

Groundwater Assessment



Groundwater well in City of Friona

Groundwater Assessment

Overview - Groundwater Resources and the Texas Groundwater Protection Committee

In 1999, Texans used 16.0 million acre-feet of water. Groundwater, a fundamental component of the state's water resources, supplied 9.3 million acre-feet, or about 58% of all the water used by Texans for domestic, municipal, industrial, and agricultural purposes. About 78 percent of the groundwater used in 1999 was for irrigation, with the remainder being used for municipal supplies, rural and municipal domestic consumption, rural livestock, electric utility, and industry. Approximately 36 percent of municipal water is obtained from groundwater sources. Groundwater also provides a significant amount of the base flow for the state's rivers and streams, and is, therefore, of key importance to the maintenance of the state's environment and economy.

The groundwater used by Texans is produced primarily from aquifers, underground layers of rock with water stored in pore spaces, cracks or voids. Major aquifers are defined as producing large quantities of water in a comparatively large area of the state, whereas minor aquifers produce significant quantities of water within smaller geographic areas or small quantities in large geographic areas. Minor aquifers are very important as they may constitute the only significant source of water supply in some regions of the state. The major and minor aquifers are composed of many rock types, including limestones, dolomites, sandstones, gypsum, alluvial gravels, and in some parts of the state, igneous rocks.

Nine major aquifers and twenty-one minor aquifers have been delineated within the state. These major and minor aquifers underlie approximately 76 percent of the state's surface area of 267,338 square miles (TWDB, 1995). Other undifferentiated, local aquifers may represent the only source of groundwater where major or minor aquifers are absent. These local aquifers, which provide groundwater that is used for all purposes, vary in extent from very small to several hundred square miles (TWC, 1989).

In March 1985 the Texas Department of Water Resources, predecessor to the Texas Commission on Environmental Quality (TCEQ) and the Texas Water Development Board (TWDB), received a grant from the EPA to improve coordination of groundwater protection activities undertaken by State agencies. In response to this federal mandate, the interagency Groundwater Protection Committee was established.

In 1989, the 71st Texas Legislature created the Texas Groundwater Protection Committee (Committee or TGPC) as a means to bridge the gap between existing state groundwater programs and to optimize water quality protection by improving coordination among agencies involved in groundwater activities. State law (Texas Water Code, §§ 26.401 through 26.407) establishes the Committee and outlines the powers, duties, membership, and responsibilities of the Committee. The Committee effectively replaced, and continued with the efforts of the predecessor Groundwater Protection Committee.

Section 26.401 of the Texas Water Code establishes the state's groundwater protection policy. The policy sets out non-degradation of the state's groundwater resources as the goal for all state programs. The policy recognizes the variability of the state's aquifers, the importance of maintaining water quality for existing and potential uses, the protection of the environment, and the maintenance and enhancement of the long-term economic health of the state. The policy states that discharges of pollutants, disposal of wastes, and other regulated activities be conducted in a manner that will maintain present uses and not impair potential uses of groundwater or pose a public health hazard. The use of the best professional judgement by the responsible state agencies in attaining the goal and policy is also recognized.

The TGPC actively seeks to implement this policy by identifying opportunities to improve existing groundwater quality programs and promoting coordination between agencies. The Committee also strives to improve or identify areas where new or existing programs could be enhanced to provide additional protection (TGPC, 1996a).

Texas Water Code §26.403 and subsequent legislative amendments identify the following entities with groundwater protection programs for membership to the TGPC:

- ! Texas Commission on Environmental Quality (TCEQ)
- ! Texas Water Development Board (TWDB)
- ! Railroad Commission of Texas (RCT)
- ! Texas Department of Health (TDH)
- ! Texas Department of Agriculture (TDA)
- ! Texas State Soil and Water Conservation Board (TSSWCB)
- ! Texas Alliance of Groundwater Districts (TAGD)
- ! Texas Agricultural Experiment Station (TAES)
- ! Bureau of Economic Geology (BEG)
- ! Texas Department of Licensing and Regulation (TDLR)

The TCEQ is designated as the lead agency of the TGPC. The regulatory protection of groundwater is primarily the responsibility of the TCEQ. Certain

activities requiring the regulatory protection of groundwater are under the jurisdiction of the RCT, the TDA, the TSSWCB, and the TDLR. The TWDB has certain monitoring authorities in regard to groundwater but does not possess the statutory authority to regulate activities which may contaminate groundwater. The TAGD, as an organization, has no regulatory or enforcement authority, but individual groundwater districts may have limited authorities for action with regard to groundwater contamination. TAES and the BEG conduct research activities related to groundwater.

Table 14 - 1 has been compiled to summarize the state's groundwater protection programs. The table provides a list of the programs or activities, and indicates the implementation status of the program and the state agency with the major responsibilities related to the program. A brief summary of the groundwater protection responsibilities and activities under the jurisdiction of the TGPC's member agencies/organizations follows Table 14 - 1.

Table 14 - 1. Summary of State Groundwater Protection Programs

Programs or Activities	Check (X)	Implementation Status	Responsible State Agency
Active SARA Title III Program	X	fully established	TCEQ*
Ambient Groundwater Monitoring System	X	fully established	TWDB
Aquifer Vulnerability Assessment	X	continuing efforts	TCEQ*
Aquifer Mapping	X	fully established	TWDB
Aquifer Characterization	X	fully established	TWDB
Comprehensive Data Management System	X	under development	TGPC*
Core Comprehensive State Groundwater Protection Program (CSGWPP)	X	under development	TGPC*
Groundwater Best Management Practices	X	under development	TGPC*
Groundwater Legislation	X	fully established	TCEQ*
Groundwater Classification	X	fully established	TGPC*
Groundwater Quality Standards	X	fully established	TCEQ
Interagency Coordination for Groundwater Protection Initiatives	X	fully established	TGPC*
Municipal Solid Waste Program (Subtitle D Primacy)	X	fully established	TCEQ
Nonpoint Source Controls/Agricultural & Silvicultural	X	continuing efforts	TSSWCB
Nonpoint Source Controls/All Others	X	continuing efforts	TCEQ
Pesticide State Management Plan (Generic)	X	received EPA concurrence	TGPC*

Table 14 - 1. Summary of State Groundwater Protection Programs

Programs or Activities	Check (X)	Implementation Status	Responsible State Agency
Pesticide Specific Regulation Programs	X	fully established	TDA
Pollution Prevention Program	X	fully established	All Agencies
Radioactive Waste Disposal Program	X	fully established	TCEQ
Resource Conservation and Recovery Act (RCRA) Primacy	X	fully established	TCEQ
State Hydrocarbon Exploration/Production Regulations	X	fully established	RCT
State Superfund	X	fully established	TCEQ
State Oilfield Cleanup Fund	X	fully established	RCT
State Petroleum Storage Tank Remediation Fund	X	fully established	TCEQ
State RCRA Program incorporating more stringent requirements than RCRA Primacy		not applicable	
State Septic System Regulations	X	fully established	TCEQ*
Surface Mining and Reclamation Regulations	X	fully established	RCT
Underground Storage Tank Installation Requirements	X	fully established	TCEQ
Underground Storage Tank Registration Program	X	fully established	TCEQ
Underground Injection Control Program/Industrial	X	fully established	TCEQ
Underground Injection Control Program/Oil & Gas	X	fully established	RCT
Vulnerability Assessment for Drinking Water/ Source Water Protection	X	fully established	TCEQ
Wellhead Protection Program (EPA-approved)	X	fully established	TCEQ
Wastewater Permits	X	fully established	TCEQ
Water Well Abandonment Regulations	X	fully established	TDLR
Water Well Installation Regulations	X	fully established	TDLR

NOTES:

TCEQ - Texas Commission on Environmental Quality
 TGPC - Texas Groundwater Protection Committee
 TDA - Texas Department of Agriculture
 TDLR - Texas Department of Licensing and Regulation

TWDB - Texas Water Development Board
 TSSWCB - Texas State Soil and Water Conservation Board
 RCT - Railroad Commission of Texas

* Indicates responsibility for the program falls to more than one state agency.

Texas Commission on Environmental Quality

The TCEQ conducts various groundwater protection programs that focus on both prevention of contamination and remediation of existing problems through education, permitting, and enforcement. As the state lead agency for water resources, the TCEQ administers both state and federally mandated programs including: the Resource Conservation and Recovery Act; the Comprehensive Environmental Response, Compensation and Liability Act; the Clean Water Act; the Safe Drinking Water Act; and the development of state management plans for groundwater under the Federal Insecticide, Fungicide and Rodenticide Act.

TCEQ reorganized the primary agency operations into three main functional offices, designed to streamline regulatory processes: the Office of Permitting Remediation and Registration, the Office of Environmental Planning, Assessment and Analysis, and the Office of Compliance and Enforcement. Under the Commission and Executive Director, these three offices, with support help from the Office of Legal Services, Office of Administrative Services:

- ! regulate underground and above ground product storage tanks and require groundwater monitoring and remediation at contaminated sites
- ! prevent groundwater contamination and insuring remediation at industrial sites through the waste disposal facility permitting program, the Class I, Class III and Class V underground injection control programs, and uranium and radioactive waste disposal programs
- ! monitor activities associated with the collection, handling, storage, processing, and disposal of municipal solid waste to ensure protection of groundwater and require remediation where these activities have failed
- ! are responsible for both Federal and State Superfund activities, including conducting remedial investigations, and seeking funding for remedial activities based upon a health risk ranking program
- ! are responsible for the surface and groundwater quality management and planning programs , the implementation of the surface and groundwater non-point source pollution programs, the pesticides in groundwater program, and supporting the TGPC
- ! are responsible for the development and implementation of water quality standards
- ! ensure that groundwater resources are protected through permitting activities related to confined animal feeding operations, municipal and industrial wastewater treatment
- ! monitor public water systems for compliance with state drinking water standards, implements the Safe Drinking Water Act Source Water Protection Program, and conducts the Wellhead Protection Program
- ! investigate contamination complaints and the inspect permitted and non-permitted facilities
- ! administer the Edwards aquifer pollution abatement plan review program and administer the on-site wastewater program

- ! ensure that groundwater resources are protected during enforcement activities related to the municipal solid waste, industrial and hazardous waste, petroleum storage tank, agricultural/watershed management, water utilities, and public water supply programs.

In November 1999, the State of Texas received EPA approval of its Source Water Assessment and Protection (SWAP) Program. This approval represents a major milestone in an ongoing cooperative effort between the TCEQ and the USGS to develop and implement a scientifically-defensible methodology for assessing susceptibility of Texas' public water supplies (PWS) to contamination. Significant progress toward this goal is being achieved as well as all tasks and time lines being met.

As per EPA's agreement and approval of the program in November 1999, no assessments will be released until May 2003. At that point in time, over 17,000 assessments will be complete and released to both EPA and the public.

Railroad Commission of Texas

The Surface Mining and Reclamation Division of the Railroad Commission of Texas (RCT) is authorized to enforce laws and regulations consistent with the Texas Surface Coal Mining and Reclamation Act and the Texas Uranium Surface Mining and Reclamation Act. Groundwater information is required in the regulations, as are monitoring plans for pre-mining and post-mining conditions. Groundwater investigations and monitoring by the Surface Mining and Reclamation Division is conducted in response to citizen complaints of adverse impact from surface mining activities.

The RCT's Oil and Gas Division is responsible for protecting groundwater from activities related to the drilling, exploration, and production of oil, gas, and geothermal resources, the underground storage of hydrocarbons, and the solution mining of brine. The regulations of the Oil and Gas Division for the well drilling, completion, and plugging focus on the protection of groundwater resources. The RCT administers the EPA-delegated Underground Injection Control Program under the Safe Drinking Water Act for Class II injection wells associated with oil and gas activities. The RCT regulates the handling, storage, treatment, and disposal of oil and gas wastes. The RCT responds to spills from pipelines under its jurisdiction and to other emergencies related to the production and transportation of oil and gas. The RCT responds to citizen complaints regarding alleged groundwater contamination from oil and gas activities and to alleged unauthorized activities, which may endanger groundwater.

Texas Department of Agriculture

The Texas Department of Agriculture (TDA) has lead authority for pesticide regulation in the state of Texas. Recognizing pesticides as potential groundwater contaminants, and having primary responsibility to prevent unreasonable risk to humans or the environment from the use of pesticides, TDA performs studies and analyses aimed at assessing health, ecological, and environmental effects of various pesticides. This analysis is performed by the agency's Pesticide Impact Evaluation activity in order to ensure compliance with federal laws and regulations relating to the use of pesticides and eventual protection of groundwater resources. TDA accomplishes this by independently substantiating and validating claims of pesticide contamination relating to human health and the environment.

Texas Department of Health

The Texas Department of Health's (TDH) Bureau of Radiation Control (BRC) regulates radioactive materials in Texas under the authority of the Atomic Energy Act of 1954 as amended. The BRC monitors groundwater for radionuclides on a routine basis at two facilities in Texas - Pantex and the University of Texas System Interim Storage site. Intermittently the BRC will sample groundwater as a result of an incident, complaint, or situation which leads the BRC to believe there may be groundwater contamination.

Texas State Soil and Water Conservation Board

The TSSWCB, under Title 7, Chapter 201 and 203 of the Agriculture Code of Texas, is charged with the overall responsibility for administering and coordinating the state's soil and water conservation program with the state's soil and water conservation districts. Section 201.016 gives the agency responsibility for planning, implementing, and managing programs and practices for abating agricultural and silvicultural non-point source pollution. Currently, the agricultural/silvicultural non-point source management program includes: problem assessment, management program development and implementation, monitoring, education, and coordination.

Texas Water Development Board

The Texas Water Development Board (TWDB) collects data on the state's aquifers which includes the occurrence, availability, quality, and quantity of groundwater and the current and projected demands on groundwater resources. This is done through the statewide groundwater level measurement program, groundwater quality sampling program, and groundwater studies.

The purpose of the groundwater quality sampling program is to: 1) monitor changes, if any, in the quality of groundwater over time; and 2) establish, as accurately as possible, the baseline quality of groundwater occurring naturally in

the state's aquifers. The groundwater quality monitoring program is accomplished in accordance with procedures established in the TWDB's *Field Manual for Groundwater Sampling*, in supplemental samples analyzed on Hach instruments, and by obtaining data collected by other entities such as groundwater conservation districts and other state/federal agencies (Nordstrom and Beynon, 1991).

Texas Department of Licensing and Regulation

The Texas Department of Licensing and Regulation (TDLR) is responsible for the water well drilling program in which all monitor wells, water wells, and Class V injection wells are subject to the TDLR's rules regarding driller licensing, reporting, and well construction criteria.

Texas Alliance of Groundwater Districts

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

Texas Agricultural Experiment Station

The Texas Agricultural Experiment Station (TAES) is the official agricultural research agency in Texas. Headquartered at Texas A&M University, TAES promotes food and fiber production that emphasizes water conservation and the protection of natural resources. Broad goals of the TAES groundwater research program are to protect, preserve, and efficiently use water resources, and to develop sustainable agricultural production systems. Groundwater programs of TAES stress the development of management strategies, technologies, and educational programs to support sustainable agriculture. TAES groundwater quality research focuses on reductions in chemical use; the control, fate, and transport of agricultural chemicals; and the remediation of contaminated groundwater.

Bureau of Economic Geology

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

Groundwater Protection Strategy

State law mandates the major responsibilities of the Committee are, on a continuing basis:

- ! to improve interagency coordination in the area of groundwater protection;
- ! to develop and update a comprehensive groundwater protection strategy for the state;
- ! to study and recommend to the Legislature groundwater protection programs for areas in which groundwater is not protected by current regulation;
- ! to publish an interagency groundwater monitoring and contamination report; and
- ! to file with the governor, lieutenant governor, and speaker of the house of representatives a report of the Committee's activities during the biennium preceding each regular legislative session, including any recommendations for legislation for groundwater protection.

The Texas Legislature has charged the Committee with developing and updating a comprehensive groundwater protection strategy for the state that provides guidelines for the prevention of contamination and for the conservation of groundwater and provides for the coordination of the groundwater protection activities of the agencies represented on the Committee. With the recent state focus on the need for assuring a high quality supply of groundwater and recognizing the programmatic changes that have occurred since the state's first groundwater protection strategy was developed, the TGPC decided in January 2001 to update the strategy. Since the first strategy was published, the nature and extent of many of the state's water quality and quantity programs have dramatically changed.

The first state groundwater protection strategy was published in January 1988 and, until now, has not been updated. However, there have been several efforts to describe the groundwater protection program and authorities of state agencies including the *Texas Ground Water Protection Profiles, 1991*, and later in each of

the Committee's annual *Joint Groundwater Monitoring and Contamination Report*. In addition, the TGPC has worked on an unpublished Comprehensive State Groundwater Protection Plan, a non-mandatory U.S. Environmental Protection Agency supported effort, which was the predecessor of this document. These past efforts have helped the Committee identify problem areas and have aided groundwater protection program improvements.

In developing the current draft of the *Strategy*, the TGPC recognized that the state has numerous successful groundwater programs spread across local and state governmental agencies, and research institutions. Therefore, a key part of the draft *Strategy* is documenting how the current regulatory, outreach, and research programs work to protect groundwater resources. The second fundamental component of the draft *Strategy* is the identification of protection gaps in program implementation or coordination. TGPC believes that this approach to developing the strategy, grounded firmly within the existing policy and programmatic directions given by the Legislature, will result in a document that sets realistic objectives for success and provides a road map for action over the next five years (the TGPC's short-term planning horizon).

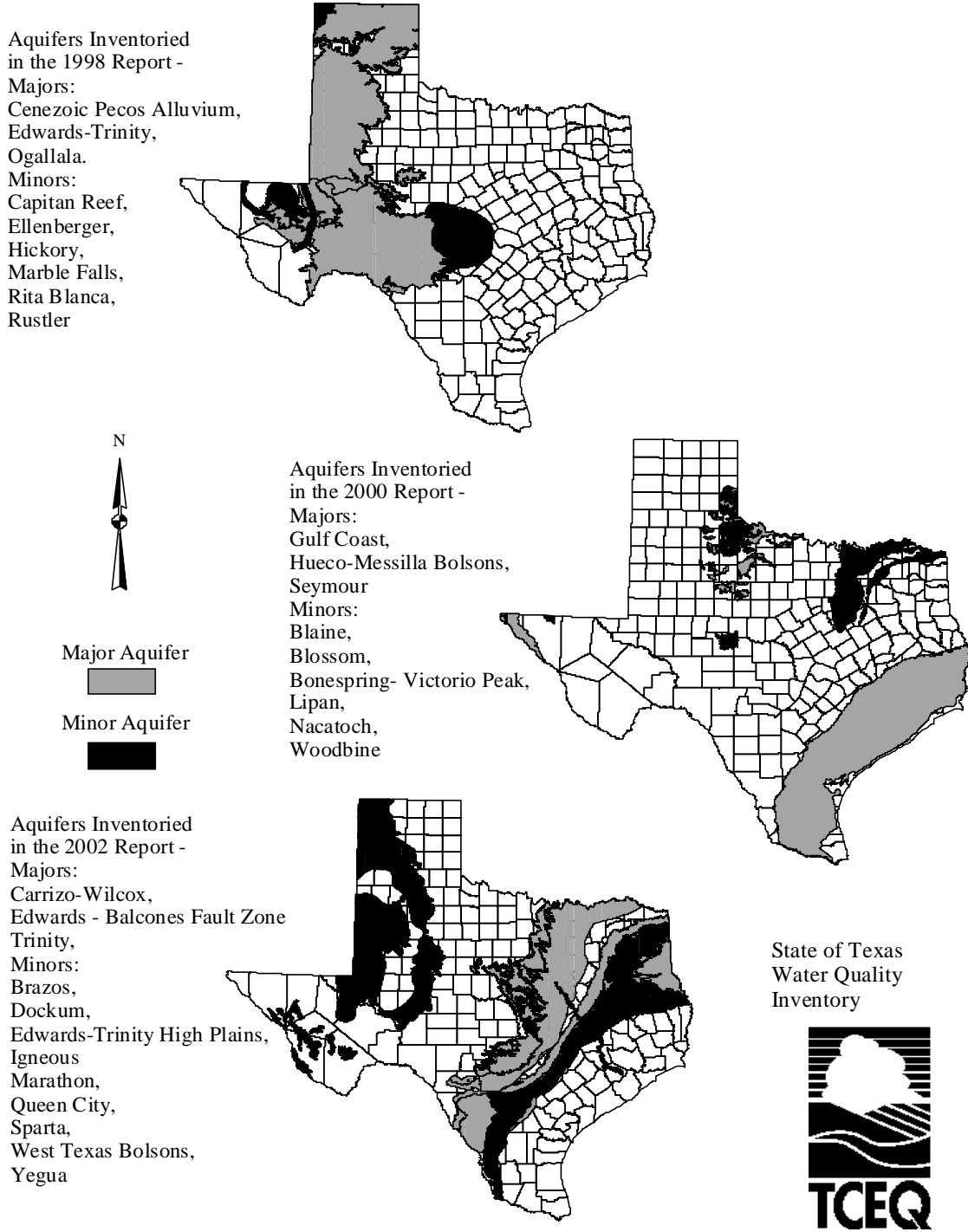
The TGPC acknowledges that draft *Strategy* does not contain an analysis of whether the groundwater resources in the state are being adequately protected for current and future uses. The Committee plans to tackle this issue in the future.

The TGPC, as the coordinating entity for groundwater protection issues in Texas, has begun the process of consolidating ambient, facility, and public water supply groundwater monitoring data as the groundwater component of a continuing water quality inventory that will be readily available to the public, local government, state agencies, the Texas Legislature, the EPA, and Congress, to evaluate Texas water quality. This report, submitted to the EPA under the CWA, Section 305(b), shows TGPC groundwater inventory efforts performed between 1996 and 2002, address all the designated major and minor aquifers in Texas.

Figure 14 - 1 shows the aquifers that have been inventoried. Funding for these inventories has been made available to the TCEQ through the EPA 106 grant program.

The TGPC's goal is to inventory the water quality of all major and minor aquifers at least every five years, using ambient, facility, and public water supply data. Statewide groundwater quality data will be compiled and made readily available to the public for current and historical analyses of state groundwater quality.

Figure 14 - 1. Selected Texas Aquifers - 1998, 2000, and 2002 Reports



Process

TGPC member agencies provide data for the TGPC's groundwater quality inventorying efforts. In 1996, the TGPC, through the partnership of two of its member agencies, the TNRCC, predecessor agency to the TCEQ and the TWDB, began this process by performing an inventory of the groundwater quality of one major, one minor, and two of Texas' local aquifer systems. This information was published in the TNRCC's *State of Texas Water Quality Inventory 1996*, addressing both surface water and groundwater quality (TNRCC, 1996).

EPA representatives requested that the 1998 report update emphasize the spatial and graphical representation of the most recent available groundwater quality data, with maps showing examples of groundwater quality in wells located in the selected aquifers. This 2000 report continues to honor that request by illustrating, as an example, ambient nitrate concentrations for the selected aquifers, and demonstrates the efforts toward TGPC's goal of providing timely and concurrent analyses of state groundwater quality using the most current spatially related data from available sources. Each selected aquifer is represented with a map showing the locations of water wells sampled by the TWDB from 1994 to 1996, from 1996 to 1997, or 1998 to 2002 showing nitrate analyses exceeding EPA drinking water standards (10 mg/l). Tables follow each map showing analyzed values of a number of EPA drinking water standard parameters (Ambient Monitoring Groundwater Quality Data) and summaries of the sources and types of groundwater contamination at regulated facilities (Groundwater Contamination Summary).

Currently, spatial groundwater quality data is only reliably available for ambient water well monitoring efforts performed by the TWDB. Data from other state agencies is increasingly but not consistently available with geographic coordinates, but rather as location addresses (street, city, county, etc.). Correlating this address information with the spatial representation that is the TGPC's goal is problematic, and is not attempted in this report. Efforts to provide spatial data representation for these facilities is a primary focus for the TGPC, and will be supplied in future groundwater inventory reporting.

The TGPC relies upon ambient monitoring data available from the TWDB for state groundwater quality information. The TWDB maintains a database of ambient groundwater monitoring data for the state from over 51,000 water wells (Figure 14 - 2), and performs ambient groundwater monitoring on water wells in a particular number of Texas aquifers each year, so that all major and minor aquifers of the state are monitored approximately every five years. The TGPC's groundwater quality inventory efforts correspond to the TWDB's monitoring schedule. Sample data from TWDB sampling programs for the twenty-one aquifers, nine completed in 1995 and 1996, nine others completed in 1997 and

1998, and the remaining twelve from 1999 through 2002, taken from over 3,000 domestic and agricultural water wells, were used as part of the 2002 current report. Table 14 - 2 is a summary of analyses results of samples taken from the thirty aquifers. The TWDB has published detailed reports of some of its collected groundwater quality data in *Hydrologic Atlases* of certain individual aquifers (Ashworth, 1991; Payne, 1991; Hopkins, 1995; Hopkins, 1996a; Biri, 1996; Brown; 1996; Hopkins 1996b; Brown; 1997; and Brown; 1998).

