

1.0 What Is Texas Watch?

Recognizing the size and complexity of the water environment, the time and expense of monitoring water quality, and the significant role each one of us has in protecting Texas' waters, the Texas Natural Resource Conservation Commission (TNRCC), the U.S. Environmental Protection Agency (EPA), and Southwest Texas State University (SWT) have formed a cooperative partnership to support Texas Watch. Texas Watch is an environmental education and monitoring program funded through a USEPA Nonpoint Source Pollution (NPS) grant (section 319, Federal Clean Water Act). Texas Watch emphasizes communication about the environment, which is based on the premises that water issues are inextricably linked with air, biological, land, and human resource issues, and that the protection of the environment requires the active, positive, cooperative participation of all Texans. Texas Watch involves the participation of volunteers, students and faculty, the TNRCC and Texas Watch Partners such as river authorities, regional councils, businesses, universities and other agencies.

Texas Watch encourages everyone to ask:

- What questions do we want to answer about the environment?
- What part of the environment are we most concerned with?
- What can I do to help preserve and protect the environment?

For those people whose concerns are centered on water quality, Texas Watch helps them design water quality monitoring programs to address those concerns.

1.1 The Texas Watch Water Quality Monitoring and Environmental Education Program

The Texas Watch water quality monitoring manual was first developed not only to provide volunteers with clear instructions on how to collect water quality data, but also to educate volunteers about the importance of the tests and why they are relevant to understanding water quality. This updated version of the manual features an expanded educational section on nonpoint source pollution. Texas Watch encourages new and veteran monitors to read these new sections to ensure they have a solid grasp on such key concepts as watersheds, stream order, and eutrophication. By bringing nonpoint source pollution into the foreground of sampling projects, Texas Watch seeks to direct volunteer monitors to more effective strategies for resolving water quality problems that originate at the community level.

Another important development in the Texas Watch Program is its increasing emphasis on middle school and high school education. To support this emphasis, Texas Watch has developed a companion to this manual that adapts the information in this manual for the classroom. This Curriculum Companion can be found on the Texas Watch website (www.texaswatch.geo.swt.edu) in the Environmental Education Toolbox section. This education tool provides teachers the option of effectively conveying to students Texas Watch oriented environmental concepts and skills, either in the classroom or in the field.

The primary emphasis of this monitoring manual is to present methods and procedures for volunteers to become Texas Watch Certified Water Quality Monitors (CWQM). This certification enables volunteers to collect water quality data which meet the requirements of the EPA approved Texas Watch Quality Assurance Project Plan (QAPP).

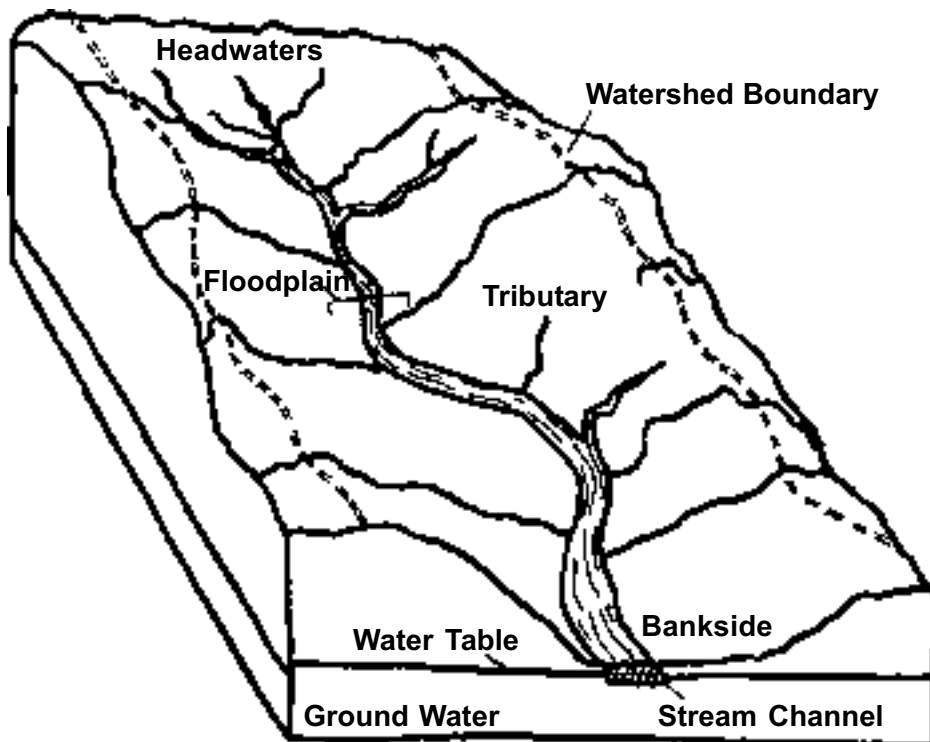
Texas Watch has developed this monitoring program with input from the EPA and TNRCC to address the following goals and benefits:

