

CHAPTER 6 IMPLEMENTATION

Nonpoint source pollution management makes use of both regulatory and non-regulatory programs. Regulatory programs establish rules for certain activities in order to prevent harm to the environment resulting from these activities. The rules often require notification and reporting to a regulatory authority when the activity is engaged in, and specific prior authorization for the activity, such as registration, permitting, or certification. Regulatory activities also include inspections to determine whether rules are being complied with, as well as pursuit of apparent violations through investigations, enforcement activities, and litigation.

Non-regulatory programs do not establish or enforce environmental protection rules. Non-regulatory programs are voluntary. Regulation of everyday practices which individuals can use to control some nonpoint sources of pollution is impractical. In these cases, Texas encourages voluntary compliance through education and outreach. In addition, the size and complexity of the problem, low public awareness, and the lack of rigorous scientific definition of NPS problems make regulation difficult. Without regulation, a coordinated effort from the highest levels of government down to the citizens must occur to have an impact and reduce nonpoint source pollution.

The Texas Commission on Environmental Quality (TCEQ) is designated by law as the lead state agency for water quality in Texas. The Texas State Soil and Water Conservation Board (TSSWCB) also plays an important role as the lead agency in the state for the management of agricultural and silvicultural (forestry) nonpoint source runoff. Local, regional, state, and federal agencies have specific responsibilities that are critical to the restoration and protection of polluted water bodies. Non-government organizations, especially at the watershed level, provide information about local concerns and infrastructure, and help build support for the kind of pollution controls necessary to restore water quality.

This chapter describes ongoing programs throughout the state which address NPS pollution. The programs are conducted by the agencies described in Chapter 4. This chapter is divided into the following types of NPS management issues:

- Surface Water Plans
- Groundwater Plans
- Remediation of Contaminated Sites
- Emergency Response and Disaster Recovery
- Hydromodification
- Marinas and Recreational Boating
- Solid and Hazardous Waste Management

- Wastewater Management
- Storm Water Management
- Pesticide Management
- Agricultural Management
- Silvicultural Management
- Pollution Prevention
- Protection for Drinking Water Sources
- Aquifer Protection
- Wetlands Protection
- Coastal Programs
- Border Programs

Surface Water Plans

An important tool in managing nonpoint source pollution is the development of implementation plans. Once the sources or causes of pollution have been identified through the development of TMDLs or special studies (described in Chapter 5), an implementation plan must be developed. Implementation plans describe the management measures necessary to achieve the pollutant reductions. Management measures incorporate both nonregulatory and regulatory mechanisms. These management measures may include permit effluent limits and recommendations, nonpoint source pollution management practices, stream standard revisions, special projects, pollution prevention, public education, and watershed-specific rule recommendations.

Implementation plans may include both control actions and management measures. Control actions are point source pollution reduction strategies like the construction of centralized wastewater treatment facilities. Management measures are nonpoint source pollution reduction strategies which are the focus of this document. The best management measures for each individual watershed are developed in cooperation with regional and local stakeholders.

There are two types of plans developed in the State of Texas, TMDL Implementation Plans and plans developed at the local level called Watershed Protection Plans.

Both types of implementation plans describe implementation activities, the schedule for implementing them, and the authority for the regulatory measures. It also provides reasonable assurance that the voluntary practices will be undertaken and identifies partners who may perform these tasks. For instance, the plan may identify funds needed to implement voluntary actions. The plan also includes the measurable results that will be achieved, along with a follow-up monitoring plan to determine its

success. Interim results are evaluated to assess progress toward the goal of the plan.

Even after plans are fully implemented, it is difficult to accurately predict how long it will take for improvements to occur in the water body, or how much improvement will be seen. For this reason, there is a schedule for phasing in implementation activities, especially those that address nonpoint sources of pollution. Less expensive, time-tested activities are implemented first, and their affects are assessed. If the water quality goal of the plan is not yet achieved, then another round of activities is implemented. Through this adaptive management approach, the water body is continually reassessed, and adjustments are made in the implementation activities as needed to attain the water quality goal of the plan.

The following elements will be addressed in plans implemented through the CWA §319(h) Grant Program as required by EPA Guidance:

- a. An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in the TMDL.
- b. An estimate of the load reductions expected for the management measures described in the implementation plan.
- c. A description of the NPS management measures that will need to be implemented to achieve the load reductions estimated in the implementation plan, and an identification of the critical areas in which those measures will be needed to implement the plan.
- d. An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement the plan.
- e. An information/education component that will be used to enhance public understanding of the project and encourage early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.
- f. A schedule for implementing the NPS management measures identified in the plan.
- g. A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.
- h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether the TMDL needs to be revised.

- i. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established in the plan.

TMDL Implementation Plans

Chapter 5 explains how Total Maximum Daily Loads (TMDLs) serve as part of the assessment process to identify sources and quantities of pollutant loadings that are preventing a water body from meeting water quality standards. After a TMDL is completed, an implementation plan is developed that describes the management measures necessary to achieve the pollutant reductions identified in the TMDL. The ultimate goal of TMDL Implementation Plans is the attainment of the water quality standard, but additional, interim results may be evaluated to assess progress toward that goal as described above. The development of TMDL Implementation Plans and implementation of NPS management measures defined in these plans is a priority for CWA §319(h) funding (described in Chapter 2).

Watershed Protection Plans

Watershed Protection Plans, are also developed at the local level to address water quality issues. Watershed Protection Plans are often based on special studies conducted to gather more data in certain areas where problems are known to exist but more intense monitoring is necessary to determine the source of the problem.

Watershed Protection Plans are developed by river authorities, cities, or other local government entities to determine how to best solve the water quality problems of that area and to define the implementation activities needed to attain or maintain water quality standards. Priority for CWA §319(h) funding (described in Chapter 2) is provided to develop and implement these plans.

Water Quality Trading

The concept of water quality trading has often been discussed as a way to increase the efficiency of TMDL and Watershed Protection Plan implementation and/or provide more flexibility for sources required to achieve extreme load reductions. In the context of TMDL and Watershed Protection Plan implementation, “water quality trading” refers to theoretical trading of pollutant allocations among local or regional sources, and generally does not mean physical transfers of actual effluent discharge. Arranging pollutant trades amongst watershed sources typically would require that some entity tracks the trades and keeps the account balanced to remain within the planned load allocations. The accounting entity may also need to mediate legal agreements, or disagreements, between trading partners.

Action with regard to water quality trading studies or plans will depend largely on the initiative of others, and the TCEQ and TSSWCB cannot stipulate when or if such efforts will occur. However, the TCEQ and TSSWCB will attempt to cooperate with such efforts in a timely and helpful manner. The development of a water quality trading program is optional. Any such effort that uses CWA §319 grant funding will have the tracking/accounting assurance stipulated in the grant stipulations.

Groundwater Plans

The Texas Groundwater Protection Committee strives to improve or identify areas where new or existing programs could be enhanced to provide additional protection for groundwater resources. The committee actively seeks to improve existing groundwater programs and promotes coordination among agencies and Groundwater Conservation Districts.

Joint Groundwater Monitoring and Contamination Report

The TGPC uses many tools to verify pollutant and contamination sources and develop plans to address the sources. The *Joint Groundwater Monitoring and Contamination Report* is essential to this process. The report is a compilation of all known groundwater contamination cases in the state and their enforcement status. In general, once groundwater contamination has been confirmed through regulatory compliance monitoring, the case will follow a generic sequence of actions until the investigation concludes no further action is necessary. The sequence of actions to verify pollutant sources and develop plans based on this report generally consists of confirmation of the contamination, an investigation to study the extent, composition, and circumstances of the contamination, and the planning of corrective action measures based on the investigation.

Groundwater Protection Strategy

There are no specific programs that routinely examine the quality of water being consumed by Texans utilizing private/domestic wells, the segment of Texas' population most likely to be impacted by NPS pollution of groundwater. Surveys of the groundwater quality of private wells in Texas are rare; however, studies that have been conducted by various agencies have indicated that both man-made and naturally occurring contaminants - (eg fecal coliform, nitrate, radioactive nuclides, pesticides and pesticide degradation byproducts, arsenic, and other heavy metals) have been found in some domestic wells at levels that exceed health-based maximum contaminant levels (based upon a lifetime exposure to the constituent). The TGPC has prepared the new *Texas Groundwater Protection Strategy* (AS-188, February 2003) that details actions to be taken to remedy this situation and address other aspects of NPS pollution.

The state's groundwater protection efforts are implemented through three types of groundwater program activities: groundwater protection, groundwater remediation, and groundwater conservation.

Protection. Groundwater protection is the first programmatic component that defines the state's efforts. TWC§26.401 sets out nondegradation of the state's groundwater resources as the goal for all state programs and asserts that groundwater be kept reasonably free of contaminants that interfere with the present and potential uses of groundwater.

Remediation. The second programmatic component of the state's efforts is groundwater remediation. Once contamination has occurred, the goal of remediation programs is to restore the quality of groundwater if feasible. The remediation of groundwater contamination is accomplished through the implementation of corrective action plans developed as a result of the *Joint Groundwater Contamination Report*, monitoring of the effectiveness of corrective action measures, and ultimately, the completion of the corrective action measures.

Conservation. Another component of groundwater programs is conservation. Groundwater Conservation Districts are the state's preferred method of managing groundwater resources. Groundwater Conservation Districts have the authority to adopt and enforce rules, require well permits, monitor groundwater quality and quantity, and provide public education. These activities are useful in assisting with the implementation of the Districts' management plans described above.

Groundwater Conservation Districts

The legislature has stressed the importance and responsibility of groundwater conservation districts in developing and implementing comprehensive management plans to conserve and protect groundwater resources. Wastewater reuse, desalination, well spacing regulations, brush control, and other strategies are featured in the plans.

This chapter, and the following two chapters, represents the toolbox of programs in place throughout the state which attempt to achieve the goals defined in this management plan through implementation of the defined milestones. The implementation programs and measures described in the plan work together to manage nonpoint source pollution in the State of Texas and are often defined through planning to achieve specific water quality goals.

Remediation of Contaminated Sites

Environmental contamination can occur in many ways. Some examples include, unreported spills of hazardous materials, undetected leaks from pipes or other malfunctioning industrial equipment, improper disposal of

byproducts of industrial processes, abandoned municipal solid waste landfills, and abandoned, inactive industrial sites. If not remedied, ground and surface water contamination may occur which can pose environmental and human health problems. Below is a discussion of several state programs in place which address remediation of contaminated sites.

Superfund Program

The state Superfund program's mission is to remediate abandoned or inactive sites within the state that pose an unacceptable risk to public health and safety or the environment, but which do not qualify for action under the federal Superfund program. The state Superfund program is administered by the TCEQ.

The TCEQ manages or provides management assistance to the U.S. Environmental Protection Agency (EPA) with regard to the Superfund remediation process, after the site is identified as being eligible for listing on either the state Superfund registry or the federal National Priorities List. The TCEQ ensures that all Superfund activities are completed in a timely and efficient manner, and in accordance with all applicable state and federal laws and rules.

Brownfields Program

In Texas, many former industrial properties lie dormant or underutilized due to liability associated with real or perceived contamination. These properties are broadly referred to as brownfields. The TCEQ, in close partnership with the EPA and other federal, state, and local agencies, facilitates cleanup, transferability, and revitalization of brownfields. This is accomplished through the development of regulatory, tax, and technical assistance tools. In addition, the TCEQ is available at no cost to local governments to provide technical advice, education, and project partnering for brownfields redevelopment projects.

Voluntary Cleanup Programs

The Texas Voluntary Cleanup Program (VCP) provides administrative, technical, and legal incentives to encourage the cleanup of contaminated sites in Texas. Non-responsible parties, including future lenders and landowners, receive protection from liability to the state of Texas for cleanup of sites under the VCP. Therefore, constraints for completing real estate transactions at those sites are eliminated. Also under the VCP, site cleanups follow a streamlined approach to reduce future human and environmental risk to safe levels. As a result, many unused or under used properties may be restored and become economically productive and beneficial to the community.

In addition, the RRC has a Voluntary Cleanup Program, which oversees the remediation of oil and gas related pollution and provides an incentive

to remediate the pollution through a release of liability to the state in exchange for a successful cleanup. Applicants to the program may not have caused or contributed to the pollution.

Corrective Action Program

The mission of the industrial and hazardous waste corrective action program is to oversee the cleanup of sites with soil and groundwater contamination from industrial and municipal hazardous and industrial non-hazardous wastes. This program is administered by the TCEQ. The goal of this program is to assure that the public is not exposed to hazardous levels of chemicals by requiring mitigation, and the removal of contamination to levels protective of human health and the environment.

The RRC is responsible for plugging and cleanup of abandoned wells and sites. The RRC oversees cleanup by responsible parties of pollution associated with oil and gas activities under RRC jurisdiction. Funding for the RRC's program comes from regulatory fees, permit fees, and bond fees paid by the oil and gas industry. Cleanup and prioritization of sites is based on protection of public health, public safety, and the environment.

Leaking Petroleum Storage Tank Program

The TCEQ is responsible for administering the leaking petroleum storage tank (LPST) program. The program mission is to oversee the cleanup of spills from regulated storage tanks by recording and evaluating all reported incidents of releases of petroleum and other hazardous substances from underground and above-ground storage tanks. The program goal is to assure that the public is not exposed to hazardous levels of contamination by requiring the removal of contamination from LPSTs to levels protective of human health and the environment.

Any entity performing or coordinating regulated LPST corrective action services must be licensed by the TCEQ, as an LPST corrective action specialist. Any individual who supervises any corrective action required on a LPST site but is not a qualified professional engineer must be registered as an LPST corrective action project manager. Corrective action services include measures to determine and report the extent of a release in progress, attempts to halt and prevent future releases of regulated substances, cleanup of surface and subsurface contamination on site, site closures, post-remediation monitoring, or any other actions reasonably necessary to protect public health and preserve environmental safety.

Emergency Response and Disaster Recovery

Nonpoint source pollution can occur as a result of natural disasters or spills of hazardous materials. Emergency response to these incidents can reduce the amount of impact pollutants from these activities present to the environment.

Severe storms can cause loss of vegetation, severe erosion, and runoff of contaminants, all of which can impact water quality. Clean-up efforts following severe storms often create large quantities of waste materials, which place additional pressures on the environment.

Spills on land are considered an emergency, because chemicals or other hazardous materials can enter nearby water resources and pose a threat to the environment and public health. Transportation and storage of hazardous materials increases the risk of the occurrence of spills. Some of the programs in the state of Texas that are responsible for response to spills and recovery from natural and manmade disasters are discussed below.

Floodplain Management

Development in some Texas communities has raised the elevation of portions of the floodplain, increased drainage over impervious surfaces, channeled runoff away from new growth areas, and caused other physical changes to the environment. These changes can contribute to the severity of flooding events, and result in further damage to the environment.

The TCEQ serves as the state floodplain coordinator and implements the National Flood Insurance Program (NFIP) in Texas. As part of this program, the TCEQ provides guidance, support, and training to floodplain administrators to become participants in the NFIP. TCEQ staff visit communities throughout the state to provide planning, assistance, and information to community officials, and help coordinate disaster response to severe floods.

The Texas Water Code authorizes cities and counties in the state to adopt ordinances and court orders to create comprehensive floodplain management programs designed to protect public health, safety, and the general welfare of its citizens. To participate in the NFIP, a community must adopt and enforce a floodplain management ordinance which prevents new development from increasing the flood threat and protect new and existing buildings from anticipated flood events.

Local floodplain management programs are responsible for reviewing all construction plans and conducting inspections of approved projects to assure conformance with NFIP regulations. NFIP regulations ensure that construction methods and materials will minimize future flood damage and impacts to the environment from floods. Best management practices are required in floodplain areas to provide for water conveyance, and reduce runoff volumes associated with development. Examples of a few BMPs used include swales, detention and retention ponds, and infiltration basins.

Emergency Response Program

The TCEQ Emergency Response team is on call 24-hours a day, year-round for response to oil and hazardous substance spills, emergencies, and human-caused disasters. The TCEQ responds to incidents such as, midnight dumping of abandoned drums, the breakup of the space shuttle Columbia in the skies over central and east Texas, and natural disasters.

The TCEQ collaborates with the EPA, the Coast Guard, other state agencies, counties, cities, local hazardous material teams, fire departments, law enforcement, and corporate response units. TCEQ staff lead response efforts when appropriate and provide planning or support.

The TCEQ assesses health and environmental risks in conjunction with the Texas Department of State Health Services (DSHS), the Railroad Commission of Texas (RRC), the Texas Parks and Wildlife Department (TPWD), Texas General Land Office (GLO) or other experts as necessary. DSHS identifies communities where people may be exposed to hazardous substances in the environment, assess a site's hazards, and recommends actions that need to be taken to protect human health. The RRC is responsible for response and clean-up of inland oil and gas related spills. TPWD is responsible for assessing impacts of spills to fish and wildlife. GLO responds to coastal oil spills.