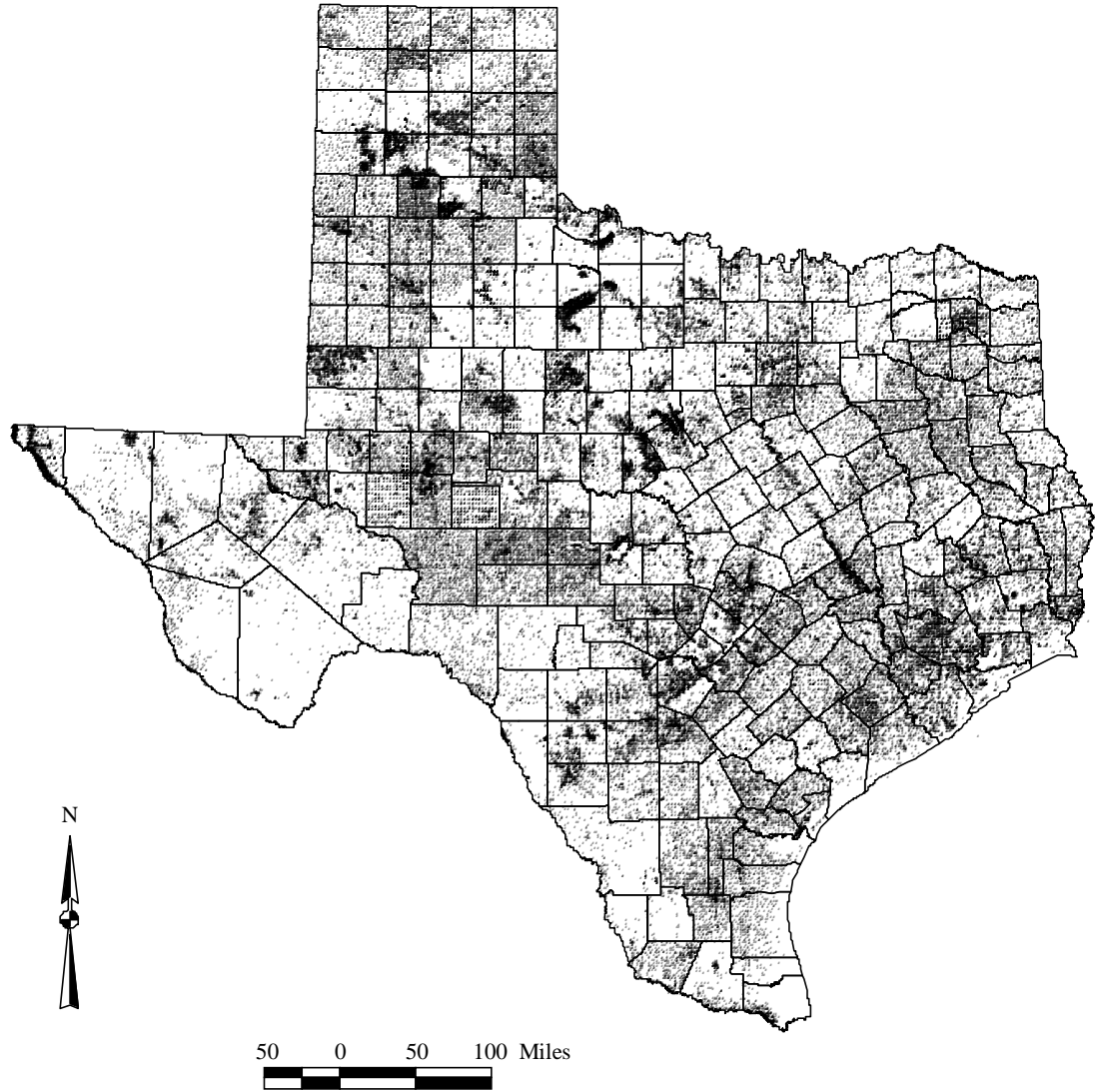
Table 14 - 2. Ambient Monitoring Groundwater Quality Data / Selected Major and Minor Aquifers (1994 - 2002)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL ¹	< MCL ² (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	3037	1188	1825	25
Barium	2 mg/l	3045	41	2996	8
Cadmium	5 µg/l	1893	793	1050	33
Chromium	100 µg/l	1857	537	1316	4
Fluoride	4 mg/l	2914	406	2347	176
Mercury	2 µg/l	580	551	1629	792
Nitrate (N)	10 mg/l	2943	515	1629	792
Selenium	50 µg/l	3275	1446	1721	95
Secondary Constituents					
Chloride	300 mg/l	2931	0	2450	481
Copper	1 mg/l	3348	938	2409	1
Fluoride	2 mg/l	2582	406	1552	639
Iron	0.3 mg/l	3416	871	2143	401
Manganese	50 µg/l	3353	1102	2096	152
Silver	100 µg/l	584	570	11	24
Sulfate	300 mg/l	2931	26	2487	643
Dissolved Solids	1000 mg/l	2928	0	2284	643
Zinc	5 mg/l	3355	495	2856	0
Radioactivity					
Gross Alpha	15 pCi/l	761	242	405	118
Beta	50 pCi/l	767	243	499	27

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Figure 14 - 2. Ambient Monitoring Network Wells



State of Texas Water Quality
Inventory - Texas Ambient
Groundwater Monitoring Wells

Data provided by the Texas Water
Development Board - 1998



Joint Groundwater Monitoring and Contamination Report

State law (TWC, §§26.405 & 26.406) requires the TGPC to compile and publish an annual report to describe the current status of groundwater monitoring activities conducted by or required by each state agency at regulated facilities or associated with regulated activities. The report is required to contain a description of each case of groundwater contamination documented during the previous calendar year, and a description of each case of contamination documented during previous periods for which enforcement action was incomplete at the time of issuance of the preceding report. The report is also required to indicate the status of enforcement action for each case of groundwater contamination.

The purpose of the annual *Joint Groundwater Monitoring and Contamination Report* (henceforth referred to as the joint report) is to compile and make available to the public the status of groundwater monitoring associated with activities regulated by the contributing state agencies, and the status of groundwater contamination reasonably suspected of having been caused by activities regulated by state agencies. The report provides background information on monitoring and regulatory rules and policies. The information is provided to assist the public and state policy makers in interpreting the current picture of groundwater contamination in the state and the status of state agency response.

The groundwater protection programs of the state agencies generally fall within one of three categories: regulatory agencies requiring or conducting groundwater monitoring to assure compliance with guidelines and regulations for the protection of groundwater from discharges of contaminants; agencies or entities conducting groundwater monitoring to assess ambient or existing groundwater quality conditions and to track changes in water quality over time; and agencies or entities conducting research activities related to groundwater resources and groundwater conservation.

Each regulatory agency which requires or conducts groundwater monitoring to assure compliance with guidelines and regulations to protect groundwater from discharges of contaminants has its own monitoring program requirements and procedures. The criteria used to assess the need for groundwater monitoring varies among the regulatory entities. There are thirteen programs in three agencies monitoring changes in groundwater quality for permit and operational requirements at more than 8,650 facilities statewide. An estimated 24,650 monitor and water wells are being used for groundwater monitoring purposes at these facilities. The majority (greater than 98%) of the facilities being monitored are under the jurisdiction of the TCEQ, with the remainder under the jurisdiction of the RCT, and the TDH.

Some agencies or entities do not have specific regulatory functions which would be served by groundwater monitoring programs. Agencies or entities such as the TWDB and the member districts of the Texas Alliance of Groundwater Districts conduct groundwater monitoring to assess ambient or existing groundwater quality conditions and to track changes in water quality over time. Some monitoring programs are developed for water quality assessment studies which target specific geographic areas, specific contaminants or constituents, or specific activities. Contamination cases discovered by these agencies or entities through groundwater studies or groundwater sampling programs are referred to the regulatory agency with appropriate jurisdiction.

Regulatory groundwater monitoring data is extensive in many program areas. However, the application of monitoring requirements within and across regulatory programs can be diverse, dependent upon the level of program development and the potential of the regulated activity to impact public health. Many non-permitted facilities were in existence prior to the implementation of the current regulatory program, and are therefore exempt or grandfathered from monitoring requirements. In the wastewater programs, there are also areas where monitoring is not required, however permits for older facilities are now limited to a five year duration, and any change in the permit for municipal, agricultural, and industrial wastewater treatment facilities will subject the facility to a review of its potential for groundwater impact. Monitoring for pesticides in groundwater targets only areas with the highest risk for impact, as determined by a vulnerability assessment, and is not routinely conducted statewide.

As defined by Committee rules (Title 30, Texas Administrative Code, § 601.3) for inclusion in the annual joint report, groundwater contamination is the detrimental alteration of the naturally occurring physical, thermal, chemical, or biological quality of groundwater reasonably suspected of having been caused by the activities of entities under the jurisdiction of the agencies with groundwater protection responsibilities. The Committee recognizes that groundwater contamination may result from many sources, including current and past oil and gas production and related practices, agricultural activities, industrial and manufacturing processes, commercial and business endeavors, domestic activities, and natural sources that may be influenced by, or may result from, human activities. The contamination cases identified in the annual joint report are primarily those where contaminants have been discharged to the surface, to the shallow subsurface, or directly to groundwater from activities such as the storage, processing, transport, or disposal of products or waste materials.

There were 7,435 documented groundwater contamination cases addressed in the 2001 (most recently published) joint report. Approximately 97 percent of the reported cases were under the jurisdiction of the TCEQ. The remainder of the

cases were under the jurisdiction of the RCT and the groundwater conservation districts which make up the Texas Alliance of Groundwater Districts. The vast majority of the cases documented under the jurisdiction of the TCEQ were identified through regulatory compliance monitoring, while the cases under the jurisdiction of the RCT and the groundwater conservation districts were identified from special studies, investigations in response to complaints, or ambient groundwater quality monitoring activities (TGPC, 2002).

The most common contaminants reported in 2001 included gasoline, diesel, and other petroleum products, due to the large number of petroleum storage tank related cases in this report. Less common contaminants included volatile organic compounds (such as benzene, toluene, xylene, phenol, trichloroethylene, carbon tetrachloride, dichloroethylene, and naphthalene), pesticides (such as alachlor, atrazine, bromacil, dicamba, and prometon), creosote constituents, solvents, heavy metals, and sodium chloride (TGPC, 2002).

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 generally consists of confirmation of the contamination; an investigation to study the extent, composition, and circumstances of the contamination; the planning of corrective action measures based upon the investigation; the implementation of the corrective action plan; monitoring of the effectiveness of the corrective action measures; and ultimately, the completion of the corrective action measures. Table 14 - 3 is a list of ten major contaminant sources, some of which are quantifiable through information obtained from documented cases of groundwater contamination, and some selected using best professional judgement and from reliable but anecdotal information.

Figure 14 - 3 shows the number of regulated facilities with known groundwater contamination by county, and Table 14 - 4 lists statewide documented groundwater contamination case data collected by the TCEQ for 2001, by agency and division. Table 14 - 5 is a "Groundwater Contamination Summary" listing sites with groundwater contamination by source type for all counties which contain outcrop of the nine selected aquifers inventoried in this report.

Since spatial data for most of these facilities is not available to the compilers of the joint report, it is difficult to correlate this groundwater contamination data with aquifer outcrop locations. These facilities are currently listed by county, but the TCEQ has begun to collect spatial location (latitude and longitude) data so that the distribution of facilities with known groundwater contamination can be analyzed precisely.

Public water supply (PWS) system water quality data is maintained by the TCEQ for all drinking water systems in Texas. Many PWS systems obtain some or all of their water from groundwater sources (Figure 14 - 4), and all systems must have periodic outflow water quality testing. It is difficult to use this data for ambient monitoring purposes since testing is performed after treatment, yielding results which are not representative of in situ groundwater quality. A number sites with known groundwater contamination are listed in the *Joint Groundwater Monitoring and Contamination Report*. In the 1996 report, 2 aquifers were analyzed for ambient purposes. This analysis was not performed for this inventory cycle because it is difficult to associate analytical data with specific wells and accurate well completion data was not available. The TCEQ is currently reviewing submitted monitoring data to recognize data useful for ambient monitoring and as indicators of groundwater quality. When this is accomplished, and since PWS systems are precisely geographically located, the data will be used to provide additional aquifer-level analyses of ambient groundwater quality.

Groundwater Quality Data

The 2002 groundwater inventory efforts show that ambient groundwater quality in Texas varies among the thirty study aquifers, with maximum contaminant level (MCL) being exceeded for some parameters (nitrate, sulfate, total dissolved solids, or others) in groundwater taken from water wells sampled in the Ogalalla and Dockum aquifers in the Texas Panhandle; in some wells in the Edwards-Trinity, Cenozoic Pecos Alluvium, Capitan Reef Complex, and Rustler aquifers in West Texas; in some wells in the Gulf Coast aquifer; in the majority of the wells in the Blaine and Lipan aquifers in the north-central and west-central parts of Texas. Fluoride (naturally occurring) appears as a secondary contaminant of concern sporadically throughout the wells sampled. Wells sampled in the Seymour aquifer indicate that nitrate is also a major concern in north-central Texas. Ambient groundwater quality is generally good in the other aquifers inventoried in all years, but for the twelve aquifers sampled for the 2002 report, all aquifers had at least some excursions above the MCL for nitrate.

In the following section, each inventoried aquifer is illustrated on a map delineating aquifer outcrop, down-dip extent if present, sample well locations, and wells with groundwater samples which exceeded the maximum contamination level (MCL) for nitrate according to EPA drinking water standards. Each map is followed by an “Ambient Monitoring Groundwater Quality Data” table listing drinking water standard parameter analyses and a “Groundwater Contamination Summary” table listing the program-specific number of contaminated sites in counties where subject aquifers outcrop. Since spatial data for these facilities is not available, they may not occur at an aquifer location in particular counties.

Groundwater contamination at regulated facilities occurs principally in heavily populated areas of the state, such as Houston, Dallas, Fort Worth, San Antonio and El Paso, primarily at petroleum storage tank facilities. An evaluation of the spatial occurrence of regulated facility and PWS system groundwater impacts will be completed and reported in a subsequent inventory.

Comparing ambient water quality data to the occurrence of contamination sites suggests that a high concentration of regulated surface activity sites with groundwater contamination does not correlate with area-wide ambient groundwater degradation. This is understandable, given that contamination from most regulated surface activities tends to impact shallow, local water bearing zones that are separated from the major and minor aquifers.

Conclusion

Generally, the groundwater quality in the state of Texas remains good on a regional basis. There may be local degradation of groundwater due to contamination from regulated surface activities, however these occurrences have not impacted the overall aquifer to any great extent. Trend analysis to determine if the quality has degraded with respect to use has not been performed, and is complicated by changing minimum detection levels in lab analysis, widespread distribution of wells in the sampling network, and the long term nature of the ambient groundwater sampling program.

Table 14 - 3. Ten Major Sources of Documented/Potential Groundwater Contamination

Contaminant Source	Factors Considered in Selecting a Contaminant Source ¹	Contaminants ²
Storage, Treatment, and Disposal Activities		
Storage tanks (underground)	A, B, C, D	D, C
Storage tanks (above ground)	A, B, C, D	D, C
Surface impoundments	A, F, D, C, G	D, G, H, A, B
Landfills	A, F, D, E, G	C, G, A, B, H
Septic systems	F, B, C, D, E, G	E, B, A
Agricultural Activities		
Unknown/not quantified	A, F, C, D, E, G	E, A, B
Other		
Abandoned wells	A, F, C, D, E, G	NA
Oil & Gas activities	F, C, D, E, G	D, G
Grandfathered sites/past practices	A, F, D, E, G	D, E, G, H, A, B
Natural sources	F, E, G, I	G, F, E, H

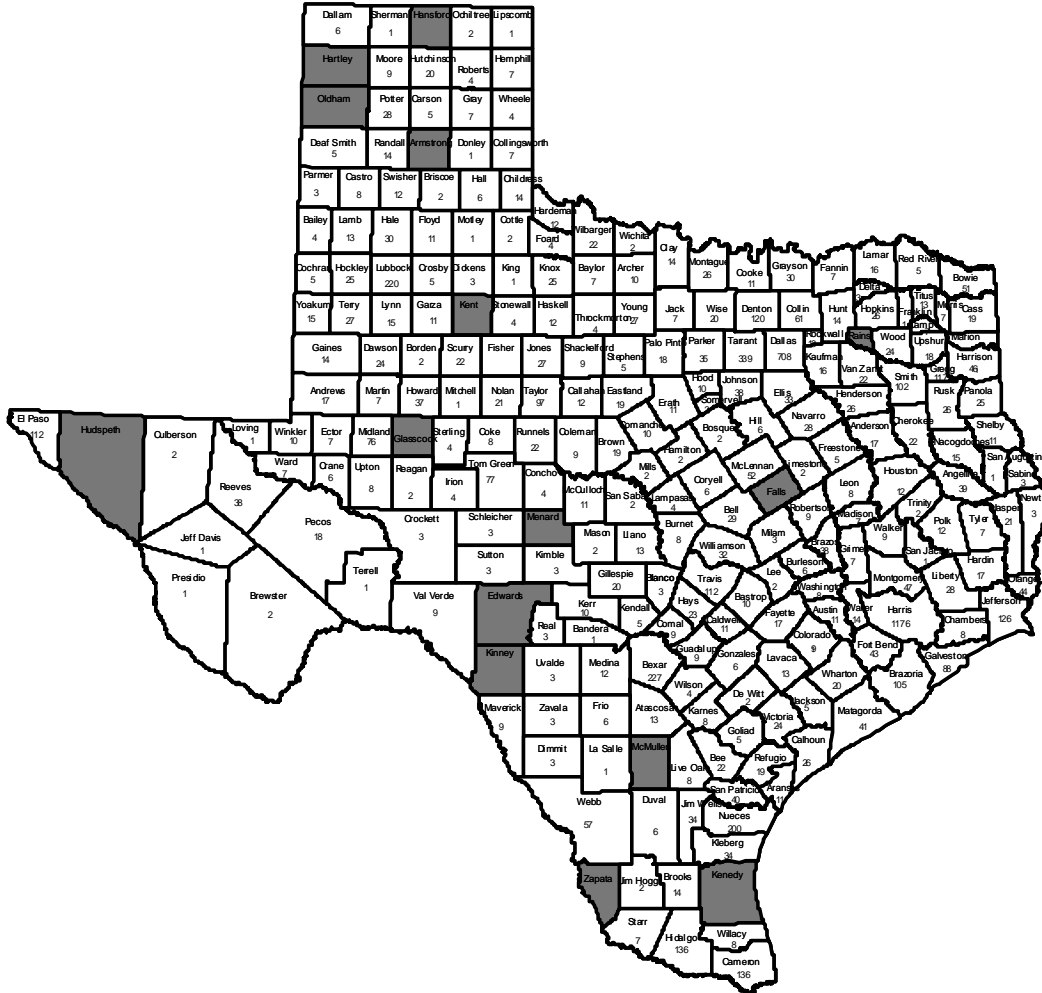
1. Factors Considered for Selection

- A. Documented from mandatory reporting
- B. Size of population at risk
- C. Location of the sources relative to drinking water sources
- D. Number and/or size of contaminant sources
- E. Hydrogeologic sensitivity
- F. Potential from state and other findings
- G. Geographic distribution/occurrence
- H. Human health and/or environmental risk (toxicity)
- I. Other criteria (described in narrative)

2. Contaminants

- A. Inorganic compounds
- B. Organic compounds
- C. Halogenated solvents
- D. Petroleum compounds
- E. Nitrate
- F. Fluoride
- G. Salinity/brine
- H. Metals

Figure 14 - 3. Texas Regulated Facilities With Known Groundwater Contamination



State of Texas Water Quality
 Inventory - Texas Regulated Facilities
 TCEQ and RCT

Data Provided by the
 Texas Commission on
 Environmental Quality -
 2001



Table 14 - 4. Statewide Documented Groundwater Contamination Cases by Agency/Activity Status, 2001

Agency/Division	Total Cases (2001) ¹	New Cases (2001) ²	Activity Status Code ³								
			0	1	2	3	4	5	6	None	
Texas Commission on Environmental Quality											
/Enforcement Division	9	1	1	2	1	2	1	1	0	1	1
/Field Operations Division	8	0	1	0	4	0	0	0	0	1	2
/Remediation Division - Corrective Action Section	550	45	11	25	219	113	123	112	37	12	12
/Remediation Division - Petroleum Storage Tanks Section	5540	275	0	776	3344	0	691	0	729	0	0
/Remediation Division - Superfund Cleanup Section	60	4	0	3	17	12	12	17	2	0	0
/Remediation Division - Superfund Site Discovery & Assessment	16	5	0	5	0	0	0	0	0	11	0
/Remediation Division - Voluntary Cleanup Section	609	123	74	10	279	23	130	38	54	0	0
/Remediation Division - Voluntary Cleanup/Innocent Landowner	217	75	0	179	0	0	0	0	13	25	0
/Remediation Division - Voluntary Cleanup Section/Brownfields Site Assessment	13	2	2	1	4	0	0	0	6	0	0
Technical Analysis Division	42	0	29	13	0	0	0	0	0	0	0
/Waste Permits Division - Underground Injection Control	1	0	0	0	0	0	0	1	0	0	0
/Waste Permits Division - Municipal Solid Waste Section	19	0	1	0	4	7	2	5	0	0	0
/Water Quality Division	6	0	0	0	1	0	3	5	0	0	0
/Water Supply Division	107	11	1	0	0	0	0	0	106	0	0
Subtotal	7197	541	120	1014	3873	157	962	178	949	51	51
Railroad Commission of Texas/Oil and Gas Division	217	28	0	17	39	36	66	41	18	0	0
Texas Alliance of Groundwater Districts	21	2	0	0	0	0	1	0	16	4	4
Total	7435	571	120	1031	3912	193	1029	219	983	55	55

Notes:
 1. Total number of groundwater contamination cases documented or under enforcement during calendar year 1998.
 2. Number of new cases documented or under enforcement during calendar year 1998.
 3. Activity Status Codes: 0—No Activity; 1—Contamination Confirmed; 2—Ongoing Investigation; 3—Corrective Action Planning; 4—Corrective Action Implementation; 5—Monitoring Action; 6—Action Completed. Facilities may have more than one Activity Status Code.