- Standardized training and quality assurance procedures helps the volunteer to collect accurate information that can be used in making environmentally sound decisions.
- As recognized by the EPA and TNRCC, volunteer collected quality assured data can serve to enhance professionally collected data.
- Collection of quality assured data improves understanding of environmental issues and promotes communication and positive cooperation between citizens, professional monitors, and the regulated community.

1.2 Key Concepts

What is a watershed?

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



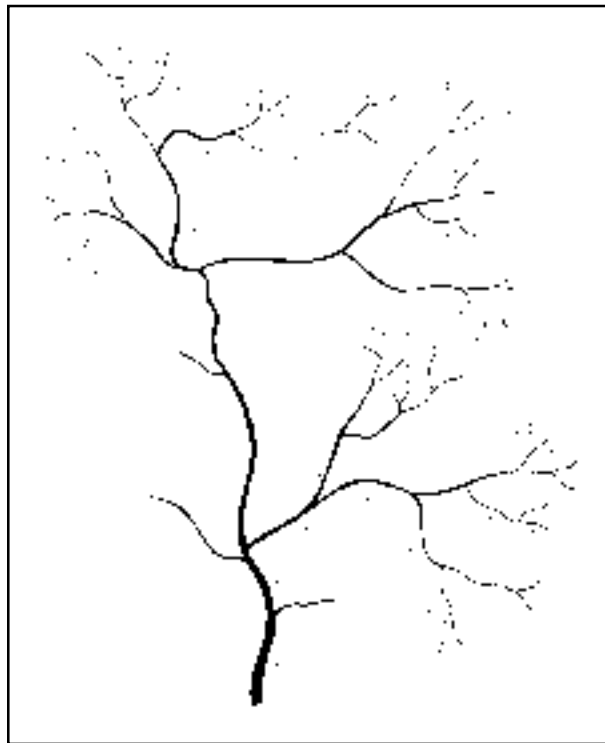
Another example is the Colorado River watershed, which contains thousands of smaller watersheds and is one of the largest watersheds in Texas. All of these smaller watersheds and their corresponding streams flow downhill and converge with each other, forming a tree-like network with the Colorado River as the trunk. All of the streams, from the smallest branch of Bee Creek to large tributaries such as the Llano River, constitute the river system of the Colorado River watershed.

A **watershed** is the area of land on which precipitation drains to a single point.

Stream Order

Water quality professionals have developed a simple method to categorize the streams of a river system. Streams that have no tributaries flowing into them are called first order streams. Streams receiving the flow from only first order streams are second order streams. When at least two second order streams combine, the result is a third order stream. This continues until all the streams merge into the largest river, which ultimately drains into a lake or ocean.