Some of the services the TCEQ offers in response to spills and other pollution related emergencies include:

- assisting water supply officials providing drinking water and making systems operational; evaluating water quality; assisting individuals in maintaining private water or sewer systems; and assessing damages to public drinking water systems;
- providing information and aid to the State Emergency Management Council on matters of flood-hazard areas, floodplain management, flood hydrology, engineering, dam safety, reservoir operation, water rights and uses, water quality, and hazardous waste management;
- making available the services of specialists (floodplain management, hydrology, meteorology, groundwater geology, water quality, dam safety, wastewater treatment, water rights and uses, solid waste management including hazardous waste and radioactive waste, and emergency response) that may be of assistance during a disaster;
- providing spill response maps, as well as maps relating to flood-hazard areas;

- providing TCEQ data, including data from neighboring states and Mexico, needed for dealing with a disaster that transcends the boundaries of Texas;
- providing support for post-emergency weather and damage assessment;
- providing technical assistance to local governments in the physical siting of disposal facilities for debris including municipal wastes whenever a disaster generates excessive amounts of waste;
- providing cleanup funding as appropriate from funds under the TCEQ's statutory authorities; and
- providing contracting resources for cleanups.

To the extent possible, TCEQ ensures that the individuals or entities responsible for spills bear the cost of clean-up activities. Violators who intentionally or knowingly allow an unauthorized discharge of pollutants that causes or threatens to cause water pollution may be prosecuted. Failure to report a spill is also cause for prosecution.

Coastal Oil Spill Prevention and Response

The Oil Spill Prevention and Response Act of 1991 (OSPR) designated the GLO as the lead state agency for preventing and responding to oil spills in the marine environment. A two-cent-per-barrel fee on crude oil loaded or off-loaded in Texas supports funding for the GLO's response efforts. To ensure rapid response, field offices are located along the Texas coast. In preparation for spills, the program has pre-staged response equipment in sensitive and geographically advantageous locations. The GLO's Oil Spill Prevention and Response (OSPR) program functions include deploying state-owned response equipment, designating responsible parties, coordinating spill response strategies, investigating the spill causes, and conducting follow-ups to ensure that appropriate corrective actions are identified and implemented. The program maintains a substantial inventory of response equipment.

The OSPR program maintains an active outreach effort, visiting schools, associations, and interest groups. The outreach program emphasizes the environmental impacts of small, chronic spills. Pollution prevention methods are highlighted in every presentation. In addition, the OSPR sponsors the Clean Gulf Conference and Exhibition annually to bring experts from government and industry together to discuss the latest developments in oil spill technology and the issues facing both responders and industry.

The OSPR program has also completed construction of four bilge water reception facilities along the coast. The Oily Bilge Water Reception Facility Program deters disposal of bilge water containing oil directly into

surface water by providing operators of pleasure and commercial boats with disposal facilities. In addition, the GLO has increased its presence with additional boat and harbor patrols. The OSPR program maintains a comprehensive, unannounced oil spill drill and audit program designed to measure the readiness level of all sectors of the oil handling community: deep draft vessels, pipelines, and shore-based facilities.

The OSPR program is one of only a few state programs in the nation that funds oil spill prevention and response-related research. The Shoreline Environment Research Facility (SERF) enables oil spill researchers to conduct biological and chemical experiments in nine tanks that are capable of simulating a variety of coastal environments. The American Petroleum Institute has conducted two of the first "field conditions" dispersant experiments at the SERF facility, and works with program personnel to perfect response strategies for maritime applications.

The Texas Automated Buoy System (TABS) was developed to assist in predicting the movement of oil in offshore environments. Nine offshore buoys transmit real time ocean current data, which is then fed into computer trajectory models to produce a predicted pattern of oil movement.

To increase spill preparedness and streamline the OSPR program, the On-Line Vessel database was created to enable vessel operators to register response and preparedness information electronically, rather than submit hard copy plans.

The Texas Oil Spill Planning and Response Toolkit , produced by the OSPR program, with assistance from the Coast Guard, is the most comprehensive oil spill preparedness tool available. The toolkits are comprised of sensitivity maps, local knowledge guides, forms, and Area Contingency Plans for all of Texas. The program publishes the toolkit as both a downloadable program and CD Rom. The toolkit is updated annually and is widely distributed free of charge throughout the Gulf Coast.

Kills and Spills Team

The Texas Parks and Wildlife Department (TPWD) has assembled a Kills and Spills Team (KAST) comprised of biologists and team members headquartered in and assigned to five regions across Texas. The KAST assumes four key responsibilities: 1) respond to fish and wildlife kills and pollution incidents, including oil and hazardous material spills; 2) minimize environmental degradation resulting from pollution incidents and fish and wildlife kills; 3) obtain compensation, repair, and restoration for environmental damage; and, 4) act as a technical resource with respect to relationships between water quality, habitat, and living organisms.

The majority of incidents the KAST team responds to are fish kills. Natural causes responsible for fish kills include extreme weather temperatures, bacteria and disease, and toxic algal blooms. The actions of humans can result in fish and wildlife kills through the introduction of toxic chemicals, pesticides, fertilizers, and contaminated storm water runoff. Low dissolved oxygen concentration is another cause of fish kills. Low dissolved oxygen concentrations may be natural or man-induced. Low dissolved oxygen can result from large amounts of plant life depleting oxygen levels during the night. Other causes of low dissolved oxygen include hot, still days, dams, and dead end canals. A fish or wildlife kill is physical evidence that something is wrong. The sooner it is reported, the sooner it can be investigated and remedied.

A fish or wildlife kill is physical evidence that something is wrong. The sooner it is reported, the sooner it can be investigated and remedied. Immediately after a kill or spill is reported, an investigation begins to determine the source of a spill or the cause(s) of a kill. Though differences exist between investigating fish and wildlife kills and spills, the need for prompt response and accurate analysis applies in either case. Crucial details can be lost in a short amount of time. In addition, factors that may seem insignificant such as weather, vegetation, algal blooms, water chemistry, water flow, and pollution, can have serious impacts to an ecosystem when they change rapidly. Therefore, TPWD biologists must pay close attention to details, follow proper sampling procedures, and keep valid records. For large pollution events, TPWD biologists often work together with other state and local authorities.

Often in the case of a kill or spill, a responsible party is identified as having caused the incident. The responsible party may be asked to make restitution for the ecological damages. Restitution may consist of a monetary payment for the value of fish or wildlife killed, or may be some project that restores value to the ecosystem.

Hydromodification

Hydromodification is defined by EPA as the alteration of the hydrologic characteristics of surface waters. Hydromodification may cause degradation of water resources. Three general types of hydromodification contribute to nonpoint source pollution:

Channel modification. Channel modification describes river and stream channel engineering undertaken for the purpose of flood control, navigation, drainage improvement, and reduction of channel migration potential. Activities such as straightening, widening, deepening, or relocating existing stream channels fall into this category. This term also refers to the excavation of borrow pits, canals, underwater mining, or other practices that change the depth, width, or location of waterways or bay formations in coastal areas. Channelization and channel modification

activities can diminish suitability of instream and streamside habitat for fish and wildlife. They can also result in reduced flushing, lowered dissolved oxygen levels, saltwater intrusion, loss of streamside vegetation, accelerated discharge of pollutants, and changed physical and chemical characteristics of bottom sediments in surface waters. In addition, hardening of banks along waterways can increase the movement of NPS pollutants from the upper reaches of watersheds into downstream or coastal waters.

Dams. Dams are defined as constructed impoundments that are either (1) 25 feet or more in height and greater than 15 acre-feet in capacity, or (2) 6 feet or more in height and greater than 50 acre-feet in capacity. Dams can adversely impact the quality of the surface waters and habitat in the stream or river where they are located. A variety of impacts can result from the siting, construction, and operation of these facilities. Construction activities from dams can cause increased turbidity and sedimentation in the waterway resulting from vegetation removal, soil disturbance, and soil rutting. The operation of dams can also generate a variety of types of nonpoint source pollution in surface waters. Controlled releases can change the timing and quantity of freshwater inputs into coastal waters, reduce downstream flushing, and create sediment deposition downstream of the dam. Dam releases can result in erosion of the streambed and scouring of the channel below the dam. Finally, reservoir releases can alter water temperature and lower dissolved oxygen levels in downstream waterbodies.

Streambank erosion. Streambank erosion refers to the loss of land along streams and rivers. The force of water flowing in a river or stream causes erosion. Eroded material can be carried downstream and deposited in the channel bottom or in point bars located along bends in the waterway. These deposits can have adverse impacts on the creation and maintenance of riparian habitat. Excessively high sediment loads can smother submerged aquatic vegetation, cover shellfish beds and tidal flats, fill in riffle pools, and contribute to increased levels of turbidity and nutrients.

The State of Texas achieves protection of water resources from hydromodification activities through a mixture of management measures. Below are examples of some of the programs that implement these measures.

Clean Water Act §401/404 Water Quality Certification

CWA§401 provides for the protection of the state's surface water resources by ensuring that federal discharge permits are consistent with the Texas Surface Water Quality Standards. Under CWA§401, states are given the authority to review federally permitted or licensed activities that may result in a discharge of pollutants to waters of the U.S., such as the discharge of dredge or fill material. CWA§401 is a cooperative

federal/state program that gives states authority to review federal activities in or affecting state waters and reflects the state's role at the forefront in administering water quality programs.

Only those activities that require a federal permit are subject to state review for §401 certification. However, any federally authorized activity which may result in a discharge is subject to CWA§401 certification. An important type of permit subject to CWA§401 certification is the U.S. Army Corps of Engineers (Corps) CWA§404 permit for discharges into wetlands or other navigable waters.

Before issuing a federal permit in Texas, the permitting agency must receive, from TCEQ or RRC, certification, conditional certification, or waiver stating that the discharge will not violate the Texas Surface Water Quality Standards. If the state denies certification, the federal permit is also denied. The TCEQ is responsible for certifying most federal permits, except for federal permits related to oil and gas production, which are certified by the Railroad Commission of Texas (RRC). The RRC certified permit activities include dredging an access channel to conduct drilling or production operations in a critical area; construction of a drilling pad or installation of a production platform in a critical area; or construction, operation, or maintenance of a crude oil or natural gas pipeline facility in waters of the state. The Texas Parks and Wildlife Department participates in the review of CWA§404 permits and CWA§401 wetland certifications to determine effects on fish and wildlife, and wetland habitats.

The CWA§401 certification program also plays an important role protecting coastal resources under the Texas Coastal Management Program (CMP). The CMP is designed to accomplish the goals set by the state legislature for coastal resource protection and to meet specific requirements for an approved plan under the federal Coastal Zone Management Act (CZMA). Certain activities, such as discharges authorized by CWA§404 permits, must be consistent with the state CMP when they occur within the coastal zone boundary. CWA§404 permits often involve impacts to coastal wetlands. Efforts to avoid and/or minimize adverse impacts to wetlands are taken to retain the important functions these water bodies provide for wildlife and aquatic habitat.

Water Rights Permit Review

Water flowing in Texas' creeks, rivers, and bays is public property; however, the State of Texas confers on individuals and organizations the right to pump water from a stream, creek, pond, or lake or to impound water in a lake or pond, under the authority of Chapter 11 of the Texas Water Code. With a few exceptions, surface waters may be used only with explicit permission of the state, granted in the form of water rights. Water rights projects have the potential to cause, amplify, or exacerbate nonpoint

source problems through flow modification, dam construction, sediment load alteration, loss of wetlands, and removal of riparian vegetation.

Each application for a water rights permit is reviewed for administrative and technical requirements by the TCEQ to evaluate its impact on other water rights, bays and estuaries, conservation, water availability, public welfare, etc. TCEQ assesses the effects that the issuance of a water rights permit will have on existing instream uses including, water quality, fish and wildlife habitat, recreation, and freshwater inflows to bays and estuaries. In addition, Texas Parks and Wildlife Department reviews water rights applications, and is required by law to provide recommendations for permit conditions, mitigation, and schedules of flow or releases to protect fish and wildlife resources (Parks and Wildlife Code 12.024).

Factors that the TCEQ evaluates when performing an assessment of a water rights permit include the perennial nature of the stream, aquatic life use and biological integrity of the stream, water quality issues, presence of species of concern, and recreational uses. In addition to setting streamflow restrictions, mitigation may be recommended for altered, inundated, or destroyed terrestrial or riparian wetland habitats. The results of these assessments are incorporated into limitations and/or special conditions attached to water rights permits in order to protect the environmental integrity of the impacted stream reach.

Marinas and Recreational Boating

Marinas and boating activities can be sources of nonpoint source pollution. Texas has over 350 coastal and inland marinas statewide encompassing slips and storage for more than 57,000 boats. Marinas, if not sited and constructed properly, can destroy wetlands, aquatic habitat and submerged aquatic vegetation, and can also restrict or alter water flows. Improper siting and construction can also lead to decreased dissolved oxygen levels and increases in pollutant concentrations. Activities that occur at marinas can create sources of nonpoint pollution including petroleum hydrocarbons such as fuel and oil. These substances can enter surface water directly from spills during refueling, may be present in bilge discharge, or can be transported in storm water runoff from these facilities. Other potential pollutants include copper and tin which are used in antifoulants used to prevent fouling of the submerged portions of ships, and iron and chrome which are contained in boats themselves. These substances may enter the water during boat cleaning.

Recreational boating can also degrade water quality and destroy aquatic habitat. Sewage, waste from fish cleaning, and food waste discharged from boats, either accidental or intentional, can lower dissolved oxygen levels, increase nutrients and impact aquatic life. In addition, discharges of sewage can elevate fecal coliform bacteria to levels that are unsafe for swimming and fishing. Some of the programs in place to address the

nonpoint source problems resulting from marinas and recreational boating activities are discussed below.

The Clean Marina Initiative

The Clean Marina Initiative is a voluntary, incentive-based program promoted by the National Oceanic and Atmospheric Administration (NOAA) and others that encourages marina operators and recreational boaters to protect coastal water quality by engaging in environmentally sound operating and maintenance procedures. NOAA is jointly responsible for administering the Coastal Nonpoint Control Program with EPA, and plays an important role in protecting coastal waters from polluted runoff. The Coastal Nonpoint Program establishes a consistent set of management measures for all coastal states to use in controlling nonpoint source pollution. Management measures are designed to prevent or reduce runoff from a variety of sources, including marinas.

NOAA recognizes that the Clean Marina Initiative can serve a valuable role in protecting coastal waters from nonpoint source pollution and has promoted the program as a way for states to meet many of the marina management measure requirements under the Coastal Nonpoint Program. As a result, the Coastal Nonpoint Program has been responsible for driving the development of most of the state Clean Marina Programs existing today and developing a national interest in the initiative. NOAA continues to support the Clean Marina Initiative through targeted grant funding to states developing Clean Marina Programs.

The Clean Texas Marinas Program

The Clean Texas Marinas Program is a proactive partnership designed to encourage marinas, boatyards and boaters to use simple, innovative solutions to keep Texas coastal and inland water resources clean. The basic goal of the program is pollution prevention by increasing awareness of environmental laws, rules, and jurisdictions, and increasing the number of designated Texas Clean Marinas. To be designated as a Texas Clean Marina and be recognized for environmental stewardship, marina owners are asked to identify opportunities and implement best management practices to control pollution associated with:

- Vessel maintenance and repair
- Petroleum storage and transfer
- Sewage disposal
- Solid, liquid and hazardous wastes
- Stormwater runoff
- Facilities management

The program also offers information, guidance, and technical assistance to marina operators, local governments, and recreational boaters on best management practices (BMP's) that can be used to prevent or reduce pollution. The Clean Texas Marinas Program was developed by the Texas Sea Grant College Program in partnership with the GLO, TCEQ, Marina Association of Texas, the Marina Advisory Board, and others.

Solid and Hazardous Waste Management

Many county unincorporated areas in the state do not have organized waste collection services. 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 creeks, resacas, or arroyos. Irrigation canals are also subjected to illegal dumping.

Environmental risks associated with illegal dumping and burning of solid waste include: 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. Leachate from illegal dumping sites can contaminate water supplies, as can ash with concentrated contaminants created during illegal burning. Burn sites are often buried, creating potential for future water contamination.

Over one-fifth of the trash going to landfills in Texas is made up of yard trimming and vegetative food material. These materials can be used, instead of being wasted, as an organic, environmentally-friendly substitute for home chemical fertilizers. Practices by homeowners, such as the use of mulching lawnmowers and home composting, can reduce the amount of yard waste entering landfills. Manure from animal waste and sludge from human waste can also be used in this way. Private enterprise can make use of these materials to produce compost on the commercial level.

Another NPS contributor associated with waste management is the improper disposal of hazardous waste. Hazardous waste comes from industry, manufacturing, and households. Hazardous waste comes in many different shapes and forms. Chemical, medical, and furniture processing are some examples of processes that produce hazardous waste. Household products that contain corrosive, toxic, ignitable, or reactive ingredients such as paints, cleaners, oils, batteries, and pesticides are also hazardous wastes that contribute to NPS pollution. Oversized containers for household products can contribute to NPS due to overuse to get rid of the product, storage which can be unsafe, and improper disposal.

Hazardous and solid wastes, if not disposed of properly, can pollute the environment and pose a threat to human health. The State of Texas has

several programs in place to address hazardous and solid waste management.

