		D	L
1301	San Bernard River Tidal	33 miles	entire segment	ps/al	low DO	9000		D	M
				ns/cr	bacteria	9000		D	M
1304	Caney Creek Tidal	32 miles	entire segment	ns/cr	bacteria	9000		D	M
1411	E.V. Spence Reservoir	14,950 acres	entire lake	cn/al	sulfates, TDS, chlorides	5500		D	U

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
1414	Pedernales River	25 miles	downstream confluence w/ Barons Creek below Fredericksburg	ps/al	low DO	4000, 1000	*	D	M
				ns/cr	bacteria	4000, 1000	*	D	M
1421	Concho River	8 miles	San Angelo	ps/al	low DO	4000		D	L
				ns/cr	bacteria	4000		D	L
1427	Onion Creek	78 miles	entire segment	cn/al	TDS	4300, 7700	*	D	L
1428	Colorado River below Town Lake	25 miles	entire segment	ns/cr	bacteria	4000	*	D	M
1429	Town Lake	500 acres	entire lake	ns/fc	chlordanane	4000		D	T
				ns/cr	bacteria	4000		D	T
1430	Barton Creek	40 miles	entire segment	ns/cr	bacteria	1500		D	M
1602	Lavaca River above Tidal	94 miles	entire segment	ns/cr	bacteria	9000		D	M
1906	Lower Leon Creek	21 miles	entire segment	ns/al	cadmium	4000	*	E	M
1910	Salado Creek	2 miles	1 mile downstream Rigsby Ave to Southcross Blvd	ns/al	low DO	4000	*	E	U
		22 miles	entire segment	ns/cr	bacteria	4000	*	E	U
		5 miles	From Loop 410 to Pershing Rd	ns/al	low DO	4000	*	E	U
1911	Upper San Antonio River	12 miles	1 mile upstream S. Alamo Rd to 2 miles upstream of Blue Wing	ns/cr	bacteria	4000	*	E	L
2002	Mission River above Tidal	9 miles	entire segment	ns/cr	bacteria	4000		E	L
2106	Nueces/Lower Frio River	27 miles	entire segment	ns/cr	bacteria	1500	*	E	L
2107	Atascosa River	103 miles	entire segment	ns/al	low DO	1500, 4000	*	E	L

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
				ns/cr	bacteria	1500, 4000	*	E	L
2116	Choke Canyon Reservoir	26,000 acres	upper reaches of the reservoir	ns/cr	bacteria	9000		E	M
2117	Frio River above Choke Canyon	158 miles	entire segment	ns/cr	bacteria	1500		E	L
2201	Arroyo Colorado Tidal	16 miles	upper 16 miles of segment	ns/al	low DO	4000, 1000	*	E	U
2202	Arroyo Colorado above Tidal	333 acres	Donna Reservoir	ns/fc	PCBs	4000, 1000	*	E	U
		63 miles	entire segment	ns/fc	chlordan, toxaphene, DDE	4000, 1000	*	E	U
		63 miles	entire segment	ns/cr	bacteria	4000, 1000	*	E	U
2302	Rio Grande below Falcon Reservoir	231 miles	entire segment	ns/cr	bacteria	9000	*	E	L
2304	Rio Grande below Amistad Reservoir	226 miles	entire segment	ns/cr	bacteria	1500, 4000	*	E	L
2307	Rio Grand below Riverside Diversion	222 miles	entire segment	ps/cr	bacteria	4000	*	E	L
2310	Lower Pecos River	89 miles	entire segment	cn/al	chloride, sulfate, TDS	1500, 8600		E	M
2421	Upper Galveston Bay	80.1 square miles	Red Bluff-Five Mile Cut-Houston Pt-Morgans Pt	ns/ps/sfw	bacteria	4000	*	C	M
2422	Trinity Bay	8 square miles	north of Exxon C-1 platform	ns/fc	mercury	9000		C	M
		108.1 square miles	outer perimeter of bay	ns/ps/sfw	bacteria	9000		C	M
2423	East Bay	8 square miles	between Marsh & Elm Grove Points	ns/fc	mercury	9000		C	M

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
		11.5 square miles	near East Bay Bayou and Intracoastal Waterway	ns/sfw	bacteria	9000		C	M
2424	West Bay	8 square miles	near Carancahua Reef	ns/fc	mercury	9000		D	L
		8 square miles	near Carancahua Reef	ns/al	mercury, copper	9000		D	L
		24.4 square miles	east end near Galveston & Texas City	ns/sfw	bacteria	9000		D	L
2426	Tabbs Bay	3.6 square miles	entire segment	ns/cr	bacteria	9000	*	D	L
2429	Scott Bay	1.7 square miles	entire segment	ns/cr	bacteria	9000	*	C	M
2432	Chocolate Bay	7.6 miles	entire segment	ns/sfw	bacteria	9000	*	C	L
2439	Lower Galveston Bay	74.6 square miles	outer perimeter, Galveston & Texas City	ns/ps/sf w	bacteria	9000	*	D	L
		16 square miles	near Redfish Island and Galveston Channel	ns/fc	mercury	9000	*	D	L
		8 square miles	outer perimeter, Galveston and Texas City	ns/hqah	copper	9000	*	D	L
2441	East Matagorda Bay	3.2 square miles	near Caney Cr & Live Oak confluences with bay	ns/ps/sf w	bacteria	9000	*	D	L
2442	Cedar Lakes	6.9 miles	entire segment	ns/sfw	bacteria	8600		D	L
2451	Matagorda Bay/ Powderhorn Lake	26.1 square miles	west end and lower half of bay	ns/ps/sf w	bacteria	9000		E	L
2452	Tres Palacios Bay	14.7 square miles	entire segment	ns/ps/sf w	bacteria	9000	*	E	L

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
2453	Lavaca Bay/ Chocolate Bay	2.5 square miles	n-nw end near Lavaca Riv confl & Port Lavaca	ns/fc	mercury	1000,4000	*	E	M
		39.4 square miles	n-nw end near Lavaca Riv confl & Port Lavaca	ns/sfw	bacteria	9000	*	E	M
2454	Cox Bay	1.7 square miles	1.7 miles of segment	ns/fc	mercury	9000	*	E	M
		.5 square miles	North end of bay and Cox Creek	ns/sfw	bacteria	9000	*	E	M
2456	Carancahua Bay	9.2 square miles	North end of Bay and Carancahua Creek	ns/sfw	bacteria	9000	*	E	T
2462	San Antonio/ Hynes/ Guadalupe Bay	71 square miles	N end near San Antonio/Guadalupe R. & Seadrift	ns/ps/ sfw	bacteria	9000	*	E	T
2471	Aransas Bay	6.8 square miles	northern edge of bay and Rockport	ns/sfw	bacteria	9000	*	E	L
2472	Copano Bay	13.4 square miles	Near intracoastal wtrwy, shoreline & Aransas/Mississippi	ns/sfw	bacteria	9000	*	E	L
2473	St Charles Bay	6.7 square miles	Northern half, tributary and marsh drain	ns/sfw	bacteria	9000		E	L
2481	Corpus Christi Bay	16 square miles	near Corpus Christi	ns/sfw	bacteria	9000	*	E	L
2482	Nueces Bay	28.9 square miles	entire segment	ns/sfw	zinc	9000	*	E	L
2484	Corpus Christi Inner Harbor	.7 square miles	Avery and Viola turning basins	ps/al	low DO	9000	*	E	L
2485	Oso Bay	7.2 square miles	entire segment	ns/sfw	bacteria	9000	*	E	M
				ps/al	low DO	9000	*	E	M