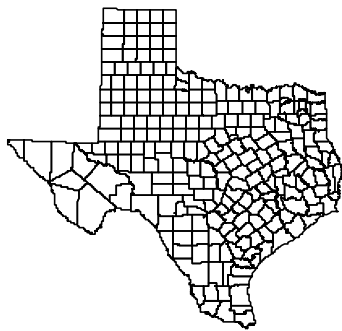
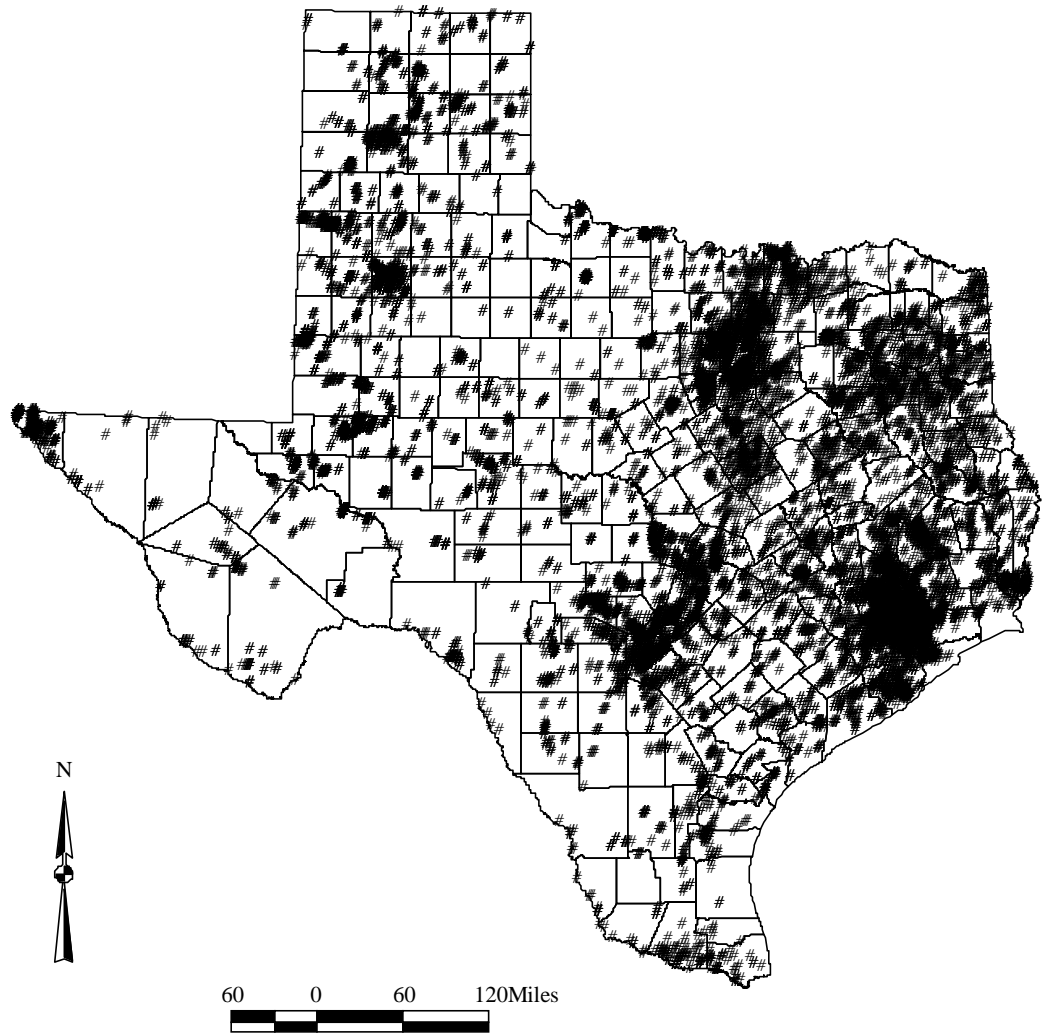
Table 14 - 5 . Groundwater Contamination Summary / Selected Major and Minor Aquifers Outcrops (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	51	1	9	13	19	7	1	VOCs, chromium benzene, TCE, high explosives,
CERCLIS (non-NPL)	Yes	9	0	2	0	7	0	0	
DOD/DOE	Yes	11	0	5	2	3	6	1	benzene, TCE, high explosives, chromium
LUST*	Yes	3837	526	2274	0	416	0	371	gasoline, diesel, waste oil, jet fuel, BTEX, TPH
RCRA Corrective Action	Yes	375	20	129	65	90	116	17	VOCs, BTEX, TPH, chromium, lead
Underground Injection	No	0	0	0	0	0	0	0	
State Sites	Yes	207	61	51	8	32	6	60	
Nonpoint Sources	Yes	0	0	0	0	0	0	0	pesticides, nitrate, arsenic
Oil/Gas Activities	Yes	165	20	24	27	44	25	20	VOCs, NaCl, crude oil, natural gas, HCL, sulfates, chromium
Totals		4655	628	2494	115	611	160	470	

NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 4. Public Water Supply Wells



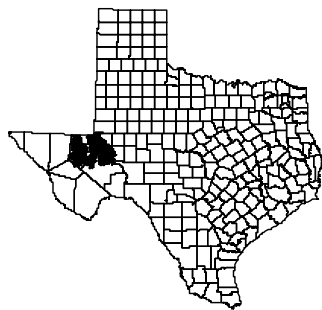
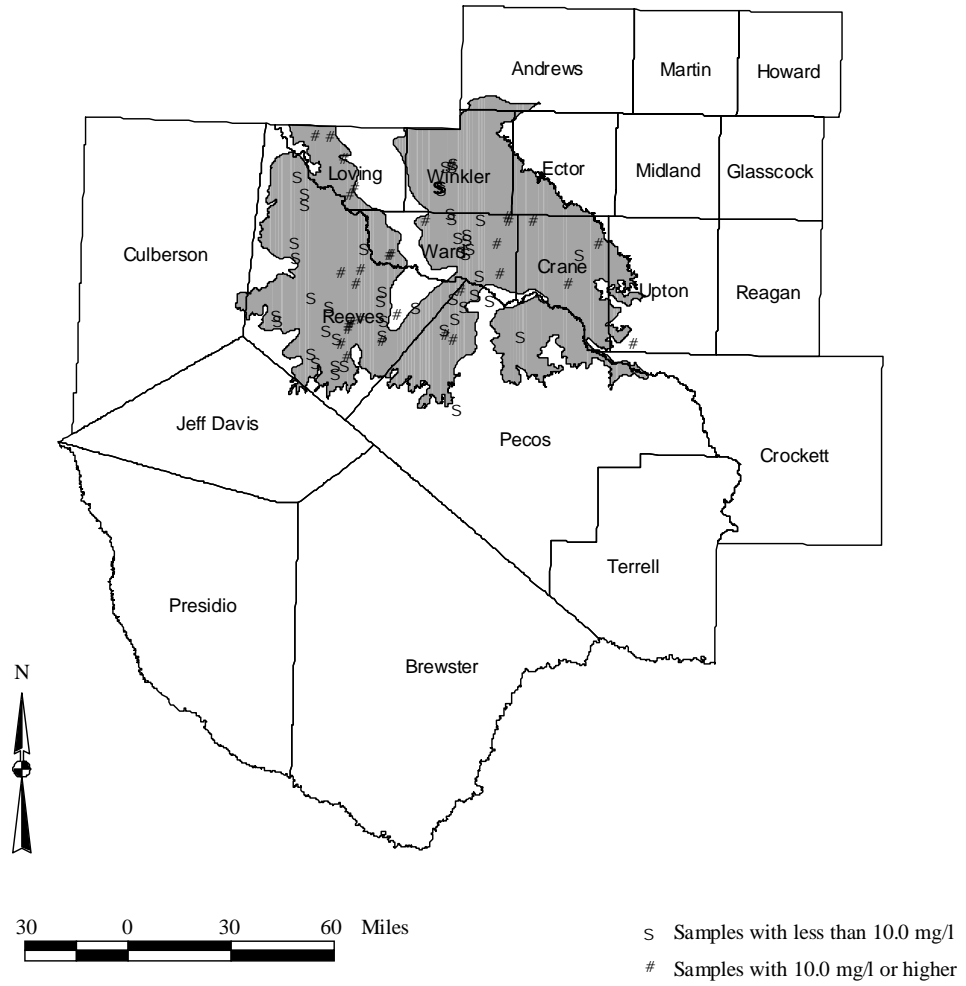
State of Texas Water Quality
Inventory - Texas Public Water

Data Supplied by Texas Commission
on Environmental Quality 2002

Data provided by the Texas Natural
Resource Conservation Commission - 1998



Figure 14 - 5. Cenozoic Pecos Alluvium Aquifer



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1995



Table 14 - 6. Ambient Monitoring Groundwater Quality Data
Cenozoic Pecos Alluvium Aquifer (1995)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL ¹	< MCL ² (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	95	68	27	0
Barium	2 mg/l	95	3	92	0
Cadmium	5 µg/l	95	91	2	2
Chromium	100 µg/l	93	78	15	0
Fluoride	4 mg/l	95	3	91	1
Mercury	2 µg/l	93	91	2	0
Nitrate (N)	10 mg/l	95	3	49	43
Selenium	50 µg/l	94	84	8	2
Secondary Constituents					
Chloride	300 mg/l	95	0	46	49
Copper	1 mg/l	93	79	14	0
Fluoride	2 mg/l	95	3	73	19
Iron	0.3 mg/l	94	12	73	9
Manganese	50 µg/l	95	50	37	8
Silver	100 µg/l	94	84	8	0
Sulfate	300 mg/l	95	0	35	60
Dissolved Solids	1000 mg/l	95	0	30	65
Zinc	5 mg/l	93	17	76	0
Radioactivity					
Gross Alpha	15 pCi/l	95	28	51	16
Beta	50 pCi/l	95	16	76	3

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

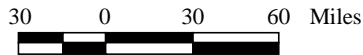
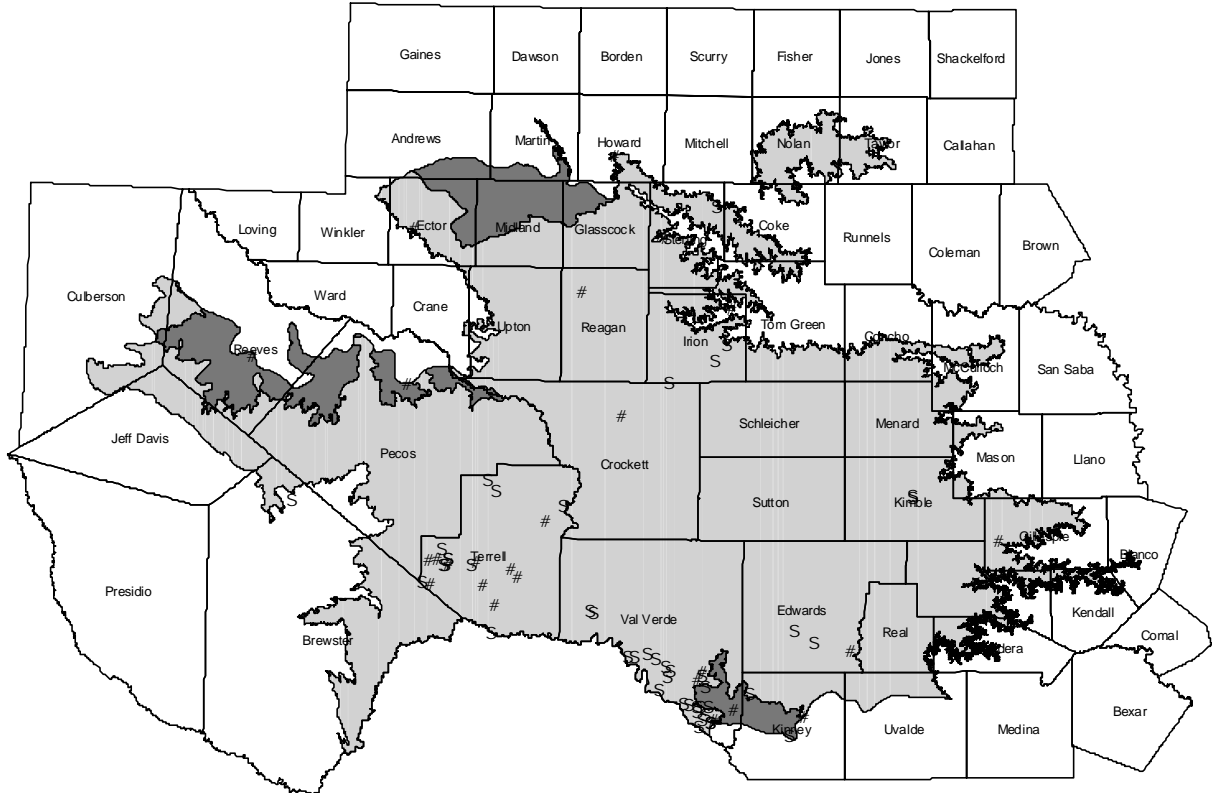
Table 14 - 7. Groundwater Contamination Summary
 Cenozoic Pecos Alluvium Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	5				1			chromium
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	152	18	79		36		19	gasoline, diesel, waste oil, jet fuel, BTEX, TPH
RCRA Corrective Action	Yes	18		3	6	4		1	VOCs, BTEX, TPH, chromium, lead
Underground Injection	No								
State Sites*	Yes	11	1	2		2		6	
Non-point Sources	No								
Oil/Gas Activities	Yes	30		2	1	8		7	VOCs, NaCl, crude oil, HCL, sulfates, chromium
Totals		216	19	86	7	51	19	33	

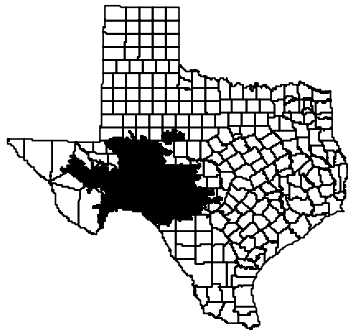
NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 6. Edwards - Trinity (Plateau) Aquifer



- S Samples with less than 10.0 mg/l
- # Samples with 10.0 mg/l or higher
- Outcrop
- Downdip



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1996



Table 14 - 8. Ambient Monitoring Groundwater Quality Data
Edwards-Trinity (Plateau) Aquifer (1996)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	71	56	15	0
Barium	2 mg/l	71	0	71	0
Cadmium	5 µg/l	58	58	0	0
Chromium	100 µg/l	58	44	14	0
Fluoride	4 mg/l	72	8	64	0
Mercury	2 µg/l	51	48	3	0
Nitrate (N)	10 mg/l	72	2	44	26
Selenium	50 µg/l	71	61	9	1
Secondary Constituents					
Chloride	300 mg/l	72	0	65	7
Copper	1 mg/l	71	36	35	0
Fluoride	2 mg/l	72	8	57	7
Iron	0.3 mg/l	76	39	20	17
Manganese	50 µg/l	72	33	36	3
Silver	100 µg/l	53	52	1	0
Sulfate	300 mg/l	72	0	65	7
Dissolved Solids	1000 mg/l	72	0	64	8
Zinc	5 mg/l	71	4	67	0
Radioactivity					
Gross Alpha	15 pCi/l	54	13	33	8
Beta	50 pCi/l	54	22	31	1

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

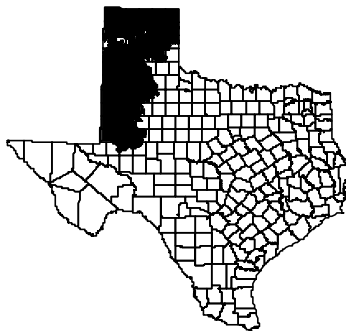
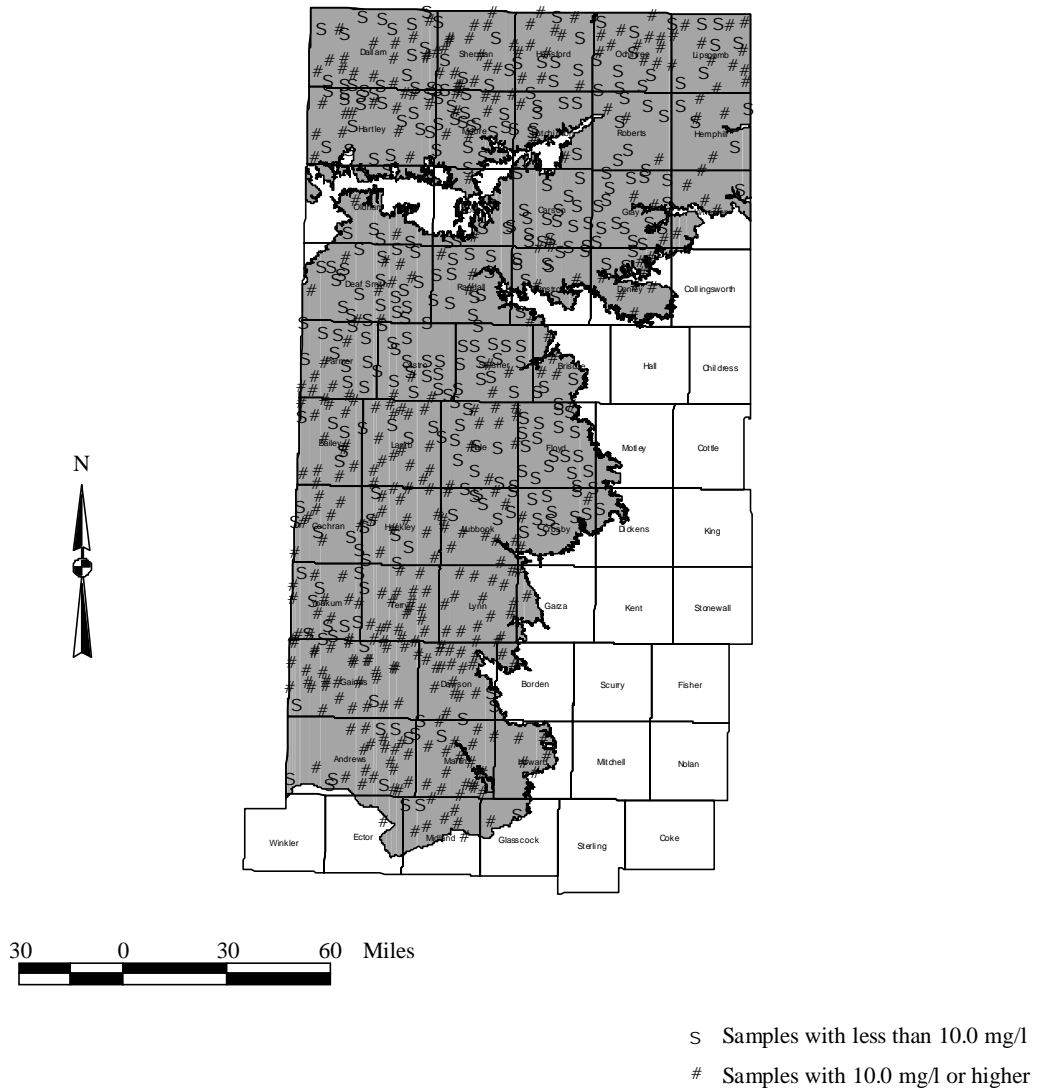
Table 14 - 9. Groundwater Contamination Summary
Edwards - Trinity (Plateau) Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	4			1	2			Not Specified
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	186		93		52		33	gasoline, diesel, waste oil, jet fuel, BTEX, TPH
RCRA Corrective Action	Yes	19		3		10		2	VOCs, BTEX, TPH, chromium, lead
Underground Injection	No								
State Sites*	Yes	22		9		7		6	
Non-point Sources	No								
Oil/Gas Activities	Yes	24	5	4	4	8	3	2	NaCl, crude oil, natural gas, HCL, sulfates, chromium
Totals		255	5	109	5	79	19	43	

NPL - National Priority List
DOE - Department of Energy
LUST - Leaking Underground Storage Tanks
*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOD - Department of Defense
RCRA - Resource Conservation and Recovery Act

Figure 14 - 7. Ogallala Aquifer



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1996



Table 14 - 10. Ambient Monitoring Groundwater Quality Data
Ogallala Aquifer (1996)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	723	117	594	12
Barium	2 mg/l	724	2	722	0
Cadmium	5 µg/l	26	26	0	0
Chromium	100 µg/l	26	2	24	0
Fluoride	4 mg/l	724	1	586	137
Mercury	2 µg/l	26	21	5	0
Nitrate (N)	10 mg/l	724	3	336	385
Selenium	50 µg/l	723	237	415	71
Secondary Constituents					
Chloride	300 mg/l	724	0	640	84
Copper	1 mg/l	723	149	574	0
Fluoride	2 mg/l	724	1	353	370
Iron	0.3 mg/l	737	317	394	26
Manganese	50 µg/l	723	469	238	16
Silver	100 µg/l	26	26	0	0
Sulfate	300 mg/l	724	0	621	103
Dissolved Solids	1000 mg/l	724	0	599	125
Zinc	5 mg/l	723	25	698	0
Radioactivity					
Gross Alpha	15 pCi/l	25	1	20	4
Beta	50 pCi/l	25	1	24	0

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

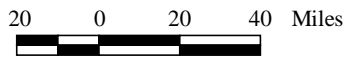
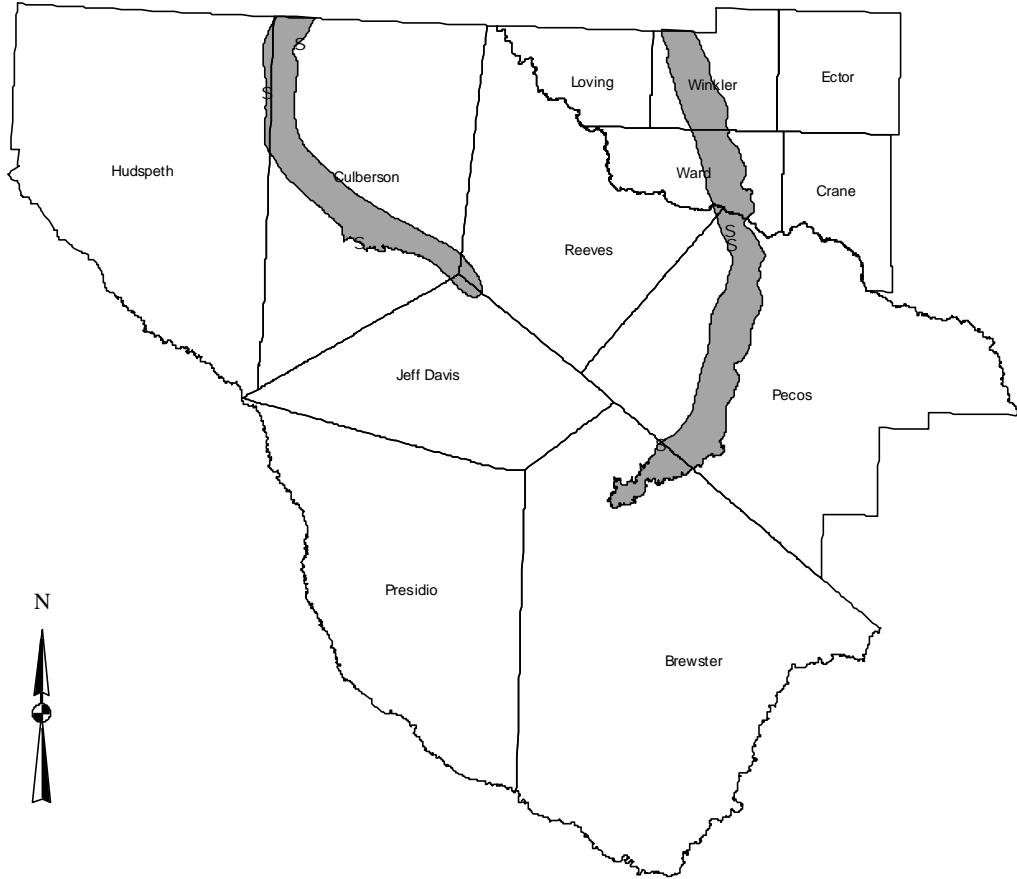
Table 14 - 11. Groundwater Contamination Summary
Ogallala Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	Yes	1		1					benzene, TCE, high explosives, chromium
LUST	Yes	295	15	184		29		31	gasoline, diesel, waste oil, jet fuel, BTEX, TPH
RCRA Corrective Action	Yes	19	1	9	1	3			VOCs, BTEX, TPH, chromium, lead
Underground Injection	No								
State Sites*	Yes	32	4	15		6		6	Pesticides, arsenic, VOC's
Non-point Sources	No								
Oil/Gas Activities	Yes	49	8	7	8	8		2	VOCs, NaCl, crude oil, natural gas, HCL, sulfates, chromium
Totals		396	28	216	9	46	11	39	

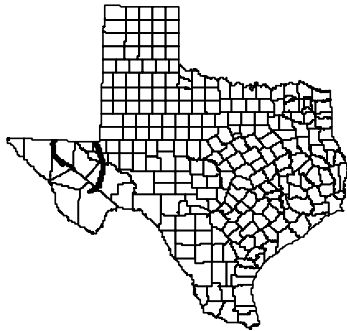
NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 8. Capitan Reef Complex Aquifer



s Samples with less than 10.0 mg/l
Samples with 10.0 mg/l or higher



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1995



Table 14 - 12. Ambient Monitoring Groundwater Quality Data
Capitan Reef Complex Aquifer (1995)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	12	10	2	0
Barium	2 mg/l	12	1	11	0
Cadmium	5 µg/l	12	12	0	0
Chromium	100 µg/l	9	7	2	0
Fluoride	4 mg/l	12	0	12	0
Mercury	2 µg/l	5	2	3	0
Nitrate (N)	10 mg/l	12	0	12	0
Selenium	50 µg/l	12	10	0	0
Secondary Constituents					
Chloride	300 mg/l	12	0	3	9
Copper	1 mg/l	11	8	3	0
Fluoride	2 mg/l	12	0	6	6
Iron	0.3 mg/l	11	5	3	3
Manganese	50 µg/l	12	5	3	4
Silver	100 µg/l	10	9	0	1
Sulfate	300 mg/l	12	0	4	8
Dissolved Solids	1000 mg/l	12	0	2	10
Zinc	5 mg/l	11	7	4	0
Radioactivity					
Gross Alpha	15 pCi/l	11	2	3	6
Beta	50 pCi/l	11	1	8	2

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 13. Groundwater Contamination Summary
Capitan Reef Complex Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	37	4	28	2	3	gasoline, diesel, waste oil, jet fuel, BTEX, TPH		
RCRA Corrective Action	Yes	2		1		1	VOCs, DDT, dieldrin, methyl parathion		
Underground Injection	No								
State Sites*	Yes	1				6			
Non-point Sources	No								
Oil/Gas Activities	Yes	10	3		4	1	VOCs, crude oil, sulfates		
Totals		50	7	29	6	10			

NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 9. Ellenberger - San Saba Aquifer