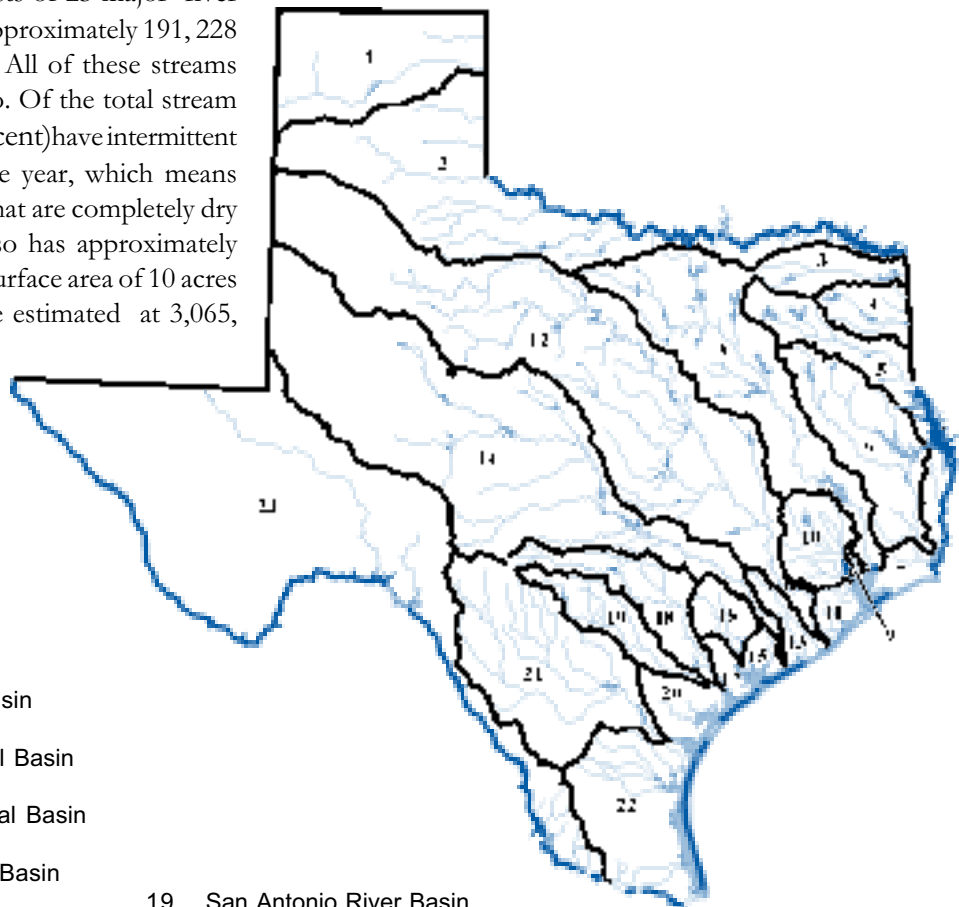
*Small headwater streams, also called first order streams, flow into larger streams. The network of streams in a single watershed is known as the **river system**.*



(Drawing by Christine Kolbe, TNRCC)

Texas River Basins

The state of Texas consists of 23 major river basins (watersheds) and has approximately 191,228 miles of streams and rivers. All of these streams drain into the Gulf of Mexico. Of the total stream mileage, 144,603 miles (76 percent) have intermittent flow during some part of the year, which means these streams have portions that are completely dry some of the time. Texas also has approximately 5,700 reservoirs, each with a surface area of 10 acres or larger, for a total coverage estimated at 3,065,600 acres.



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

1.3 Nonpoint Source Pollution

Getting to the Point

To a large extent, water quality within a watershed is linked to the actions of the people who live, work, and play within its boundaries. Water quality problems can be a result of either point source or nonpoint source (NPS) pollution. A **point source** is a single, identifiable source of pollution such as a discharge from a municipal or industrial wastewater treatment plant. Point sources are regulated under the Federal Clean Water Act and Texas state law and are subject to permit requirements. These permits specify effluent limits, monitoring requirements, and enforcement mechanisms. Even though effluent discharges are permitted and regulated, many of these point sources contribute to water quality degradation.