Segment Number	Water Body	Total Impaired Miles/Area	Location of Impairment	Impact/ Use	Cause Detail	Source Code	Point *	Basin Group	Priority
2491	Laguna Madre	18.1 square miles	near Arroyo Colorado	ns/sfw	bacteria	9000	*	E	L
2501	Gulf of Mexico	3879 square miles	entire segment	ps/fc	mercury	8000		E	L

Legend for coded columns in Table F-2:

- Impact/Use:** the level of support is shown, followed by the use impaired. The support abbreviations are: ns=not supporting, ps=partially supporting, t=threatened, cn=nonsupport of narrative criteria. The use abbreviations are: al=aquatic life, cr=contact recreation, fc=fish consumption, pws=public water supply, sfw=shellfish waters
- Source Code:** See Table F-1.
- Point*:** An * indicates the water body is impacted by point sources as well as nonpoint sources.
- Basin Group:** Refers to TNRCC water quality planning basin groups for the watershed managment approach.
- Group A: Canadian River, Red River, Sulphur River, Cypress Creek, Sabine River, and Neches River
 - Group B: Trinity River
 - Group C: Neches-Trinity Coastal, Trinity-San Jacinto Coastal, San Jacinto River, San Jacinto-Brazos Coastal
 - Group D: Brazos River, Brazos-Colorado Coastal, Colorado River, Lavaca River
 - Group E: Colorado-Lavaca Coastal, Lavaca-Guadalupe Coastal, Guadalupe River, San Antonio River, San Antonio-Nueces Coastal, Nueces River, Nueces-Rio Grande Coastal, Rio Grande
- Priority Ranking:** Initial ranking for TMDL development (final scheduling includes other factors, such as the basin management cycle). H=high, M=medium, L=low, Th-h=threatened-high, Th-m=threatened-medium.

APPENDIX G

NPS IMPAIRED GROUND WATERS



Methodology for Determination of NPS Impacts to Ground Water

Data from a variety of sources were received and analyzed by staff of the Ground-water Nonpoint Source Team at TNRCC to determine the impacts to state ground water from nonpoint sources of pollution. Persons submitting data were asked to determine both the source of the impact and the indicators of the impact. Staff relied on the judgement of those submitting data in determining the above factors. Staff used best professional judgement to evaluate data taken directly from reports received by the agency.

Impacts were classified based on the Texas criteria for ground-water use and public drinking water standards, and federal drinking water health advisory limits. This included both primary and secondary maximum contaminant levels for organics, inorganics, and other parameters; Texas monitoring parameters for drinking water supplies; federal drinking water health advisory limits for chemical parameters and microbiologic factors. The Texas ground-water classification system separates water on the basis of total dissolved solids content. The system applies to all ground water in the state. Texas Water Code Section 26.401 is the ground-water protection policy for Texas, which has a goal of nondegradation of water resources. Additionally, guidelines for the interpretation of water quality for such uses as irrigation and industrial use were applied to determine if ground-water quality can meet these usage categories. Aquifers were ranked based on vulnerability (Appendix C). The DRASTIC methodology, in concert with other factors including population served and background water quality, was used to determine the ranking of the major and minor aquifers in Texas.

Industrial Use of Ground Water

High total dissolved solids content is usually avoided for industrial water supplies, although the specific water-quality requirements are generally determined by the type of industry (Muller and Price, 1979). Of main concern to many industries, is that the supply does not contain corrosive or scale-forming constituents. Both magnesium and calcium affect the water hardness, and are of concern in boiler use. Excessive amounts of silica and iron cause scale deposits which reduce the efficiency of many industrial processes. Water quality is of concern in food processing due to possible taste or vegetable hardness problems. Water that contains sulfate along with calcium and magnesium will contribute to the formation of non-carbonate water hardness which can form hard scale in boilers and is not suitable for some industrial uses. Sulfates are considered beneficial in irrigation waters, especially in the presence of calcium (Bouwer, 1978). The addition of gypsum (calcium sulfate) to irrigation waters is a common practice with the excess calcium used to counteract high sodium content. Calcium may prevent the formation of, or restore soils that have reduced permeability and are therefore difficult to cultivate. Humans can tolerate up to 1500 mg/l chloride in their drinking water (Anderson, 1981), however, large quantities will increase the corrosivity of the water, causing problems with piping. Waters for irrigation use which contain less than 142 mg/l chloride are considered to pose no problem under ordinary conditions of climate and soil, if water is absorbed by roots only. If water is also absorbed by the leaves, 106 mg/l is considered safe. Waters ranging between 142 and 355 mg/l will cause

increasing problems, with greater than 335 mg/l chloride causing severe problems. Irrigation water, absorbed by the leaves, greater than 106 mg/l chloride will cause increasing problems. Waters for irrigation use which contain less than 5 mg/l nitrate (as N) are considered to pose no problem under ordinary conditions of climate and soil. Waters ranging between 5 and 30 mg/l nitrate (as N) will cause increasing problems, with greater than 30 mg/l nitrate (as N) causing severe problems. Excess nitrogen may delay harvest time, and adversely affect crop yield. Iron is necessary for metabolism in animals and plants, however, when present in excessive amounts in water, it forms a red precipitate which stains laundry and plumbing fixtures (Hem, 1995), gives water a taste, and can clog pipes and well screens. Large amounts of iron pose a nuisance, and cause problems for many domestic, municipal, and industrial users of ground water in parts of east Texas (Broom, 1966).