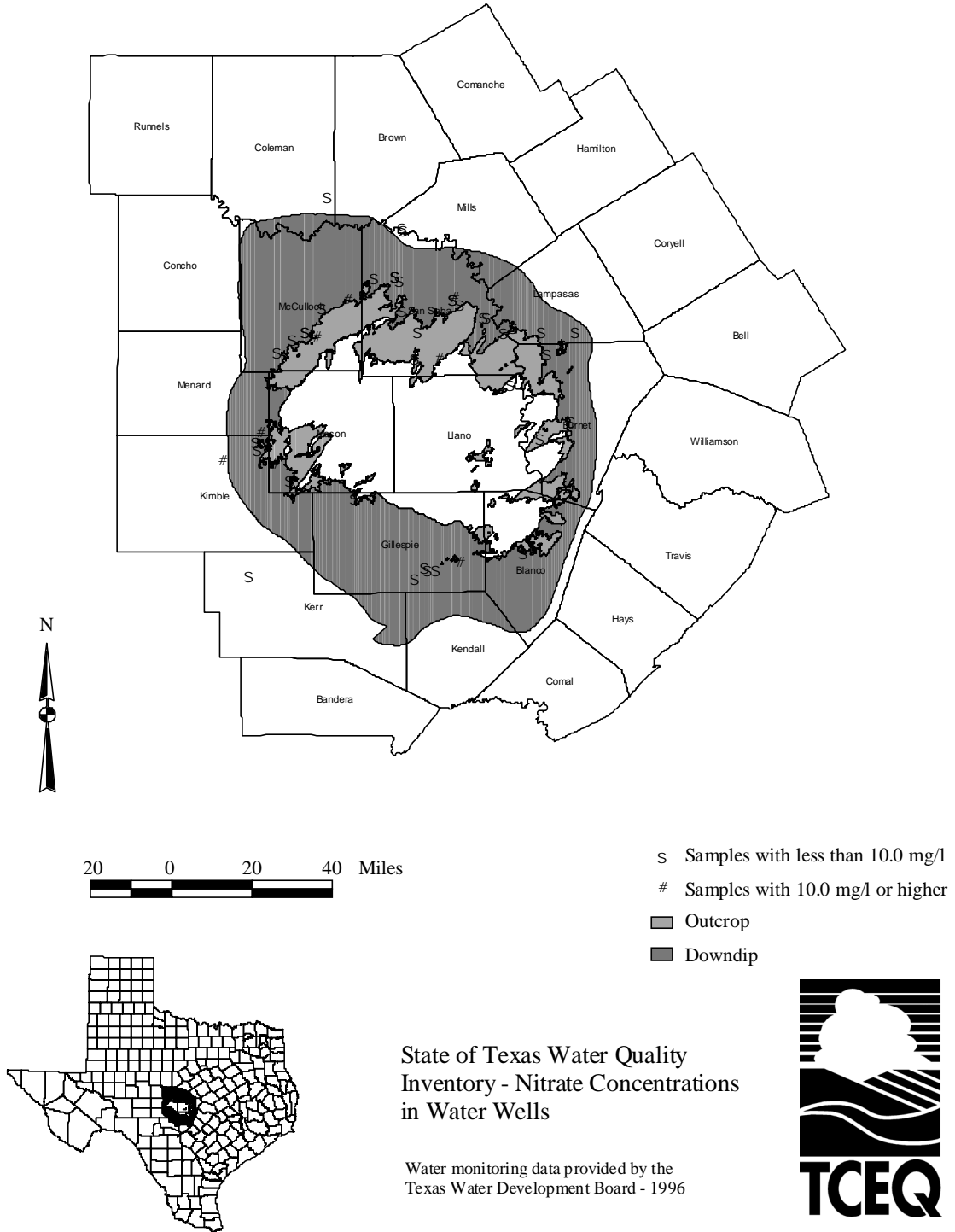


Table 14 - 14. Ambient Monitoring Groundwater Quality Data
Ellenberger - San Saba Aquifer (1996)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	44	35	9	0
Barium	2 mg/l	44	0	44	0
Cadmium	5 µg/l	16	16	0	0
Chromium	100 µg/l	16	16	0	0
Fluoride	4 mg/l	44	0	40	4
Mercury	2 µg/l	16	16	0	0
Nitrate (N)	10 mg/l	44	11	26	8
Selenium	50 µg/l	44	34	7	3
Secondary Constituents					
Chloride	300 mg/l	44	0	37	7
Copper	1 mg/l	44	18	26	0
Fluoride	2 mg/l	44	0	37	7
Iron	0.3 mg/l	44	30	6	8
Manganese	50 µg/l	44	26	17	1
Silver	100 µg/l	16	16	0	0
Sulfate	300 mg/l	44	3	40	1
Dissolved Solids	1000 mg/l	44	0	36	8
Zinc	5 mg/l	44	11	33	0
Radioactivity					
Gross Alpha	15 pCi/l	38	13	18	9
Beta	50 pCi/l	38	18	18	3

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

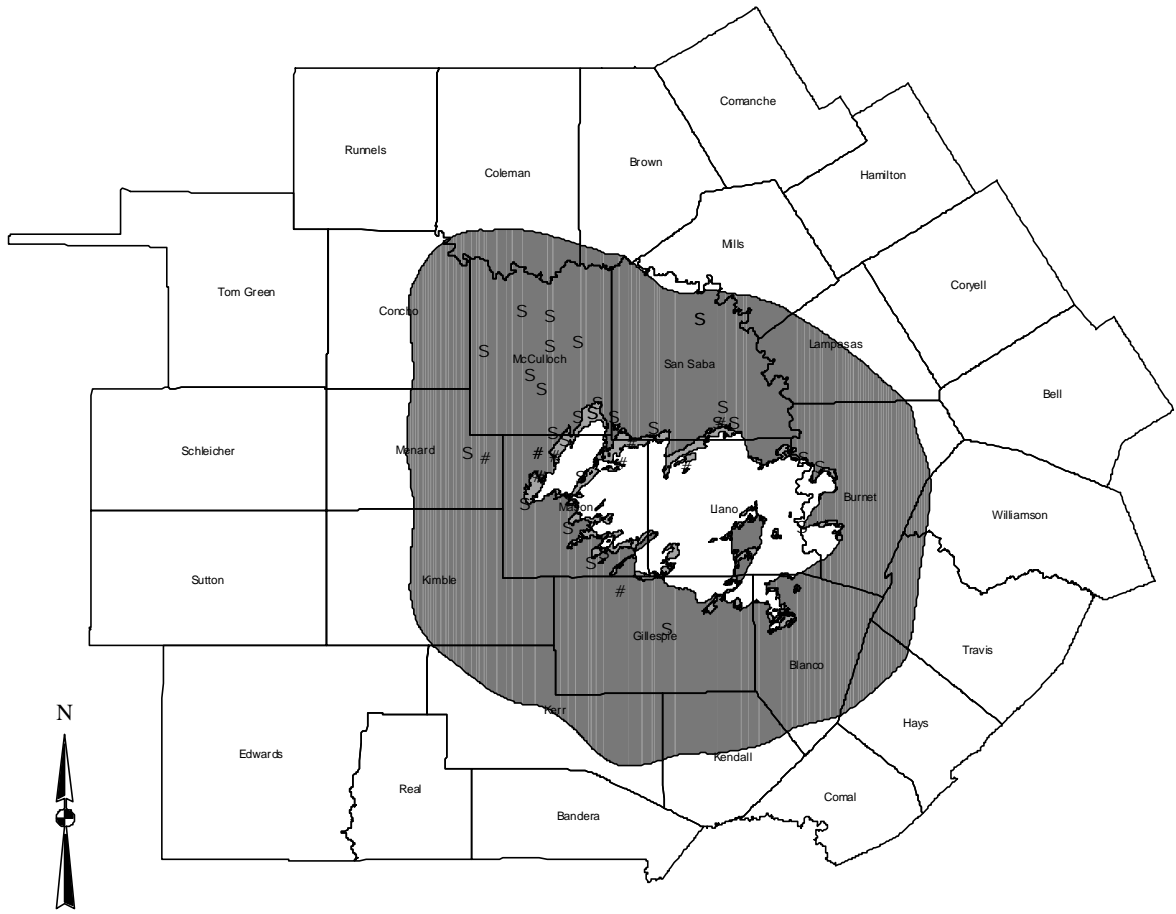
Table 14 - 15. Groundwater Contamination Summary
Ellenberger - San Saba Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	3		3					gasoline, diesel
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		3		3					

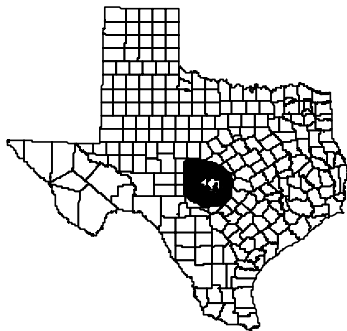
NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 10. Hickory Aquifer



- S Samples with less than 10.0 mg/l
- # Samples with 10.0 mg/l or higher
- Outcrop
- Downdip



State of Texas Water Quality Inventory - Nitrate Concentrations in Water Wells

Water monitoring data provided by the Texas Water Development Board - 1996



Table 14 - 16. Ambient Monitoring Groundwater Quality Data
Hickory Aquifer (1996)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	40	37	4	0
Barium	2 mg/l	40	1	39	0
Cadmium	5 µg/l	11	11	0	0
Chromium	100 µg/l	11	11	0	0
Fluoride	4 mg/l	40	0	39	1
Mercury	2 µg/l	11	11	0	0
Nitrate (N)	10 mg/l	40	11	19	10
Selenium	50 µg/l	40	36	4	0
Secondary Constituents					
Chloride	300 mg/l	40	0	39	1
Copper	1 mg/l	40	16	24	0
Fluoride	2 mg/l	40	0	36	4
Iron	0.3 mg/l	41	26	8	7
Manganese	50 µg/l	40	20	17	3
Silver	100 µg/l	11	11	0	0
Sulfate	300 mg/l	40	0	40	0
Dissolved Solids	1000 mg/l	40	0	40	1
Zinc	5 mg/l	40	17	23	0
Radioactivity					
Gross Alpha	15 pCi/l	40	4	21	17
Beta	50 pCi/l	40	7	30	4

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

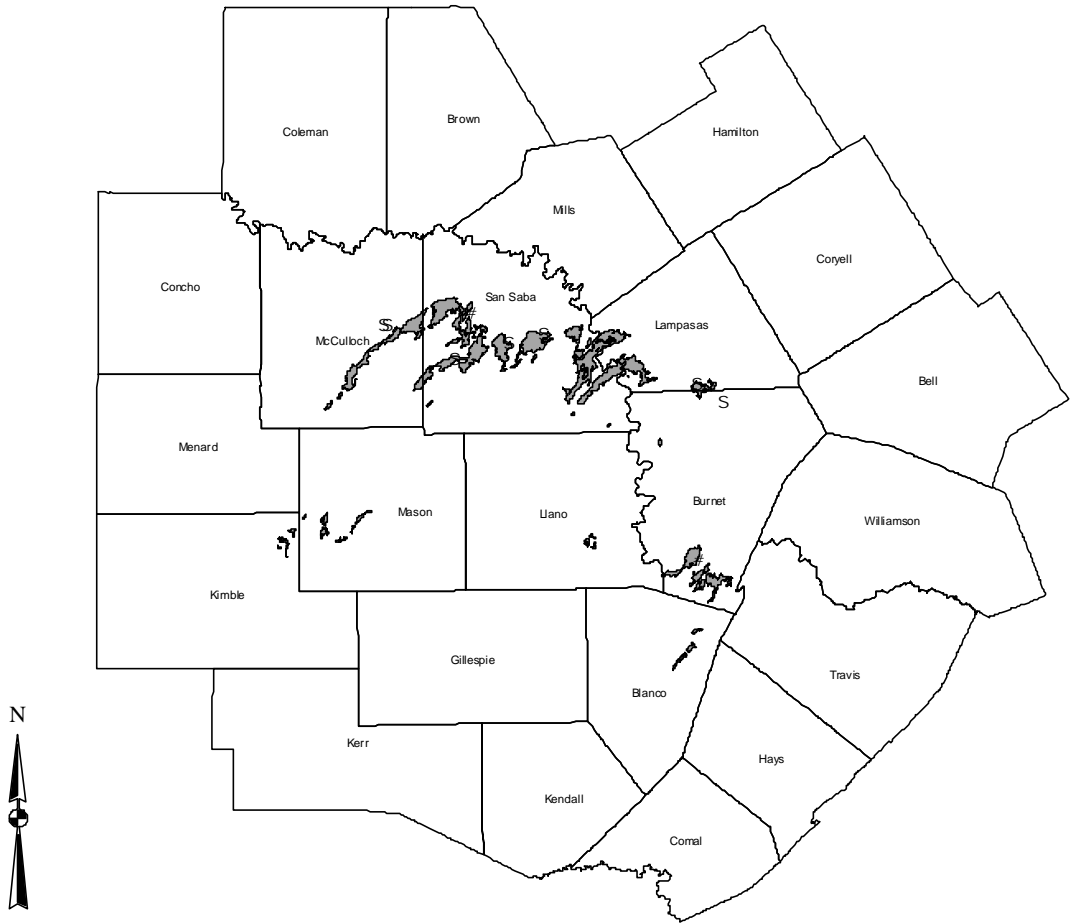
Table 14 - 17. Groundwater Contamination Summary
Hickory Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	4		2					gasoline, diesel
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		4		2					

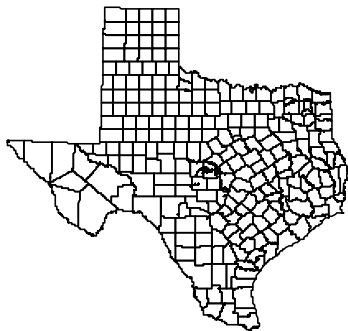
NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 11. Marble Falls Aquifer



S Samples with less than 10.0 mg/l
 # Samples with 10.0 mg/l or higher



State of Texas Water Quality
 Inventory - Nitrate Concentrations
 in Water Wells

Water monitoring data provided by the
 Texas Water Development Board - 1996



Table 14 -18. Ambient Monitoring Groundwater Quality Data
Marble Falls Aquifer (1996)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	9	7	2	0
Barium	2 mg/l	9	0	9	0
Cadmium	5 µg/l	1	1	0	0
Chromium	100 µg/l	1	1	0	0
Fluoride	4 mg/l	9	0	9	0
Mercury	2 µg/l	1	1	0	0
Nitrate (N)	10 mg/l	9	3	4	2
Selenium	50 µg/l	9	8	1	0
Secondary Constituents					
Chloride	300 mg/l	9	0	8	1
Copper	1 mg/l	9	4	5	0
Fluoride	2 mg/l	9	0	8	1
Iron	0.3 mg/l	9	6	3	0
Manganese	50 µg/l	9	3	6	0
Silver	100 µg/l	1	1	0	0
Sulfate	300 mg/l	9	0	8	1
Dissolved Solids	1000 mg/l	9	0	8	1
Zinc	5 mg/l	9	3	6	0
Radioactivity					
Gross Alpha	15 pCi/l	9	3	5	1
Beta	50 pCi/l	9	5	4	0

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

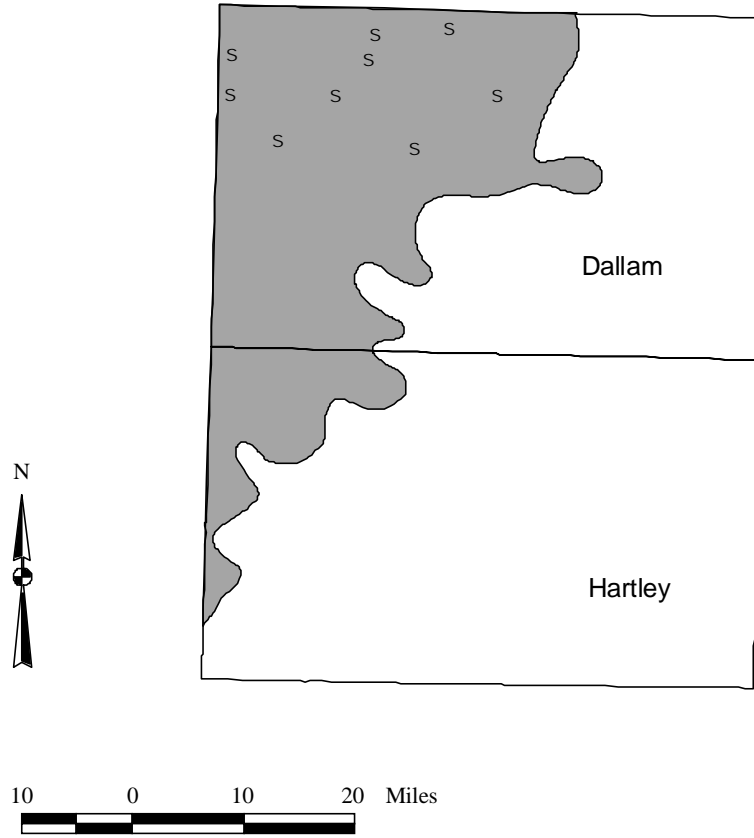
Table 14 - 19. Groundwater Contamination Summary
Marble Falls Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	1				1			VOCs
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	4		4					gasoline, diesel
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		5		4					

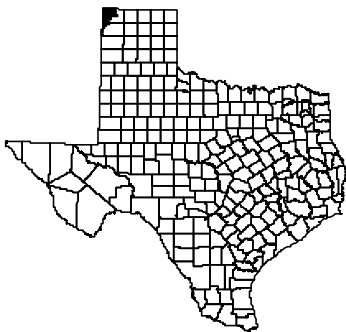
NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 12. Rita Blanca Aquifer



S Samples with less than 10.0 mg/l
Samples with 10.0 mg/l or higher



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1996



Table 14 - 20. Ambient Monitoring Groundwater Quality Data
Rita Blanca Aquifer (1996)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	9	3	6	0
Barium	2 mg/l	9	0	9	0
Cadmium	5 µg/l	0	-	-	-
Chromium	100 µg/l	0	-	-	-
Fluoride	4 mg/l	9	0	8	1
Mercury	2 µg/l	0	-	-	-
Nitrate (N)	10 mg/l	9	0	9	0
Selenium	50 µg/l	9	7	2	0
Secondary Constituents					
Chloride	300 mg/l	9	0	9	0
Copper	1 mg/l	9	2	7	0
Fluoride	2 mg/l	9	0	8	1
Iron	0.3 mg/l	9	1	8	0
Manganese	50 µg/l	9	4	5	0
Silver	100 µg/l	0	-	-	-
Sulfate	300 mg/l	9	0	9	0
Dissolved Solids	1000 mg/l	9	0	9	0
Zinc	5 mg/l	9	1	8	0
Radioactivity					
Gross Alpha	15 pCi/l	0	-	-	-
Beta	50 pCi/l	0	-	-	-

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 21. Groundwater Contamination Summary
Rita Blanca Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	No								
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals									

NPL - National Priority List
DOE - Department of Energy
LUST - Leaking Underground Storage Tanks
*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOD - Department of Defense
RCRA - Resource Conservation and Recovery Act

Figure 14 -13. Rustler Aquifer

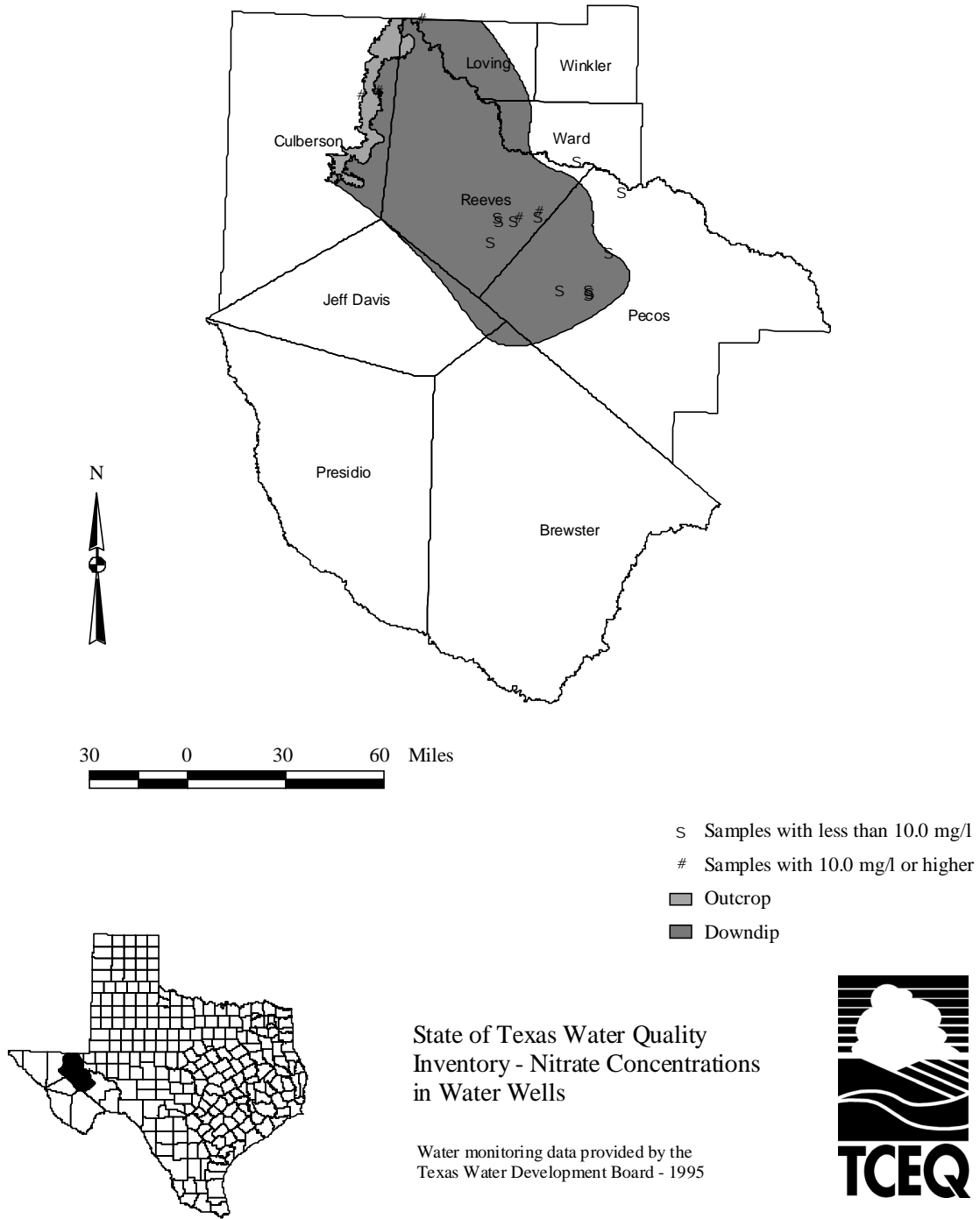


Table 14 - 22. Ambient Monitoring Groundwater Quality Data
Rustler Aquifer (1995)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	17	17	0	0
Barium	2 mg/l	17	1	16	0
Cadmium	5 µg/l	17	17	0	0
Chromium	100 µg/l	12	11	1	0
Fluoride	4 mg/l	17	1	15	1
Mercury	2 µg/l	7	6	1	0
Nitrate (N)	10 mg/l	17	2	10	5
Selenium	50 µg/l	17	12	5	0
Secondary Constituents					
Chloride	300 mg/l	17	0	10	7
Copper	1 mg/l	12	9	3	0
Fluoride	2 mg/l	17	1	6	10
Iron	0.3 mg/l	16	1	8	7
Manganese	50 µg/l	17	7	9	1
Silver	100 µg/l	12	10	2	0
Sulfate	300 mg/l	17	0	1	16
Dissolved Solids	1000 mg/l	17	0	0	17
Zinc	5 mg/l	13	7	6	0
Radioactivity					
Gross Alpha	15 pCi/l	15	1	2	12
Beta	50 pCi/l	15	0	7	8

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 23. Groundwater Contamination Summary
Rustler Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	No								
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals									

NPL - National Priority List
DOE - Department of Energy
LUST - Leaking Underground Storage Tanks
*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOD - Department of Defense
RCRA - Resource Conservation and Recovery Act

Figure 14 - 14. Gulf Coast Aquifer

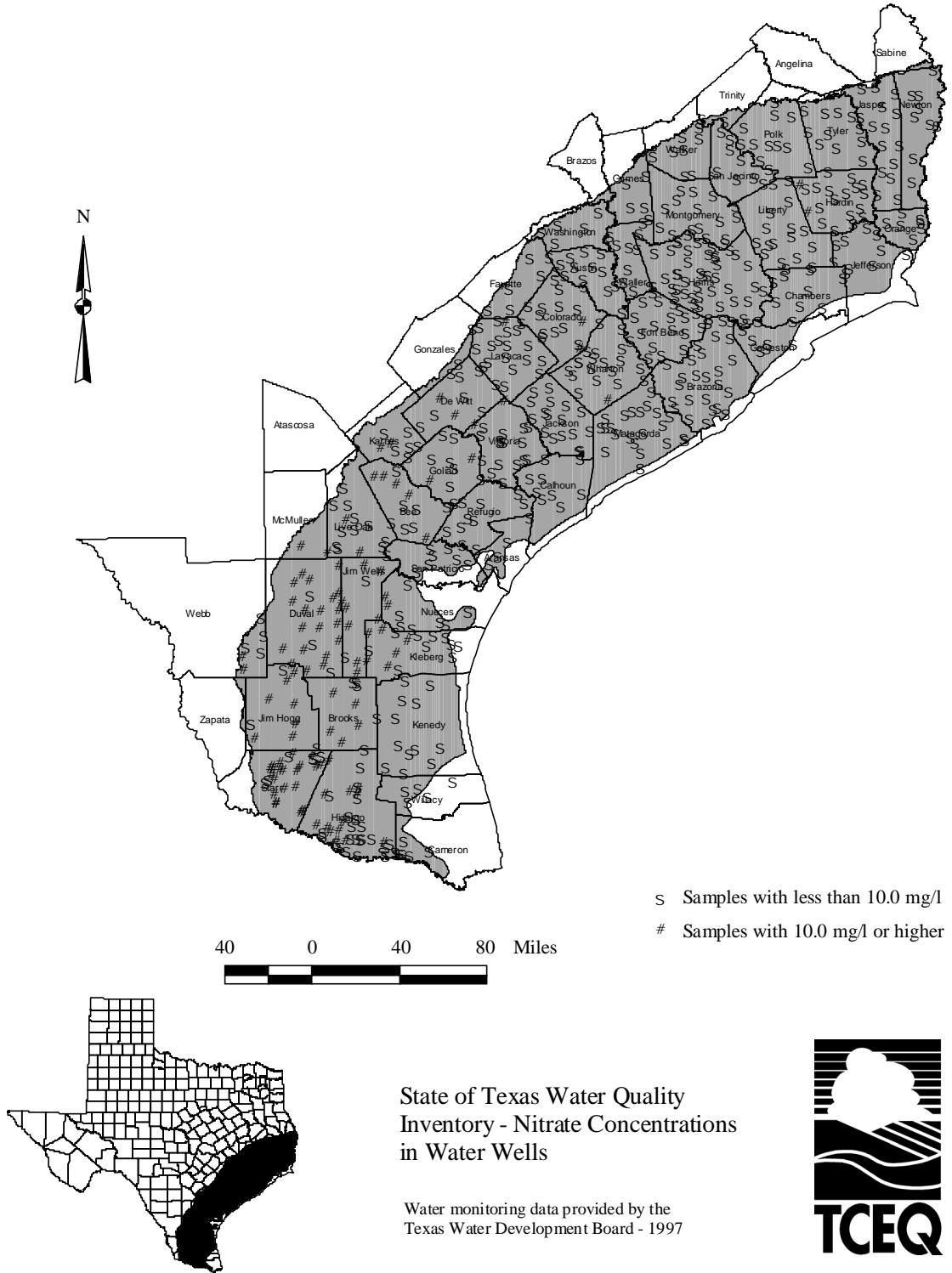


Table 14 - 24. Ambient Monitoring Groundwater Quality Data
Gulf Coast Aquifer (1997)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	964	631	323	10
Barium	2 mg/l	966	18	940	8
Cadmium	5 µg/l	362	361	1	0
Chromium	100 µg/l	360	310	50	0
Fluoride	4 mg/l	650	348	302	15
Mercury	2 µg/l	303	289	14	0
Nitrate (N)	10 mg/l	650	413	130	107
Selenium	50 µg/l	966	842	119	5
Secondary Constituents					
Chloride	300 mg/l	650	0	466	184
Copper	1 mg/l	964	534	429	1
Fluoride	2 mg/l	650	348	220	97
Iron	0.3 mg/l	993	318	513	162
Manganese	50 µg/l	962	363	599	0
Silver	100 µg/l	312	312	0	0
Sulfate	300 mg/l	650	23	565	62
Dissolved Solids	1000 mg/l	650	0	481	169
Zinc	5 mg/l	964	303	657	0
Radioactivity					
Gross Alpha	15 pCi/l	278	136	127	15
Beta	50 pCi/l	280	107	173	0