State Solid Waste Permitting Programs

With a few exceptions, the TCEQ uses permitting to regulate the storage, transport, processing, and disposal of solid waste in Texas to prevent nonpoint source releases to the environment. TCEQ rules require that solid waste be processed and disposed of only in authorized facilities.

The TCEQ randomly audits a portion of waste stream notifications in order to ensure proper classification and coding of waste in Texas. Hazardous waste is defined as any solid waste listed as hazardous or possesses one or more hazardous characteristics as defined in federal waste regulations. Industrial waste is waste that results from or is incidental to operations of industry, manufacturing, mining, or agriculture. Under the definition of a waste, certain materials recycled in certain ways are excluded from being considered waste while others are not.

Facilities that aggregate, process, and return to use source-separated, non-putrescible recyclable materials from the municipal solid waste stream are exempt from permitting or registration requirements. All other recycling facilities must be authorized by the TCEQ.

The TCEQ certifies Municipal Solid Waste (MSW) technicians. The operating permits of most MSW facilities, including landfills, transfer stations, processing facilities, and recycling and resource recovery facilities, require the presence of a certified MSW technician. The responsibilities of an MSW technician include the proper screening, handling, transportation, collection, storage, and disposal of municipal solid waste.

The Beneficial Use Sludge Permitting Program

Sewage sludge, also known as biosolids, must be properly processed, transported, and used or disposed of in order to prevent adverse environmental and public health impacts. Sludge is the material that remains after bacteria has digested the human waste from municipal water and wastewater treatment plants. Sludge can also originate from septic tanks, chemical toilets, grease and grit traps.

Because of the nutrient and soil-conditioning characteristics of most biosolids, local governments are encouraged to consider beneficial land application or composting of sludge. An activity to land-apply Class B biosolids for a beneficial use must be authorized by the TCEQ. An activity to land apply Class A biosolids (e.g. compost) for beneficial use does not require authorization by TCEQ. Beneficial use is defined as the land application of treated municipal sludge at or below the agronomic needs of

a cover crop or the use of water treatment sludge as a soil amendment.

Because some municipal wastewater treatment plants also receive industrial wastewater, sewage sludge can contain pesticides and chemicals along with human waste. A permit is required for most activities that involve the processing, transportation, beneficial use, or disposal of sludge. If a sludge is not of domestic origin, it is regulated as either a municipal solid waste or an industrial solid waste.

The Illegal Disposal Abatement Program

To successfully address illegal dumping problems, communities must develop long-term comprehensive solutions. The TCEQ has developed a model approach for use in developing solutions for illegal dumping and other municipal solid waste problems. This model approach focuses on developing and maintaining a program that includes the following four components:

- Garbage collection services. Provide residents with convenient and affordable ways to dispose of their garbage, such as citizen collection stations for rural communities.
- Public awareness campaigns. Increase public awareness on the health and safety hazards of illegal dumping and available legal options for garbage disposal.
- Cleanup of existing dumps. Clean up illegal dump sites to discourage other dumpers, who are attracted to these existing sites, and to improve the community's awareness of the problem.
- Enforcement. Increase the cost of illegal dumping through increased enforcement and more severe punishments for offenders.

The TCEQ has an extensive outreach campaign to address the issue of illegal dumping. The TCEQ also provides funding to Councils of Government (COGs) through the Regional Solid Waste Grant program. Funds for the grant program are generated by state fees on Municipal Solid Waste (MSW) disposed of at landfills. The COGs use the funds to develop an inventory of closed MSW landfills; conduct regional coordination and planning activities; provide technical assistance and informational programs pertaining to solid waste management; serve as central point of contact for solid waste management outreach, education, and training programs; maintain a regional solid waste management plan; and administer pass-through grant programs to provide funding for regional and local MSW projects.

Texas Environmental Enforcement Task Force

Intentional damage to the environment is a serious threat to the public's health and safety. In many cases, offenders favor rural areas or low-income neighborhoods for environmental crimes such as illegal dumping. The most common environmental crimes involve the dumping of various pollutants like septic waste, household garbage, used motor oil, auto batteries and barrels of hazardous waste.

Texas is a national leader in the investigating and prosecuting of environmental crime. This distinction is a direct result of the formation of the Texas Environmental Enforcement Task Force. The task force's sole responsibility is to combat environmental crime, both directly and by informing and training Texas peace officers.

Each year TCEQ dedicates a week to educating Texas about environmental damage caused by dumping and other illegal pollution. Activities during the week include educational forums with community groups and law enforcement, a traveling exhibit on preventing environmental crime, police officer training, and a ceremony recognizing environmental crime fighters. Training sessions for police officers cover state and federal environmental statutes and emphasize the differences between criminal and civil cases. Primary instruction includes evidence collection and the use of scientific and technical expertise. Officers are led through re-enactments of illegal discharges and the execution of a search warrant.

The TCEQ heads up the Texas Environmental Enforcement Task Force with TPWD, Attorney General's Office, GLO, RRC, and the Governor's Office. While operating as a task force, these state agencies coordinate with various U.S. Attorney's Offices, the EPA, and the FBI. Task force membership has expanded to include a dozen more state, federal, and local entities. The task force meets bimonthly to review referrals for investigations. Tips come from many sources: employees at the offending company, business competitors, or task force members who come across leads. If the environmental task force adopts a case, each member agency appoints an investigator and the group consults with prosecutors to determine whether the case is better suited for state or federal courts. The participating agencies collaborate in conducting searches, taking and analyzing samples, and performing other functions necessary to support criminal investigations and prosecutions.

Citizen Complaints

Responding to complaints from the general public about alleged environmental violations is an important part of TCEQ's regional office responsibilities. Each complaint is assigned a priority status to ensure that staff respond to the most environmentally serious complaints first. TCEQ

has established procedures by which staff will investigate complaints once the most appropriate course of action is determined. An investigation may take the form of an on-site inspection or sampling.

Complaints are categorized as follows:

- conditions relating to air quality such as odor, dust, and smoke
- conditions that create a potential to pollute the water or land
- alleged violations of TCEQ permits or rules
- smoking vehicles
- spills
- other environmental concerns

Matters not within TCEQ jurisdiction will be referred to the appropriate state agency. The TCEQ does not have the authority to regulate, enforce, or mediate private actions between citizens.

Citizen Environmental Watch

The Citizen Environmental Watch Program allows information gathered by private individuals to be developed as evidence of environmental violations. This program provides an opportunity for citizens to get involved with environmental protection.

The program is implemented by the TCEQ regional offices. Regional staff review the complainant's information—such as photos, videotapes, and water samples—and decide on the appropriate course of action. If necessary, an investigator will visit the site or facility in question. Individuals must be willing to disclose their identities and, in some cases, asked to testify. Strict agency procedures for gathering and preserving evidence must be followed. The TCEQ can pursue an enforcement action only if the evidence is admissible at a hearing, based on Texas rules of evidence. The agency will not consider information gathered illegally.

If a serious or unresolved violation is found, the TCEQ will initiate an enforcement action. Individuals providing evidence in an enforcement case will be notified of the results of the investigation and any follow-up enforcement actions.

Composting

Compost is produced by aerobic decomposition of organic matter. Compost feedstock may include, but is not limited to, leaves and yard trimmings, biosolids, food scraps, food-processing residuals, manure or other agricultural residuals, forest residues, bark, and paper. Composting benefits water quality by saving landfill capacity, reducing the use of

chemical fertilizers, improving manure management which aids in the reduction of phosphorus and bacteria concentrations due to storm water runoff from dairy farms, and promoting establishing vegetation which helps reduce NPS pollution from rainfall runoff.

The TSSWCB and the TCEQ partnered to initiate an innovative solution to water quality problems in the North Bosque and Leon watersheds, the Composted Manure Incentive Program (CMIP). Storm water runoff containing manure from dairy farms is a significant source of phosphorus and bacteria in the two watersheds. Incentive payments, funded by CWA §319 funds, are given to governmental entities towards the purchase of eligible composted manure to be used in beneficial uses. The ultimate goal of the project is to ensure that markets are in place to support the continued export of manure from these two watersheds after rebate funds have been exhausted. The Texas Department of Transportation (TxDOT) uses the compost throughout the state to promote establishment and maintenance of roadside vegetation.

The TCEQ provides outreach and technical assistance in the use of compost throughout the state. The outreach program provides workshops, demonstrations, and technical assistance specifically addressing the benefits, opportunities, and incentives for using composted manure. The TCEQ has an expanded outreach program in the North Bosque and Leon watersheds that is conducted in conjunction with the CMIP.

The Texas Cooperative Extension also has an expanded education and marketing campaign for composted manure. This campaign effort has surveyed existing and potential markets for composted manure in the CMIP watersheds, organized a comprehensive education and marketing campaign focused on these markets, and begun field trials and demonstrations to document and publicize the effectiveness of the appropriate uses of composted manure in a wide array of landscaping, horticultural, and agricultural applications.

Used Oil Recycling

Texas law prohibits dumping used oil on land or into sewers or waterways. This includes the use of used oil as a dust suppressant. Texas has also banned used oil filters from being placed in or accepted for disposal in a landfill. TCEQ requires all transporters, handlers, and collection centers for used oil to register with the agency and report annual quantities of used oil handled. A facility which accepts used oil from household *do-it-yourselfers* may be exempted from the state fee on the sale of new automotive oil.

Oil and Gas Waste Management

The Railroad Commission of Texas (RRC) regulates activities and the wastes generated as a result of activities associated with the exploration, development, or production of oil or gas or geothermal resources, including transportation of crude oil or natural gas by pipeline. These wastes are termed “oil and gas wastes”, and include both hazardous and non-hazardous oil and gas wastes.

The RRC has responsibility for the prevention of pollution that might result from activities associated with exploration, development, and production of oil, gas, or geothermal resources of the State to prevent operations dangerous to life or property. The RRC uses rule-authorization and permitting to regulate the storage, transport, processing, and disposal of oil and gas wastes in Texas to prevent releases to the environment. RRC rules require that oil and gas wastes be processed and disposed of only in an authorized or permitted manner. RRC’s environmental and safety programs cover drilling, operation, and plugging of wells; separation and treatment of produced fluids in the field or at natural gas processing plants; storage of crude oil before it enters the refinery; underground storage of hydrocarbons in salt caverns or natural gas depleted reservoirs; transportation of crude oil or natural gas by pipeline; drilling, operation and plugging of brine wells; and storage, hauling, reclamation, or disposal of wastes generated by these activities.

The RRC’s environmental and safety regulations for oil and gas wastes are administered through the Environmental Services, the Well Plugging, the Site Remediation and Special Response, and the Compliance programs. The Environmental Services program includes permitting programs for management of wastes and protection of the public from surface storage or disposal, disposal and enhanced recovery wells, underground hydrocarbon storage and brine mining. The Environmental Services program also coordinates with other state and federal agencies on environmental and safety matters. The Compliance program coordinates the activities of nine district offices in inspecting oil and gas operations and enforcing the RRC’s environmental and safety rules. The Well Plugging and the Site Remediation and Special Response programs handle special Oil Field Cleanup Fund (OFCUF). The OFCUF is supported by the oil and gas industry through various fees, taxes, and penalties. The Site Remediation and Special Response program also reviews operator cleanup activities and coordinates the RRC’s response to large spills and other major events.

The TCEQ Household Hazardous Waste Management Program

TCEQ’s Household Hazardous Waste (HHW) Management program primarily regulates HHW collections and programs. Technical and regulatory information is also provided to entities on setting up HHW

collection programs as well as general information to citizens of Texas on HHW issues. Quarterly meetings of a HHW managers network are also coordinated.

Tire Disposal Program

Scrap tires must be managed to prevent fires and control disease vectors (mosquitos and rats). The toxic air pollutants from tire fires can become nonpoint source water pollutants through atmospheric deposition. Prior to Texas' scrap tire management program, large illegal tire dumps often appeared on the beds and banks of streams, damaging riparian habitat. The TCEQ regulates the collection, processing and recycling/disposal of over 20 million tires discarded each year in Texas. Anyone who stores more than 500 scrap tires must register with the TCEQ as a scrap tire storage site. Scrap tires must be hauled by a registered transporter to either a permitted landfill or an authorized scrap tire facility. All facilities must keep manifest records showing the disposition of scrap tires.

The City of San Antonio Waste Management Programs

The City of San Antonio's Household Hazardous Waste (HHW) Program operates a permanent HHW Drop-off Center (DoC). This service provides an environmentally safe means for citizens to dispose of items such as paint, pesticides, oil, anti-freeze, batteries and household cleansers. If thrown in the regular trash, these items could potentially harm the solid waste collectors and contaminate our environment. The program has developed an outreach campaign, "Take it to the Doc!", that urges the public to dispose of hazardous household waste properly by bringing it to the HHW DoC.

All collected HHW materials are handled and packaged for disposal by technically trained personnel. Following collection, the transport of all materials is performed by a licensed hazardous materials transporter. The method of disposal depends upon the type of material. Approximately 80% of all materials collected through the City of San Antonio HHW Program are recycled. Materials that cannot be recycled are disposed of by a licensed hazardous materials treatment, storage and disposal facility.

City of Austin Biosolids Composting

Another innovative strategy for wastewater management was developed by the City of Austin in the 1950's. Originally established as a series of stabilization ponds used to treat wastewater residuals from the city's wastewater plants, the Hornsby Bend Beneficial Reuse Program has become a nationally recognized, EPA award-winning sludge-recycling facility.

Situated on 700 acres of land along the Colorado River, about 10 miles east of downtown Austin, the facility is a national model for innovative

approaches to solving environmental problems. Each year, thousands of tons of wastewater sludge is anaerobically digested and composted into an EPA-certified soil conditioner called "Dillo Dirt". Waste products (tree trimming and yard waste), which would ordinarily be disposed of in a landfill, are utilized as bulking agents, significantly reducing the cost of waste disposal for Austin residents. This popular product is distributed to various city departments for use in park facilities and to commercial vendors for sale.

Water separated from the sludge flows through a 250-acre facultative pond system. After polishing in a 4-acre greenhouse enclosed aquatic plant facility, the treated effluent is used to irrigate approximately 160 acres of a 220-acre on-site farm. Hay and other feed crops are harvested from this land by a contract farmer, and the city receives a portion of the profits. Some digested and dried sludge is also land applied to the on-site farm to improve soil conditions. Plans are underway for the program, regulated by the TCEQ, to be expanded to off-site agricultural locations.

Wastewater Management

Municipalities, industries, and agricultural operations can produce large volumes of wastewater. Unless proper disposal methods are used, wastewater can contaminate the state's surface and ground waters by contributing pathogens, organics, and metals to stormwater runoff.

Multiple segments around the state are not meeting water quality criteria and improperly treated on-site sewage (OSSF) effluent has been identified as a major nonpoint source contributor. Historically, individual OSSFs were found primarily in rural areas. However, rapidly increasing urban populations, combined with shifts in population from rural to urban areas, have led to pressure for widespread suburban development. One way to reduce the amount of NPS pollution resulting from on-site sewage effluent is to develop centralized wastewater collection and treatment facilities. These facilities are regulated in Texas by the TCEQ to ensure that the effluent they release into the waters of the state is treated to certain standards that minimize NPS pollution. This is an example of a point source solution to a nonpoint source problem.

Raw sewage and wastewater can increase levels of nutrients in water. Elevated nutrient concentrations encourage algal growth and decrease dissolved oxygen. Low dissolved oxygen endangers aquatic plants and animals. Following is a discussion of some of the programs in place to manage nonpoint source pollution from wastewater.

The On-Site Sewage Facility Program

About 50,000 on-site wastewater treatment systems are installed annually in Texas to treat wastewater from rural and suburban homes and small

businesses. An on-site wastewater treatment system collects, treats and applies wastewater to soil. By definition, wastewater managed by an on-site system cannot leave the property where it is generated. Texas has approximately 4-5 million households relying upon on-site sewage facilities (OSSF) for wastewater disposal and the numbers are increasing each year.

The Texas legislature passed legislation to regulate on-site sewage facility systems statewide. The law established parameters for delegation of authority to regional and local governments-such as counties, cities, river authorities and special districts to implement and enforce on-site sewage regulations with approval and oversight by the TCEQ. The TCEQ sets minimum standards, local authorities can adopt more stringent rules if approved by the TCEQ.

The TCEQ provides technical assistance for designers and installers of OSSF systems by reviewing plans to ensure that new facilities are designed and constructed using best current technology. TCEQ staff conduct plan reviews, installation inspections, and follow up inspections to ensure that designated controls are used and compliance with regulations is achieved. These inspections also assist in pinpointing areas of concern. Existing, failing systems are generally identified by citizen complaints and required to be brought to current standards. TCEQ staff also provide oversight of delegated local authorities.

The TCEQ is also responsible for the certification of inspectors and installers of OSSFs. The responsibilities of a registered installer include the installation of treatment tanks and the installation or replacement of sewer lines or disposal components according to minimum state standards or the more stringent conditions in the authorized agent's order or ordinance. OSSFs must be constructed by licensed individuals who have been properly trained in appropriate installation procedures. Any individual who is compensated by another individual to construct, install, alter, or repair an on-site sewage facility must be licensed as an installer. Individuals who manage the on-site sewage program for an authorized agent must be licensed as a "designated representative." Designated representatives review planning materials, issue permits to construct, investigate and resolve complaints, initiate enforcement on violators, issue authorizations to operate, maintain records, and submit reports as required.