Table G-1. Ground Water NPS List Source Codes

1000 Agriculture	2000 Silviculture
1100 Nonirrigated crop production 1200 Irrigated crop production 1300 Specialty crop production 1400 Pasture land 1500 Rangeland 1510 Riparian grazing 1640 Concentrated animal feeding operations 1800 Off-farm animal holding/mgmt areas	2000 Silviculture
3000 Construction	4000 Urban Runoff/Storm Sewers
3100 Highway/road/bridge 3200 Land development	4200 Industrial permitted urban runoff 4300 Other urban runoff
5000 Resource Extraction	6000 Land Disposal
5100 Surface mining 5200 Subsurface mining 5500 Petroleum activities	6100 Sludge 6200 Wastewater 6300 Landfills 6500 On-site wastewater systems 6600 Hazardous waste
7000 Hydromodification	8000 Other-NPS
7400 Flow regulation/modification 7700 Streambank modification 7900 Marina(s)	8200 Waste storage/storage tank leaks 8300 Highway maintenance & runoff 8400 Spills 8600 Natural 8700 Recreational activities 8800 Upstream impoundment 8920 Ground-water withdrawal
9000 Unknown	

Table G-2. Ground Water NPS Cause Codes

0000	Cause unknown	1000	pH (high or low)
0100	Unknown toxicity	1100	Siltation
0200	Pesticides	1200	Organic enrichment (low dissolved oxygen)
0300	Priority organics	1300	Salinity/TDS/chlorides
0400	Nonpriority organics	1400	Thermal modifications
0500	Metals	1500	Flow alterations
0600	Unionized ammonia	1600	Other habitat alterations
0800	Other inorganics	1700	Pathogens
0900	Nutrients	1900	Oil & grease
0910	Nitrogen		

Table G-3. Major Sources of Documented/Potential Ground-Water Contamination

Contaminant Source	Factors Considered in Selecting a Contaminant Source ¹	Contaminants ²
Storage, Treatment, and Disposal Activities		
Storage tanks (underground)	A, B, C, D	D, C
Storage tanks (above ground)	A, B, C, D	D, C
Surface impoundments	A, F, D, C, G	D, G, H, A, B
Landfills	A, F, D, E, G	C, G, A, B, H
Septic systems	F, B, C, D, E, G	E, B, A
Agricultural Activities		
Unknown/not quantified	A, F, C, D, E, G	E, A, B
Other		
Abandoned wells	A, F, C, D, E, G	NA
Oil & Gas activities	F, C, D, E, G	D, G
Grand fathered sites/past practices	A, F, D, E, G	D, E, G, H, A, B
Natural sources	F, E, G, I	G, F, E, H

1. Factors Considered for Selection

- A. Documented from mandatory reporting
- B. Size of population at risk
- C. Location of the sources relative to drinking water sources
- D. Number and/or size of contaminant sources
- E. Hydrogeologic sensitivity
- F. Potential from state and other findings
- G. Geographic distribution/occurrence
- H. Human health and/or environmental risk (toxicity)
- I. Other criteria (described in narrative)

2. Contaminants

- A. Inorganic compounds
- B. Organic compounds
- C. Halogenated solvents
- D. Petroleum compounds
- E. Nitrate
- F. Fluoride
- G. Salinity/brine
- H. Metals

Statewide List of NPS-Impaired Ground Waters

The following table presents a summary of the information received for nonpoint source impaired ground-waters. TNRCC grouped the major and minor aquifers based on the intersecting river basin boundaries. A list of the counties that lie within the basin boundaries that contained the aquifers was then compiled to further target the data.

Table G-4. Statewide List of NPS Impaired Ground Waters

Basin	Aquifer	County	Cause	Source
Brazos River	Blaine	Knox	300, 400	8200
Red River	Blaine	Childress, Collingsworth, Foard, Hardeman, Wheeler	300, 400, 1900	6600, 8200
Red River	Blossom	Lamar	300, 400	6300, 6600, 8200
Sulphur River	Blossom	Lamar, Red River	300, 400	6300, 6600, 8200
Brazos River	Brazos	Austin, Fort Bend, Grimes, McLennan, Milan, Robertson, Waller, Washington	300, 400, 500, 800, 1900	5500, 6600, 8200, 9000
Brazos-Colorado Coastal	Brazos	Austin, Fort Bend	300, 400, 500, 1900	5500, 6000, 6600, 8200
San Jacinto River	Brazos	Fort Bend, Grimes, Waller	300, 400, 500, 1300, 1900	5500, 6000, 6600, 8200, 9000
San Jacinto River	Brazos	Fort Bend, Waller	300, 400, 500, 1900	5500, 6000, 6600, 8200
San Jacinto-Brazos Coastal	Brazos	Fort Bend	300, 400, 500, 1900	5500, 6000, 6600, 8200
Trinity	Brazos	Grimes	300, 400	8200
Trinity	Brazos	Grimes	300, 400	8200
Rio Grande River	Captain Reef Complex	Pecos, Ward, Winkler	300, 400, 1900	5500, 8200
Rio Grande River	Carrizo-Wilcox	Maverick, Webb	300, 400	5500, 6000, 6600, 8200
Brazos River	Carrizo-Wilcox	Burleson, Brazos, Grimes, Limestone, Lee, Leon, Milan, Robertson	300, 400, 800, 1900	5500, 6600, 8200
Colorado River	Carrizo-Wilcox	Bastrop, Colorado, Fayette, Lee	300, 400, 500, 1900	6700, 8200

Basin	Aquifer	County	Cause	Source
Cyress Creek	Carrizo-Wilcox	Camp, Cass, Gregg, Marion, Morris, Titus, Upshur, Wood	300, 400, 500, 1300, 1900	5500, 6300, 6600, 8000, 8200
Guadalupe River	Carrizo-Wilcox	Caldwell, Gonzales, Guadalupe	300, 400, 500, 1900	6300, 6600, 8200
Neches River	Carrizo-Wilcox	Anderson, Angelina, Cherokee, Henderson, Houston, Nacogdoches, Runnels	300, 400, 800, 1300, 1900	5500, 6300, 6600, 8000, 8200
Nueces River	Carrizo-Wilcox	Atascosa, Dimmit, Live Oak, Medina, Zavala	300, 400, 1900	5500, 6000, 8000, 8200
Sabine River	Carrizo-Wilcox	Gregg, Harrison, Upshur, Van Zandt, Wood	300, 400, 500, 1300, 1900	5500, 6300, 6600, 8000, 8200
Sabine River	Carrizo-Wilcox	Panola, Sabine, Shelby, Smith	300, 400, 800, 1300, 1900	5500, 6300, 6600, 8200
San Antonio River	Carrizo-Wilcox	Bexar, Guadalupe, Karnes, Medina, Wilson	200, 300, 400, 500, 800, 900, 1300,	1000, 5500, 6000, 6300, 6600, 8000, 8200
Sulphur River	Carrizo-Wilcox	Bowie, Cass, Franklin, Hopkins, Hunt, Lamar, Morris, Red River	300, 400, 500, 900, 1900	5500, 6300, 6600, 8000, 8200
Trinity	Carrizo-Wilcox	Anderson, Freestone, Henderson, Houston, Leon, Madison, Navarro,	300, 400, 1900	3000, 5500, 6600, 8200, 9000
Rio Grande River	Cenozoic Pecos	Crane, Pecos, Reeves, Upton, Ward, Winkler	200, 300, 400, 1300, 1900	1000, 5500, 6000, 8200
Brazos River	Dockum	Crosby, Dickens, Fisher, Floyd, Garza, Hale, Nolan, Palmer	300, 400, 500, 800, 900, 1300, 1900	5500, 6600, 8200, 9000
Canadian River	Dockum	Dallam, Moore, Potter, Sherman	300, 400, 500	5500, 6600, 8200
Colorado River	Dockum	Andrews, Borden, Coke, Ector, Gaines, Howard, Nolan, Martin, Midland, Mitchell, Reagen, Sterling	200, 300, 400, 500, 1300, 1900	1000, 5500, 6000, 6600, 8200, 9000
Red River	Dockum	Briscoe, Deaf Smith, Randall, Swisher	200, 300, 400	1000, 6600, 8000, 8200, 9000
Rio Grande River	Dockum	Crane, Pecos, Reeves, Upton, Ward, Winkler	200, 300, 400, 1300, 1900	1000, 5500, 6000, 8200