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

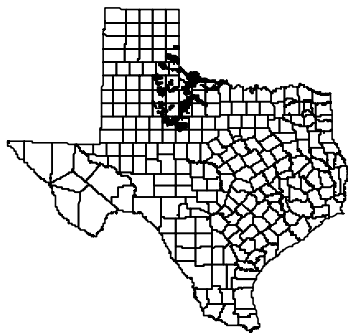
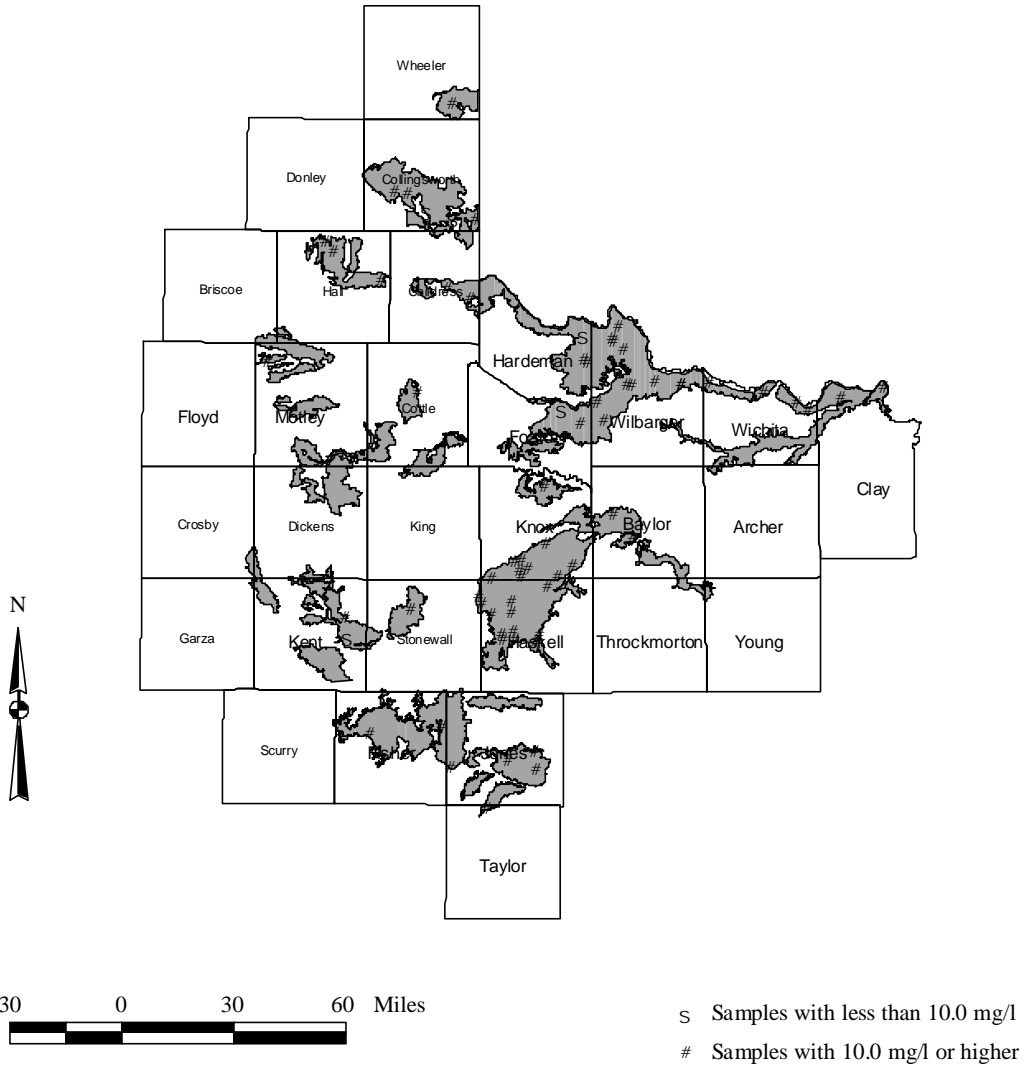
Table 14 - 25. Groundwater Contamination Summary
Gulf Coast Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	27	1	6	6	2	6	Metals, VOC, arsenic, organic chemicals	
CERCLIS (non-NPL)	Yes	8		2		6		Metals, VOC, arsenic, organic chemicals	
DOD/DOE	No								
LUST	Yes	1531	199	847		203	110	gasoline, diesel, waste oil, jet fuel, BTEX, TPH	
RCRA Corrective Action	Yes	188	13	58	40	45	9	DDT, Dieldrin, methyl parathion	
Underground Injection	No								
State Sites*	Yes	40	13	7	4	13	5	Organic chemicals, creosote, pH, Epichlorohydrin, DCE,	
Non-point Sources	No								
Oil/Gas Activities	Yes	23	2	4	5	8	2	Chloride, TDS, Crude	
Totals		1817	228	924	55	277	79	126	

NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 15. Seymour Aquifer



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1997



Table 14 - 26. Ambient Monitoring Groundwater Quality Data
Seymour Aquifer (1997)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	95	63	32	0
Barium	2 mg/l	103	0	103	0
Cadmium	5 µg/l	57	57	0	0
Chromium	100 µg/l	36	12	24	0
Fluoride	4 mg/l	70	14	56	0
Mercury	2 µg/l	12	11	1	0
Nitrate (N)	10 mg/l	70	0	5	65
Selenium	50 µg/l	98	49	49	0
Secondary Constituents					
Chloride	300 mg/l	70	0	60	10
Copper	1 mg/l	95	27	68	0
Fluoride	2 mg/l	70	14	46	10
Iron	0.3 mg/l	103	63	38	2
Manganese	50 µg/l	95	70	25	0
Silver	100 µg/l	0	0	0	0
Sulfate	300 mg/l	70	0	56	14
Dissolved Solids	1000 mg/l	70	0	48	22
Zinc	5 mg/l	95	21	74	0
Radioactivity					
Gross Alpha	15 pCi/l	25	5	20	0
Beta	50 pCi/l	24	16	8	0

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 27. Groundwater Contamination Summary
Seymour Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	Yes	1		1					metals
LUST	Yes	166	15	141		6		4	gasoline, diesel, waste oil, BTEX, TPH
RCRA Corrective Action	Yes	7		3	1			2	BTEX, Arsenic, metals, VOC's, SVOC's, MTBE,
Underground Injection	No								
State Sites*	Yes	20	19	1					arsenic, chlorinated hydrocarbons
Non-point Sources	No								Pesticides
Oil/Gas Activities	Yes	5		3	2				Oil, salt
Totals		199	34	149	3	6	0	6	

NPL - National Priority List

DOE - Department of Energy

LUST - Leaking Underground Storage Tanks

*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System

DOD - Department of Defense

RCRA - Resource Conservation and Recovery Act

Figure 14 - 16. Blaine Aquifer

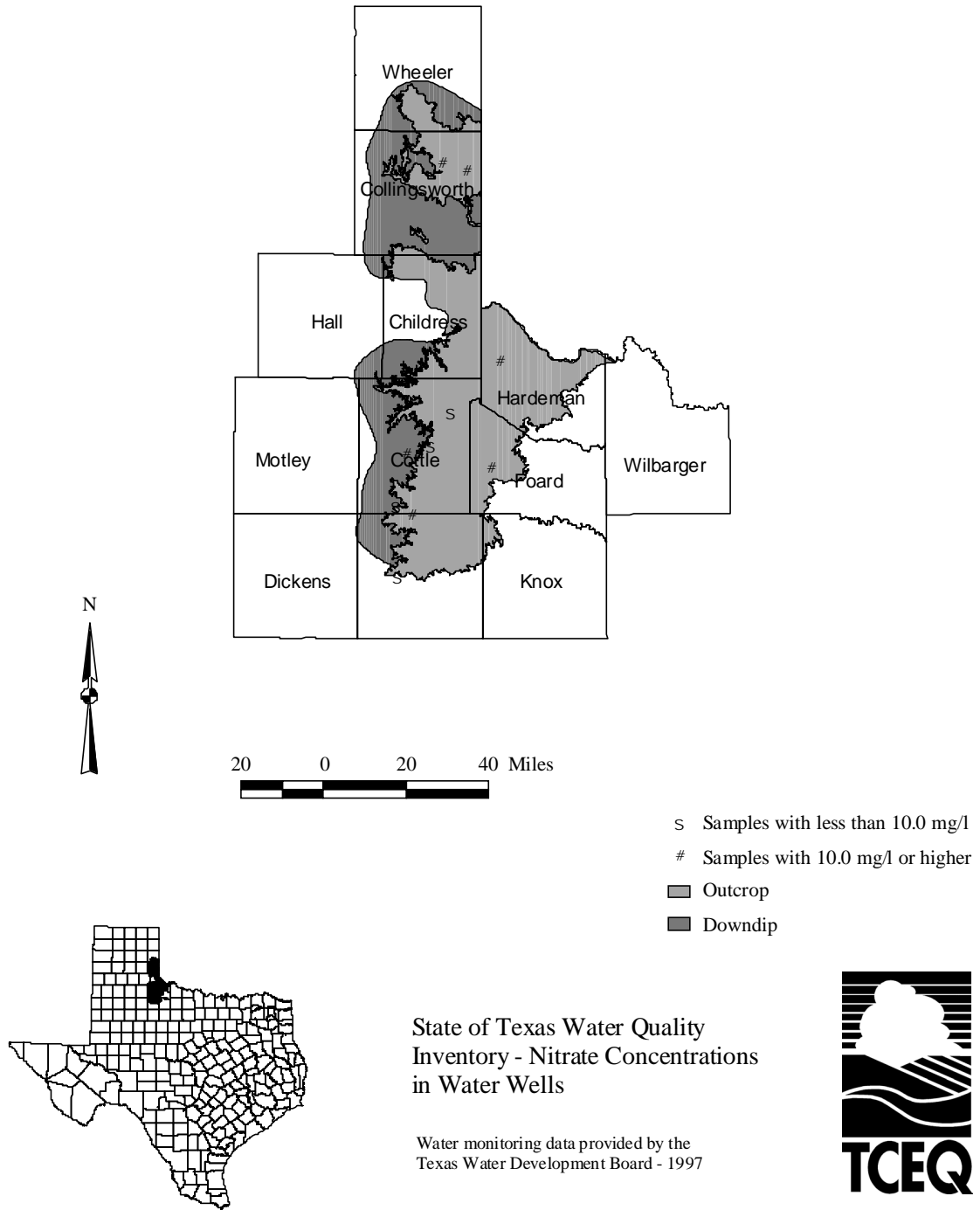


Table 14 - 28. Ambient Monitoring Groundwater Quality Data
Blaine Aquifer (1997)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	12	10	2	0
Barium	2 mg/l	14	0	14	0
Cadmium	5 µg/l	4	4	0	0
Chromium	100 µg/l	1	0	1	0
Fluoride	4 mg/l	10	6	4	0
Mercury	2 µg/l	2	2	0	0
Nitrate (N)	10 mg/l	10	0	4	6
Selenium	50 µg/l	13	5	8	0
Secondary Constituents					
Chloride	300 mg/l	10	0	6	4
Copper	1 mg/l	12	2	10	0
Fluoride	2 mg/l	10	6	4	0
Iron	0.3 mg/l	14	3	6	5
Manganese	50 µg/l	12	3	9	0
Silver	100 µg/l	0	0	0	0
Sulfate	300 mg/l	10	0	1	9
Dissolved Solids	1000 mg/l	10	0	1	9
Zinc	5 mg/l	12	0	12	0
Radioactivity					
Gross Alpha	15 pCi/l	4	0	3	1
Beta	50 pCi/l	4	3	1	0

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 29. Groundwater Contamination Summary
Blaine Aquifer Outcrop (1998)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	22	5	12				3	gasoline, diesel, waste oil, BTEX, TPH
RCRA Corrective Action	Yes	1			1				PCE, TCE, 1,2,DCE
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		23	5	12	1		0	3	

NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 17. Woodbine Aquifer

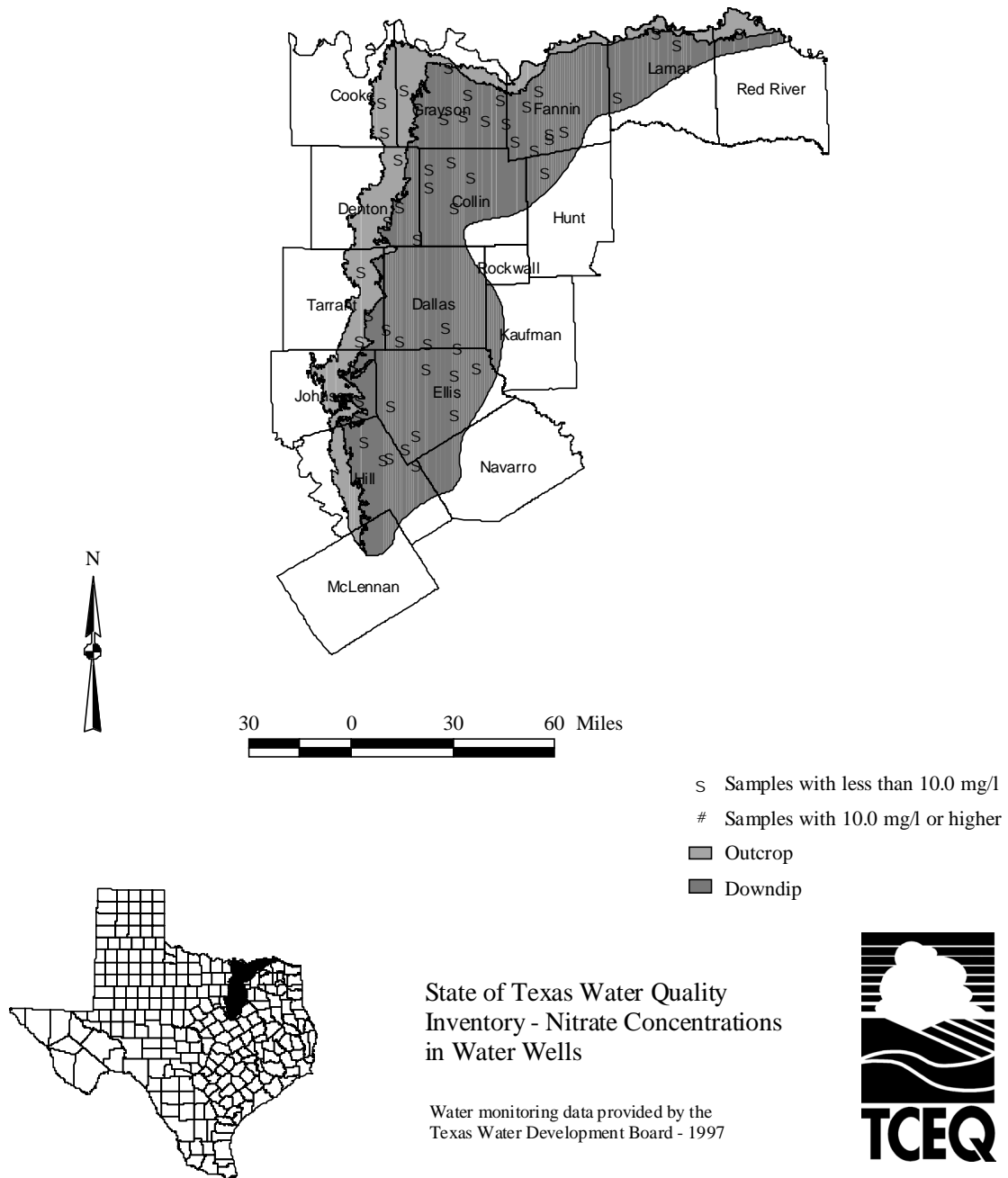


Table 14 - 30. Ambient Monitoring Groundwater Quality Data
Woodbine Aquifer (1997)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	83	73	10	0
Barium	2 mg/l	83	6	77	0
Cadmium	5 µg/l	79	79	0	0
Chromium	100 µg/l	79	26	53	0
Fluoride	4 mg/l	53	14	35	4
Mercury	2 µg/l	29	29	0	0
Nitrate (N)	10 mg/l	53	46	8	0
Selenium	50 µg/l	29	27	2	0
Secondary Constituents					
Chloride	300 mg/l	53	0	50	3
Copper	1 mg/l	83	21	62	0
Fluoride	2 mg/l	53	14	23	16
Iron	0.3 mg/l	87	12	67	8
Manganese	50 µg/l	82	6	76	0
Silver	100 µg/l	30	30	0	0
Sulfate	300 mg/l	53	0	40	13
Dissolved Solids	1000 mg/l	50	0	40	13
Zinc	5 mg/l	83	43	40	0
Radioactivity					
Gross Alpha	15 pCi/l	27	24	3	0
Beta	50 pCi/l	27	27	0	0

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 31. Groundwater Contamination Summary
Woodbine Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	1							TCE, vinyl
CERCLIS (non-NPL)	Yes	1				1			metals
DOD/DOE	Yes	1					1		TCE, vinyl
LUST	Yes	456	121	233		17		50	gasoline, diesel, waste oil, jet fuel, BTEX, TPH
RCRA Corrective Action	Yes	27		14	3	8	1		BTEX, TPH, VOC's, lead, arsenic, MTBE, cadmium, chrome, TCE
Underground Injection	No								
State Sites*	Yes	15	4	1	1			7	Chromium, Arsenic, Lead, BTEX
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		501	125	248	4	27	1	57	

NPL - National Priority List
DOE - Department of Energy
LUST - Leaking Underground Storage Tanks
*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOD - Department of Defense
RCRA - Resource Conservation and Recovery Act

Figure 14 - 18. Blossom Aquifer

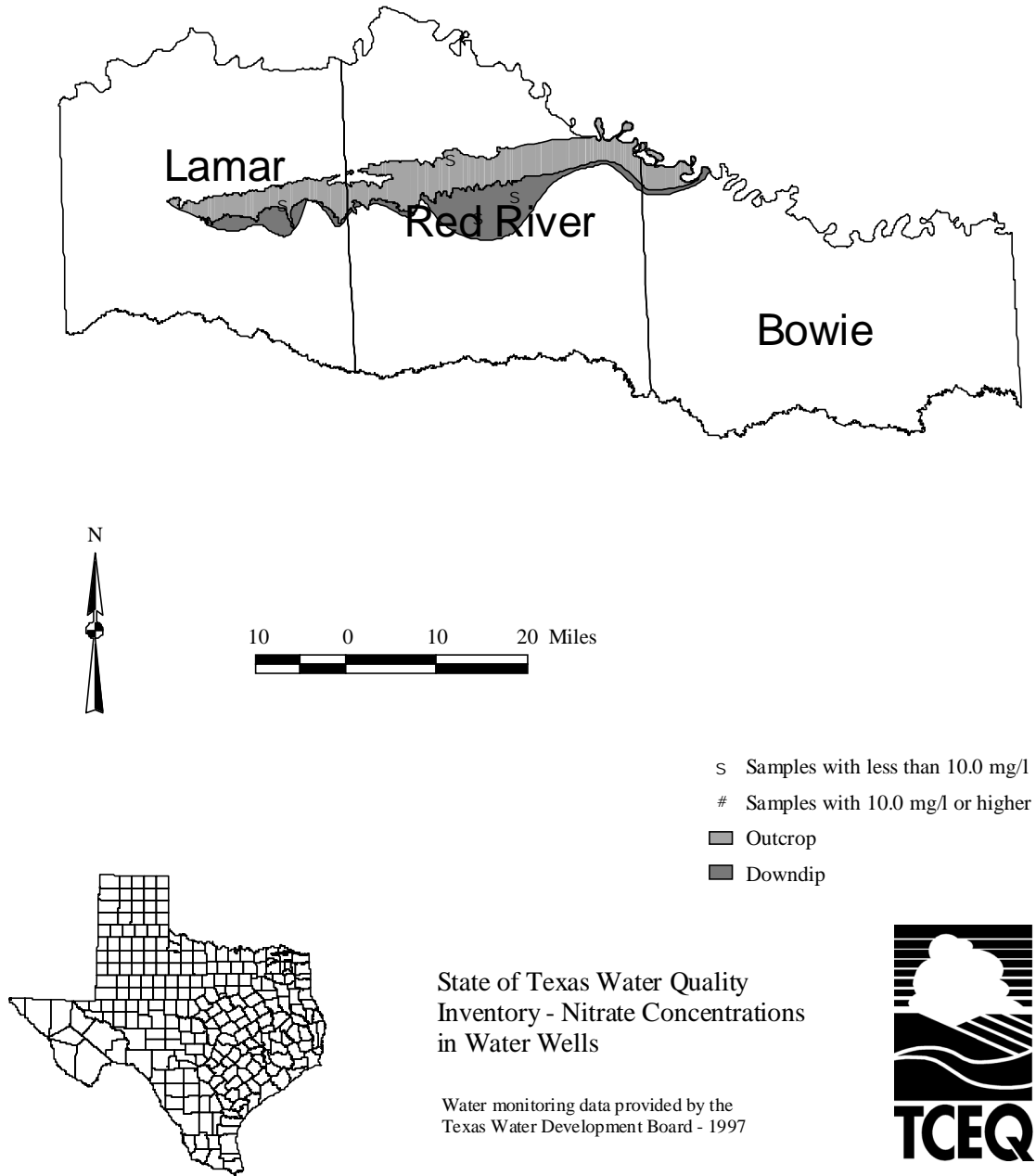


Table 14 - 32. Ambient Monitoring Groundwater Quality Data
Blossom Aquifer (1997)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	6	6	0	0
Barium	2 mg/l	6	0	6	0
Cadmium	5 µg/l	2	2	0	0
Chromium	100 µg/l	2	2	0	0
Fluoride	4 mg/l	4	1	3	0
Mercury	2 µg/l	2	2	0	0
Nitrate (N)	10 mg/l	4	4	0	0
Selenium	50 µg/l	6	6	0	0
Secondary Constituents					
Chloride	300 mg/l	4	0	4	0
Copper	1 mg/l	6	2	4	0
Fluoride	2 mg/l	4	1	2	1
Iron	0.3 mg/l	7	0	6	1
Manganese	50 µg/l	6	0	6	0
Silver	100 µg/l	0	0	0	0
Sulfate	300 mg/l	4	0	1	3
Dissolved Solids	1000 mg/l	4	0	1	3
Zinc	5 mg/l	6	3	3	0
Radioactivity					
Gross Alpha	15 pCi/l	2	2	0	0
Beta	50 pCi/l	2	2	0	0