The Texas On-Site Wastewater Treatment Research Council

Meeting the research and technology transfer needs of individuals involved in wastewater treatment in Texas is the major goal of the Texas On-site Wastewater Treatment Research Council. The Council was established by the Legislature to fund research that demonstrates the feasibility of on-site treatment alternatives. The Council awards competitive grants to accredited colleges and universities in Texas,

governmental entities, or other acceptable public or private entities. Research funded by the grant must be for improvement in the quality, and reduction in cost, of on-site wastewater treatment technologies provided to Texans. The Council also awards grants to enhance technology transfer regarding on-site wastewater treatment by using educational courses, seminars, symposia, publications, and other forms of information dissemination. To support the research program, a \$10 fee is charged to all property owners in Texas who apply to construct OSSFs for treatment and disposal of wastewater.

The City of El Paso Reclaimed Water System

The City of El Paso Water Utilities (EPWU), one of the nation's most progressive water agencies, has been delivering reclaimed water since 1963. As a pioneer in water reclamation, EPWU has attained international recognition for its innovative and extensive use of recycled water. EPWU now operates the most extensive and advanced reclaimed water system in Texas for industrial use and landscape irrigation.

EPWU's philosophy is that water is too valuable to be used only once. Wastewater from within the EPWU collection area is collected and treated from one of four EPWU's Wastewater Reclamation Plants using advanced or tertiary treatment. The result is a high water quality that has earned the EPWU the reputation as operating the first wastewater treatment plant in the world to meet Drinking Water Standards for its reclaimed water. The other three plants meet the highest possible quality rating of Type I reclaimed water as described in state regulations monitored by the TCEQ. These facilities were constructed with funding from the U.S. Bureau of Reclamation grants, U.S. Economic Development Administration grants, Texas Water Development Board low interest loans, and City of El Paso Water and Sewer revenue bonds.

Reclaimed water use has been proven safe for the following types of applications throughout the U. S. and are approved for use by the TCEQ: city parks, school playgrounds and sports fields, landscape nurseries, sports complexes, golf courses, street median landscaping, construction projects, street sweeping, fire protection, residential and multi-family landscape, industrial cooling towers, and other industrial processes. The EPWU is also authorized to reinject wastewater treated to drinking water standards into the local aquifer.

The Brazos River Authority Technical Assistance Program

The Brazos River Authority (BRA) is committed to its mission of developing, managing, and protecting the water resources of the Brazos River Basin to meet the needs of Texas. The diversity that exists within the 42,000 square mile Brazos River Basin is extreme. Annual rainfall ranges from about 19 inches in West Texas to more than 56 inches along

the gulf coast. Rapid and localized population growth, and ever changing land uses, presents the BRA with many challenges that must be planned for and addressed appropriately. To meet the needs of Texas, innovative measures are utilized to deal with issues such as moving water from areas with surplus water to areas with water deficits and removing constituents such as salt from both inland and gulf coast waters.

Beginning in the early 1970's, the BRA pioneered the development of regional wastewater treatment systems to reduce the amount of NPS pollution resulting from OSSFs. Today BRA operates 4 regional wastewater treatment plants, 8 municipal wastewater treatment plants, one regional composting operation, and 3 water treatment plants. Over the years, BRA has received numerous awards from the TCEQ and EPA, recognizing the excellence of their operations, maintenance, and design.

The BRA is a prominent and active partner in numerous water quality improvement projects and studies throughout the Brazos River Basin with a major emphasis on non-point source agricultural issues such as confined animal feeding operations (poultry and dairy) and crop production, and non-agricultural sources such as on-site sewage facilities. The BRA is committed to a positive and proactive approach to identify water quality problems and to follow through with appropriate restoration measures.

The BRA also offers programs such as the Technical Assistance Program to assist cities, water districts, and other entities with their particular water and wastewater treatment operations. These services include regulatory review, operations assistance, preventive maintenance, program preparation, laboratory testing, and industrial pretreatment. A key component of the industrial pretreatment program is to work with cooperating industries to reduce their pollutants before they enter the sewerage system, thereby reducing the potential to impact water quality.

Storm Water Management

Storm water pollution is a form of water pollution that originates from urban and rural landscapes. Everyday activities such as landscape maintenance, the operation of automobiles, and building construction can cause water pollution under certain circumstances. Pollution occurs when rainfall or infiltrating groundwater carry accumulated pollutants to receiving water bodies such as surface lakes, streams, and coastal waters or groundwater aquifers.

The fertilizers used to maintain urban landscapes can cause excessive growths of aquatic vegetation and can lead to unhealthy concentrations of nitrates in groundwater used as drinking water supply. Metals and organic compounds associated with the operation of automobiles can be toxic or carcinogenic to human health and wildlife. Air emissions that originate from a multitude of industrial, urban, and mobile sources are deposited

onto the ground, with the potential to add pollutants to surface and ground water when rainfall runoff occurs. Sediments that erode from land areas disturbed by construction activities can impair aquatic wildlife habitats, shorten the design life of reservoirs, and act as a carrier for contaminants. In addition, increased impermeable surface due to urbanization can alter the quantity and quality of storm water runoff by facilitating the transportation of runoff and accumulated sediments from paved surfaces. The water-related impacts of construction and urbanization can include habitat alteration, higher peak flows and flooding, erosion, and increased pollutant loads such as sediment, metals, nutrients, and bacteria. The following is a discussion of some of the programs in place throughout the state to address NPS pollution resulting from storm water runoff.

State Storm Water Permitting Programs

The state of Texas assumed the authority to administer the National Pollutant Discharge Elimination System (NPDES) program in Texas on September 14, 1998. NPDES is a federal regulatory program to control discharges of pollutants to surface waters of the United States. The TCEQ's Texas Pollutant Discharge Elimination System (TPDES) program now has federal regulatory authority over discharges of pollutants to Texas surface water, with the exception of discharges associated with oil, gas, and geothermal exploration and development activities, which are regulated by the Railroad Commission of Texas (RRC).

The urban storm water program administered through the TPDES program addresses small municipalities, growing urban fringe areas, and other urban development under the Phase II rules. If an urban area falls within the scope of the storm water program, a TPDES permit is required, a management plan for the reduction of the runoff impacts must be implemented locally, permit compliance must be evaluated, and maintenance of existing surface water quality must occur, consistent with the water quality standards. TPDES permits regulate storm water discharges from industrial activities, construction activities, and municipal separate storm sewer systems (MS4s) to Texas waters. The TCEQ issues and manages TPDES permits for storm water discharges from these activities and systems. Factors that EPA require states to consider in designating urban areas as so-called MS4s include discharges to sensitive waters, high growth areas or growth potential, contiguity to an existing urban area, significant contribution of pollutants to surface water, and ineffective protection of water quality by other state programs.

Texas Land Application Permits (referred to as no discharge permits) authorize individual facilities to manage storm water and/or wastewater through evaporation, subsurface disposal, or irrigation systems which prevent runoff and prevent accumulation of nutrients in the soil. The TCEQ has a general permit which provides authorization for qualifying

manure composting facilities to dispose of storm water through irrigation and/or evaporation.

The RRC regulates discharges of waste from activities associated with the exploration, development, or production of oil, gas, or geothermal resources, including transportation of crude oil and natural gas by pipeline, and from solution brine mining activities (except solution mining activities conducted for the purpose of creating caverns in naturally-occurring salt formations for the storage of wastes regulated by the TCEQ). Discharges of waste regulated by the RRC into water in the state cannot cause a violation of the water quality standards. While water quality standards are established by the TCEQ, the RRC has the responsibility for enforcing any violations of such standards. In addition, the NPDES authority delegated to Texas by EPA does not include those discharges from activities under the RRC's jurisdiction; such a discharger must obtain authorization from both the RRC and the EPA.

Texas Department of Transportation Storm Water Management Guidelines

Involvement in construction and urbanization makes the Texas Department of Transportation (TxDOT) a key player in the control of storm water pollution. It is TxDOT's responsibility to be aware of the problem and to take measures to minimize and/or prevent storm water pollution. Therefore, it is the goal of TxDOT to prevent the degradation of receiving waters due to storm water runoff from highway operations. TxDOT is developing a comprehensive storm water management program aimed at achieving this goal.

TxDOT has published a document entitled, "Storm Water Management Guidelines for Construction Activities". Although other issues are mentioned such as project planning and maintenance, the focus of the document is to provide guidance on the use of storm water management measures during highway construction.

With this document, the user can develop a storm water management plan tailored to the needs of a particular project. In addition, the measures in this document will assist in meeting regulatory requirements where storm water is a concern. Although runoff control measures are required by law in some instances, these measures are applicable anywhere soil is disturbed and erosion and sedimentation are potential problems. The material in this manual is derived primarily from storm water guidance documents developed and adopted by the TCEQ.

The City of Dallas Trinity River Corridor Project

The Trinity River Corridor Project is made up of several distinct elements. The overall effort will include the building of levees, wetlands, a

downtown lake, gateway parks, trails, equestrian centers, and an interpretive center. It will also involve the expansion and preservation of the Great Trinity Forest through the acquisition of 2,700 acres of land along the Trinity River.

One element of the Trinity River Corridor project is the construction of a flood control project along the Trinity River that will reduce the flooding risk for about 12,500 structures in Dallas. The Dallas Floodway Extension (DFE) will restore standard project flood (800-year) protection to the downtown Dallas vicinity and the densely populated areas along the southern Trinity River corridor.

A Chain of Wetlands will be constructed in conjunction with the DFE. The Chain of Wetlands extends about four miles in length and is comprised of seven wetland cells that produce 170 acres of water surface. About 100 acres of grasslands will fill in between and around the wetland cells. The wetlands will be fed by treated wastewater discharge. The Chain of Wetlands also offer a secondary route for flood waters of the Trinity River lowering the flood elevations and filtering flood waters of nutrients and sediments prior to discharge into the Trinity River. The design team for the Chain of Wetlands includes the Corps, EPA, U. S. Fish and Wildlife Service, City of Dallas staff, TPWD, and the Trinity River Corridor Citizens Committee.

The San Antonio River Tunnel

The San Antonio River Tunnel system was constructed to lower the risk of damage due to flooding and help reduce nonpoint source pollution in storm water runoff discharged into the San Antonio River. The system consists of 12 trash rakes cycled on a daily basis to prevent large bulky floatable debris from entering the tunnel system and eventually the San Antonio River. During a storm event, the trash rakes are run as needed to ensure operational efficiency of the system. Approximately 500 tons of floatable debris is removed annually, with three tons removed weekly and the remainder from storm events.

This facility also contains a re-circulation feature incorporating a Parkson screen that removes smaller debris prior to entering the San Antonio River. This re-circulation system helps maintain water quality in the famous downtown riverwalk during periods of low flow in the river. The tunnel is to remain full of water at all times allowing the re-circulation feature to ensure water quality is maintained in the tunnel itself so when initial flushing during a storm occurs, downstream water quality is not affected.

Integrated Storm Water Management Project

The North Central Texas Council of Governments (NCTCOG) organized the integrated Storm Water Management (ISWM) project in order to protect streams and rivers from nonpoint source pollution and heightened flooding risks due to urban development. The project will foster partnerships with state and federal agencies to meet regulatory requirements and provide guidelines for communities to establish a successful comprehensive storm water management program. The project provides an innovative site development approach for addressing both storm water quantity and quality. The ISWM project is intended to be an essential element for ongoing and future cooperative storm water initiatives in North Central Texas.

The NCTCOG is working with approximately 55 local governments in order to create sound storm water management guidance documents for the region through the ISWM project. The ISWM Design Manual for Development will outline the most current and applicable storm water management techniques and provide criteria and rationales for the selection of structural and nonstructural storm water quality and quantity BMPs.

The San Angelo Urban Nonpoint Source Abatement Program

The north fork of the Concho River winds through the City of San Angelo traversing residential, recreational, industrial, and commercial land use areas. This urban reach of the river has a long history of poor water quality and a record of frequent fish kills encompassing a period of at least thirty years. Several water quality studies conducted by private and public entities have confirmed that urban runoff and nonpoint source pollution have been the primary cause of poor water quality conditions.

Recognizing the desire of city residents and stakeholders to improve water quality in the North Concho, the Upper Colorado River Authority (UCRA) partnered with the City of San Angelo to appoint a Citizen's Advisory Group to develop a plan for eliminating the fish kills and addressing nonpoint source pollution impacting the river. The work of the committee culminated in a Master Plan for pollution abatement targeting seven urban subwatersheds. The worst watersheds for pollutant loadings were identified and a priority system established for construction of facilities that would lessen the load of organic material and nutrients entering the river.

The implementation plan includes construction of a gabion retention structure, stormwater control structures, and streambank stabilization. The plan is still in the process of being implemented. The best management practices that have been implemented have produced improvements in

water quality expressed by the absence of fish kills following major storm events. The program also has involvement and support from local elected officials and the initiation of an extensive public outreach program, the Aquatic Experience, which is discussed in Chapter 7.

Pesticide Management

Texas Pesticide Laws define a pesticide as a substance or mixture of substances intended to prevent, destroy, repel, or mitigate any pest, or any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant. Pesticides enter water bodies through runoff from sites where there are applied such as farms, golf courses, parks, highway right-of-ways, and lawns and gardens; by leaching into groundwater; wastewater discharges; and atmospheric deposition. Pesticide contamination occurs as a result of improper or over use, spills, improper storage, and improper disposal. According to a USGS study of 48 drinking water reservoirs in Texas (September 2000), the pesticides most frequently detected in Texas drinking water reservoirs included atrazine, diazinon, metolachlor, and simazine. EPA has identified pesticide contamination as a nationwide problem in surface water and groundwater. In response, there has been a coordinated state effort to monitor pesticides and define roles and responsibilities in responding to the water quality effects of pesticide contamination.

In addressing pesticide contamination several major principles need to be taken into account. Agricultural pesticides are beneficial and important to the production of food and fiber, and are of significance to the state economy. However, the use of pesticides should not impair any use of waters of the state or cause a public health hazard. Drinking water supplies, both groundwater and surface water, should especially be protected. State and local government should be the first line of protection, their efforts being complemented by federal expertise and information. Efforts in Texas in addressing these issues include, for groundwater, the adoption of the *Groundwater Pesticide Management Plan* and, for surface water, the incorporation into this document, of a similar elaboration of management measures. These surface water pesticide management measures were primarily developed under the guidance of the Texas Watershed Protection Committee.

Groundwater Pesticide Management Plan

Considerable progress has been made in the prevention of groundwater contamination from pesticides by laying out specific management measures in *The State Management Plan for Prevention of Pesticide Contamination of Groundwater* – usually referred to as the *Groundwater Pesticide Management Plan* or *PMP*. This plan was published in January 2001 after several years of development under the guidance of the Texas Groundwater Protection Committee. A similar elaboration of management

measures has been developed, by an interagency group, for the prevention of pesticide contamination of surface water. Many of the measures for preventing pesticide contamination of groundwater and surface water are the same, however, there are important differences.

Surface Water Pesticide Management

The goal of surface water pesticide management is to provide a mechanism for the protection of surface water from pesticide contamination similar to that provided to groundwater under the *PMP*. The goal of surface water pesticide management is to protect and maintain the existing quality of surface water and to prevent the degradation of state surface water resources. This goal subscribes to unimpaired use of surface water, allowing for the normal use of pesticides without impairing surface water quality or posing a public health hazard. All used and potentially usable surface waters are subject to the same protection afforded by the antidegradation policy goal. This level of surface water protection complements the protection of groundwater influenced or hydrologically connected to surface water.

Pesticide contamination of surface water is detected through the state's assessment process as described in Chapter 5. Public water supplies are regularly monitored by the Public Drinking Water Section of the TCEQ. NPS pollution resulting from pesticides is managed through prevention and response to contamination. The Texas Watershed Protection Committee (defined in Chapter 4) coordinates these activities.

Prevention and Mitigation

The Texas Watershed Protection Committee recommends and coordinates a five tiered approach for prevention of pesticide contamination.

- **General Education:** General information is shared statewide to raise awareness of the potential for pesticide contamination. Brochures, displays, and slide presentations are the tools used to raise awareness. These materials are created and distributed throughout the state by the cooperating agencies of the Texas Watershed Protection Committee (TWPC).

- **Education Focused on Affected Water Bodies:** Educational efforts will be expanded in areas where a surface drinking water source is identified as affected by specific pesticides. This effort will be applied even though monitoring has not shown contamination beyond the Maximum Contaminant Level (MCL). Dissemination of information will be through public presentations, articles in newsletters, and advertisement of available educational literature.

- **Education and Application of Best Management Practices (BMPs) in Areas with Lower Levels of Pesticides:** Where monitoring has revealed contamination of surface water used as a drinking water source, but at concentrations lower than the pesticide MCL or Health Advisory Level (HAL), a voluntary BMP program will be encouraged. Furthermore, cooperating agencies may take additional action through their standard education programs.