Basin	Aquifer	County	Cause	Source
Brazos River	Edwards (BFZ)	Bell, Grimes, Williamson	300, 400, 500	6000, 6600, 8200
Guadalupe River	Edwards (BFZ)	Comal, Hays	300, 400, 1900	6600, 8000, 8200, 9000
Nueces River	Edwards (BFZ)	Medina, Uvalde	300, 400	6000, 8000, 8200
San Antonio River	Edwards (BFZ)	Medina	300, 400	6000, 8200
San Antonio River	Edwards-Trinity	Bandera	300, 400	8200
Colorado River	Edwards-Trinity	Andrews, Coleman, Coke, Concho, Ector, Gillespie, Howard, Kerr, M	200, 300, 400, 500, 1900	1000, 5500, 6000, 6200, 6600, 8200, 9000
Colorado River	Edwards-Trinity	Borden, Dawson, Gaines, Terry, Yoakum	200, 300, 400, 1900	1000, 5500, 6000, 6600, 8200, 9000
Colorado River	Edwards-Trinity	Hays, Travis	300, 400, 500, 1800, 1900	5500, 6000, 6000, 6600, 8200, 9000
Guadalupe River	Edwards-Trinity	Kendall, Kerr	300, 400	8200
Nueces River	Edwards-Trinity	Bandera, Real, Uvalde	300, 400	8000, 8200
Rio Grande River	Edwards-Trinity	Jeff Davis, Pecos, Reeves, Terrell, Upton, Val Verde	200, 300, 400, 1300, 1900	1000, 6000, 6600, 8000, 8200
Colorado River	Edwards-Trinity (BFZ)	Hays, Travis	300, 400, 500, 1800, 1900	5500, 6000, 6000, 6600, 8200, 9000
Brazos River	Edwards-Trinity (High Plains)	Bailey, Cochran, Floyd, Garza, Hockley, Hale, Lamb, Lubbock, Lynn	200, 300, 400, 800, 900, 1300, 1900	1000, 1200, 1400, 5500, 6600, 8200, 9000
Colorado River	Edwards-Trinity (High Plains)	Borden, Dawson, Gaines, Terry, Yoakum	200, 300, 400, 1900	1000, 5500, 6000, 6600, 8200, 9000
Brazos River	Edwards-Trinity (Plateau)	Nolan, Taylor	300, 400, 1900	5500, 8200, 9000
Colorado River	Edwards-Trinity (Plateau)	Andrews, Coleman, Coke, Concho, Ector, Gillespie, Howard, Kerr, Martin, Mason, McCulloch, Midland, Nolan, Reagan, Schleicher, Sterling, Taylor, Tom Green, Upton	200, 300, 400, 500, 1900	1000, 5500, 6000, 6200, 6600, 8200, 9000

Basin	Aquifer	County	Cause	Source
Brazos River	Ellenburger-San Saba	Burnet, Lampassas	300, 400	8200
Colorado River	Ellenburger-San Saba	Blanco, Burnet, Brown, Gillespie, Lampasas, Llano, Kerr, Mason, McCulloch, San Saba	200, 300, 400, 500, 900, 1900	1000, 6200, 6600, 8200, 9000
Guadalupe River	Ellenburger-San Saba	Blanco, Kendall, Kerr	300, 400, 1900	8200
Brazos River	Gulf Coast	Austin, Brazoria, Brazos, Fort Bend, Waller, Washington	200, 300, 400, 500, 1900	5500, 6000, 6600, 8200, 9000
Brazos-Colorado Coastal	Gulf Coast	Austin, Brazoria, Colorado, Fort Bend, Matagorda, Wharton	300, 400, 500, 1900	5500, 6000, 6600, 8200
Colorado River	Gulf Coast	Colorado, Fayette, Matagorda, Wharton	300, 400, 500, 1900	6600, 6700, 8200
Guadalupe River	Gulf Coast	Goliad, Gonzales, Victoria	300, 400	6600, 8200
Lavaca River	Gulf Coast	Colorado, Fayette, Jackson, Lavaca, Wharton	300, 400, 500, 1900	6700, 8200, 9000
Neches River	Gulf Coast	Hardin, Jasper, Liberty, Orange, Polk, Trinity, Tyler	300, 400, 500, 1900	6000, 6300, 6600, 8000, 8200, 9000
Neches-Trinity Coastal	Gulf Coast	Chambers, Jefferson	300, 400, 500, 1700, 1900	5500, 6200, 6600, 8200
Nueces River	Gulf Coast	Live Oak, San Patricio	200, 300, 400, 500, 800, 1300, 1900	1000, 5500, 6000, 6300, 6600, 8000, 8200
Nueces-Rio Grande Coastal	Gulf Coast	Brooks, Cameron, Duval, Hidalgo, Jim Hogg, Jim Wells, Kleberg, Nueces	200, 300, 400, 500, 1300, 1900	1000, 5500, 6000, 6300, 6600, 8000, 8200
Rio Grande River	Gulf Coast	Starr, Webb	300, 400, 1900	5500, 6000, 6600, 8200
San Antonio River	Gulf Coast	Goliad, Karnes	300, 400, 800, 1300	5500, 6600, 8200
San Antonio-Nueces Coastal	Gulf Coast	Aransas, Bee, Goliad, Refugio, San Patricio	200, 300, 400, 500, 800, 1300, 1900	1000, 5500, 6000, 6300, 6600, 8000, 8200