Nonpoint sources of pollution are largely unregulated and have not been evaluated in the same rigorous manner as point source pollution. NPS pollution originates from many different locations. We've all seen trash in our waterways following a storm. Other contaminants, not so easily seen, enter our waters in much the same way. NPS pollution occurs when rainfall runoff transports contaminants on the surface of the land into adjacent water bodies. Contaminated storm water can cause impairment to the beneficial uses of streams, reservoirs, estuaries, and oceans. Pollutants carried by water percolating through the soil and aquifer recharge features can contaminate groundwater. Agriculture, forestry, and residential and urban development can increase NPS pollutants.



Nonpoint Source (NPS) Pollution: *Pollution from sources which are diffuse and do not have a single point of origin or are not introduced into a stream from a specific outfall. The pollutants are generally carried off the land by stormwater runoff.*

Common sources of NPS pollutants include:

- sediment from croplands, forestry activities, construction sites, and streambank erosion
- nutrients from croplands, lawn and gardens, livestock operations, septic systems, and land waste application; sediments from erosion can reduce clarity and sun penetration in bodies of water, harming aquatic plant life and fish
- nutrients, such as runoff from over-fertilized areas or decaying leaves and lawn clippings; excessive nutrients in waterways can cause excess plant and bacteria growth, resulting in eutrophication (oxygen depletion) and fish kills
- bacteria from livestock, seepage from improperly maintained septic systems, leaking sewer lines, wildlife, and urban runoff
- man-made chemicals, including pesticides from roadways, croplands, lawns, gardens, and forestry operations; toxic materials, such as improperly applied pesticides or automotive products such as motor oil, engine degreasers and antifreeze; these toxins can wash from city streets and other areas or can result from illegal dumping
- surface trash, such as plastic containers or cigarette butts; this trash is not only aesthetically unappealing, but residue from discarded containers can be washed into water bodies

Nonpoint Source Pollution and Eutrophic Conditions

Dissolved oxygen (DO) is a basic requirement for a healthy aquatic ecosystem. Most fish and beneficial insects “breathe” oxygen dissolved in the water. Some fish and aquatic organisms (such as gar and sludge worms) are adapted to low DO concentrations, but most desirable fish species (such as largemouth bass and darters) suffer if DO concentrations are below 4 mg/L. Insect larvae and juvenile fish are more sensitive and require even higher concentrations of DO to function in a healthy way.

Oxygen concentrations in the water column fluctuate under natural conditions, but severe depletion may be the result of human activities that introduce large quantities of biodegradable organic materials into surface waters. Biodegradable organic materials which include lawn clippings, raw and treated sewage, food processing wastes, rice field drainage, and pulp paper wastes, are some examples of oxygen depleting organic materials that enter surface waters. As these wastes decompose and break down into essential nutrient enriched building blocks, many chemical and biological processes are directly affected. Nutrients are fundamental building blocks for healthy aquatic communities, but excess nutrients (especially nitrogen and phosphorus compounds) may over stimulate the growth of aquatic plants and algae. Excessive growth of these plants, in turn, can clog waterways and interfere with boating and swimming. In addition, these plants will out-compete native submerged aquatic vegetation, and with excessive decomposition, lead to oxygen depletion. Oxygen concentrations often fluctuate widely, increasing during the day as aquatic plants conduct photosynthesis (produces oxygen) and falling at night as plants continue to respire, consuming oxygen.

Fertilizers, malfunctioning septic systems, detergents and organic materials in treated sewage, and manure in agricultural runoff are examples of nutrient sources often responsible for water quality degradation. Rural areas are susceptible to groundwater contamination from nitrates found in fertilizer and manure. Nutrients are difficult to control because they typically recycle among the water column, algae, and bottom sediments. For example, algae may temporarily but significantly reduce phosphorus from the water column, but the nutrients will return to the water column when the algae die and are decomposed by bacteria. Gradual inputs of nutrients tend to accumulate over time rather than leave the system.

Detecting & Tracking NPS Pollution

Nonpoint source pollution is episodic. This means it typically enters our rivers and lakes during episodes of rainfall, during isolated events such as incidences of illegal dumping, or in a random fashion, as when a sewer line overflows or breaks. It is difficult and expensive to monitor nonpoint source pollution using a fixed monitoring schedule and employing tests for only a few chemical variables. Analyzing data for trends and correlations provides an effective strategy to investigate NPS pollution.