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

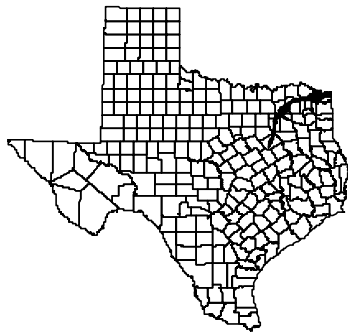
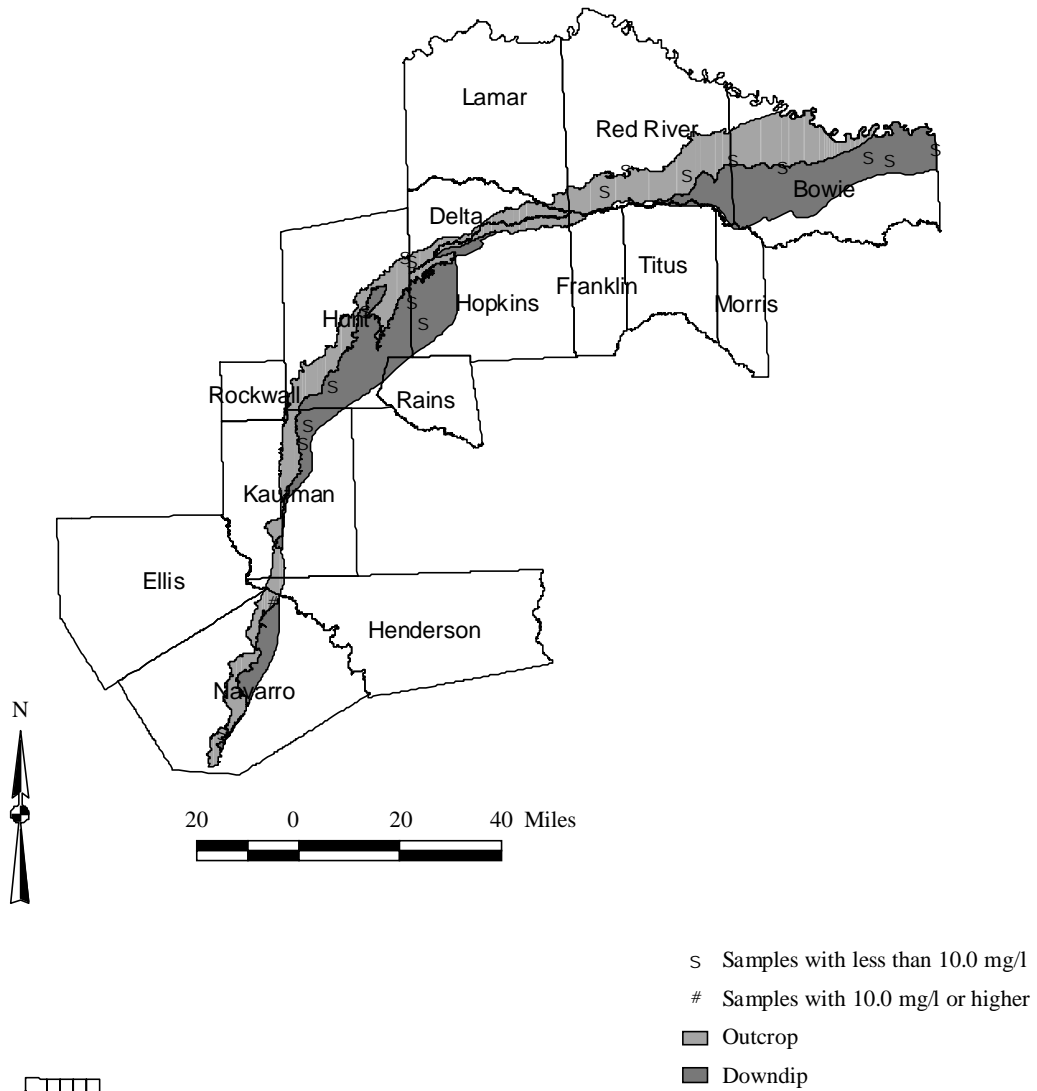
Table 14 - 33. Groundwater Contamination Summary
Blossom Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	15	3	8		1		1	gasoline, diesel, waste oil, BTEX, TPH
RCRA Corrective Action	Yes	1				1			diesel fuel
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		16	3	8		2	0	1	

NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 19. Nacatoch Aquifer



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1997



Table 14 - 34. Ambient Monitoring Groundwater Quality Data
Nacatoch Aquifer (1997)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	29	27	2	0
Barium	2 mg/l	29	3	26	0
Cadmium	5 µg/l	19	19	0	0
Chromium	100 µg/l	19	11	8	0
Fluoride	4 mg/l	18	9	9	0
Mercury	2 µg/l	11	11	0	0
Nitrate (N)	10 mg/l	18	15	2	1
Selenium	50 µg/l	0	0	0	0
Secondary Constituents					
Chloride	300 mg/l	18	0	14	4
Copper	1 mg/l	29	11	18	0
Fluoride	2 mg/l	18	9	6	3
Iron	0.3 mg/l	28	9	17	2
Manganese	50 µg/l	28	7	21	0
Silver	100 µg/l	12	12	0	0
Sulfate	300 mg/l	18	0	16	2
Dissolved Solids	1000 mg/l	18	0	12	6
Zinc	5 mg/l	29	12	17	0
Radioactivity					
Gross Alpha	15 pCi/l	10	9	1	0
Beta	50 pCi/l	10	10	0	0

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

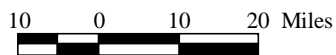
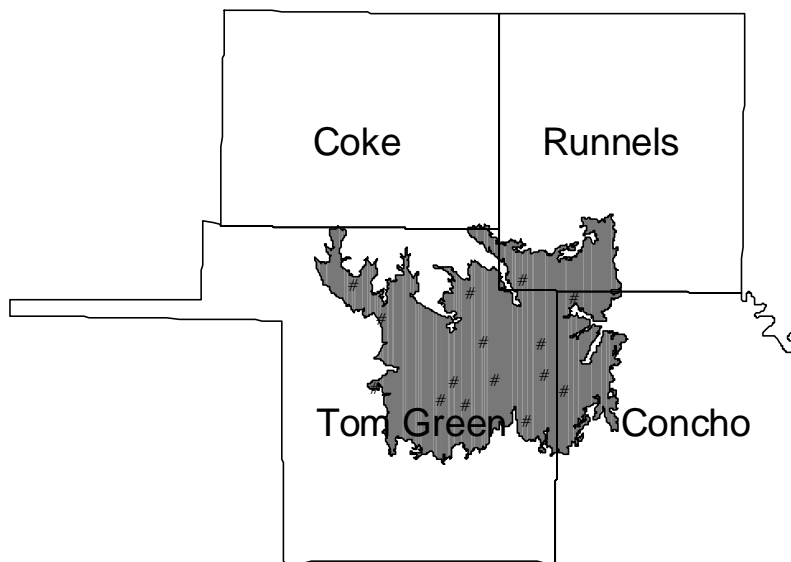
Table 14 - 35. Groundwater Contamination Summary
Nacatoch Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	18	7	8		1	1	2	gasoline, diesel, waste oil, BTEX, TPH
RCRA Corrective Action	Yes	1				1	1		Solvents
Underground Injection	No								
State Sites*	Yes	3		1				2	
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		22	7	9	1	2	1	4	

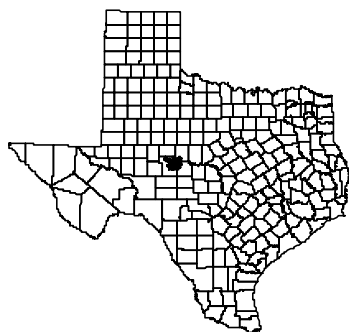
NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 -20. Lipan Aquifer



- s Samples with less than 10.0 mg/l
- # Samples with 10.0 mg/l or higher



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1997



Table 14 - 36. Ambient Monitoring Groundwater Quality Data
Lipan Aquifer (1997)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	29	11	18	0
Barium	2 mg/l	29	1	28	0
Cadmium	5 µg/l	22	22	0	0
Chromium	100 µg/l	22	6	16	0
Fluoride	4 mg/l	15	0	15	0
Mercury	2 µg/l	7	7	0	0
Nitrate (N)	10 mg/l	15	0	0	15
Selenium	50 µg/l	29	10	19	0
Secondary Constituents					
Chloride	300 mg/l	15	0	3	12
Copper	1 mg/l	29	13	16	0
Fluoride	2 mg/l	15	0	15	0
Iron	0.3 mg/l	29	18	11	0
Manganese	50 µg/l	29	20	9	0
Silver	100 µg/l	7	7	0	0
Sulfate	300 mg/l	15	0	12	3
Dissolved Solids	1000 mg/l	15	0	2	13
Zinc	5 mg/l	29	13	16	0
Radioactivity					
Gross Alpha	15 pCi/l	7	0	7	0
Beta	50 pCi/l	7	3	4	0

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 37. Groundwater Contamination Summary
Lipan Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)									
DOD/DOE	Yes	2		1				5	aviation fuel, gasoline, waste oil
LUST	Yes	57	9	39		5			gasoline, diesel
RCRA Corrective Action	Yes	6		2	2			2	Methylene Chloride, metals, PCB's, Chlorinated Hydrocarbons
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		65	9	42	2	5	7	1	

NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 21. Hueco and Mesilla Bolsons

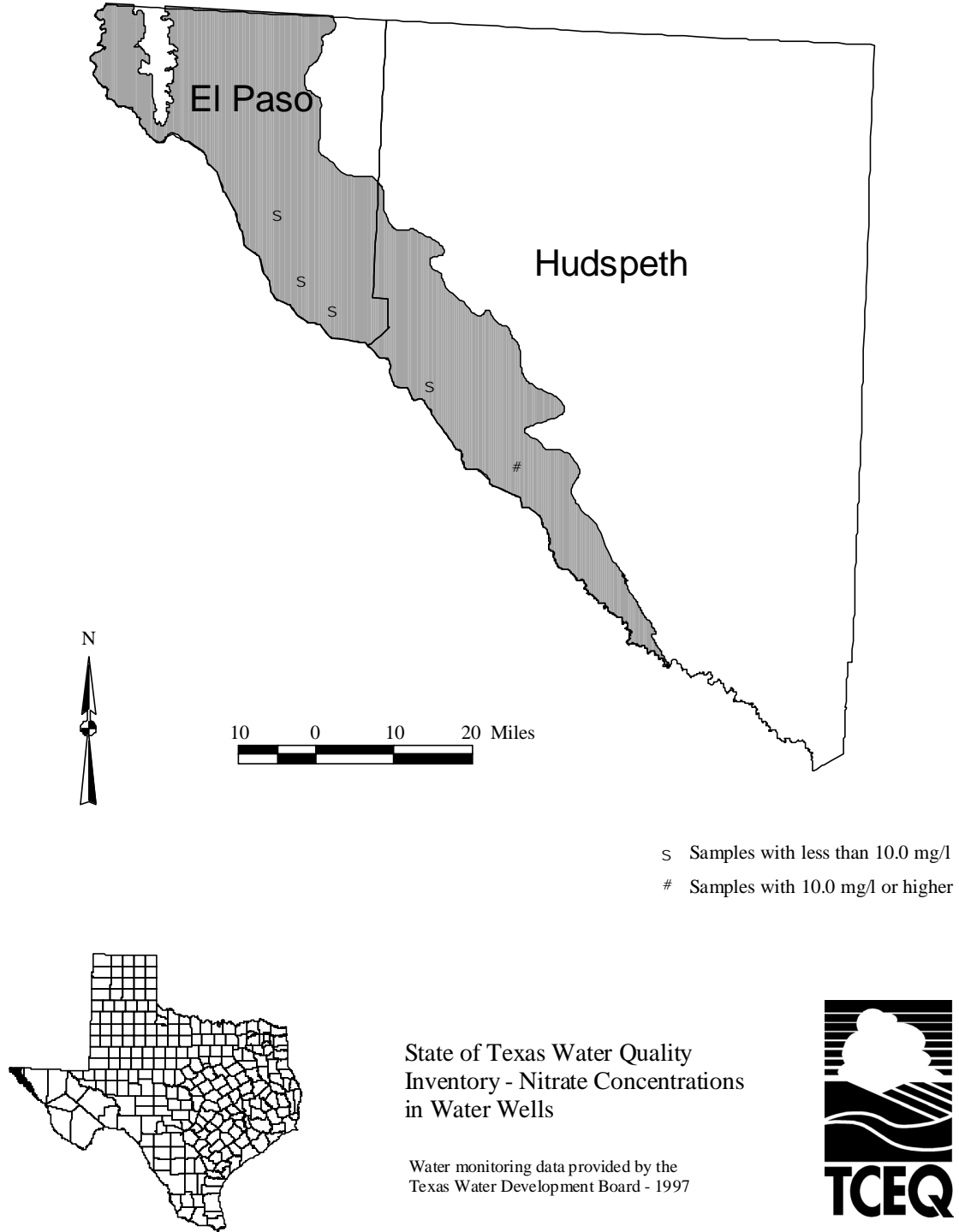


Table 14 - 38. Ambient Monitoring Groundwater Quality Data
Hueco - Mesilla Bolsons (1997)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	6	0	6	0
Barium	2 mg/l	12	0	12	0
Cadmium	5 µg/l	6	6	0	0
Chromium	100 µg/l	5	0	5	0
Fluoride	4 mg/l	5	1	3	1
Mercury	2 µg/l	4	4	0	0
Nitrate (N)	10 mg/l	5	2	2	1
Selenium	50 µg/l	5	3	2	0
Secondary Constituents					
Chloride	300 mg/l	5	0	4	1
Copper	1 mg/l	5	0	5	0
Fluoride	2 mg/l	5	1	2	2
Iron	0.3 mg/l	5	1	4	0
Manganese	50 µg/l	5	1	4	0
Silver	100 µg/l	0	0	0	0
Sulfate	300 mg/l	5	0	2	3
Dissolved Solids	1000 mg/l	5	0	3	2
Zinc	5 mg/l	11	5	6	0
Radioactivity					
Gross Alpha	15 pCi/l	5	0	3	2
Beta	50 pCi/l	11	5	6	0

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 39. Groundwater Contamination Summary
Hueco - Mesilla Bolsons Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	Yes	1						1	Mercury, chromium
LUST	Yes	90	14	65				8	gasoline, diesel
RCRA Corrective Action	Yes	6		3	2			1	Plating solution, paint, mercury, chromium
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		97	14	68	2	0	1	9	

NPL - National Priority List

DOE - Department of Energy

LUST - Leaking Underground Storage Tanks

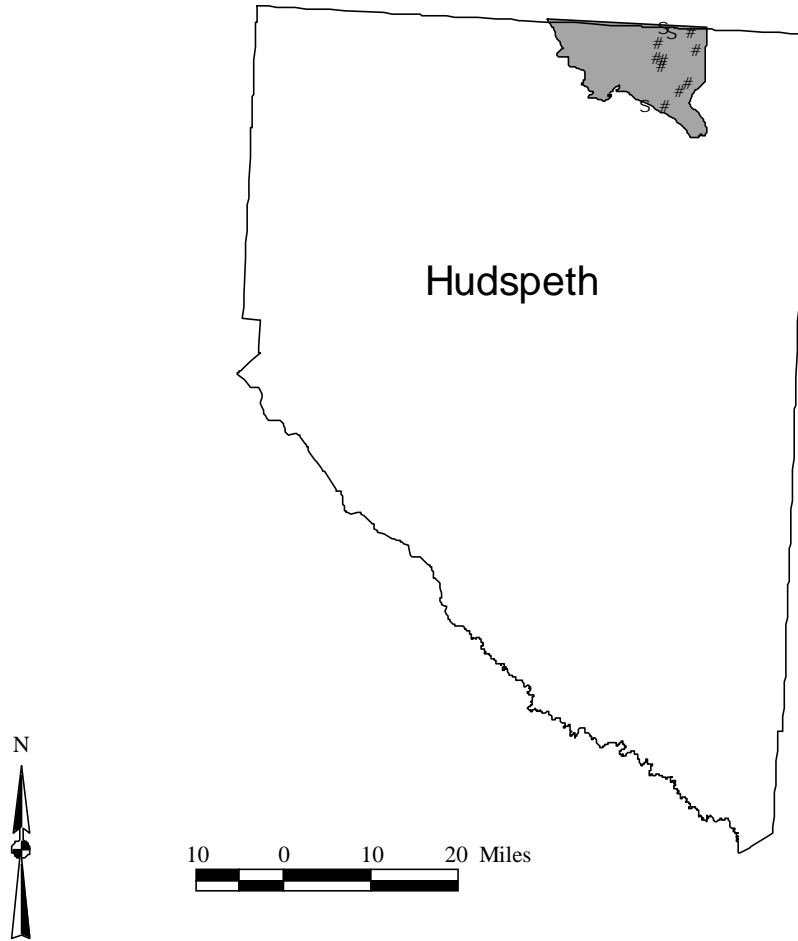
*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System

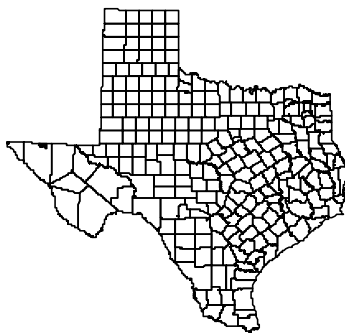
DOD - Department of Defense

RCRA - Resource Conservation and Recovery Act

Figure 14 - 22. Bone Spring - Victorio Peak Aquifer



s Samples with less than 10.0 mg/l
Samples with 10.0 mg/l or higher



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1997



Table 14 - 40. Ambient Monitoring Groundwater Quality Data
Bone Spring - Victorio Peak Aquifer (1997)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells Sampled	< MDL	< MCL (other than <MDL)	\$MCL
Primary Constituents					
Arsenic	50 µg/l	18	17	1	0
Barium	2 mg/l	18	5	13	0
Cadmium	5 µg/l	11	11	0	0
Chromium	100 µg/l	12	0	12	0
Fluoride	4 mg/l	12	0	12	0
Mercury	2 µg/l	0	0	0	0
Nitrate (N)	10 mg/l	12	0	3	9
Selenium	50 µg/l	18	15	3	0
Secondary Constituents					
Chloride	300 mg/l	12	0	3	9
Copper	1 mg/l	18	7	11	0
Fluoride	2 mg/l	12	0	3	9
Iron	0.3 mg/l	18	10	7	1
Manganese	50 µg/l	18	15	3	0
Silver	100 µg/l	0	0	0	0
Sulfate	300 mg/l	12	0	0	12
Dissolved Solids	1000 mg/l	12	0	0	12
Zinc	5 mg/l	18	3	15	0
Radioactivity					
Gross Alpha	15 pCi/l	6	1	2	3
Beta	50 pCi/l	6	0	5	1

Notes:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular sampling event. The MDL is determined by the analyzing laboratory.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's, and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 41. Groundwater Contamination Summary
 Bone Spring - Victorio Peak Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	No								
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals									

NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 23. Carrizo - Wilcox Aquifer

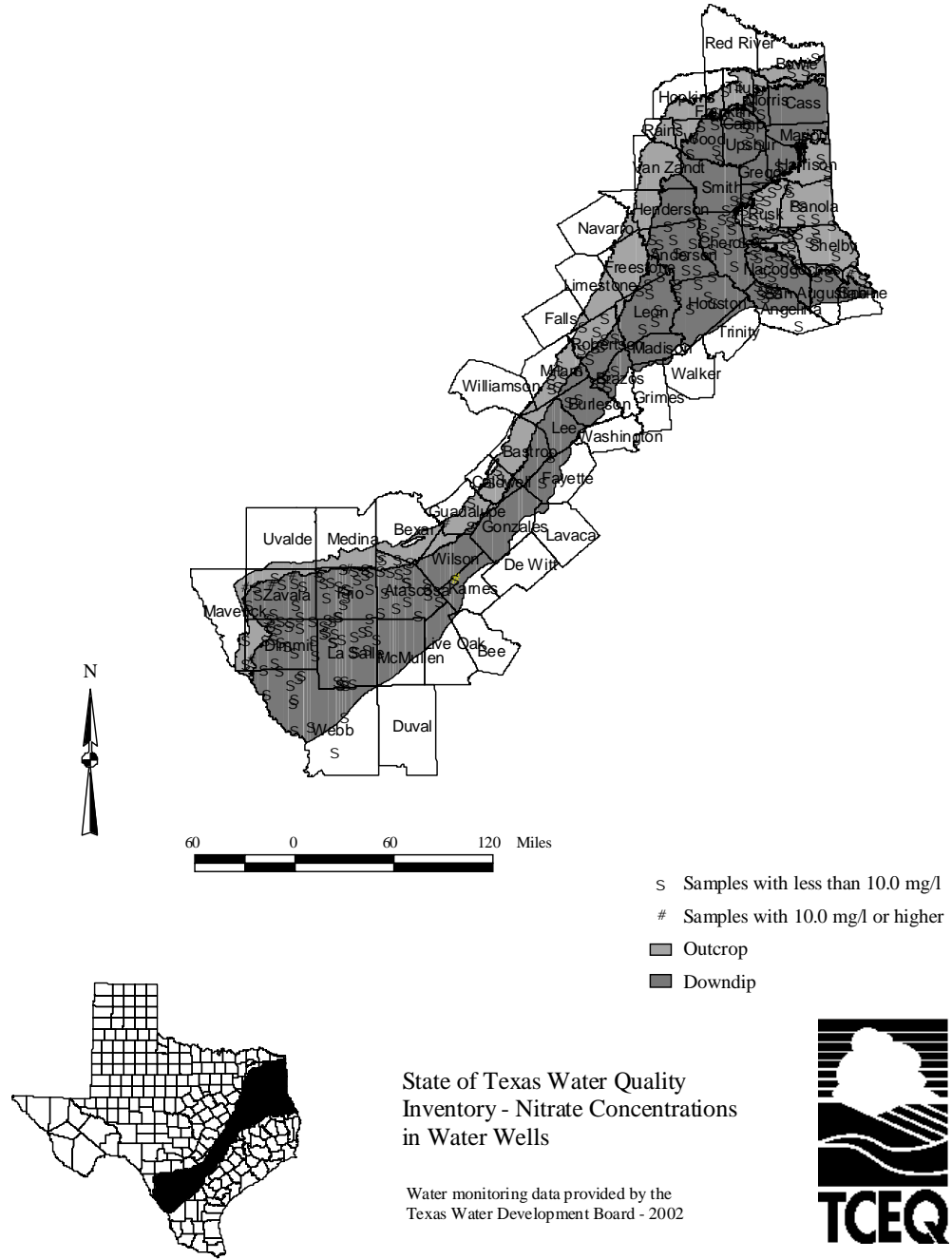


Table 14 - 42. Ambient Monitoring Groundwater Quality
Carrizo-Wilcox Aquifer (2002)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL)	≥ MCL
Primary Constituents					
Arsenic	50ug/l	265	0	265	0
Barium	2ug/l	265	0	265	0
Cadmium	5ug/l	265	0	256	9
Chromium	100ug/l	265	0	265	0
Fluoride	4mg/l	266	0	264	2
Mercury	2ug/l				
Nitrate (N)	10mg/l	266	0	259	7
Selenium	50ug/l	265	0	261	4
Secondary Constituents					
Chloride	300mg/l	266	0	247	19
Copper	1mg/l	265	0	265	0
Fluoride	2mg/l	266	0	256	10
Iron	0.3mg/l	265	0	208	57
Manganese	50ug/l	265	0	231	34
Silver	100ug/l	0	0	0	0
Sulfate	300mg/l	266	0	255	11
Dissolved Solids	1000mg/l	266	0	236	30
Zinc	5mg/l	265	0	265	0
Radioactivity					
Gross Alpha	15pci/l	0	0	0	0
Beta	50pci/l	0	0	0	0

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determined by the analyzing laboratory and changes regularly.