Basin	Aquifer	County	Cause	Source
San Jacinto River	Gulf Coast	Fort Bend, Grimes, Harris, Liberty, Montgomery, San Jacinto, Walker, Waller	200, 300, 400, 500, 800, 1300, 1900	3100, 5500, 6000, 6200, 6300, 6600, 8200
San Jacinto-Brazos Coastal	Gulf Coast	Brazoria, Fort Bend, Galveston, Harris	200, 300, 400, 500, 1300, 1900	3100, 5500, 6000, 6300, 6600, 8200, 9000
Trinity	Gulf Coast	Chambers, Grimes, Liberty, Polk, San Jacinto, Trinity, Walker	300, 400, 500, 1900	6000, 6600, 8200
Brazos River	Hickory	Burnet, Lampassas	300, 400	8200
Colorado River	Hickory	Blanco, Burnet, Brown, Concho, Gillespie, Hays, Kerr, Lampassas, Llano, McCulloch, Travis	200, 300, 400, 500, 900, 1800, 1900	1000, 5500, 6000, 6200, 8200, 9000
Guadalupe River	Hickory	Blanco, Hays, Kendall, Kerr	300, 400, 1900	6600, 8200, 9000
Rio Grande River	Hueco-Mesilla	El Paso	300, 400, 500, 1900	5500, 6000, 6600, 8200
Rio Grande River	Igneous	Jeff Davis, Presidio	300, 400	8200
Colorado River	Lipan	Concho, Runnels, Tom Green	300, 400, 500, 1900	6600, 8200, 9000
Brazos River	Marble Falls	Lampassas	300, 400	8200
Colorado River	Marble Falls	Blanco, Lampassas, Llano, Mason, McCullech	200, 300, 400, 500, 1900	1000, 6600, 8200, 9000
Guadalupe River	Marble Falls	Blanco	300, 400, 1900	8200
Sulphur River	Nacatoch	Bowie, Hopkins, Hunt, Red River	300, 400, 500, 900, 1900	5500, 6300, 6600, 8000, 8200
Trinity	Nacatoch	Kaufman, Navarro	300, 400, 1900	5500, 8200
Brazos River	Ogallala	Bailey, Cochran, Crosby, Dickens, Floyd, Garza, Hale, Hockley, Lamb, Lubbock, Lynn, Palmer	200, 300, 400, 500, 800, 900, 1300, 1900	1000, 1200, 1400, 5500, 6600, 8200, 9000
Canadian River	Ogallala	Dallam, Hemphill, Lipscomb, Moore, Ochiltree, Potter, Roberts, Sh	300, 400, 500	5500, 6600, 8000, 8200, 9000

Basin	Aquifer	County	Cause	Source
Colorado River	Ogallala	Andrews, Borden, Ector, Gaines, Howard, Martin, Midland, Terry, Yoakum	200, 300, 400, 500, 1900	1000, 5500, 6000, 6600, 8200, 9000
Red River	Ogallala	Briscoe, Carson, Deaf Smith, Donley, Gray, Motley, Randall, Swisher	200, 300, 400, 500	1000, 6600, 8000, 8200, 9000
Brazos River	Queen City	Brazos, Burleson, Grimes, Lee, Leon, Milan, Robertson, Washington	200, 300, 400, 500, 800, 1900	5500, 6000, 6600, 8200, 9000
Colorado River	Queen City	Bastrop, Fayette, Lee	300, 400, 500, 1900	6700, 8200
Cyress Creek	Queen City	Camp, Cass, Gregg, Marion, Morris, Titus, Upshur, Wood	300, 400, 500, 1300, 1900	5500, 6300, 6600, 8000, 8200
Guadalupe River	Queen City	Caldwell, Gonzales	300, 400	6300, 8200
Neches River	Queen City	Angelina, Anderson, Cherokee, Henderson, Houston, Nacogdoches, Sm	300, 400, 800, 1300, 1900	5500, 6300, 6600, 8000, 8200
Nueces River	Queen City	Atascosa	300, 400, 1900	5500, 8200
Sabine River	Queen City	Gregg, Harrison, Upshur, Van Zandt, Wood	300, 400, 500, 1300, 1900	5500, 6300, 6600, 8000, 8200
Sabine River	Queen City	Smith	300, 400, 800, 1300	5500, 6600
San Antonio River	Queen City	Wilson	300, 400, 1900	8200
San Jacinto River	Queen City	Grimes	300, 400	8200
Trinity	Queen City	Anderson, Freestone, Grimes, Henderson, Houston, Leon, Madison, Val Verde	300, 400, 1900	3000, 5500, 6600, 8200, 9000
Canadian River	Rita Blanca	Dallam	300, 400	8200
Rio Grande River	Rustler	Pecos, Reeves	200, 300, 400, 1900	1000, 8200
Brazos River	Seymour	Baylor, Crosby, Dickens, Fisher, Haskell, Jones, Knox, Stonewall, Throckmorton	300, 400, 1900	5500, 8200

Basin	Aquifer	County	Cause	Source
Red River	Seymour	Childress, Clay, Collingsworth, Foard, Hall, Hardeman, Motley, Wh	300, 400, 500, 1900	6600, 8200
Brazos River	Sparta	Brazos, Burleson, Lee, Leon, Robertson	200, 300, 400, 500, 1900	5500, 6000, 6600, 8200
Colorado River	Sparta	Bastrop, Fayette, Lee	300, 400, 500, 1900	6700, 8200
Guadalupe River	Sparta	Gonzales	300, 400	8200
Neches River	Sparta	Anderson, Angelina, Cherokee, Houston, Nacogdoches, San Augustine	300, 400, 1900	5500, 6600, 8200
Nueces River	Sparta	Atascosa	300, 400, 1900	5500, 8200
Sabine River	Sparta	Sabine	300, 400	8200
San Antonio River	Sparta	Wilson	300, 400, 1900	8200
San Jacinto River	Sparta	Grimes	300, 400	8200
Trinity	Sparta	Anderson, Grimes, Houston, Leon, Madison, Trinity, Walker	300, 400, 500, 1900	5500, 6000, 6600, 8200, 9000
Brazos River	Trinity	Bell, Burnet, Callahan, Comanche, Coryell, Eastland, Erath, Hamilton, Hill, Hood, Jack, Johnson, Lampasses, Limestone, McLennan, Palo Pinto, Parker, Somervell, Stephens, Taylor, Williamson, Young	300, 400, 500, 1900	5500, 6000, 6600, 8200, 9000
Colorado River	Trinity	Blanco, Burnet, Brown, Callahan, Gillespie, Hays, Kerr, Lampasas, Llano, San Saba, Taylor, Travis	200, 300, 400, 500, 900, 1800, 1900	1000, 5500, 6000, 6200, 6600, 8200, 9000
Guadalupe River	Trinity	Blanco, Comal, Hays, Kendall, Kerr	300, 400, 1900	6600, 8000, 8200, 9000
Nueces River	Trinity	Bandera, Medina, Real	300, 400	6000, 8200
Red River	Trinity	Fannin, Grayson, Lamar, Montague	300, 400, 500, 1900	1000, 6300, 6600, 8000, 8200, 9000
Rio Grande River	Trinity	Val Verde	300, 400, 1900	8000, 8200