Running chemical tests on water quality is like taking a snapshot of the river or lake at that moment. Trend analysis based on DO concentrations, secchi depth measurements, and fluctuations in conductivity levels, provides additional clues in assessing NPS pollution. Looking at this information over an extended period of time provides a strong foundation to infer the corresponding DO values (oxygen concentrations will correspond to plant production and decomposition), rainfall contributions (conductivity values will change with runoff), and nutrient fluctuations (secchi measurements can be used to determine the productivity status of a system, which is influenced by nutrient loading).

Looking at the living organisms in a stream or lake can tell you a lot about what has happened there over time as well. For example, if you monitor a stream that has good habitat and good chemical water quality but no living organisms, something may have happened there prior to your sampling to account for this lack of critters. Perhaps a heavy rain storm washed a lot of water through your site and dislodged all the organisms. Perhaps an episode of NPS pollution lowered the DO level, causing the organisms to die or move downstream. There are many possible explanations, but by looking at the biological community of the stream over time, the monitor knows more about the long-term conditions of the stream than if they performed only chemical tests.

Sources of water pollution from the nonpoint sources are less obvious than those from point sources and are not as easy to control through traditional treatment strategies. The variability of rainfall events and the complexity of the landscapes and geologic strata lead to nonpoint source pollution phenomena which are highly variable and intricate. The lack of a single identifiable source of pollution makes it difficult to establish specific cause-and-effect relationships.

1.4 Texas Watch Core Variables

Under the current Texas Watch Core monitoring program, volunteers monitor water temperature, pH, DO, conductivity or salinity, and water clarity. These variables are documented in an approved monitoring plan that is required for all individuals, groups or organizations engaged in monitoring in conjunction with Texas Watch. An approved monitoring plan identifies the objectives of monitoring and specifies the sites and variables monitored and monitoring procedures. A monitoring plan is unique to the conditions and needs of a site. In addition to providing information on monitoring techniques, this manual also provides extensive information on safety procedures in the classroom and in the field, along with data management procedures and proper cleanup and storage of equipment. The variables monitored and the significance of these variables are described below.

Water Temperature

Temperature affects feeding, reproduction, and the metabolism of aquatic animals. In addition, temperature affects the solubility of compounds in water, distribution and abundance of organisms living in the water, rates of chemical reactions, density inversions and mixing, and current movements.

Temperature preferences among species vary widely, but all species can tolerate slow, seasonal changes better than rapid changes. Thermal stress and shock can occur when temperatures change more than 1 to 2 degrees Celsius in 24-hours.

pH

An indication of the water's acidity, pH measurements run on a scale of 1.0 to 14.0. A pH measurement of 7.0 is considered neutral. Solutions with a pH below 7.0 are considered acids, those above 7.0 are considered bases.

The pH scale is logarithmic, so every one-unit change in pH actually represents a ten-fold change in acidity. This means that pH 6.0 is ten times more acidic than pH 7.0, and pH 5.0 is 100 times more acidic than pH 7.0.

A range of pH 6.5 to pH 8.2 is optimal for most organisms. Rapidly growing algae and submerged

aquatic vegetation remove carbon dioxide from the water during photosynthesis. This can result in significant increases in pH levels. This in turn can affect aquatic life indirectly by changing other aspects of the water chemistry. For instance, toxic metals trapped in sediment are released into the water at lower pH levels, and the level of ammonia that fish can tolerate varies tremendously within a small range of pH values.

Dissolved Oxygen

Dissolved oxygen (DO) is the oxygen freely available in water and it is vital to fish and other aquatic life. Oxygen is transferred from the atmosphere into surface waters and is produced by aquatic plants, algae and phytoplankton as a by-product of plant photosynthesis. Once dissolved in water, oxygen diffuses very slowly and distribution depends on the movement of aerated water from turbulence and currents caused by wind, water flow and thermal upwelling.