- **Education and Application of BMP's in Areas with Greater Levels of Pesticides:** In a surface water body used as a drinking water source, where monitoring has revealed a nonpoint source contamination by a pesticide at levels greater than the MCL or HAL, a voluntary education and BMP program will be initiated. If there is no evidence of sufficient improvement, use restrictions will be implemented.

- **Pesticide Use Restrictions:** If all previous levels of preventive measures fail, the final recourse will be use restriction of the pesticide in the water body which is contaminated. Such actions will be implemented by the TDA after consultation with the other involved agencies through the TWPC. Users will be notified of the restricted use status of the pesticide in their area.

Response to Contamination

The response to contamination of surface water by pesticides falls under the jurisdiction of a number of agencies. Pesticide runoff is typically treated as an agricultural nonpoint source pollution therefore, the TSSWCB plays a key role in response. The TCEQ Source Water Assessment and Protection (SWAP) program provides response assistance when the water body is a drinking water supply. The Texas Department of Agriculture (TDA), the lead regulatory agency for agricultural pesticides, provides expertise on pesticide regulation and education. When pesticide contamination results in a surface water body not meeting standards the response is addressed through the TMDL process as described in Chapter 5. When the pesticide contamination does not result in a standards violation response occurs through the preventive actions described above and, if the local entity responsible for the affected water body chooses to participate, through the TCEQ's SWAP program described below. The TWPC coordinates all responses to pesticide contamination to ensure that the responsible agencies or programs are notified and take appropriate action.

Implementation Under Source Water Assessment Program

Under the Source Water Assessment Program (SWAP) all surface waters that contribute to public drinking water supplies are investigated for potential contamination. Investigations proceed in the following stages:

- Identification of areas that supply public drinking water
- Delineation of the boundaries of the assessment areas needed to protect the water supplies
- Inventorying of potential sources of contamination within the assessment areas
- Informing the public of the results
- Implementation of a source water protection program (see page 113)

Pesticide Review Program

The EPA reviews and registers pesticides to ensure they meet current scientific and regulatory standards. Through this process consideration is made for human health and ecological effects of pesticides. The EPA issues risk management decisions based on the reviews that may result in registration eligibility, risk reduction measures, or elimination of uses. Risk factors that are analyzed include risks to workers, risks associated with residential uses, and risks affecting drinking water. Measures used to address risks include requiring intensive monitoring programs, prohibition of use in specified geographic areas or watersheds, education programs to ensure proper use and mitigation requirements. The State of Texas has developed programs to enforce and ensure compliance with this EPA program at the state level.

Agricultural Pesticide Regulation

The Texas Department of Agriculture (TDA) 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. TDA is responsible for licensing all agricultural pesticide applicators and labeling, storage, sales, usage, and disposal of all pesticides. TDA also cooperates with other state agencies that have statutory pesticide responsibilities, such as the TCEQ, the Structural Pest Control Board, and the DSHS. TDA is 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 TDA is also 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. The Texas Cooperative Extension is responsible for training in relation to the state pesticide applicator certification program.

The Structural Pest Control Board

The Structural Pest Control Board (SPCB) is authorized to promulgate rules and regulations governing the methods and practices pertaining to structural pest control to prevent adverse effects on human health and the environment. SPCB has established regulations which authorize it to enforce label instructions approved by EPA and TDA regarding application and disposal of pesticides in the urban environment. Many label instructions contain information relating to proper application and disposal of pesticides to prevent surface water contamination.

In addition, the SPCB licenses businesses, certified commercial applicators, certified noncommercial applicators, technicians, technician apprentices, non-commercial applicator apprentices, and management technicians in the structural pest control industry. The SPCB also has the authority to take action against any licensee for engaging in practices that could be detrimental to public health, safety, or the environment. The SPCB also has the authority to perform inspections to monitor pesticide use and investigate complaints regarding label violations.

Agriculture Resource Protection Authority

The Agriculture Resource Protection Authority (ARPA) is the coordinating body for TDA, TSSWCB, TAES, DSHS, TCEQ, and SPCB with respect to their policies and programs for management, regulation, and control of pesticides. In addition, ARPA helps to avoid overlapping responsibilities of the state agencies, facilitates all the involved agencies participation in the regulation of pesticides, and helps demarcate the various areas of responsibility of the participating agencies.

ARPA may cooperate with and advise the member agencies or any other state agency that may be concerned with the regulation of pesticides and review any rule relating to pesticides that is proposed by any of its member agencies, except rules under Chapter 125 of the Texas Agriculture Code.

ARPA can inform and advise the governor on matters involving pesticides, prepare and recommend to the governor and to the legislature any legislation that ARPA considers proper for the management and control of pesticides, and make annual reports to the governor and the appropriate legislative oversight committees.

The Agricultural Waste Pesticide Collection Program

The TCEQ, partners with Texas Cooperative Extension (TCE) and Texas Department of Agriculture (TDA), to organize regional waste pesticide collections held statewide. The free collections provide agricultural producers and other Texans with an opportunity to dispose of pesticides and other household hazardous wastes at no expense and with no questions asked. In addition, mercury fever thermometers are accepted and replaced at no charge with mercury-free thermometers. The program is strictly voluntary. Participants are asked to answer several survey questions. The survey responses are evaluated to determine program effectiveness.

Agricultural Management

Texas has the largest number of farms and the most land in agricultural production in the United States. According to the 1997 Ag Census, 77% of the land area of Texas was in agricultural production. Of this, there are 26,762,000 acres of cropland, 15,807,000 acres of pastureland, and 95,323,000 acres of rangeland. In addition, there are almost 400 cattle feedlots, over 1200 dairies, approximately 100 hog operations, and over 1300 poultry operations in Texas.

Agricultural activities are a potential source of nonpoint source pollution. Possible nonpoint source pollutants associated with agricultural activities include nutrients, pesticides, organic matter, sediment and bacteria. These pollutants may be transported to surface waters through runoff or eroded soil particles. Pesticides and nutrients may also leach into groundwater or be transported through avenues such as abandoned and improperly constructed wells or through naturally occurring hydrologic connections. Below is a discussion of some programs in place to address nonpoint source pollution resulting from agricultural activities.

Agricultural Waste Permitting

Animal feeding operations, such as feedlots, dairies, and poultry operations, can be a source of pollutant discharges following rainfall events. An animal feeding operation is required to apply for a wastewater permit if it exceeds a given number of animals. These concentrated animal feeding operations (CAFOs) are prohibited from directly discharging into surface waters except under catastrophic rainfall or a chronic rainfall event.

Animal Feeding Operations (AFOs), which have fewer animals than CAFOs, do not require written authorization. AFOs are under the purview of the Texas State Soil and Water Conservation Board (TSSWCB) and must meet the same technical requirements as a CAFO. All poultry operations must obtain a TSSWCB-certified water quality management plan (WQMP). However, by April 13, 2006, dry litter poultry operations meeting certain size requirements must obtain written authorization. AFOs and CAFOs may receive technical assistance from the TSSWCB and the U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS).

The TCEQ Agriculture Permitting Program reviews technical designs of CAFOs for new facilities, facilities being modified or increased, and for facilities renewing their authorization. The designs are reviewed for selection, implementation, and use of environmentally sound BMPs to collect, store and utilize waste and wastewater and to control air emissions and odor in a manner to conform with good agricultural management practices. Waste and wastewater must be properly land-applied for beneficial use on agricultural land at agronomic rates.

A Pollution Prevention Plan (PPP) must be prepared for every CAFO facility in the State. The PPP must be prepared in accordance with good engineering practices and include measures necessary to limit the discharge of pollutants to waters in the state. The PPP must describe practices which are to be used to assure compliance with the CAFO rules. Specific components of a PPP include a site plan indicating all animal confinement areas, waste treatment/retention facilities, waste/wastewater application areas, management of waste/wastewater application areas at agronomic rates, as well as an identification of potential pollutant sources used, stored, or disposed of at the facility. Any recharge zone/features must be located, evaluated and protected. Procedures for monitoring discharges and sampling of land application areas are included in the PPP. Also, descriptions of all other protective measures or BMPs used to control potential pollutant sources must be included in the PPP.

TSSWCB Water Quality Management Plan Program

Texas Agriculture Code, §201.026 makes the TSSWCB responsible for planning, implementing, and managing programs and practices for abating agricultural and silvicultural nonpoint source pollution. This is primarily accomplished through the TSSWCB Water Quality Management Plan Program, which was established in 1993 by the Texas Legislature when it passed Senate Bill 503. Senate Bill 503 authorized the TSSWCB to assist agricultural and silvicultural producers in meeting the state's water quality goals and standards through this voluntary, incentive-based program.

Through this program, agricultural and silvicultural producers develop and implement site specific water quality management plans (WQMPs) in

cooperation with local Soil and Water Conservation Districts (SWCDs). The WQMPs include appropriate land treatment practices, production practices, management measures, technologies or combinations thereof, and an implementation schedule.

Local SWCDs provide technical assistance to develop the plan through agreements with United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) or the TSSWCB. After being approved by the district, the developed plan requires TSSWCB certification. Certified water quality management plans ensure farming or ranching operations are carried out in a manner consistent with state water quality goals. The state legislature provides funding through the TSSWCB for the implementation of WQMPs.

The Dairy Outreach Program

Some areas of the state have been identified as having water quality problems and concerns resulting from point and NPS pollution as a result of animal feeding operations. These areas are involved in the TCEQ's Dairy Outreach Program and include Erath, Bosque, Hamilton, Comanche, Johnson, Hopkins, Wood, and Rains counties. The TCEQ, TCE, and TSSWCB conduct various NPS related activities in the 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
- Information on CAFOs rules
- Education and training to producers on NPS issues such as land application of manure

Owners/operators of CAFOs located in the Dairy Outreach Program Areas, and operating under the state's CAFO rules, must complete an initial eight-hour course and subsequent eight hours every two years of continuing education in animal waste management. Similarly, employees of any CAFO responsible for work activities relating to compliance must be regularly trained or informed of information pertinent to the proper operation and maintenance of the facility and waste disposal. Employees at all levels of responsibility shall be informed of the general components and goals of the PPP. Training topics include land application of waste, proper operation and maintenance, good housekeeping and material management practices, recordkeeping requirements, and spill response and cleanup.

The Texas Brush Control Program

The TSSWCB also achieves nonpoint source abatement through the implementation of the Texas Brush Control Program. The Texas Brush Control Program was created to enhance the State's water resources through selective control of brush species. This program is a voluntary program in which landowners may contract with the state for cost-share assistance. Local SWCDs assist landowners with development of resource management plans addressing brush control, soil erosion, water quality, wildlife habitat and other natural resource issues.

The Agricultural Loan Program

The Texas Water Development Board (TWDB) provides grants and loans for agricultural water conservation equipment and practices which promote, demonstrate, or evaluate more efficient use of irrigation in agriculture. Grants are available to political subdivisions and state agencies. Loans are also available to political subdivisions and individuals through political subdivisions or a linked deposit program. The use of more efficient practices can reduce agricultural NPS loadings in surface and groundwater.

The Private Lands Enhancement Program

Through the Private Lands Enhancement Program, the Texas Parks and Wildlife Department (TPWD) provides technical assistance to persons who desire to include wildlife management considerations in present or future land use practices. On request, a TPWD biologist will meet with the land manager and conduct 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. 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 grazing rotation and management for increased grass cover. Filter strips in riparian areas are established. Upland erosion controls and establishment of vegetative cover reduce runoff and allow filtration. Strip removal practices for cedar are used to decrease loss of subsurface water to cedar. These practices combined lead to improved infiltration, increased water retention, and in some instances the rejuvenation of natural springs.

The Environmental Quality Incentives Program

Resources available to address issues related to nonpoint sources from privately owned agricultural land were significantly enhanced by the passage and implementation of the 2002 Federal Farm Bill. The Environmental Quality Incentives Program (EQIP) in the Conservation

Title of the 2002 Farm Bill is a voluntary conservation program that promotes agricultural production and environmental quality as compatible goals. Through EQIP, farmers and ranchers may receive financial and technical assistance to install or implement structural and management conservation practices on eligible agricultural land. EQIP is administered by the USDA-NRCS, but the priorities for allocation and distribution of funds are established with input from a State Technical Committee that is composed of representatives from federal and state resource agencies and organizations that are associated with agriculture. The TSSWCB and TCEQ are represented on this committee. In Texas, financial assistance funds will be used to address both the local high priority practices identified by the Local Work Groups that are chaired by soil and water conservation districts and the statewide resource concerns identified by the State Technical Committee. The State Technical Committee and Local Work Groups recommend the practices eligible for cost share and the cost share rates that will be paid. Eligible persons may select to apply in the county-based program recommended by the Local Work Group or in one of the Statewide Resource Concerns recommended by the State Technical Committee. Landowners and operators will choose the practices and evaluation systems that best fit their needs.

The availability of EQIP, active participation in the State Technical Committee, Local Work Groups, and accommodation of recommendations from the State Technical Committee by the State Conservationist have provided opportunities to focus resources on problem areas that were previously difficult or impossible to address. The voluntary nature of the program has enabled the state technical committee and the USDA-NRCS to establish state level resource concerns. By bringing this program down to the state level they are able to provide a portion of funds as incentive payments to producers that implement structural and management practices to address specific environmental problems. Before, EQIP funding assistance for individual land owners and agricultural producers was unavailable or very difficult to obtain. Through the State Technical Committee, the USDA-NRCS has actively pursued information on areas of the state where changes or adjustments in practices by individual land owners would be needed to contribute to the alleviation of identified environmental problems. This has enhanced the opportunities for regulatory agencies to use a combination of regulatory and voluntary practices to address specific problem areas impacted by nonpoint sources or a combination of point sources and nonpoint sources.

The Watershed Program

The purpose of the Watershed Program, administered by the USDA-NRCS, is to assist Federal, State, local agencies, local government sponsors, tribal governments, and program participants to protect and restore watersheds from damage caused by erosion, floodwater, and sediment; to conserve and develop water and land resources; and solve

natural resource and related economic problems on a watershed basis. The program provides technical and financial assistance to local citizens or project sponsors, builds partnerships, and requires local and state funding contribution.

Resource concerns addressed by the program include watershed protection; flood prevention; erosion and sediment control; water supply; water quality; opportunities for water conservation; wetland and water storage capacity; agricultural drought problems; rural development; municipal and industrial water needs; upstream flood damages; water needs for fish, wildlife, and forest-based industries; fish and wildlife habitat enhancement; wetland creation and restoration; and public recreation in watersheds of 250,000 or fewer acres.

Plans or surveys including watershed plans, river basin surveys and studies, flood hazard analyses, and flood plain management assistance are developed to identify solutions that use conservation practice and nonstructural measures to solve resource problems. If approved, technical and financial assistance is provided for installation of improvement measures specified in the plans.

Conservation Technical Assistance Program

The Conservation Technical Assistance program, administered by the USDA-NRCS, provides voluntary conservation technical assistance to land-users, communities, units of state and local government, and other Federal agencies in planning and implementing conservation practices that address natural resource issues. The program encourages and assists citizens to voluntarily conserve, improve and sustain natural resources.

Conservation Reserve Program

The principal mission of the Farm Services Agency (FSA) is designed to stabilize farm income, assist farmers with conservation of land and water resources, provide credit to new or disadvantaged farmers and ranchers, and help farm operations recover from the effects of disaster. Many of the FSA operated programs are funded through the Commodity Credit Corporation (CCC), a government owned and operated corporation established to stabilize, support, and protect farm income and prices. The Conservation Reserve Program is a voluntary program administered by the FSA that offers annual rental payments, incentive payments, annual maintenance payments for certain activities, and cost-share assistance to establish approved cover on eligible cropland. The program encourages farmers to plant long-term resource-conserving cover to improve soil, water, and wildlife resources. The CCC makes available cost-share assistance in an amount equal to not more than 50% of the participant's costs in establishing approved practices. Contract duration is between 10 and 15 years. The NRCS, Cooperative State Research and Education

Extension Service, state forestry agencies, and local soil and water conservation districts provide technical support for this program.

USDA-Agricultural Research Service

The Agricultural Research Service (ARS) is the principal in-house research agency of the USDA. ARS conducts research to develop and transfer solutions to agricultural problems of high national priority. The mission of the ARS is to increase understanding and develop solutions to protect the Nations's soil and water resources. Two of the twenty-two ARS National Programs, Water Quality Management and Soil Resource Management, are strongly committed to applied nonpoint source pollution research. In Texas, ARS is conducting ongoing research on NPS related issues such as: land application of municipal and agricultural wastes; improved management of soil, water, nutrients, and chemicals in agricultural production systems; and enhanced simulation tools for water quality, hydrology, and crop growth. ARS research, conducted by laboratories throughout the state, is often carried out in cooperation with universities, state research and extension centers, and private organizations.

The Texas Institute for Applied Environmental Research

The Texas Institute for Applied Environmental Research (TIAER) was established as part of the Texas A&M System to conduct applied research on environmental issues that have public policy implications. TIAER is also responsible for providing 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 responsibility of TIAER. Partnerships with other universities and state agencies build on the strengths of each entity to produce an effective, efficient program.

The TIAER goal is to impact state and national environmental policy. A fundamental principal to this goal is improvements in the environment are best accomplished by conducting scientific research and 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.