Basin	Aquifer	County	Cause	Source
Sabine River	Trinity	Hunt	300, 400, 500	5500, 6600, 8200
San Antonio River	Trinity	Bandera, Bexar, Medina	200, 300, 400, 500, 800, 900, 1900	1000, 5500, 6000, 6300, 6600, 8000, 8200
Sulphur River	Trinity	Hunt, Lamar, Red River	300, 400, 500	5500, 6300, 6600, 8200
Trinity	Trinity	Collin, Cooke, Dallas, Denton, Ellis, Grayson, Hill, Jack, Johnson	200, 300, 400, 500, 1300, 1900	1000, 5500, 6000, 6600, 8000, 8200, 9000
Rio Grande River	West Texas Bolsons	Jeff Davis, Presidio	300, 400	8200
Brazos River	Woodbine	Hill, Johnson, McLennan	300, 400, 500, 1900	6600, 8200
Red River	Woodbine	Fannin, Grayson, Lamar	300, 400, 500, 1900	1000, 6300, 6600, 8000, 8200
Sabine River	Woodbine	Hunt	300, 400, 500	5500, 6600, 8200
Trinity	Woodbine	Collin, Cooke, Dallas, Denton, Ellis, Grayson, Hill, Johnson, Kaufman	200, 300, 400, 500, 1300, 1900	1000, 5500, 6000, 6600, 8000, 8200, 9000

APPENDIX H

AQUIFER VULNERABILITY RANKING SYSTEM



Aquifer Vulnerability Ranking System

Major Aquifers	Average Drastic Index	Vulnerability Rank*
Seymour	144	High
Edwards (Balcones Fault Zone- San Antonio)	135	High
Edwards (Balcones Fault Zone - Austin)	126	High
Carrizo-Wilcox	117	Medium
Edwards-Trinity (Plateau)	107	Medium
Ogallala-South	99	Medium
Gulf Coast	95	Medium
Trinity	95	Medium
Cenozoic Pecos Alluvium	95	Medium
Ogallala-North	87	Low
Hueco-Mesilla Bolson	84	Low
Minor Aquifers	Average Drastic Index	Vulnerability Rank*
Brazos River Alluvium	144	High
Ellenburger-San Saba	126	High
Marble Falls	126	High
Hickory	114	Medium
Nacatoch	111	Medium
Blossom	109	Medium
Queen City	108	Medium
Lipan	108	Medium
Rustler	106	Medium
Blaine	102	Medium
Bone Springs-Victoria Peak	100	Medium
Capitan Reef Complex	98	Medium
Minor Aquifers	Average Drastic Index	Vulnerability Rank*
Sparta	98	Medium
Marathon	96	Medium

West Texas Bolsons	90	Low
Edwards-Trinity (High Plains)	83	Low
Rita Blanca	83	Low
Woodbine	82	Low
Igneous	79	Low
Dockum	78	Low

*Based on Drastic Index System

High > 125

Medium 95 - 125

Low < 95

APPENDIX I

CLEAN WATER ACT, SECTION 319

NONPOINT SOURCE MANAGEMENT PROGRAMS



[Section 319 added by PL 100-4]

(a) State Assessment Reports. --

(1) Contents. -- The Governor of each State shall, after notice and opportunity for public comment, prepare and submit to the Administrator for approval, a report which:

(A) identifies those navigable waters within the State which, without additional action to control nonpoint sources of pollution, cannot reasonably be expected to attain or maintain applicable water quality standards or the goals and requirements of this Act;

(B) identifies those categories and subcategories of nonpoint source or, where appropriate, particular nonpoint sources which add significant pollution to each portion of the navigable waters identified under subparagraph (A) in amounts which contribute to such portion not meeting such water quality standards or such goals and requirements;

(C) describes the process, including intergovernmental coordination and public participation, for identifying best management practices and measures to control each category and subcategory of nonpoint sources and, where appropriate, particular nonpoint sources identified under subparagraph (B) and to reduce, to the maximum extent practicable, the level of pollution resulting from such category, subcategory, or source; and

(D) identifies and describes State and local programs for controlling pollution added from nonpoint sources to, and improving the quality of, each such portion of the navigable waters, including but not limited to those programs which are receiving Federal assistance under subsections (h) and (i).

(2) Information Used in Preparation. -- In developing the report required by this section, the State (A) may rely upon information developed pursuant to sections 208, 303(e), 304(f), 305(b), and 314, and other information as appropriate, and (B) may utilize appropriate elements of the waste treatment management plans developed pursuant to sections 208(b) and 303, to the extent such elements are consistent with and fulfill the requirements of this section.

(b) State Management Programs. --

(1) In General. -- The Governor of each State, for that State or in combination with adjacent States, shall, after notice and opportunity for public comment, prepare and

submit to the Administrator for approval a management program which such State proposes to implement in the first four fiscal years beginning after the date of submission of such management program for controlling pollution added from nonpoint sources to the navigable waters within the State and improving the quality of such waters.

(2) Specific Contents. -- Each management program proposed for implementation under this subsection shall include each of the following:

(A) An identification of the best management practices and measures which will be undertaken to reduce pollutant loadings resulting from each category, subcategory, or particular nonpoint source designated under paragraph (1)(B), taking into account the impact of the practice on ground water quality.

(B) An identification of programs (including, as appropriate, nonregulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology transfer, and demonstration practices by the categories, subcategories, and particular nonpoint source designated under subparagraph (A).

(C) A schedule containing annual milestones for (i) utilization of the program implementation methods identified in subparagraph (B), and (ii) implementation of the best management practices identified in subparagraph (A) by the categories, subcategories, or particular nonpoint sources designated under paragraph (1)(B). Such schedule shall provide for utilization of the best management practices at the earliest practicable date.

(D) A certification of the attorney general of the State or States (or the chief attorney of any State water pollution control agency which has independent legal counsel) that the laws of the State or States, as the case may be, provide adequate authority to implement such management program or, if there is not such adequate authority, a list of such additional authorities as will be necessary to implement such management program. A schedule and commitment by the State or States to seek such additional authorities as expeditiously as practicable.

(E) Sources of Federal and other assistance and funding (other than assistance provided under subsections (h) and (I)) which will be available in each of such fiscal years for supporting implementation of such practices and measures and the purposes for which such assistance will be used in each of such fiscal years.

(F) An identification of Federal financial assistance programs and Federal development projects for which the State will review individual assistance applications or development projects for their effect on water quality pursuant to the procedures set forth in Executive Order 12372 as in effect on September 17, 1983, to determine whether such assistance applications or development projects would be consistent with the program prepared under this subsection; for the purposes of this subparagraph, identification shall not be limited to the assistance programs or development projects subject to Executive Order 12372 but may

include any programs listed in the most recent Catalog of Federal Domestic Assistance which may have an effect on the purposes and objectives of the State's nonpoint source pollution management program.