2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 43. Groundwater Contamination Summary
Carrizo-Wilcox Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	8			1	1		1	Not Specified
CERCLIS (non-NPL)	No								
DOD/DOE	Yes	3		2	1				Explosives, Nitrate, Metals, Volatiles, Methylene Chloride
LUST	Yes	206	30	135		18		23	Gasoline, Diesel, Waste Oil
RCRA Corrective Action	Yes	21	1	9	2	4		1	Chlorinated Solvents, Boron, Selenium, TCE, Acetone, Chromium, Organic Chemicals
Underground Injection	No								
State Sites*	Yes	10	3	3	2	1			VOC's, Chlorinated Solvents, Coal Tar, TPH
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		248	34	149	6	24		5	

NPL - National Priority List
DOE - Department of Energy
LUST - Leaking Underground Storage Tanks
*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOD - Department of Defense
RCRA - Resource Conservation and Recovery Act

Figure 14 - 24. Edwards (Balcones Fault Zone) Aquifer

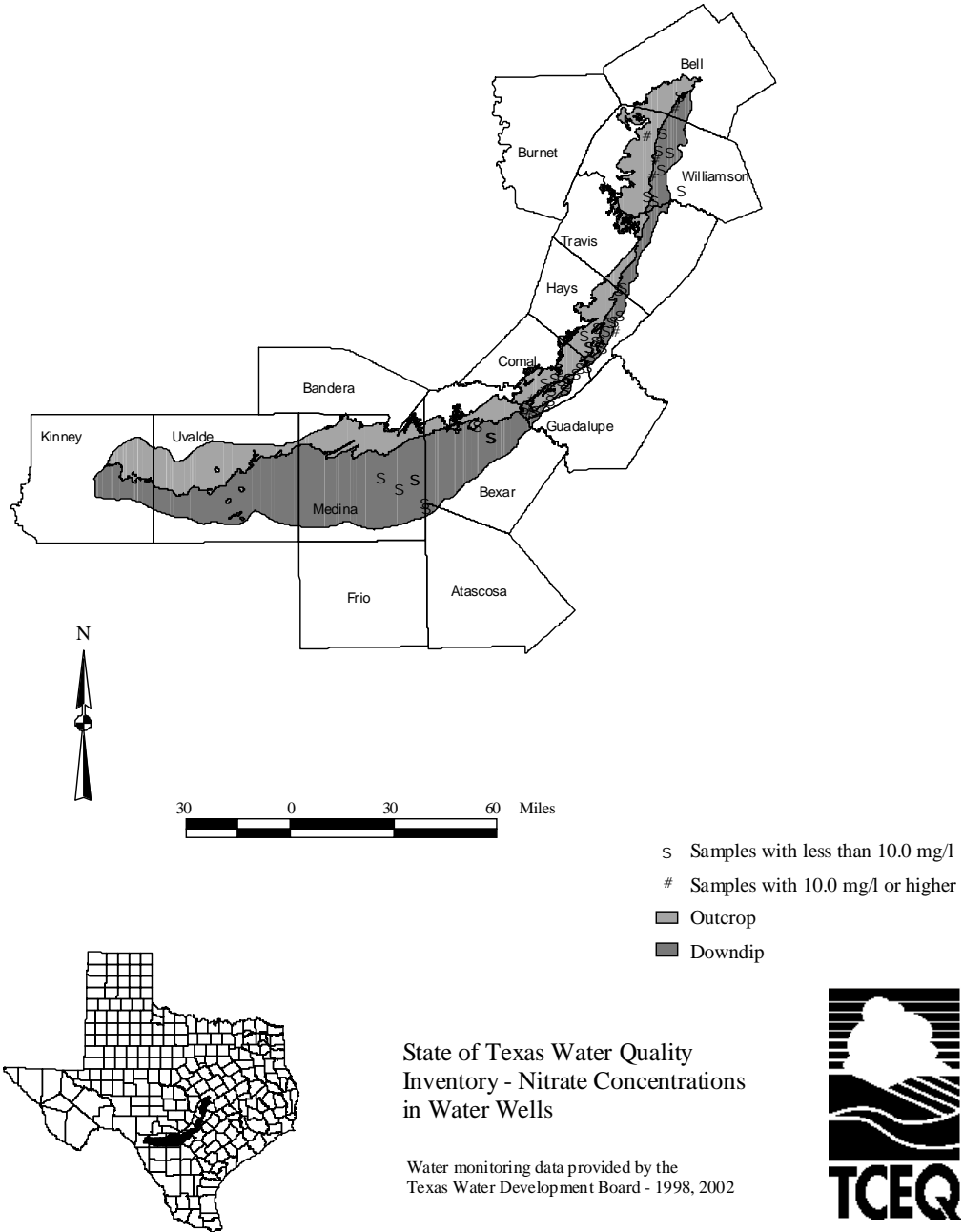


Table 14 - 44. Ambient Monitoring Groundwater Quality Data
Edwards (Balcones Fault Zone) (1998, 2002)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL	≥ MCL
Primary Constituents					
Arsenic	50ug/l	58	0	58	0
Barium	2mg/l	58	0	58	0
Cadmium	5ug/l	58	0	58	0
Chromium	100ug/l	58	0	58	0
Fluoride	4mg/l	55	0	55	0
Mercury	2ug/l				
Nitrate (N)	10mg/l	55	0	49	7
Selenium	50ug/l	55	0	55	0
Secondary Constituents					
Chloride	300mg/l	55	0	54	1
Copper	1mg/l	58	0	58	0
Fluoride	2mg/l	55	0	45	10
Iron	0.3mg/l	58	0	55	3
Manganese	50ug/l	58	0	57	1
Silver	100ug/l	0	0	0	0
Sulfate	300mg/l	55	0	54	1
Dissolved Solids	1000mg/l	55	0	54	1
Zinc	5mg/l	58	0	58	0
Radioactivity					
Gross Alpha	15pci/l	0	0	0	0
Beta	50pci/l	0	0	0	0

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determined by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 45. Groundwater Contamination Summary
Edwards Balcones Fault Zone (BFZ) Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	30	4	21		2		1	Gasoline, Diesel
RCRA Corrective Action	Yes	3	1	2					PCE, Phenol, Chromium, Hydrocarbons
Underground Injection	No								
State Sites*	Yes	14	4	5				5	VOC, Metals, Mercury, Sewage, Freon
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		47	9	28		2	0	6	

NPL - National Priority List

DOE - Department of Energy

LUST - Leaking Underground Storage Tanks

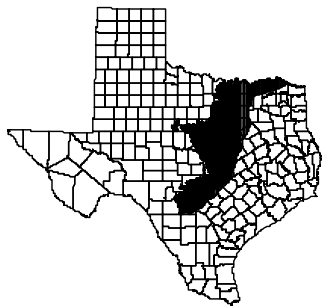
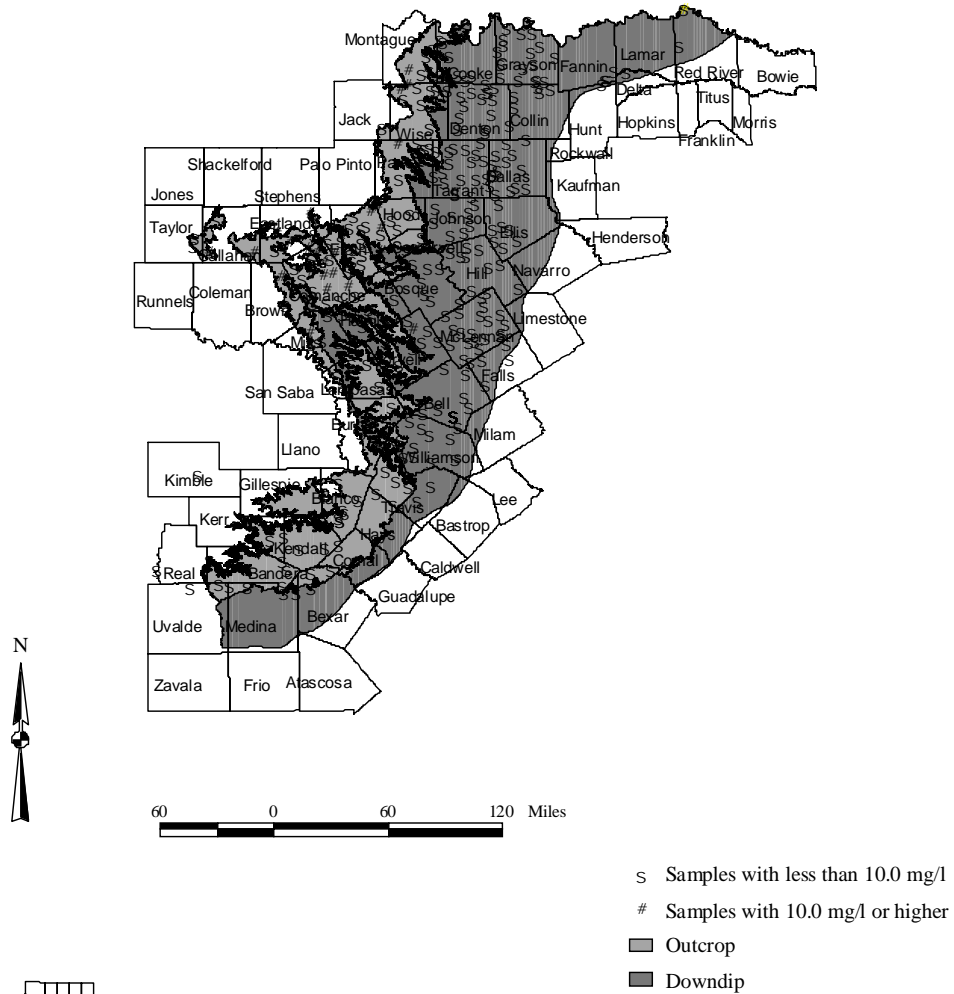
*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System

DOD - Department of Defense

RCRA - Resource Conservation and Recovery Act

Figure 14 - 25. Trinity Aquifer



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1999, 2001



Table 14 - 46. Ambient Monitoring Groundwater Quality Data
Trinity Aquifer (1999, 2001)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL	≥ MCL
Primary Constituents					
Arsenic	50ug/l				
Barium	2mg/l				
Cadmium	5ug/l	320	0	320	0
Chromium	100ug/l	320	0	320	0
Fluoride	4mg/l	313	0	309	4
Mercury	2ug/l				
Nitrate (N)	10mg/l	313	0	285	28
Selenium	50ug/l	320	0	320	0
Secondary Constituents					
Chloride	300mg/l	313	0	292	21
Copper	1mg/l	320	0	320	0
Fluoride					
Iron	0.3mg/l	320	0	317	3
Manganese	50ug/l	320	0	320	0
Silver	100ug/l				
Sulfate	300mg/l	313	0	286	27
Dissolved Solids	1000mg/l	313	0	264	49
Zinc	5mg/l	320	0	320	0
Radioactivity					
Gross Alpha	15pci/l				
Beta	50pci/l				

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determined by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 47. Groundwater Contamination Summary
Trinity Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	Yes	2			1	2			VOC's, Toluene
LUST	Yes	132	17	91		9		16	Gasoline, Diesel, Waste Oil
RCRA Corrective Action	Yes	5	1	3		1			TPH, BTEX, Gasoline, Metals
Underground Injection	No								
State Sites*	Yes	20	4	5				10	Dichloroethylene, Pesticides, TCE, TPH, BTEX, Bromacil
Non-point Sources	No								
Oil/Gas Activities	Yes	12	1	2	6	2		6	NaCl, Condensate, Natural Gas, Hydrocarbons
Totals		171	23	101	7	14		32	

NPL - National Priority List

DOE - Department of Energy

LUST - Leaking Underground Storage Tanks

RCRA - Resource Conservation and Recovery Act

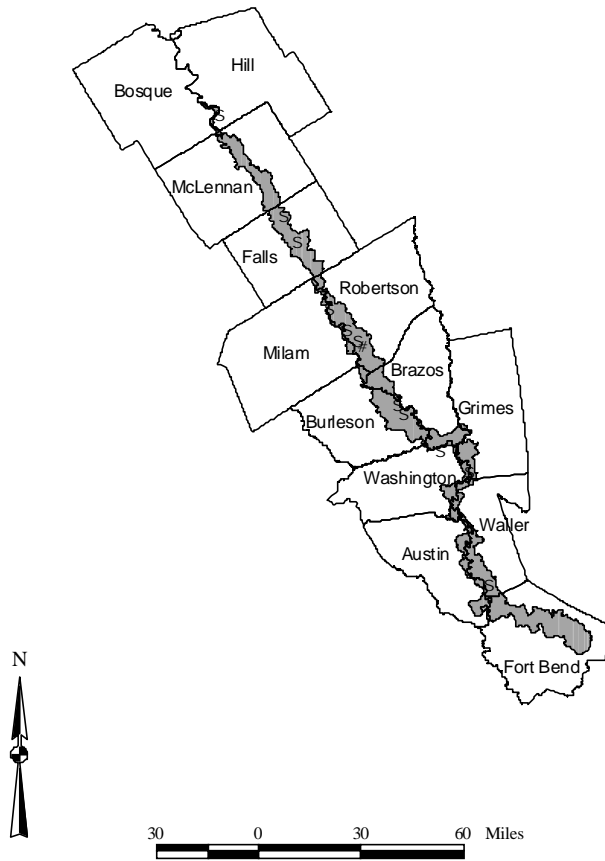
*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System

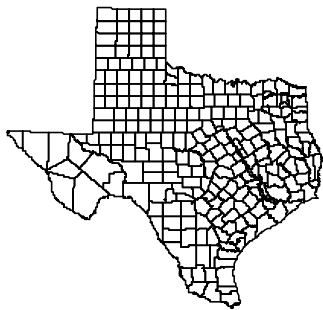
DOD - Department of Defense

RCRA - Resource Conservation and Recovery Act

Figure 14 - 26. Brazos River Alluvium Aquifer



S Samples with less than 10.0 mg/l
Samples with 10.0 mg/l or higher



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1999, 2000



Table 14 - 48. Ambient Monitoring Groundwater Quality Data
Brazos River Alluvium Aquifer (1999, 2000)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL)	≥ MCL
Primary Constituents					
Arsenic	50ug/l	12	0	12	0
Barium	2mg/l	12	0	12	0
Cadmium	5ug/l	12	0	12	0
Chromium	100ug/l	12	0	12	0
Fluoride	4mg/l	0	0	0	0
Mercury	2ug/l				
Nitrate (N)	10mg/l	12	0	11	1
Selenium	50ug/l	12	0	12	0
Secondary Constituents					
Chloride	300mg/l	0	0	0	0
Copper	1mg/l	12	0	12	0
Fluoride	2mg/l	0	0	0	0
Iron	0.3mg/l	12	0	6	6
Manganese	50ug/l	12	0	2	10
Silver	100ug/l	0	0	0	0
Sulfate	300mg/l	0	0	0	0
Dissolved Solids	1000mg/l	0	0	0	0
Zinc	5mg/l	12	0	12	0
Radioactivity					
Gross Alpha	15pci/l	0	0	0	0
Beta	50pci/l	0	0	0	0

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determined by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 49. Groundwater Contamination Summary
Brazos River Alluvium Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	1				4			Not Specified
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	50	9	31		3		7	Gasoline, Diesel, Waste Oil
RCRA Corrective Action	Yes	12		8		4		1	TCE, Chromium, Mercury, Metals, VOC's
Underground Injection	No								
State Sites*	Yes	16	7	2	1	3		1	Metals, Chromium, TPH, Wood Preservative, Pesticides, Organic Chemicals
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		79	16	41	1	14		2	9

NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites
 CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 27. Dockum Aquifer

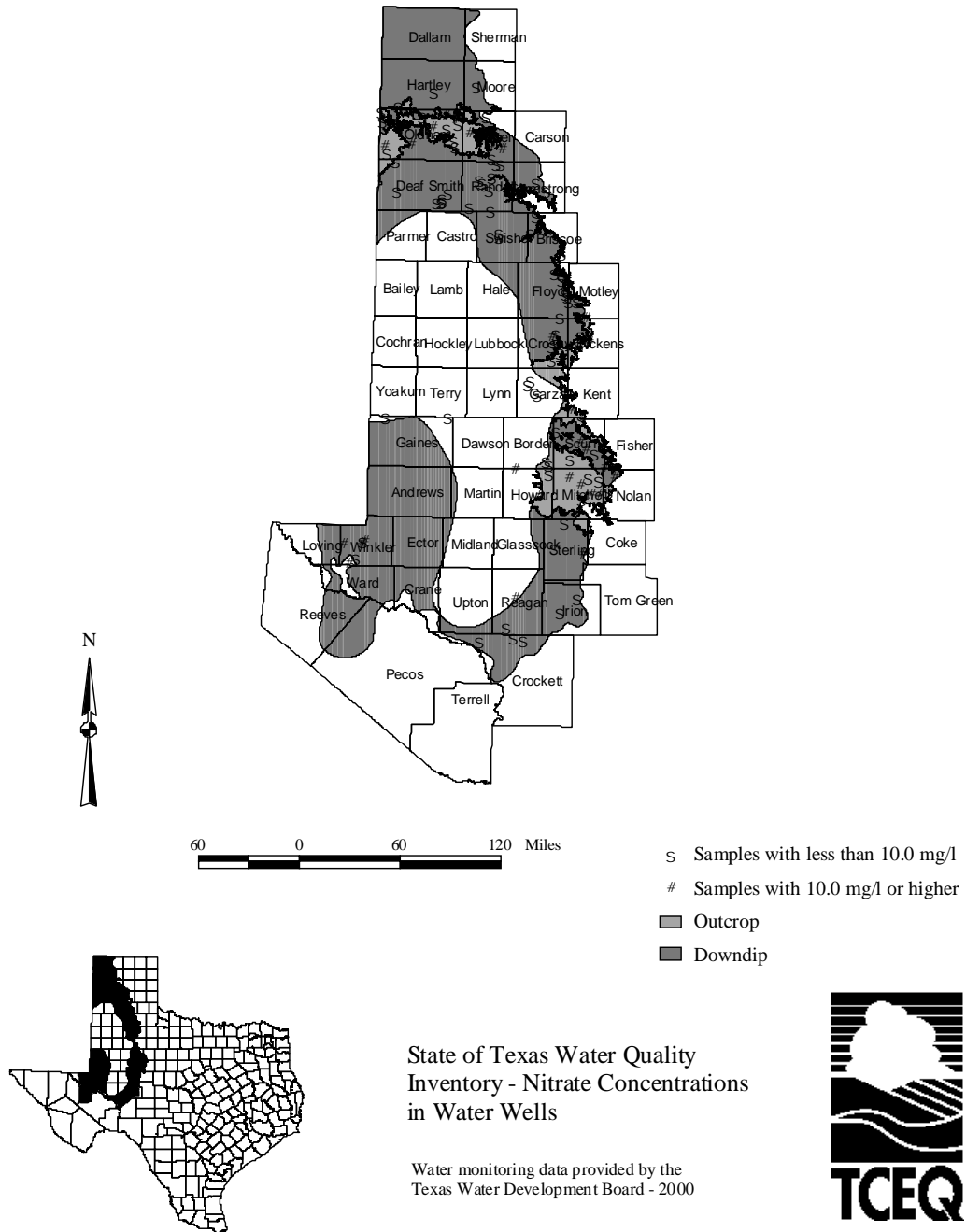


Table 14 - 50. Ambient Monitoring Groundwater Quality
Dockum Aquifer (2000)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL	≥ MCL
Primary Constituents					
Arsenic	50ug/l	107	0	104	3
Barium	2mg/l	107	0	107	0
Cadmium	5ug/l	107	0	98	9
Chromium	100ug/l	107	0	104	3
Fluoride	4mg/l	107	0	105	2
Mercury	2ug/l				
Nitrate (N)	10mg/l	107	0	78	29
Selenium	50ug/l	107	0	103	4
Secondary Constituents					
Chloride	300mg/l	107	0	95	12
Copper	1mg/l	107	0	107	0
Fluoride	2mg/l	99	0	59	40
Iron	0.3mg/l	107	0	91	16
Manganese	50ug/l	107	0	90	17
Silver	100ug/l	0	0	0	23
Sulfate	300mg/l	107	0	81	28
Dissolved Solids	1000mg/l	107	0	79	23
Zinc	5mg/l	107	0	107	0
Radioactivity					
Gross Alpha	15pci/l	99	0	75	24
Beta	50pci/l	98	0	93	5

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determine by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

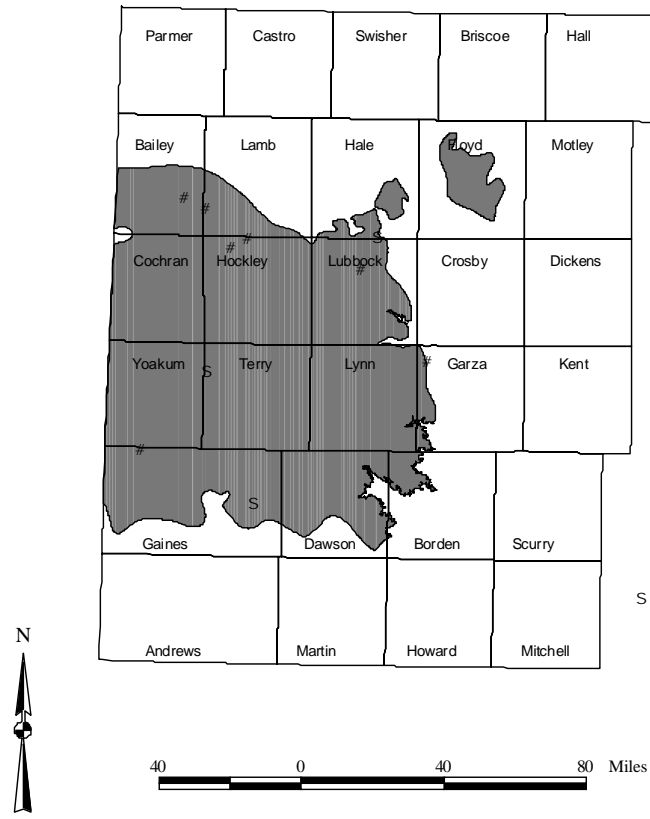
Table 14 - 51. Groundwater Contamination Summary
 Dockum Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	No								
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals									

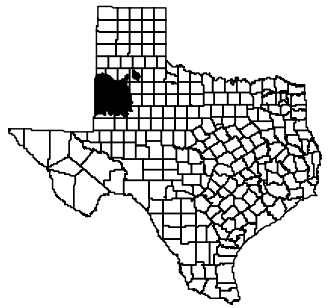
NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 28. Edward - Trinity (High Plains) Aquifer



S Samples with less than 10.0 mg/l
 # Samples with 10.0 mg/l or higher



State of Texas Water Quality
 Inventory - Nitrate Concentrations
 in Water Wells

Water monitoring data provided by the
 Texas Water Development Board - 2000



Table 14 - 52. Ambient Monitoring Groundwater Quality Data
Edwards - Trinity (High Plains) Aquifer (2000)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL	≥ MCL
Primary Constituents					
Arsenic	50ug/l	11	0	11	0
Barium	2mg/l				
Cadmium	5ug/l	11	0	11	0
Chromium	100ug/l	11	0	11	0
Fluoride	4mg/l	11	0	9	2
Mercury	2ug/l				
Nitrate (N)	10mg/l	11	0	4	7
Selenium	50ug/l	11	0	11	0
Secondary Constituents⁰					
Chloride	300mg/l	11	0	8	3
Copper	1mg/l	11	0	11	0
Fluoride					
Iron	0.3mg/l	11	0	10	1
Manganese	50ug/l	11	0	11	0
Silver	100ug/l	0	0	0	0
Sulfate	300mg/l	11	0	9	2
Dissolved Solids	1000mg/l	11	0	6	5
Zinc	5mg/l	11	0	11	0
Radioactivity					
Gross Alpha	15pci/l	11	0	11	0
Beta	50pci/l	11	0	11	0

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determine by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 53. Groundwater Contamination Summary
Edwards - Trinity High Plains Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	No								
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals									

NPL - National Priority List
DOE - Department of Energy
LUST - Leaking Underground Storage Tanks
*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOD - Department of Defense
RCRA - Resource Conservation and Recovery Act

Figure 14 - 29. Igneous Aquifer

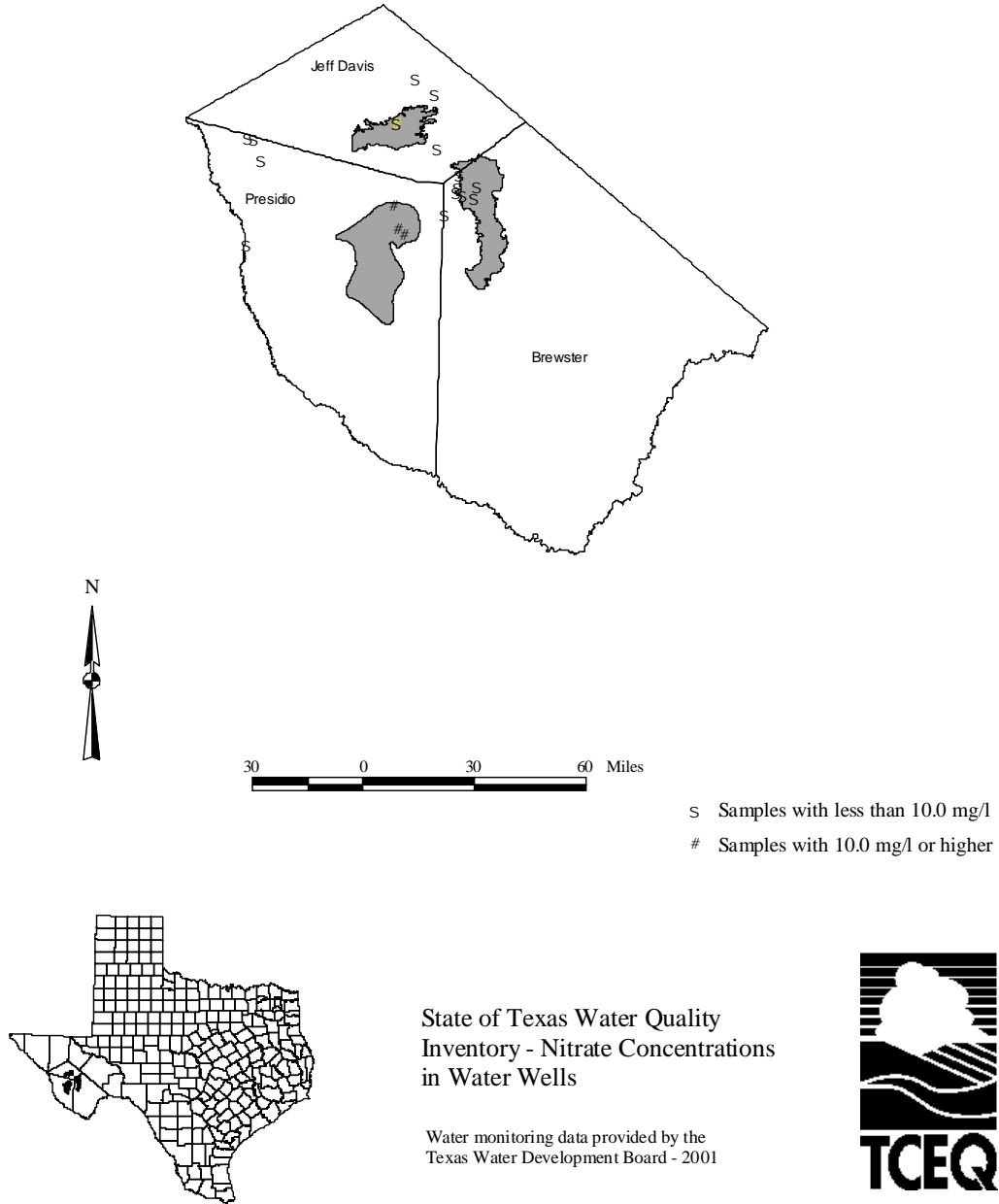


Table 14 - 54. Ambient Monitoring Groundwater Quality Data
Igneous Aquifer (2001)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL	≥ MCL
Primary Constituents					
Arsenic	50ug/l	18	0	18	0
Barium	2mg/l	18	0	18	0
Cadmium	5ug/l	18	0	1	0
Chromium	100ug/l	18	0	18	0
Fluoride	4mg/l	0	0	0	0
Mercury	2ug/l				
Nitrate (N)	10mg/l	17	0	12	5
Selenium	50ug/l	18	0	18	0
Secondary Constituents					
Chloride	300mg/l	17	0	17	0
Copper	1mg/l	18	0	18	0
Fluoride	2mg/l	0	0	0	0
Iron	0.3mg/l	18	0	18	0
Manganese	50ug/l	18	0	18	0
Silver	100ug/l	0	0	0	0
Sulfate	300mg/l	17	0	17	0
Dissolved Solids	1000mg/l	17	0	17	0
Zinc	5mg/l	18	0	18	0
Radioactivity					
Gross Alpha	15pci/l	0	0	0	0
Beta	50pci/l	0	0	0	0