Traditionally, the level of DO has been accepted as the single most important indicator of a water body's ability to support desirable aquatic life. The amount of oxygen required varies according to species and stage of life. Usually, DO levels of 5.0 to 6.0 part per million (ppm) are required for growth and activity. DO levels below 3.0 ppm are stressful to most aquatic organisms. When levels fall below 2.0 to 1.0 ppm, for an extended period of time, most fish will not be able to survive.

Total Dissolved Solids and Conductivity

Total dissolved solids (TDS) is defined as the quantity of dissolved material in water, and depends mainly on the solubility of rocks and soils the water contacts. For instance, water that flows through limestone and gypsum dissolves calcium, carbonate, and sulfate, resulting in high levels of TDS.

A convenient way to measure TDS is to test the conductivity of the sample. Conductivity is a measure of the ability of water to pass an electrical current and is affected by the presence of dissolved solids. As the level of TDS rises, the conductivity will also increase.

Conductivity is measured in micromhos per centimeter ($\mu\text{mhos/cm}$) or microsiemens per centimeter ($\mu\text{mS/cm}$), equivalent units of measure that can be used interchangeably. Distilled water has a conductivity in the range of 0.5 to 3 $\mu\text{mhos/cm}$. The conductivity of rivers generally ranges from 50 to 1500 $\mu\text{mhos/cm}$.

Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a range between 150 and 500 $\mu\text{mhos/cm}$. Conductivity outside this range could indicate that the water is not suitable for certain species of fish or macroinvertebrates. Discharges to water can change the conductivity depending on the discharge. A failing sewage system could raise the conductivity because of the presence of chloride, phosphate, and nitrate; an oil spill would lower the conductivity because oil does not conduct electrical current very well.

Salinity

Salinity is the total of all salts dissolved in water, usually expressed in parts per thousand (ppt). Salinity is a term that usually refers to waters receiving marine inflow such as bays and estuaries. In an estuary, the flow of fresh water from streams and rivers mixes with salty ocean water, producing a range of salinity from 0 to 35 ppt. The salt content of water affects the distribution of animal and plant species according to the amount of salinity they can tolerate.

Salt pollution can be caused by natural conditions intensified by drought, irrigation return flows, wastewater discharges that may be high in salts, brine waters from oil production activities, or the spreading of road salt during icy conditions. Salt pollution is a problem because it can cause the salt levels of drinking water supplies to rise above recommended levels for human consumption. In some areas, it can cause rivers or streams to become unsuitable for agricultural irrigation or industrial use. Increasing levels might also impair aquatic life in ways that are difficult to determine.

Fresh water and drinking water contain few salts and usually have a salinity of less than 0.5 ppt, while the salinity of seawater averages about 35 ppt.

Water Body	Salinity Range (ppt)
Freshwater	0 -4
Bays and Estuaries	5 - 150
Gulf of Mexico	34 - 36
World Ocean	33 - 37

Water Clarity

Materials mixed and suspended in water reduce its clarity and make the water turbid. Turbidity is a measure of water clarity, specifically, of how much the solid

matter suspended in water decreases the passage of light through the water. In the deeper waters of lakes, ponds, rivers and estuaries the Secchi disk is often used to measure water clarity (refer to page 24 for further explanation).

Sources of turbidity are primarily sediment from disturbed or eroded soil. But microscopic plankton also contribute to high turbidity when their numbers are increased due to excess nutrients and sunlight. In addition to blocking out the light needed by submerged aquatic vegetation, suspended sediment can carry nutrients and pesticides throughout the water system. Suspended particles near the water surface absorb additional heat from sunlight, raising surface water temperature. Settling sediment can bury benthic (bottom dwelling) creatures and fish eggs.

Moderately low levels of turbidity may indicate a healthy, well-functioning ecosystem in which plankton flourish at a reasonable level to form the foundation of the food web. High turbidity is an indicator of either runoff from disturbed or eroded soil or blooms of microscopic organisms due to high nutrient inputs. Very clear water is typical of the open ocean and lakes or reservoirs supporting only sparse plant and animal life.