(3) Utilization of Local and Private Experts. -- In development and implementing a management program under this subsection, a State shall, to the maximum extent practicable, involve local public and private agencies and organizations which have expertise in control of nonpoint sources of pollution.

(4) Development on Watershed Basis. -- A State shall, to the maximum extent practicable, develop and implement a management program under this subsection on a watershed-by-watershed basis within such State.

(c) Administrative Provisions. --

(1) Cooperation Requirement. -- Any report required by subsection (a) and any management program and report required by subsection (b) shall be developed in cooperation with local, substate regional, and interstate entities which are actively planning for the implementation of nonpoint source pollution controls and have either been certified by the Administrator in accordance with section 208, have worked jointly with the State on water quality management planning under section 205(j), or have been designated by the State legislative body or Governor as water quality management planning agencies for their geographic areas.

(2) Time Period for Submission of Reports and Management Programs. -- Each report and management program shall be submitted to the Administrator during the 18-month period beginning on the date of the enactment of this section.

(d) Approval or Disapproval of Reports and Management Programs. --

(1) Deadline. -- Subject to paragraph (2), not later than 180 days after the date of submission to the Administrator of any report or management program under this section (other than subsections (h), (i), and (k)), the Administrator shall either approve or disapprove such report or management program, as the case may be. The Administrator may approve a portion of a management program under this subsection. If the Administrator does not disapprove a report, management program, or portion of a management program in such 180-day period, such report, management program, or portion shall be deemed approved for purposes of this section.

(2) Procedure for Disapproval. -- If, after notice and opportunity for public comment and consultation with appropriate Federal and State agencies and other interested persons, the Administrator determines that --

(A) the proposed management program or any portion thereof does not meet the requirements of subsection (b)(2) of this section or is not likely to satisfy, in whole or in part, the goals and requirements of the Act;

(B) adequate authority does not exist, or adequate resources are not available, to implement such program or portion;

(C) the schedule for implementing such program or portion is not sufficiently expeditious; or

(D) the practices and measures proposed in such program or portion are not adequate to reduce the level of pollution in navigable waters in the State resulting from nonpoint sources and to improve the quality of navigable waters in the State; the Administrator shall within 6 months of receipt of the proposed program notify the State of any revisions or modifications necessary to obtain approval. The State shall thereupon have an additional 3 months to submit its revised management program and the Administrator shall approve or disapprove such revised program within three months of receipt.

(3) Failure of State to Submit Report. -- If a Governor of State does not submit the report required by subsection (a) within the period specified by subsection (c)(2), the Administrator shall, within 30 months after the date of the enactment of this section, prepare a report for such State which makes the identifications required by paragraphs (1)(A) and (1)(B) of subsection (a). Upon completion of the requirement of the preceding sentence and after notice and opportunity for comment, the Administrator shall report to Congress on his actions pursuant to this section.

(e) Local Management Programs; Technical Assistance. -- If a State fails to submit a management program under subsection (b) or the Administrator does not approve such a management program, a local public agency or organization which has expertise in, and authority to, control water pollution, resulting from nonpoint sources in any area of such State which the Administrator determines is of sufficient geographic size may, with approval of such State, request the Administrator to provide, and the Administrator shall provide, technical assistance to such agency or organization in developing for such area a management program which is described in subsection (b) and can be approved pursuant to subsection (d). After development of such management program, such agency or organization shall submit such management program to the Administrator for approval. If the Administrator approves such management program, such agency or organization shall be eligible to receive financial assistance under subsection (h) for implementation of such management program as if such agency or organization were a State for which a report submitted under subsection (a) and a management program submitted under subsection (b) were approved under this section. Such financial assistance shall be subject to the same terms and conditions as assistance provided to a State under subsection (h).

(f) Technical Assistance for States. -- Upon request of a State, the Administrator may provide technical assistance to such State in developing a management program approved under subsection (b) for those portions of the navigable waters requested by such State.

(g) Interstate Management Conference. --

(1) Convening of Conference; Notification; Purpose. -- If any portion of the navigable waters in any State which is implementing a management program approved under this section is not meeting applicable water quality standards or

the goals and requirements of the Act as a result, in whole or in part, of pollution from nonpoint sources in another State, such State may petition the Administrator to convene, and the Administrator shall convene, a management conference of all States which contribute significant pollution resulting from nonpoint sources to such portion. If, on the basis of information available, the Administrator determines that a State is not meeting applicable water quality standards or the goals and requirements of this Act as a result, in whole or in part, of significant pollution from nonpoint sources in another State, the administrator shall notify such State. The Administrator may convene a management conference under this paragraph not later than 180 days after giving such notification, whether or not the State which is not meeting such standards requests such conference. The purpose of such conference shall be to develop an agreement among such States to reduce the level of pollution in such portion resulting from nonpoint sources and to improve the water quality of such portion. Nothing in such agreement shall supersede or abrogate rights to quantities of water which have been established by interstate water compacts, Supreme Court decrees, or State water laws. This subsection shall not apply to any pollution which is subject to the Colorado River Basin Salinity control Act. The requirement that the Administrator convene a management conference shall not be subject to the provisions of section 505 of this Act.

(2) State Management Program Requirement. -- To the extent that the States reach agreement through such conference, the management programs of the States which are parties to such agreements and which contribute significant pollution to the navigable water or portions thereof not meeting applicable water quality standards or goals and requirements of the Act will be revised to reflect such agreement. Such a management program shall be consistent with Federal and State law.

(h) Grant Program. --

(1) Grants for Implementation of Management Programs. -- Upon application of a State for which a report submitted under subsection (a) and a management program submitted under subsection (b) is approved under this section, the Administrator shall make grants, subject to such terms and conditions as the Administrator considers appropriate, under this subsection to such State for the purpose of assisting the State in implementing such management program. Funds reserved pursuant to section 205(j)(5) of this Act may be used to develop and implement such management program.

(2) Applications. -- An application for a grant under this subsection in any fiscal year shall be in such form and shall contain such other information as the Administrator may require, including an identification and description of the best management practices and measures which the State proposes to assist, encourage, or require in such year with the Federal assistance to be provided under the grant.

(3) Federal Share. -- The Federal share of the cost of each management program implemented with Federal assistance under this subsection in any fiscal year shall not exceed 60 percent of the cost incurred by the State in implementing such management program and shall be made on condition that the non-Federal share is provided from non-Federal sources.

(4) Limitation on Grant Amounts. -- Notwithstanding any other provision of this subsection, not more than 15 percent of the amount appropriated to carry out this subsection may be used to make grants to any one State, including any grants to any local public agency or organization with authority to control pollution from nonpoint sources in any area of such State.