TIAER staff performs ambient monitoring and analyzes data to assess nonpoint source impacts to receiving waters and improvements to receiving water from best management practice implementation. TIAER also works to refine and apply computer models to simulate and evaluate nonpoint source management practices.

The Texas Water Resources Institute

The Texas Water Resources Institute is a unit of the Texas Agricultural Experiment Station and Texas Cooperative Extension. It is part of a national network of institutes created by the Water Resources Research Act of 1964. The Institute is funded by the United States Geological Survey and is affiliated with the National Institutes for Water Research.

The Texas Water Resources Institute serves as a focal point for water-related research at Texas universities, encouraging discussion of statewide issues through meetings and multi-university studies. The Institute links academic expertise with state and federal agencies, strengthening water research and education. Additionally, the Institute provides leadership for water resource programs through grant administration, pre-award services, project management, communication, and facilitation of interagency collaboration.

The Lower Colorado River Authority—Creekside Conservation Program

The Lower Colorado River Authority (LCRA) is dedicated to land stewardship through several innovative conservation programs. The LCRA has joined with numerous partners throughout the state to promote land conservation and preserve wildlife habitat in Central and South Texas.

As farmers and ranchers lose topsoil to erosion, land productivity decreases. Thousands of acres of valuable soil are washed into tributaries and lakes every year. This sediment can build up to create flood management problems, threaten aquatic habitats, and reduce groundwater recharge. Waterways also suffer from excessive sedimentation and nonpoint source pollution.

Since 1990, LCRA's Creekside Conservation Program has worked with landowners and state and federal agencies to reduce sedimentation and agricultural nonpoint source pollution on privately owned land in eleven counties. The LCRA strongly emphasizes brush management to improve vegetative cover that reduces erosion, increases land productivity, filters groundwater, and enhances wildlife habitat. In recent decades, the spread of invasive brush species, particularly cedar and mesquite, over Central Texas rangelands has choked out native grasses and plants that benefit water quality and quantity.

Local Soil and Water Conservation Districts (SWCDs) help landowners with project planning in the Colorado River basin. The local office of the USDA-NRCS selects potential sites and qualified landowners to participate in the Creekside Conservation Program. Local SWCDs approve the projects and submit them to LCRA for final approval. Upon completion of the project, the landowner is reimbursed for up to half of the

cost of the conservation project. The NRCS and LCRA staff monitor success of each project on an annual basis.

Silvicultural Management

Texas has more than 23 million acres of forested land. Half of this area, roughly 11.8 million acres, is considered commercial timberland. Most streams that originate or flow through these timberlands are sources of water supply, prime recreation, and other high quality uses. Because of this, forest management programs have been developed to implement adequate measures to protect water quality. Below is a discussion of some of the programs in place to address the nonpoint source problems resulting from silvicultural activities.

The Texas Forest Service Resource Development Program

The Texas Forest Service (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, and fireline plowing. 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.

The Forest Stewardship Program

The Forest Stewardship Program (FSP), a USDA Forest Service program, provides technical assistance, through State forestry agency partners, to nonindustrial private forest (NIPF) owners. The program encourages and enables active long-term forest management. A primary focus of the program is the development of comprehensive, multi-resource management plans that provide landowners with the information they need to manage their forests.

The Forest Land Enhancement Program

The Forest Land Enhancement Program (FLEP), administered by the USDA Forest Service, is a voluntary program that provides technical, educational, and cost-share assistance to non-industrial private forest (NIPF) landowners. Eligible landowners must have an approved Forest Stewardship Plan.

Pollution Prevention

The key to controlling nonpoint source pollution is often prevention. Preventing contaminants from reaching water in the first place mitigates environmental risks from pollution and eliminates the need for expensive clean-up programs. Community, business, and citizen involvement are

integral to successful pollution prevention. There are many simple day to day activities citizens can do to prevent pollution. Educating citizens about what those activities are and implementing prevention programs can be accomplished on a larger scale by federal, state, or local government programs. Following is a discussion of several programs that work with citizens, businesses, and industry to encourage voluntary implementation of pollution prevention activities.

The Site Visit Program

The TCEQ offers free, confidential on-site environmental compliance assessments (site visits) to local government facilities and independently owned and operated businesses with 100 or fewer total employees. After a site visit, the facility operator receives a report from the consultant outlining environmental compliance deficiencies and a copy of the consultant's compliance checklist. The consultant will provide specific recommendations on how the facility can achieve full compliance and possibly reduce regulatory burden.

The Small Towns Environment Program

The Texas Small Towns Environment Project (STEP) was designed to assist small towns, unincorporated communities, subdivisions, colonias, or clusters of homes with urgent drinking and wastewater problems. The TCEQ provides technical assistance and support to community leaders and residents who are willing to solve problems through self-help. Texas STEP agents work collaboratively with community residents to pull together local resources to initiate a drinking water and/or wastewater project. The Texas STEP is a partnership between the TCEQ, Texas Department of Housing and Community Affairs, the DSHS, TWDB, and GLO with support from the national Small Towns Environment Program of the Rensselaerville Institute.

The Texas Country Cleanup Program

The TCEQ, in cooperation with TCE and TDA, conducts free, one-day collections at 30-40 locations across the state annually for citizens in rural and agricultural communities to bring materials for recycling or disposal. Texas Country Cleanups offer residents recycling opportunities for materials specific to rural and agricultural materials. The materials accepted in these collections include triple-rinsed empty pesticide containers, used motor oil, used oil filters, and lead-acid batteries.

Supplemental Environmental Projects

Supplemental Environmental Projects (SEPs) prevent or reduce pollution, enhance the quality of the environment, and increase environmental public awareness. The SEP program, administered by the TCEQ, provides the opportunity for the respondent in an enforcement action to negotiate an

agreement to perform an SEP in return for a reduction in administrative penalties. Potential SEPs include cleanup of abandoned illegal dump sites; community household hazardous waste collections; purchase of Water Wise kits for local schools; and on-site pollution prevention projects that exceed regulatory requirements.

The Clean Texas Program

The Clean Texas Program is a voluntary environmental leadership program to protect the state's air, water, and land. The program offers benefits and incentives to members who commit to improving the environment and sustaining a quality of life for future generations. The Clean Texas Program is open to industries, businesses, cities, counties, schools, universities, military bases, nonprofit groups, and other organizations. Clean Texas Program "partners" make commitments to measurable environmental improvement goals, internal environmental programs, and community environmental outreach programs or projects. Clean Texas Program "leaders" make these same commitments and in addition, pledge to implement a system to assure compliance and continuous improvement (environmental management system, strategic plan, business plan), a community communication program, and a system to review and measure the environmental impact of products, processes, and community services (product stewardship program).

Oil and Gas Waste Minimization Program

The Oil and Gas Waste Minimization Program, administered by the Railroad Commission of Texas (RRC), offers assistance to oil and gas operators interested in minimizing wastes through source reduction and recycling of oil and gas wastes. The RRC's program includes several products and services, including a manual, workshops, technology transfer, waste minimization planning software, a newsletter, and on-site assistance.

Texas Chemical Council

The Texas Chemical Council (TCC) is a statewide trade association of chemical manufacturing facilities in Texas. The TCC represents the Texas chemical industry in environmental protection, health and safety issues, tort reform, and energy policy. As a partner in the TCEQ Clean Texas program, the Texas Chemical Council (TCC) encourages all its member companies to participate as program members, committed to fulfilling the requirements of membership. The TCC and its member companies strive to conserve natural resources, cultivate environmentally responsible business activities, foster product stewardship, and handle waste responsibly. The TCC supports other environmental goals such as recycling and the protection of vital habitats, wetlands, and endangered species.

Protection for Drinking Water Sources

Many Texans get their drinking water from large scale municipal water systems that rely on surface water resources, such as rivers, lakes, and reservoirs. Others depend on private sources, such as wells and aquifers. Contamination can occur in surface or groundwater supplies from wastewater discharges, urban and agricultural runoff, leaking underground storage tanks, improperly maintained on-site sewage facilities, waste sites, abandoned wells, and deposition of airborne pollutants. The State of Texas pays special attention to protecting surface and ground water supplies that serve as a source of drinking water. Protecting drinking water at the source makes good public health, economic, and environmental sense. Below is a discussion of the state programs that focus on the protection of drinking water sources.

Underground Injection Control

Underground Injection Control (UIC) involves the protection of underground sources of drinking water (USDW) through the regulatory oversight of injection wells. Given the broadest interpretation for statutes covering Underground Injection Control (UIC), any water could be determined to be fresh water provided it has beneficial use. The UIC program interprets "fresh water" as water with 10,000 mg/l or less Total Dissolved Solids (TDS), with the understanding that the broader statutory definition may be strictly applied whenever necessary to protect water containing greater than 10,000 mg/l TDS (30 TAC §331.2).

The TCEQ's authorized UIC program has elected to not specifically designate or geographically delineate aquifers as underground sources of drinking water. Any aquifer or portion thereof that fits the definition is considered an underground source of drinking water (USDW), even if not affirmatively identified as such by the agency.

Injection wells are divided by class; specifically, Class I through Class V. In Texas, regulatory responsibility for the subsurface injection of fluids and waste lies with either the Railroad Commission of Texas (RRC) or the TCEQ, depending mainly on the class of injection well, the intended use of the well, or in the case of Class III wells, the mineral to be mined.

- Class I - hazardous wastes injected beneath the lowermost formation containing an USDW. All Class I wells are regulated by the TCEQ through injection well permits.
- Class II - "oil and gas waste", including salt water. All Class II wells are regulated by the RRC through injection well permits.
- Class III - extraction of minerals, exclusive of oil and natural gas (uranium, sodium sulfate (potash), brine and sulfur. Brine

injection wells are regulated by the RRC through permits, all other Class III injection wells under TCEQ.

- Class IV -hazardous wastes into or above a formation which contains an USDW within one-quarter mile of the wellbore. Class IV injection wells are generally prohibited by the TCEQ rules (30 TAC §331.6).
- Class V - Miscellaneous injection wells that are not Class I, II, III, or IV wells, or single family residential cesspools or septic system disposal wells. Wells used for in-situ combustion of fossil fuels and geothermal wells are under the jurisdiction of the RRC. Aquifer storage and recovery wells, subsidence control wells, salt water intrusion barrier wells; air conditioning return flow wells; drainage wells; some septic system wells; cesspools; dry wells used to inject nonhazardous wastes other than domestic sewage into the unsaturated zone; and sand backfill wells used to reclaim some mines are under the jurisdiction of TCEQ.

For those facilities which handle hazardous waste, surface facilities are permitted separately by the TCEQ, under the authority of the Texas Solid Waste Disposal Act (Health and Safety Code, Chapter 361), and/or the federally delegated Resource Conservation and Recovery Act (RCRA) program. Strict application review procedures, and following monitoring and inspection programs by both the TCEQ and the Railroad Commission of Texas help prevent non-point source contamination of usable groundwater by salt water and non-hazardous wastes.

The Source Water Assessment and Protection Program

The TCEQ Source Water Assessment and Protection (SWAP) program was created in 1996 by the Safe Drinking Water Act. SWAP combines source water assessment (SWA) and source water protection (SWP).

Source Water Assessments

The Source Water Assessment (SWA) assesses a Public Water Supply system's susceptibility to 227 potential drinking water contaminants. Specific elements scrutinized include location, intrinsic characteristics, contaminant occurrence, point and nonpoint source pollution, and construction. These elements are compared with several hundred thousand database records to produce a technically defensible assessment product. The goal of the SWA component leads to local Source Water Protection (SWP) implementation.

A source water assessment report has been provided to each of 6,000 public water systems (PWS) and is intended to lead to the implementation of source water protection projects and BMP implementation. The source water assessments are used by the TCEQ SWAP program to drive the

prioritization and implementation of Source Water Protection (SWP) activities, and the recommended best management practices (BMPs) aimed at minimizing or eliminating the affects of NPS contaminants.

Source Water Protection

Source Water Protection (SWP) is a voluntary, pollution prevention program implemented at the local level. All public water supply systems are eligible to participate in the program. The TCEQ provides technical assistance and guidance to local Public Water Supply systems that implement recommended BMPs. The TCEQ coordinates BMP recommendations or implementation with other agencies/organizations with expertise and/or jurisdiction. These BMPs include signs to increase public awareness, educational programs, site-specific protection plans, and local ordinances. The TCEQ recommends communities participating in the program voluntarily implement BMPs based on results of potential contaminant source inventories. Most SWP participants have implemented programs by working cooperatively with community members and through public education programs. Costs associated with implementing a SWP program are much lower than cleaning up a contaminated water source. Implementation costs are eligible for funding through the Texas Water Development Board's Drinking Water State Revolving Fund loan program.

For over fifteen years, TCEQ has used funds from the NPS Program to fund source water protection activities. Additionally, information developed for the NPS Program serves as valuable information and data about land-based contamination sources which provide valuable input into the source water assessment process. An example of this coordination is the Regional Aquifer Protection Programs (i.e., Edwards Aquifer) which has provided a wealth of data for TCEQ's assessment and protection activities.

The hallmark of Source Water Protection is to identify a PWS's water source, sensitive contributing areas, possible sources of contamination (PSOCs), and recommend BMPs to eliminate or minimize the threat of contamination. These recommendations often advocate the involvement of other agencies/organizations having relevant expertise and/or jurisdiction to provide increased public awareness, educational programs, site-specific protection plans (i.e. TMDL-IPs, WPPs), and local ordinances.

Most SWP participants have implemented their programs by working cooperatively with community members and providing public education. The costs for implementing a SWP program are minimal and dramatically less than remediating contaminated drinking water.

Aquifer Protection

In addition to programs already identified in this document, multiple agencies have responsibilities related to protecting the groundwater in the state from impacts from NPS pollution. Groundwater is water that occurs beneath the land surface in porous or fractured rock and sediments. Groundwater is a major source of the water used by Texans for domestic, municipal, industrial, and agricultural purposes.

Vulnerability of an aquifer to contamination has two components: the environmental pathway that a contaminant would take to reach the groundwater, and the source and type of contaminants that result from activities conducted above the aquifer. Aquifer vulnerability is related to the physical, hydrological and biological characteristics of the soil, the unsaturated (non-water producing) upper portion of the aquifer and the water-bearing portion. Characteristics such as permeability and processes such as natural attenuation affect the movement and alteration of contaminants. These characteristics vary greatly among aquifers in Texas, such that aquifers have different vulnerabilities to contamination. Different parts of the same aquifer may have different vulnerabilities. The potential for impact on an aquifer is dependent on what activities are occurring above an aquifer or in its recharge zone.

Groundwater contamination occurs principally in heavily populated areas of the state, such as Houston, Dallas, Fort Worth, San Antonio, and El Paso. Petroleum storage tank facilities are the largest category of contamination sources, but other regulated surface activities have resulted in contamination as well. The following is a discussion of some of the programs in place to protect the aquifers of the state.

The Texas Groundwater Protection Committee

The Texas Groundwater Protection Committee (TGPC) is an interagency committee that was created by the Texas Legislature in 1989 to bridge the gap between state groundwater programs and optimize groundwater quality protection by improving coordination among agencies involved in groundwater protection activities. The TCEQ is designated as the lead agency for the committee and provides administrative support for its activities.

The TCEQ partners with the Railroad Commission of Texas (RRC), Texas Department of State Health Services (DSHS), Texas Department of Agriculture (TDA), TSSWCB, Texas Alliance of Groundwater Districts (TAGD), Texas Agricultural Experiment Station (TAES), Bureau of Economic Geology (BEG), and the Texas Department of Licensing and Regulation (TDLR). The committee works to effectively manage and protect Texas groundwater. The TGPC works on special issues through subcommittees composed of committee members and the general public.

The Nonpoint Source Subcommittee is an important mechanism for the TGPC to implement and evaluate NPS activities. Recognizing the dangers to human health and groundwater quality that abandoned water wells pose, for example, the TGPC initiated efforts to develop educational materials to promote low-cost, landowner-initiated closure (capping or plugging) of abandoned water wells through the Abandoned Water Well Closure Task Force, a sub-group of the Non-Point Source Subcommittee.

The Agricultural Chemicals Subcommittee is another group within TGPC that is concerned with NPS impacts resulting from the legal use of chemicals to control insect and animal pests and unwanted vegetation. The Agchem Subcommittee has produced the Texas State Management Plan for Prevention of Pesticide Contamination of Groundwater, (TCEQ, 2001, SFR-070/01), which describes the general policies and regulatory approaches the State will use in order to protect groundwater resources from risk of contamination by pesticides. The document describes a generic coordinating mechanism among all responsible and participating agencies during the implementation of the plan, and provides for specific responses when they are deemed necessary.

Underground Storage Tank Installer Licensing Program

Any entity who engages in the business of underground storage tank installation, repair, or removal in Texas, must be registered with the TCEQ as an Underground Storage Tank (UST) contractor. Individuals who supervise the installation, repair, or removal of an underground storage tank must be licensed by the TCEQ as a Type "A" UST installer on-site supervisor, and any individual who supervises the permanent removal of a UST system must be licensed as a Type "B" UST remover on-site supervisor.