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determined by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 55. Groundwater Contamination Summary
Igneous Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	2		1				6	Gasoline, Diesel
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		2		1				6	

NPL - National Priority List

DOE - Department of Energy

LUST - Leaking Underground Storage Tanks

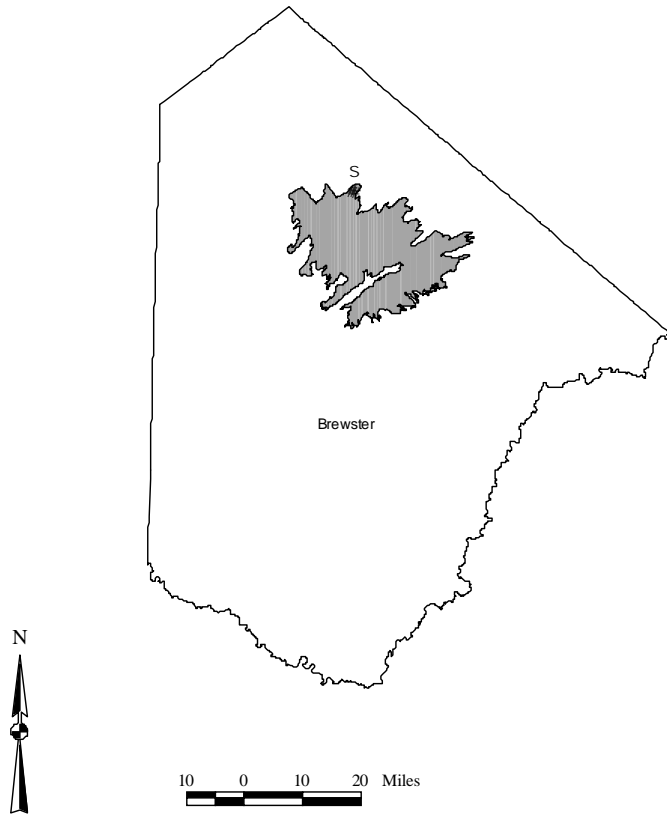
*These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System

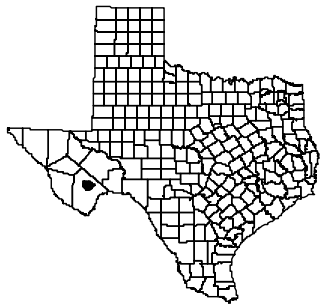
DOD - Department of Defense

RCRA - Resource Conservation and Recovery Act

Figure 14 - 30. Marathon Aquifer



S Samples with less than 10.0 mg/l
Samples with 10.0 mg/l or higher



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1998



Table 14 - 56. Ambient Monitoring Groundwater Quality Data
Marathon Aquifer (1998)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL	≥ MCL
Primary Constituents					
Arsenic	50ug/l	4	0	4	0
Barium	2mg/l	4	0	4	0
Cadmium	5ug/l	4	0	4	0
Chromium	100ug/l	4	0	4	0
Fluoride	4mg/l	4	0	4	0
Mercury	2ug/l				
Nitrate (N)	10mg/l	4	0	1	3
Selenium	50ug/l	4	0	4	0
Secondary Constituents					
Chloride	300mg/l	4	0	4	0
Copper	1mg/l	4	0	4	0
Fluoride	2mg/l	4	0	4	0
Iron	0.3mg/l	4	0	4	0
Manganese	50ug/l	4	0	4	0
Silver	100ug/l	0	0	0	0
Sulfate	300mg/l	4	0	4	0
Dissolved Solids	1000mg/l	4	0	4	0
Zinc	5mg/l	4	0	4	0
Radioactivity					
Gross Alpha	15pci/l	0	0	0	0
Beta	50pci/l	0	0	0	0

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determined by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 57. Groundwater Contamination Summary
Marathon Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	No								
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		0							

NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 31. Queen City Aquifer

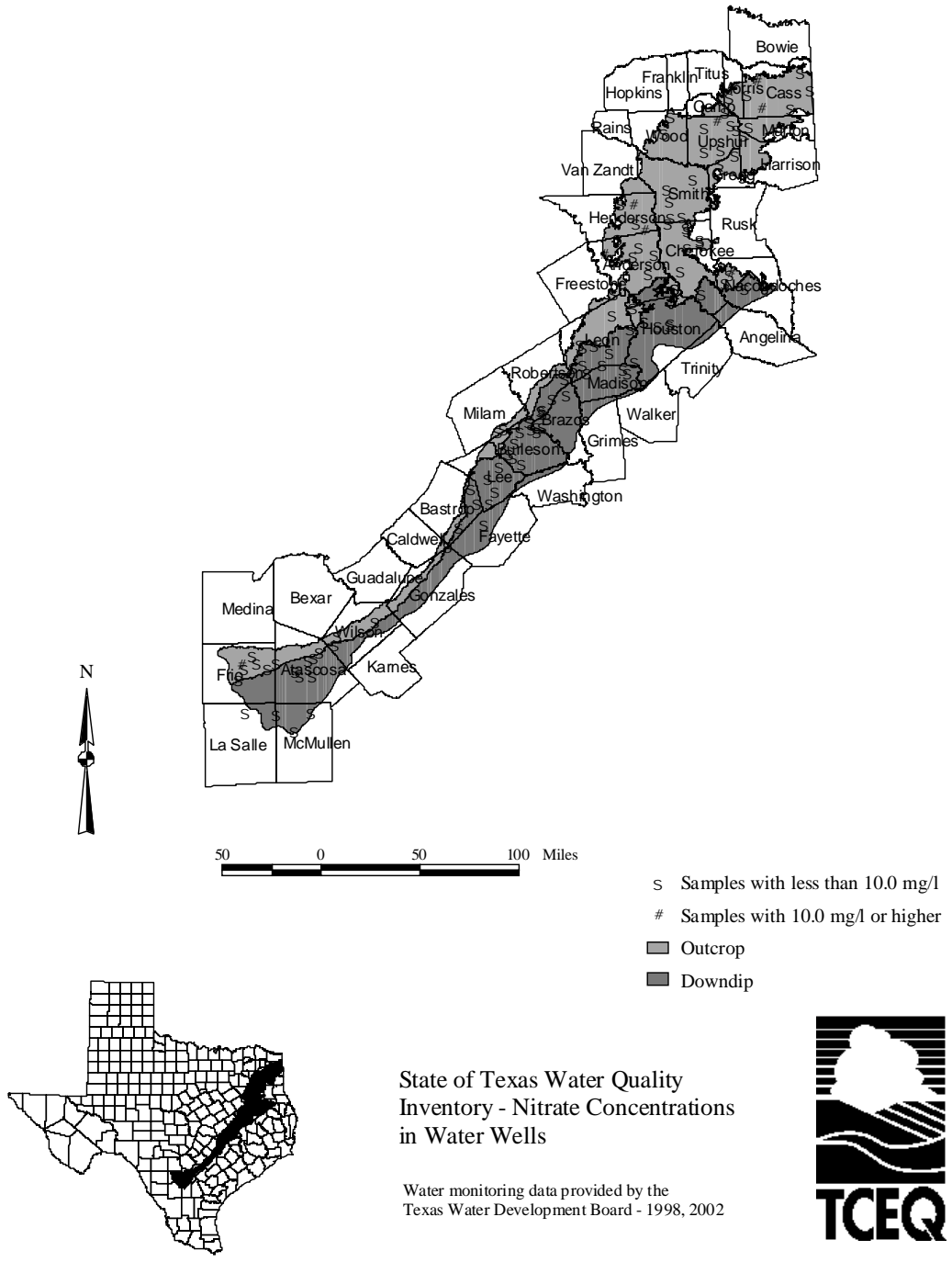


Table 14 - 58. Ambient Monitoring Groundwater Quality Data
Queen City Aquifer (1998, 2002)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL)	≥ MCL
Primary Constituents					
Arsenic	50ug/l	117	0	117	0
Barium	2mg/l	117	0	117	0
Cadmium	5ug/l	117	0	116	1
Chromium	100ug/l	117	0	116	1
Fluoride	4mg/l	117	0	117	0
Mercury	2ug/l				
Nitrate (N)	10mg/l	117	0	99	8
Selenium	50ug/l	117	0	106	0
Secondary Constituents					
Chloride	300mg/l	117	0	110	7
Copper	1mg/l	117	0	117	0
Fluoride	2mg/l	117	0	115	2
Iron	0.3mg/l	117	0	88	28
Manganese	50ug/l	117	0	101	16
Silver	100ug/l	0	0	0	0
Sulfate	300mg/l	117	0	111	6
Dissolved Solids	1000mg/l	117	0	106	11
Zinc	5mg/l	117	0	117	0
Radioactivity					
Gross Alpha	15pci/l	0	0	0	0
Beta	50pci/l	0	0	0	0

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determined by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 59. Groundwater Contamination Summary
Queen City Aquifer Outcrop (2001)

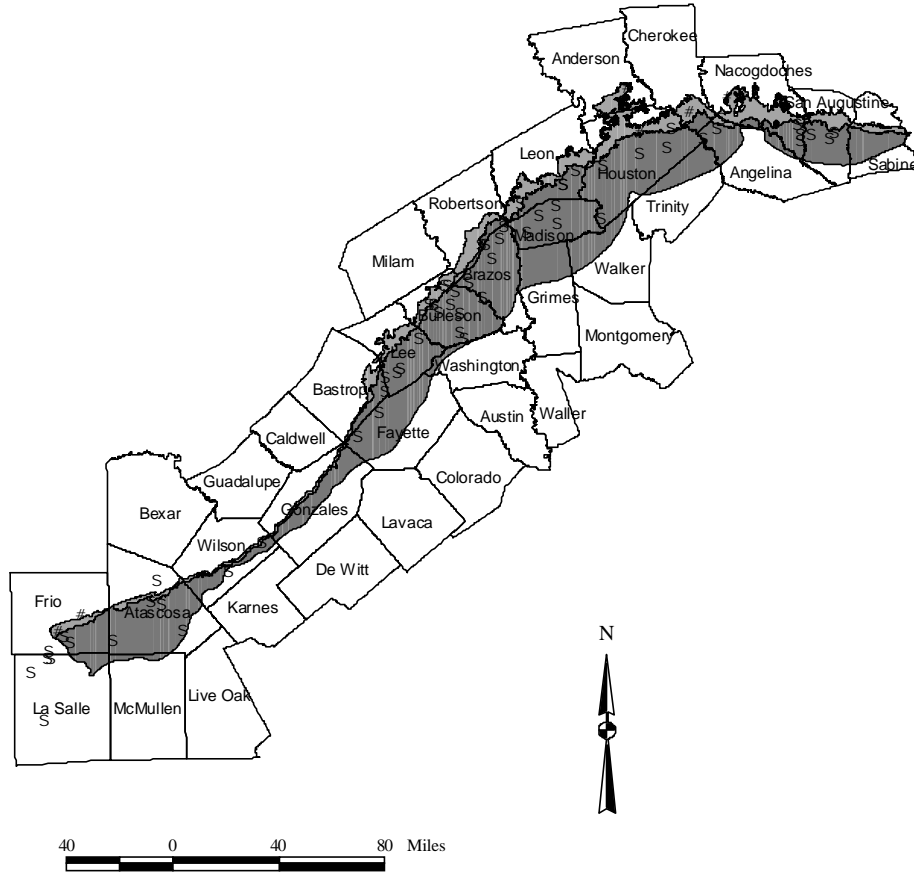
Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	1		1					
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	256	37	164		27		38	
RCRA Corrective Action	Yes	29	3	8	5	3	6	1	
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	Yes	9		1	1	5	1		
Totals		295	40	174	6	35	7	39	

NPL - National Priority List
DOE - Department of Energy
LUST - Leaking Underground Storage Tanks
*These sites may be combined with NPL sites

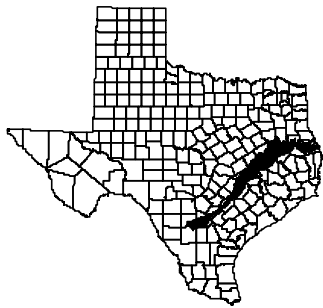
CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOD - Department of Defense

RCRA - Resource Conservation and Recovery Act

Figure 14 - 32. Sparta Aquifer



- S Samples with less than 10.0 mg/l
- # Samples with 10.0 mg/l or higher
- Outcrop
- Downdip



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 1998, 2002



Table 14 - 60. Ambient Monitoring Groundwater Quality Data
Sparta Aquifer (1998, 2002)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL	≥ MCL
Primary Constituents					
Arsenic	50ug/l	69	0	69	0
Barium	2mg/l	69	0	69	0
Cadmium	5ug/l	69	0	67	2
Chromium	100ug/l	69	0	69	0
Fluoride	4mg/l	69	0	69	0
Mercury	2ug/l				
Nitrate (N)	10mg/l	69	0	63	6
Selenium	50ug/l	69	0	68	1
Secondary Constituents					
Chloride	300mg/l	69	0	63	6
Copper	1mg/l	69	0	69	0
Fluoride	2mg/l	69	0	68	1
Iron	0.3mg/l	69	0	61	8
Manganese	50ug/l	69	0	62	6
Silver	100ug/l	0	0	0	0
Sulfate	300mg/l	69	0	65	4
Dissolved Solids	1000mg/l	69	0	61	8
Zinc	5mg/l	69	0	69	0
Radioactivity					
Gross Alpha	15pci/l	0	0	0	0
Beta	50pci/l	0	0	0	0

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determined by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

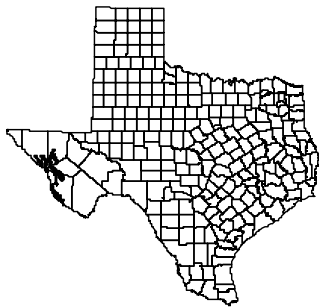
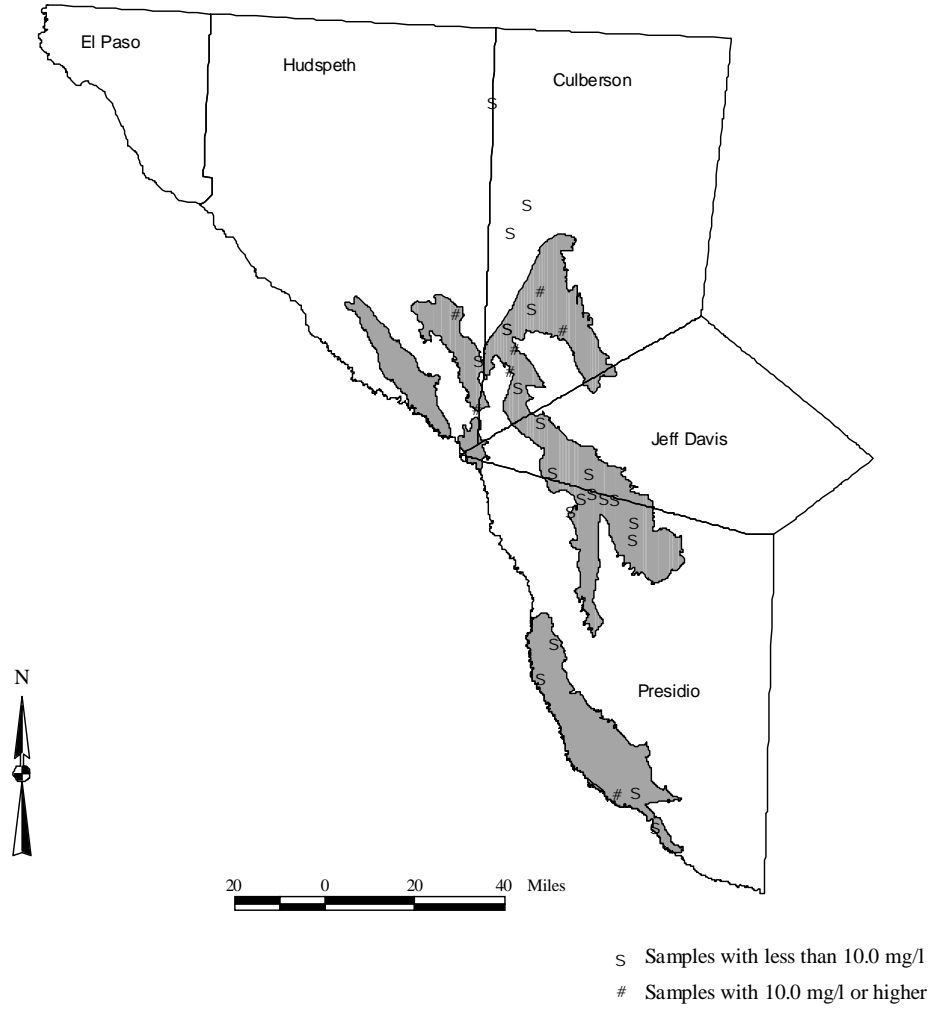
Table 14 - 61. Groundwater Contamination Summary
Sparta Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	1		1					Not Specified
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	13	4	3		1		5	Gasoline, Diesel
RCRA Corrective Action	Yes	3				2			Nitrate, Chlorinated Solvents, Lead
Underground Injection	No								
State Sites*	Yes	3	2					6	Nitrates, BTEX
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		20	6	4		3		11	

NPL - National Priority List
 DOE - Department of Energy
 LUST - Leaking Underground Storage Tanks
 *These sites may be combined with NPL sites

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
 DOD - Department of Defense
 RCRA - Resource Conservation and Recovery Act

Figure 14 - 33. West Texas Bolsons



State of Texas Water Quality
Inventory - Nitrate Concentrations
in Water Wells

Water monitoring data provided by the
Texas Water Development Board - 2001



Table 14 - 61. Ambient Monitoring Groundwater Quality Data
West Texas Bolsons (2001)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL)	≥ MCL
Primary Constituents					
Arsenic	50ug/l	30	0	30	0
Barium	2mg/l	30	0	30	0
Cadmium	5ug/l	30	0	30	0
Chromium	100ug/l	30	0	30	0
Fluoride	4mg/l	29	0	28	1
Mercury	2ug/l				
Nitrate (N)	10mg/l	29	0	22	7
Selenium	50ug/l	30	0	30	0
Secondary Constituents					
Chloride	300mg/l	29	0	28	1
Copper	1mg/l	30	0	30	0
Fluoride	2mg/l	29	0	19	10
Iron	0.3mg/l	30	0	28	2
Manganese	50ug/l	30	0	27	1
Silver	100ug/l	0	0	0	0
Sulfate	300mg/l	29	0	24	5
Dissolved Solids	1000mg/l	29	0	25	4
Zinc	5mg/l	30	0	30	0
Radioactivity					
Gross Alpha	15pci/l	0	0	0	0
Beta	50pci/l	0	0	0	0

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determined by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

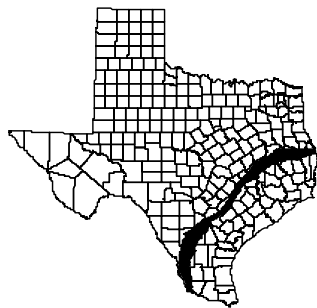
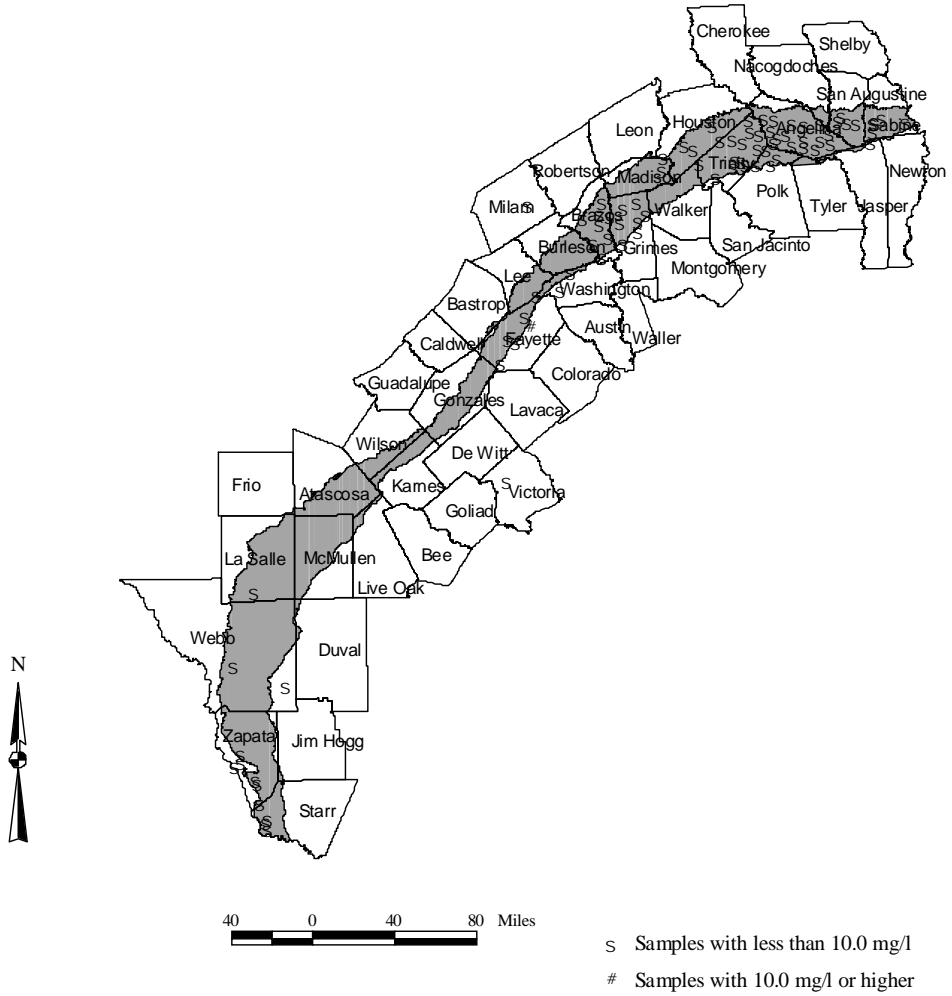
Table 14 - 63. Groundwater Contamination Summary
West Texas Bolsons Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	No								
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	3	1					2	Gasoline, Diesel
RCRA Corrective Action	No								
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	No								
Totals		3	1					2	

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Figure 14 - 34. Yegua - Jackson Aquifer



State of Texas Water Quality
 Inventory - Nitrate Concentrations
 in Water Wells

Water monitoring data provided by the
 Texas Water Development Board - 2002



Table 14 - 64. Ambient Monitoring Groundwater Quality Data
Yequa - Jackson Aquifer (2002)

Parameter Groups	Maximum Contamination Limit (MCL)	Number of Wells			
		Total Wells sampled	< MDL	< MCL (other than < MDL)	≥ MCL
Primary Constituents					
Arsenic	50ug/l	84	0	84	0
Barium	2mg/l	84	0	84	0
Cadmium	5ug/l	84	0	74	10
Chromium	100ug/l	84	0	84	0
Fluoride	4mg/l	84	0	84	0
Mercury	2ug/l				
Nitrate (N)	10mg/l	84	0	83	1
Selenium	50ug/l	84	0	80	4
Secondary Constituents					
Chloride	300mg/l	84	0	65	19
Copper	1mg/l	84	0	84	0
Fluoride	2mg/l	84	0	81	3
Iron	0.3mg/l	84	0	65	19
Manganese	50ug/l	84	0	53	31
Silver	100ug/l	0	0	0	0
Sulfate	300mg/l	84	0	65	19
Dissolved Solids	1000mg/l	84	0	56	28
Zinc	5mg/l	84	0	84	0
Radioactivity					
Gross Alpha	15pci/l	0	0	0	0
Beta	50pci/l	0	0	0	0

Note:

1. MDL = Method Detection Limit. The MDL is the lowest analysis value available for a particular constituent analysis at a particular event. The MDL is determined by the analyzing laboratory and changes regularly.
2. MCL = Maximum Contamination Level. The MCL of a particular constituent is the maximum analysis level for safe drinking water. MDL's for certain constituents at certain sampling events were greater than the MCL's and analyses from those events were not utilized when counting samples less than or greater than particular MCL's.

Table 14 - 65. Groundwater Contamination Summary
 Yegua - Jackson Aquifer Outcrop (2001)

Source Type	Documented Groundwater Contamination Present in Reporting Area	Number of Sites With Confirmed Groundwater Contamination	Site Activity Status						Contaminants
			Contamination Confirmation	Ongoing Investigation	Corrective Action Planning	Corrective Action Implemented	Monitoring of Corrective Action	Action Completed	
NPL	Yes	2		1	1				Not Specified
CERCLIS (non-NPL)	No								
DOD/DOE	No								
LUST	Yes	109	14	82		4		8	Gasoline, Diesel, Kerosene, Chemical
RCRA Corrective Action	Yes	7		3	1	4			BTEX, Naphthalene, Herbicides/Pesticides, Arsenic Pesticides, PCP, Acetone
Underground Injection	No								
State Sites*	No								
Non-point Sources	No								
Oil/Gas Activities	Yes	3	1	1		1			BTEX, Crude, Hydrocarbons
Totals		121	15	87	2	9	2	8	

NPL - National Priority List

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LUST - Leaking Underground Storage Tanks

*These sites may be combined with NPL sites

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DOD - Department of Defense

RCRA - Resource Conservation and Recovery Act