(5) Priority for Effective Mechanisms. -- For each fiscal year beginning after September 30, 1987, the Administrator may give priority in making grants under this subsection, and shall give consideration in determining the Federal share of any such grant, to States which have implemented or are proposing to implement management programs which will --

(A) control particularly difficult or serious nonpoint source pollution problems, including, but not limited to, problems resulting from mining activities;

(B) implement innovative methods or practices for controlling nonpoint sources of pollution, including regulatory programs where the Administrator deems appropriate;

(C) control interstate nonpoint source pollution problems; or

(D) carry out ground water quality protection activities which the Administrator determines are part of a comprehensive nonpoint source pollution control program, including research, planning, ground water assessments, demonstration programs, enforcement, technical assistance, education, and training to protect ground water quality from nonpoint sources of pollution.

(6) Availability for Obligation. -- The funds granted to each State pursuant to this subsection in a fiscal year shall remain available for obligation by such State for the fiscal year for which appropriated. The amount of any such funds not obligated by the end of such fiscal year shall be available to the Administrator for granting to other States under this subsection in the next fiscal year.

(7) Limitation on Use of Funds. -- States may use funds from grants made pursuant to this section for financial assistance to persons only to the extent that such assistance is related to the costs of demonstration projects.

(8) Satisfactory Progress. -- No grant may be made under this subsection in any fiscal year to a State which in the preceding fiscal year received a grant under this subsection unless the Administrator determines that such State made satisfactory

progress in such preceding fiscal year in meeting the schedule specified by such State under subsection (b)(2).

(9) Maintenance of Effort. -- No grant may be made to a State under this subsection in any fiscal year unless such State enters into such agreements with the Administrator as the Administrator may require to ensure that such State will maintain its aggregate expenditures from all other sources for programs for controlling pollution added to the navigable waters in such State from nonpoint sources and improving the quality of such waters at or above the average level of such expenditures in its two fiscal years preceding the date of enactment of this subsection.

(10) Request for Information. -- The Administrator may request such information, data, and reports as he considers necessary to make the determination of continuing eligibility for grants under this section.

(11) Reporting and Other Requirements. -- Each State shall report to the Administrator on an annual basis concerning (a) its progress in meeting the schedule of milestones submitted pursuant to subsection (b)(2)(C) of this section, and (B) to the extent that appropriate information is available, reductions in nonpoint source pollutant loading and improvements in water quality for those navigable waters or watersheds within the State which were identified pursuant to subsection (a)(1)(a) of this section resulting from implementation of the management program.

(12) Limitation on Administrative Costs. -- For purposes of this subsection, administrative costs in the form of salaries, overhead, or indirect costs for services provided and charged against activities and programs carried out with a grant under this subsection shall not exceed in any fiscal year 10 percent of the amount of the grant in such year, except that costs of implementing enforcement and regulatory activities, education, training, technical assistance, demonstration projects, and technology transfer programs shall not be subject to this limitation.

(i) Grants for Protecting Groundwater Quality. --

(1) Eligible Applicants and Activities. -- Upon application of a State for which a report submitted under subsection (a) and a plan submitted under subsection (b) is approved under this section, the Administrator shall make grants under this subsection to such State for the purpose of assisting such State in carrying out groundwater quality protection activities which the Administrator determines will advance the State toward implementation of a comprehensive nonpoint source pollution control program. Such activities shall include, but not be limited to, research planning, groundwater assessments, demonstration programs, enforcement, technical assistance, education and training to protect the quality of groundwater and to prevent contamination of groundwater from nonpoint sources of pollution.

(2) Applications. -- An application for a grant under this subsection shall be in such form and shall contain such information as the Administrator may require.

(3) Federal Share; Maximum Amount. -- The Federal share of the cost of assisting a State in carrying out groundwater protection activities in any fiscal year under this subsection shall be 50 percent of the costs incurred by the State in carrying out such activities, except that the maximum amount of Federal assistance which any State may receive under this subsection in any fiscal year shall not exceed \$150,000.

(4) Report. -- The Administrator shall include in each report transmitted under subsection (m) a report on the activities and programs implemented under this subsection during the preceding fiscal year.

(j) Authorization of Appropriations. -- There is authorized to be appropriated to carry out subsections (h) and (i) not to exceed \$70,000,000 for fiscal year 1988, \$100,000,000 per fiscal year for each of fiscal years 1989 and 1990, and \$130,000,000 for fiscal year 1991; except that for each of such fiscal years not to exceed \$7,500,000 may be made available to carry out subsection (i). Sums appropriated pursuant to this subsection shall remain available until expended.

(k) Consistency of Other Programs and Projects With Management Programs. -- The Administrator shall transmit to the Office of Management and Budget and the appropriate Federal departments and agencies a list of those assistance programs and development projects identified by each State under subsection (b)(2)(F) for which individual assistance applications and projects will be reviewed pursuant to the procedures set forth in Executive Order 12372 as in effect on September 17, 1983, the concerns of the State regarding the consistency of such applications or projects with the State nonpoint source pollution management program.

(l) Collection of Information. -- The Administrator shall collect and make available, through publications and other appropriate means, information pertaining to management practices and implementation methods, including, but not limited to, (1) information concerning the costs and relative efficiencies of best management practices for reducing nonpoint source pollution; and (2) available data concerning the relationship between water quality and implementation of various management practices to control nonpoint sources of pollution.

(m) Reports of Administrator. --

(1) Annual Reports. -- Not later than January 1, 1988, and each January 1 thereafter, the Administrator shall transmit to the Committee on Public Works and Transportation of the House of Representatives and the Committee on Environment and Public Works of the Senate, a report for the preceding fiscal year on the activities and programs implemented under this section and the progress made in reducing pollution in the navigable waters resulting from nonpoint sources and improving the quality of such waters.

(2) Final Report. -- Not later than January 1, 1990, the Administrator shall transmit to Congress a final report on the activities carried out under this section. Such report, at a minimum, shall --

(A) describe the management programs being implemented by the States by types and amount of affected navigable waters, categories and subcategories of nonpoint sources, and types of best management practices being implemented;

(B) describe the experiences of the States in adhering to schedules and implementing best management practices;

(C) describe the amount and purpose of grants awarded pursuant to subsections (h) and (i) of this section;

(D) identify, to the extent that information is available, the progress made in reducing pollutant loads and improving water quality in the navigable waters;

(E) indicate what further actions need to be taken to attain and maintain in those navigable waters (i) applicable water quality standards; and (ii) the goals and requirements of this Act;

(F) include recommendations of the Administrator concerning future programs (including enforcement programs) for controlling pollution from nonpoint sources; and

(G) identify the activities and programs of departments, agencies, and instrumentalities of the United States which are inconsistent with the management programs submitted by the States and recommend modifications so that such activities and programs are consistent with and assist the States in implementation of such management programs.

(n) Set Aside for Administrative Personnel. -- Not less than 5 percent of the funds appropriated pursuant to subsection (j) for any fiscal year shall be available to the Administrator to maintain personnel levels at the Environmental Protection Agency at levels which are adequate to carry out this section in such year.