Texas Department of Licensing and Regulation

The Texas Department of Licensing and Regulation (TDLR) is charged to protect ground water quality through the licensing of well drillers and assuring well construction standards are enforced. A Water Well Driller is defined as any individual who drills, bores, cores, or constructs a water well. A driller may include an owner, operator, contractor, or drilling supervisor. The program has a mandatory apprenticeship which requires all applicants to have at least two years of drilling experience before taking the licensing exam. TDLR has the power to suspend or revoke licenses and set administrative penalties for incompetence or violations of any section of Texas Occupation Code Chapters 1901 and 1902 or any rule.

The Texas Legislature expanded the Water Well Driller functions to include pump installers that repair wells after they have been drilled. Pump Installers install and repair well pumps and equipment, locate and survey abandoned wells, and repair existing wells. Regulation of this function

provides a mechanism to ensure that surface casing is completed on wells that were drilled before the rules on surface casing existed to prevent contamination of drinking water sources by improperly sealed wells.

Numerous state and local programs have identified abandoned water wells as having a significant, or potentially significant, negative impact on groundwater quality in the state. Abandoned water wells exist in every county and impact all of the state's aquifers. It is conservatively estimated that 150,000 of the wells drilled since 1965 are abandoned or deteriorated. Abandoned water wells not only serve as conduits or channels for contamination to reach groundwater, but large diameter wells can also be a hazard to human and animal life. In addition, uncapped, non-cemented, deteriorated or uncased wells completed in more than one water-bearing zone may allow poorer-quality water from one zone to co-mingle and impact the other(s). Abandoned municipal, industrial, irrigation wells and abandoned rig-supply, domestic or livestock wells, and unplugged test-holes also pose threats to groundwater quality.

State law requires landowners, who possess an abandoned or deteriorated well, to have the well plugged or capped under TDLR standards. The landowner is liable for any water contamination or injury due to such wells. The Abandoned Well Notification and Compliance Program, administered by the TDLR, compiles, identifies, and processes abandoned water well notification and enforcement cases. The TDLR can assess administrative and civil penalties against persons who do not comply with the provisions. Some groundwater conservation districts are implementing well-capping and plugging programs of their own.

Additionally, the Water Well Driller/Pump Installer Program provides advisories to water well drillers for areas with contaminant plumes or undesirable water quality. These advisories help water well drillers avoid impacting usable groundwater by unknowingly drilling through contaminated zones in the areas specified. Drillers are advised to case off and pressure grout those zones to prevent contaminant migration—another form of NPS pollution.

Edwards Aquifer Protection Program

The State of Texas contains only one designated sole-source aquifer, the Edwards Aquifer found in the central and south central portion of the state. The Edwards Aquifer is an arcuate band of limestone and associated formations that stretch from Bell County through Williamson, Travis, Hays, Comal, Bexar, Medina and Uvalde counties, finally terminating in Kinney County. All of these counties, except Bell, are subject to TCEQ rules promulgated to protect the quality of groundwater within the aquifer.

The rules are the basis of the Edwards Aquifer Protection Program, administered by TCEQ's Field Operations Division staff in the Austin and

San Antonio Regional Offices. The program requires anyone who plans to build on the recharge, transition, or contributing zones of the Edwards Aquifer, to first have an application, including construction plans, approved by the TCEQ. Staff in the regional offices review these plans. After a plan is approved, the site is monitored for compliance.

The rules are intended to mitigate NPS and point source impacts from regulated development over the recharge zone, transition zone and contributing zone of the Edwards aquifer, and, depending on location and type of development, may require any or all of the following:

- A water pollution abatement plan (WPAP) for any regulated activity proposed on the Edwards Aquifer recharge zone. This includes any construction-related activity on the recharge zone, such as, but not limited to, the construction of buildings, utility stations, roads, highways, railroads; clearing, excavation, or any other activities that alter or disturb the topographic, geologic, or existing recharge characteristics of a site; or any other activities which may pose a potential for contaminating the Edwards Aquifer and hydrologically connected surface streams.
- An organized sewage collection system (SCS) plan for any public or private sewerage system for the collection and conveyance of sewage to a treatment and disposal system that is regulated pursuant to rules of the commission and provisions of Chapter 26 of the Texas Water Code. A system includes lift stations, force mains, gravity lines, and all appurtenances necessary for conveying wastewater from a generating facility to a treatment plant.
- An underground storage tank (UST) facility plan for the installation or replacement of underground storage tanks or piping on either the recharge or transition zones of the Edwards Aquifer. In particular, storage tank (aboveground or underground) facilities that will store 500 gallons or more of static hydrocarbons or hazardous substances are regulated.
- An aboveground storage tank (AST) facility plan for the installation of permanent aboveground storage tanks at a facility that will have a total capacity of 500 gallons or more on either the recharge or transition zones of the Edwards Aquifer. In particular, ASTs that will store static hydrocarbons or hazardous substances are regulated.

Environmental Permitting Programs

The TCEQ, RRC, DSHS, and other regulatory agencies are responsible for permitting various activities ranging from application of pesticides to wastewater discharge. All of these permitting programs contain some form

of NPS pollution prevention requirements, whether in the form of BMPs or through monitoring.

TCEQ's Wastewater Permitting program, for example, routinely issues "no discharge" permits for facilities disposing of treated wastewater effluent via irrigation or evaporation. The effluent disposal sites must meet certain criteria to insure that groundwater and surface water are not impacted by percolation of contaminants or runoff from application areas. Permits require facilities to monitor groundwater quality, sample soils for nutrient and salt loading, and provide information on the uptake of contaminants by cover crops in order to prevent contamination. Similar requirements are made for sites handling or disposing of post-treatment wastewater sludge, wastes from permitted confined animal feeding operations and wastes from drinking water treatment facilities.

TCEQ permits for industrial and hazardous waste generators and management units, and municipal solid waste disposal facilities contain provisions designed to protect groundwater and surface water from the effects of small levels of contaminants that may escape from a facility. This provisions include pond linings, numerous monitoring points, filter strip areas, leak detection systems for production piping and other measures.

The RRC establishes oil and gas well construction and plugging standards, and requires a letter from TCEQ that establishes the location of the base of usable quality groundwater. Wells must be constructed and plugged in such a manner that the usable quality groundwater is protected from contaminants that may migrate during the life of the well. In addition, RRC authorizations by rule and permits for storage, management and disposal of oil and gas waste, include requirements for pit liners, sampling and monitoring, and runoff control.

Texas Department of State Health Services (DSHS), Bureau of Radiation Control (BRC) regulates radioactive materials, including uranium recovery and radioactive waste disposal. The BRC monitors groundwater for radionuclides on a routine basis at several facilities. Additionally, BRC regulates receipt, possession, storage, use and treatment of NORM (Naturally Occurring Radioactive Materials).

The Railroad Commission of Texas—Oil and Gas Well Plugging Program

The RRC has long been active in regulating the exploration, development and production of oil and gas in Texas, which includes protecting the environment and maintaining public safety. The RRC began regulating oil and gas exploration and production operations in 1919 and over time has adopted increasingly stringent plugging standards and procedures. Statutes

to prevent pollution from unplugged wells have also been modified over the years to increase RRC authority in this area.

The RRC has utilized the Oil Field Clean Up (OFCU) Fund to plug over 15,000 wells, however, thousands of additional abandoned wells remain. To ensure effective and efficient use of the OFCU Fund, the RRC has implemented a well plugging priority system to plug the wells that pose the greatest risk to the environment. The OFCU Fund is supported entirely by fees, penalties, and other payments collected from the oil and gas industry. The RRC has also been working with the TCEQ to utilize Clean Water Act CWA§319(h) grant funding to reduce chloride and total dissolved solids levels in several watersheds.

Wetlands Protection

Wetlands are generally considered as a transition zone between land and water where the soil is occasionally or permanently saturated with water. Wetlands are populated with plants that are specially adapted to grow in standing water or saturated soils. There are many different types of wetlands, including marshes, bogs, swamps, mangroves, prairie playas, and bottomland hardwood forests. Wetlands may not always appear to be wet. Many wetlands dry out for extended periods of time. Other wetlands may appear dry on the surface but are saturated with water beneath the surface.

Saltwater wetlands fringe estuaries; freshwater wetlands border streams, rivers, and reservoirs or occur in isolation. Generally, wetlands improve water quality, provide critical habitat for a wide variety of fish and wildlife, provide storage for flood waters, and stabilize shorelines. Wetlands filter nutrient and sediment from water before it enters adjacent water bodies and underlying groundwater aquifers.

Wetlands can be physically destroyed by filling or dewatering. Wetlands can also be damaged by the same pollutants that degrade other water bodies, such as nutrients, toxic substances, and oxygen demanding wastes. Below is a discussion of some of the programs in place to protect this precious resource.

The Wetlands Reserve Program

The Natural Resource Conservation Service (NRCS) administers the Wetlands Reserve Program (WRP). The Wetlands Reserve Program is a voluntary program that provides technical and financial assistance to eligible landowners to address wetland, wildlife habitat, soil, water, and related natural resource concerns on private land in an environmentally beneficial and cost effective manner. The program provides an opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal land from agriculture.

The Texas Wetlands Conservation Plan

Ninety-seven percent of Texas' land is privately owned and managed. Management decisions on these lands are made by private landholders. Economics often dictate what these management strategies will be. The Texas Wetlands Conservation Plan focuses on providing private landowners with information to assist them in making informed, economically beneficial management decisions, which will protect wetland functions and maximize the benefits that wetlands provide. Development of the Wetlands Conservation Plan was coordinated by the Texas Parks and Wildlife Department (TPWD) and is intended as a guide for wetlands conservation efforts throughout the state.

The Texas Wetlands Conservation Plan, initiated in 1988 and last updated in 1997, focuses on non-regulatory, voluntary approaches to conserving Texas' wetlands. It has three major goals: to enhance the landowner's ability to use existing incentive programs and other land use options through outreach and technical assistance; to develop and encourage land management options that provide an economic incentive for conserving existing or restoring former wetlands; and to coordinate regional wetlands conservation efforts.

Wetland issues addressed in the Plan fall into five general categories: education; economic incentives; statewide and regional conservation; assessment and evaluation; and coordination and funding. The Plan, in addition to providing general information and goals, highlights many specific recommendations to enhance wetlands conservation in Texas. To date, a shortage of funding has slowed implementation of recommendations identified in the Plan.

Wetlands Planning Efforts in Texas

Wetlands planning in Texas has been influenced by opportunities and requirements initiated at the national, state, and local levels. Many public and private sector organizations and individuals in Texas are involved in wetlands conservation and regulation. Each organization has a unique focus, which may include regulation, technical assistance to landowners, funding or land restoration sites. Alone, individual entities are often ill-equipped to meet wetlands conservation opportunities and challenges. However, together they form a web of conservation opportunities. Several planning efforts are working at the state level to address different aspects of wetlands management and planning.

Seagrass Conservation Plan

The Seagrass Conservation Plan was developed to address seagrass problems in Texas over the next ten years. The TCEQ, GLO, and TPWD endorsed conservation goals for the Seagrass Plan, which include defining

seagrass research needs, addressing management concerns, and expanding environmental awareness in citizens through education.

Conservation Plan for State-Owned Coastal Wetlands

The State Wetlands Conservation Plan for State-Owned Coastal Wetlands provides protection through specific actions for state-owned coastal wetlands. The TPWD and the GLO, with assistance from other agencies, are jointly developing this legislatively required plan. Eighteen specific items/actions must be included in the plan. Some of these actions include a goal of no overall net loss of state-owned wetlands, wetland mitigation policies, a requirement for freshwater inflows to estuaries, a navigational dredging and disposal plan, education and research regarding boating in wetlands, the reduction of nonpoint source pollution, improved coordination among federal and state agencies, and a plan to acquire coastal wetlands.

Local Government Wetlands Plan

The Local Government Wetlands Plan is a demonstration project that will incorporate the tools contained in Texas Coastal Wetlands: A Handbook for Local Governments. The GLO will form a partnership with a local government to develop a local wetlands plan.

Wetlands Assistance for Landowners

In 1995, a "Wetlands Assistance Guide for Landowners" was published which describes the programs, regulations and conservation options that affect landowners in Texas. The Landowner's Guide summarizes existing state, federal and private programs which provide financial and technical assistance for wetlands protection. Other topics discussed include an assessment of landowner options for wetlands protection, a summary of existing state and federal regulations affecting wetlands, a list of contacts, and a description of the roles of state and federal agencies which are involved in wetlands regulation and management.

Coastal Programs

High freshwater inflows tend to frequently flush the estuaries of the upper coast. Lower coast estuaries have low freshwater inflows and high residence times for natural and man-made pollutant inputs. Pollutants from both local and distant sources tend to accumulate in estuaries. Most pollutants that enter streams and rivers eventually migrate toward the coast. As rivers approach the coast, their mouths broaden and stream velocity decreases. The reduction in stream velocity and fluctuation of tides from the Gulf reduce flushing and entrap nutrients and pollutants at the head of estuarine waters. This natural trapping process establishes the basis for highly productive estuarine ecosystems, but also makes estuaries vulnerable to excessive pollutant loading. Thick clay soils, which persist

throughout the coast except for areas directly adjacent to large rivers, prevent the exchange of surface and groundwater.

Rural and agricultural lands comprise almost half of the total land use/land cover within the coastal management area. The upper Texas coast's heavy rainfall and thick clay soils support rice cultivation. As rainfall declines further south, dryland row crops of cotton and grain sorghum dominate the agricultural scene. Extensive irrigation systems in the Lower Rio Grande Valley support such diverse crops as citrus, vegetables, sugar cane, and aloe vera.

The Texas coast houses half the nation's petrochemical industry and more than a quarter of its refining capacity. There are four major urban and industrial centers on the Texas Coast: Beaumont-Port Arthur-Orange; Houston-Galveston; Corpus Christi; and the Lower Rio Grande Valley. In addition to dense urban and suburban development, significant oil refining and associated petrochemical industry infrastructure exist in the first three areas. The Rio Grande Valley is primarily a year-round agricultural center which is experiencing explosive population growth due to its proximity to Mexico and an improved economy in response to the North American Free Trade Agreement.

Estuaries are coastal waters where inflowing stream or river water mixes with, and measurably dilutes, sea water. In Texas, estuaries are the lower tidal portions of rivers and streams that directly enter the Gulf of Mexico or its bay systems. Estuaries serve as important nurseries for many commercial fish and shellfish populations, including shrimp, oysters, crabs, and scallops.

The steady growth of industry, as well as burgeoning marine commerce, agriculture, commercial and recreational fishing, and a thriving tourist trade, has intensified competition for coastal resources. Continued economic and population growth are projected for the Texas Coast, and as population and development increase, so do waste generation, environmental degradation, and the risks of damage to natural systems.

The coastal areas of Texas have to deal with the same nonpoint source pollution issues as the rest of the state, in addition to beach erosion, salinity, and protection of important coastal estuarine and wetland habitats. The following programs are specific to nonpoint source management along the Texas Coast.

The Texas Coastal Management Program/Coastal Coordination Council

The Texas Coastal Management Program (CMP) was created to coordinate state, local, and federal programs for the management of Texas coastal resources. The program brings in federal Coastal Zone

Management Act (CZMA) funds to Texas state and local entities to implement projects and program activities for a wide variety of purposes. The Coastal Coordination Council (CCC) administers the CMP and is chaired by the Commissioner of the GLO. It is comprised of the chair or appointed representatives from the TPWD, the TCEQ, the TWDB, TxDOT, a member of the State Soil and Water Conservation Board, a member of the RRC, the director of the Texas A&M University Sea Grant Program and four gubernatorial appointees. These members are selected to provide fair representation for all aspects concerning coastal issues.

The Council is charged with adopting uniform goals and policies to guide decision-making by all entities regulating or managing natural resource use within the Texas coastal area. The Council reviews significant actions taken or authorized by state agencies and subdivisions that may adversely affect coastal natural resources to determine their consistency with the CMP goals and policies. In addition, the Council oversees the CMP Grants Program and the Small Business and Individual Permitting Assistance Program.

The Coastal Zone Act Reauthorization Amendments (CZARA), §6217, requires each state with an approved coastal zone management program to develop a federally approvable program to control coastal nonpoint source pollution. The Texas CCC appointed a Coastal Nonpoint Source Pollution Control Program workgroup to develop this document.

On April 7, 2003, the National Oceanic and Atmospheric Administration (NOAA) recommended conditional approval of the Texas Coastal Nonpoint Source Pollution Control Program. The document discusses the coastal nonpoint source management area; an overview of program implementation and coordination; presentation of specific nonpoint source categories, the §6217 management measures, and the state rules and programs which address pollution sources and meet the federal requirements; information on additional management measures, technical assistance, and public participation; and program monitoring and evaluation.

Coastal Nonpoint Source Program

The Coastal NPS Program for Texas has been under development since 1997. To facilitate the development of the NPS Program, the Coastal Coordination Council established a subcommittee comprised of staff from the General Land Office, Texas Commission on Environmental Quality, Texas Railroad Commission, Texas Department of Transportation, Texas Parks and Wildlife Department, Texas State Soil and Water Conservation Board, and a public member from the Council. This subcommittee has addressed comments submitted by the National Oceanic and Atmospheric Administration (NOAA) and the Environmental Protection Agency (EPA) regarding Texas' Coastal NPS Program, reviewed and recommended

proposed NPS pollution control projects, and researched possible options to enhance the program.

In December 1998, Texas submitted its Coastal NPS Program to NOAA and EPA. After two and a half years of discussion between Texas and the federal agencies, NOAA and EPA published in the Federal Register, in late September 2001, their intent to approve the Texas Coastal NPS Program with certain conditions. NOAA and EPA identified six areas that Texas must strengthen or correct prior to receiving full approval of the Coastal NPS Program. (Table 6.1)

The second notice to conditionally approve Texas' Coastal NPS Program was posted in the Federal Register on April 7, 2003. The Final Conditional Approval Letter was received on July 9, 2003. Texas was given five years to meet the remaining conditions.

Texas continues to seek full approval by addressing the remaining conditions in the Final Conditional Approval Letter. The Texas Coastal Coordinating Council is preparing responses to EPA and NOAA to address these conditions and will continue to negotiate with EPA and NOAA for full approval. Texas anticipates full approval of the Texas Coastal NPS Management Program by July 9, 2008, and full implementation of this program by July 9, 2018.

Table 6.1. Texas Coastal NPS Management Program. Remaining Conditions and Anticipated Year of Condition Resolution

EPA/NOAA Condition	Projected Approval Year			
	2005	2006	2007	2008
New Development and Existing Development		X		
Site Development		X		
Watershed Protection		X		
New and Operating Onsite Disposal Systems				X
Roads, Highways, and Bridges				X
Hydromodification		X		

The National Estuary Program

The National Estuary Program (NEP) was established under §320 of the Clean Water Act to "identify nationally significant estuaries which are threatened by pollution, development, or overuse; promote comprehensive planning for, and conservation and management plans for estuaries of national significance; and enhance the coordination of estuarine research." There are two active estuary programs in Texas. The first was established for the Galveston Bay system and the second was established for the bays and estuaries along the Coastal Bend of South Texas. Each of these estuary

programs developed a Comprehensive Conservation and Management Plan (CCMP) which recommends priority actions and implementation schedules to address impacts observed in the estuary. The CCMP development is a consensus-based process involving a partnership across federal, state, and local levels. With the completion of the CCMPs, each National Estuary Program formed a nonprofit, nonregulatory management structure to implement its plan.

Galveston Bay Estuary Program

The Galveston Bay Estuary Program (GBEP) is a continuation of the National Estuary Program (NEP) established for Galveston Bay in 1989. The Galveston Bay Estuary Program is a partnership of bay stakeholders currently working to implement the Galveston Bay Plan. The plan contains action plans dealing with habitat and species protection, freshwater inflows, spills and dumping, exotic species, point sources of pollution, and nonpoint sources of pollution to protect and restore the health of the estuary, while supporting economic and recreational activities. Eighty-two initiatives are outlined under these nine action plans. The GBEP takes a leading role in facilitating and coordinating the implementation of these initiatives.

Nonpoint source pollution is the number one identified water quality problem in Galveston Bay. Implementation of the Galveston Bay Plan includes the following actions to address this problem: developing and implementing a Galveston Bay public education program aimed at reducing pollution from residential areas; compiling a Galveston Bay BMP Performance Document to inventory nonpoint source control techniques which have been evaluated; identifying and correcting priority watershed pollutant problems by maintaining and publishing an inventory of nonpoint source concerns in the bay watershed; adopting regional construction standards for nonpoint source reduction and implementing toxics and nutrient control practices; encouraging sewage pumpout, storage, and provisions for treatment; and implementing storm water programs for local municipalities.

To date, the GBEP has addressed nonpoint source pollution by convening a forum for information sharing among Galveston Bay stakeholders involved in nonpoint source pollution prevention/control activities, providing technical assistance to local and county governments, and educating and reaching out to children and adults. The GBEP partners with the Houston-Galveston Area Council, the Galveston County Health District, the Galveston Bay Foundation, and the Texas A&M Sea Grant Program to provide technical assistance on stormwater management to local governments; provide technical assistance to small businesses on implementation of waste minimization strategies and general best management practices; develop, maintain, and publish an inventory of nonpoint source concerns in the bay watershed; implement a baywide

public education program aimed at reduction of pollution from residential areas through illustration, presentations, and workshops; and to conduct voluntary inspections and provide information assistance to reduce bacterial pollution caused by malfunctioning septic systems.

Coastal Bend Bays & Estuaries Program

The TCEQ and EPA helped establish the Coastal Bend Bays & Estuaries Program (CBBEP) to develop and implement a plan to protect and restore the bays and estuaries of the Texas Coastal Bend. The CBBEP has developed a Comprehensive Conservation and Management Plan to deal with a wide array of problems ranging from public health and education, freshwater flow, and loss of natural habitats. The CBBEP has implemented the following actions to protect bays and estuaries from nonpoint source pollution:

- A regional handbook of urban nonpoint source pollution BMPs for voluntary use by local governments seeking to implement nonpoint source pollution programs.
- Compliance assistance to small business and industries in the region which are subject to NPDES permit program or have nonpoint source controls needs.
- Assistance to local governments to implement on-site sewage facility programs.
- Coordinate and implement agricultural water quality management programs necessary to meet water quality standards.

Coastal Habitat Restoration

Texas Parks and Wildlife Department has an active program to restore wetlands along the Texas Coast. These marsh creation projects establish intertidal marsh with emergent plants along bay shorelines that are suffering from severe erosion. These created marshes buffer shorelines from erosion and remove both sediments flowing into the bays and sediments that have been re-suspended by storms. These wetlands also help remove nutrients from stormwater runoff. These newly created and restored marshes provide habitat for a wide variety of ecologically and economically important marine life. Typically these restoration projects involve multiple local, state, and federal partners. Citizens also assist by replanting the marshes. Including citizens increases awareness of the value of these marshes.

The BEACH Act

In October 2000, the U.S. Congress passed the Beaches Environmental Assessment and Coastal Health Act of 2000 (BEACH Act) to protect the public health at our nation's beaches. The BEACH Act requires that states,

in cooperation with the EPA, develop and implement a program to monitor coastal recreation waters adjacent to beaches that are used by the public, and to notify the public if water quality standards for pathogens and pathogen indicators are exceeded.

The BEACH Act requires the state to identify all factors used to evaluate and rank beaches; identify coastal recreation waters in the state; identify bathing beaches adjacent to coastal recreational waters; develop a sampling, monitoring, and notification program; develop a method for issuing beach advisories and/or closings; and develop a method to notify the public. In July 2001, the Governor's office appointed the GLO as the lead state agency to implement the BEACH Act based upon the current Beach Watch Program.

The Texas Beach Watch Program gives Texans baseline data on the health of gulf waters, making sure that beaches are safe for swimmers, surfers, sailors and boaters. The Beach Watch Program involves county and city governments, universities, and organizations representing beach goers. Contractors test specified sites for Enterococcus bacteria and issue public advisories if water samples exceed the criteria recommended by the EPA.

The Gulf of Mexico Community-Based Restoration Program

The Gulf of Mexico Community-Based Restoration Program (GCRP) Partnership invites proposals for its citizen-driven habitat restoration projects. The partnership funds on-the-ground activities to restore marine, estuarine and riparian habitats. This grant program seeks to restore and protect the health and productivity of the Gulf of Mexico in ways consistent with the economic well being of the region. Projects must be within the designated priority area, the Lower Laguna Madre, Texas Coastal Bend and Bays, and Galveston Bay.

The GCRP is a multi-year, regional partnership between the Gulf Ecological Management Sites (GEMS) Program and the NOAA Community-Based Restoration Program. The purpose of this partnership was designed to strengthen the conservation efforts of the GEMS Program by supporting on-the-ground habitat restoration benefitting living marine resources and fostering local stewardship of ecologically significant areas across the Gulf of Mexico.

The Bilge Water Reclamation Program

The GLO initiated the Bilge Water Reclamation Program as an innovative response to the large number of spills from commercial and recreational vessels along the Texas coast. Facilities operating under the program collect and process bilge water that is often contaminated by petroleum hydrocarbons from local commercial fishing vessels. The facilities provide

vessels with an environmentally responsible way to dispose of bilge water. There is no charge to use the facility, and the used oil collected is recycled by a local company. The cooperative development of the Bilge Water Reclamation Program, by the GLO and its partners, has proven to have a positive impact on water quality along the Texas coast.

Coastal Texas 2020

Coastal Texas 2020 is a long-term, statewide initiative to unite local, state, and federal efforts to promote the environmental and economic health of the Texas coast. One goal of Coastal Texas 2020 is to increase the state's share of federal funding to fight rapid coastal erosion. Coastal Texas 2020 is designed to implement the vision of a comprehensive approach to coastal issues that mixes local, state, and federal funds with money from the private sector, while combining regulatory changes with market-based solutions.

The Adopt-A-Beach Program

The Texas Adopt-A-Beach Program, sponsored by the GLO, is dedicated to preserving and protecting Texas beaches by raising public awareness; educating citizens about the source of debris; and generating public support for state, national, and international action to clean up coastal waters. Since the first Adopt-A-Beach Cleanup in 1986, more than 300,000 volunteers have come to the Texas coast to haul off tons of trash. At each cleanup site, volunteers record data about the trash to learn more about the cause of marine debris. This data has been instrumental in the passage of international treaties and laws aimed at reducing the amount of offshore dumping. The program's success is due to the generous efforts of dedicated volunteer county coordinators, coastal community leaders, sponsors, and citizens. Strong support from the private sector helps carry the anti-litter message to Texans all across the state.

Border Programs

Urban populations are growing rapidly in the border region, exceeding growth throughout the rest of the state and much of the nation. The McAllen-Edinburg-Mission area is the fourth-fastest growing metropolitan statistical area in the U.S. On the Mexican side of the border, population is rising even more quickly, expanding by almost 50 percent in the past ten years. With this boom has come both an increased demand for water supplies and a strain on communities' water, wastewater, and waste management infrastructure.

The region's economy depends on agriculture, ranching, oil and gas production, trade and commerce, industry, and tourism. Agriculture is particularly important in the Lower Rio Grande Valley, where the lack of an adequate supply of high quality water is threatening the livelihood of farmers. Per capita income is lower in the border region than other parts of

Texas as a whole. Lower income results in fewer tax dollars for local governments to meet existing needs, to keep up with rapid growth, or to plan for the future. Communities are challenged to do more with less. One of the greatest threats to water quality is the lack of sufficient water and wastewater infrastructure to keep pace with border growth. A lack of adequate service increases the likelihood that raw sewage or poorly treated water can enter the river, elevating bacteria levels and the risk of contracting water-borne diseases like hepatitis A. Raw sewage, wastewater, and agricultural activity can also increase levels of nutrients in the river. Elevated nutrient concentrations encourage algal growth and decrease dissolved oxygen. Low dissolved oxygen endangers aquatic plants and animals.

In addition to the need for adequate infrastructure, water quantity problems also affect water quality in the Rio Grande. The less water available, the more concentrated pollutants can become in the river, and the less suitable the water becomes for municipal and agricultural use.

Groundwater throughout the border region is most threatened by increasingly high salt content. Overuse of a groundwater resource depletes water and increases movement of brackish water that requires more extensive treatment to meet drinking water standards. Other causes of high salinity include leaching of salts left in the soil by previous irrigation and seepage of oil-field brines into the ground. Pesticide residues can also travel into an aquifer with irrigation runoff or seepage into the soil.

Border growth also impedes communities' ability to manage the disposal of solid and hazardous wastes. Limited disposal options leads to an increase in illegal dumping. Improper disposal of used tires is a major concern in the region. Hazardous waste transportation is also a concern in border port-of entry cities, where chemical spills pose a potential threat to public health and water supplies. The following is a discussion of some of the programs in place to deal with the issue of water quality in the border region.

The TCEQ Border Pollution Prevention Initiative

The Mexican government's in-bound maquiladora ("maquila") or twin plant program allows foreign companies to establish manufacturing and production facilities in Mexico and ship raw materials and components to those facilities under no or low tariffs. The Maquilas have affected Texas' border environment in a number of ways. One of the most significant environmental impacts is the strain placed on the ability to manage additional wastewater, solid waste, and hazardous waste disposal needs. Since its inception in 1994, the TCEQ Border Pollution Prevention Initiative has worked with maquilas, local, state, and federal governments, and universities to reduce pollution along the border. The program has assisted Mexican federal and border-state governments, universities, and

other institutions in developing pollution prevention and waste minimization capability. Pollution prevention capability has been furthered by facility site assistance visits, training events, partnerships with universities in Mexico, and border roundtables.

The Border Environment Infrastructure Fund

The North American Development Bank established the Border Environment Infrastructure Fund (BEIF) in an effort to make projects affordable, especially for the smallest and poorest communities. The purpose of the BEIF is to make environmental infrastructure projects affordable for communities throughout the U. S.-Mexico border region by combining grant funds with loans or guaranties for projects that would otherwise be financially unfeasible. A primary objective of the BEIF assists communities in transition from highly subsidized projects to self-sustaining projects supported locally by user fees and other revenue. As a result, to access BEIF funds, project sponsors must demonstrate local "buy in" with the commitment of current revenues, capital reserves, and/or debt at the municipal or utility level.

The International Boundary and Water Commission

The mission of the International Boundary and Water Commission (IBWC) is to apply the rights and obligations which the Governments of the United States and Mexico assume under the numerous boundary and water treaties and related agreements. The United States and Mexican sections of the IBWC, USIBWC and MxIBWC, have recently been taking a proactive approach in support of its obligations. For example, the USIBWC holds public meetings along the border to provide information to the local communities on issues such as water quality, ongoing projects, and illegal dumping, and solicits the input of the citizens in addressing these issues. Several of the main goals of the IBWC as they relate to nonpoint source pollution include finding solutions to border sanitation, and working to address other border water quality problems. In order to obtain these goals, the USIBWC has implemented the following objectives:

- promote successful resolution of a broad range of trans-boundary environmental issues
- investigate and report on the most feasible measures for solving border sanitation problems
- conduct various planning and environmental studies for groundwater and border sanitation (water quality) programs

One of the key projects for dealing with border sanitation is the construction of an international wastewater treatment plant in the City of Nuevo Laredo. The Nuevo Laredo International Wastewater Treatment Plant (NLIWTP) provides a high level of treatment for millions of gallons

of sewage each day originating from the City of Nuevo Laredo. The NLIWTP directly impacts the water quality of the Rio Grande and reduces the health risk to residents on both sides of the river. As the project continues, the USIBWC is working with the MxIBWC and Nuevo Laredo's Comision Municipal de Agua Potable y Alcantarillado (COMAPA) on long-term planning for further improvements to the water and wastewater infrastructure in Nuevo Laredo with funds provided by the EPA.

The USIBWC also conducts water quality monitoring in support of its mission to address border sanitation problems along the border. USIBWC field offices located throughout the border provide local support for this mission. In 1998, because of the international nature of the Rio Grande, the State of Texas contracted with the USIBWC to implement the Clean Rivers Program (CRP) for the Rio Grande in its 1,254-mile international boundary section. This agreement has led to a more coordinated effort between federal, state, and local agencies in addressing the water quality of the Rio Grande.

The Economically Distressed Areas Program

The Economically Distressed Areas Program (EDAP), administered by the Texas Water Development Board, provides financial assistance in the form of a grant, a loan, or a combination grant/loan to bring water and wastewater services to economically distressed areas, where present water and wastewater facilities are inadequate to meet the needs of residents. To be eligible for the program, projects must be located in economically distressed areas within affected counties and/or be located next to an international border. The EDAP will fund construction, acquisition, or improvements to water supply and wastewater collection and treatment works, including all necessary engineering work. The program also includes measures to prevent future substandard development.

The Colonias Initiatives Program

The Colonias Initiatives Program is administered by the Texas Secretary of State's Office. One of the greatest concerns regarding the colonias is the lack of wastewater infrastructure, potable water, and the potentially serious consequences for public health and its effect on quality of life. The Colonia Incentives Program was initiated to advance efforts to get colonia residents' homes connected to water and wastewater services in a more expeditious manner.

Border Recycles Day

Border Recycles Day involves a variety of environmental events in communities and schools as part of the statewide Texas Recycles Day (and National America Recycles Day) on November 15th. The first Border Recycles Day was celebrated in November 1998. Events initially were

staged in Texas border cities by the TCEQ, but local communities have since taken ownership and created their own initiatives. Now Border Recycles Day has been formally incorporated in the State-to-State Strategic Environmental Plans that the TCEQ has developed with counterpart agencies in the neighboring states of Chihuahua, New Mexico, Coahuila, Nuevo Leon, and Tamaulipas. As a result, some Texas border communities host sister-city events with their Mexican counterparts.

Friends of the Rio Grande

One of the goals of the USIBWC Clean Rivers Program (CRP) is to promote environmental awareness through public education and outreach. TCEQ and the USIBWC CRP have teamed together to form an initiative called Friends of the Rio Grande. The goals of this initiative are to increase public outreach programs throughout the border region, implement a volunteer monitoring program in cooperation with Texas Watch, promote environmental clean ups in the basin, and to provide recognition of outstanding efforts in environmental activities to encourage greater participation in environmental awareness.