Additional Water Quality Tests and Environmental Observations

Additional environmental information which is gathered during a monitoring event includes algae cover, water color, water clarity, flow level, water surface, water conditions, water odor, present weather and rainfall accumulation. These observations can be some of the most important information collected and can significantly contribute to the process of evaluating the site's data. Close attention to detail will result in familiarity with typical site conditions and a better record of any changes that occur.

Nitrate nitrogen, ammonia nitrogen, ortho phosphate phosphorus, and *E.coli* testing methods are also available when applicable conditions exist. These tests are usually reserved for veteran monitors who have demonstrated good monitoring consistency.

As water quality monitoring tests are revised and new water quality monitoring procedures are adopted, Texas Watch will assist volunteer monitoring groups who want to add these tests to their program. Volunteers are encouraged to contact Texas Watch for information on equipment specifications, costs, and certification procedures.

1.5 Getting Started With Texas Watch

Please follow these steps to begin your monitoring project:

1. Select a monitoring site and request a site location number based on the guidelines included in this manual under Section 2.0 - Choosing a Monitoring Location.
2. Complete a Texas Watch Monitoring Plan for your volunteer monitoring program. The Monitoring Plan identifies the objectives of monitoring and specifies the sites, parameters, and monitoring procedures. A copy of the Monitoring Plan and instructions can be obtained on the Texas Watch web site.
3. Schedule volunteer orientation and training sessions with your Texas Watch Partner. Texas Watch Partner contact information can be obtained by visiting the Texas Watch Website at www.texaswatch.geo.swt.edu or by calling toll free 877-506-1401. Training phases I and II are generally scheduled with a group. Upon completion of Phases I and II, Phase III is scheduled to complete the water quality monitor certification. Phase III takes place at the volunteer's monitoring site.
4. Acquire a monitoring kit. Monitors acquire kits in a variety of ways. They may pay for a kit with their own money or raise the money from another source such as a civic organization. Several Texas Watch Partners provide kits, and the Texas Watch Headquarters office at SWT in San Marcos periodically has kits to loan volunteers.
5. Begin monitoring and send the data monthly to Texas Watch on the approved forms.

Please contact Texas Watch Headquarters at SWT in San Marcos for information on equipment, completing a monitoring plan, scheduling a training, or any other issues related to your monitoring project.

Toll-free: (877) 506-1401
Texas_Watch@geo.swt.edu
<http://www.texaswatch.geo.swt.edu>

1.6 Training

This section includes information describing the various levels of certification and training offered in the Texas Watch environmental monitoring program. The longevity of the program is dependent upon the participation of our dedicated volunteers and we encourage you to continue increasing your level of involvement each year by completing the required training to become a certified Texas Watch Trainer and/or Quality Assurance Officer. See page 14 for more information.

Certified Water Quality Monitor

To receive certification as a Texas Watch Water Quality Monitor all volunteers must complete the three-phase training program describe below. Texas Watcher Certification status can be earned by volunteers who intend to complete Phase I and II only, but do not intend to monitor regularly.

Phase I Training

Phase I training is a hands-on instructional classroom session covering approved methods of determining levels for the five Texas Watch core variables and/or other parameters. These methods are adapted from the TNRCC Surface Water Quality Monitoring Procedures Manual (GI-252 June 1999 or subsequent edition). Safety in both the laboratory and field settings is also discussed.

Each volunteer receives a Volunteer Monitor Training Packet for recording comments and training session results. The Volunteer Waiver and Acknowledgment form is included in the packet. Volunteers must read, understand and sign this form before they can be trained.

The training is led by a Texas Watch certified trainer who explains how the monitoring equipment should be handled and demonstrates the water quality tests to the volunteers. The volunteers then perform the water quality tests under close supervision of the trainer, recording their results on the Phase I Monitoring Form. Adherence to safety procedures is emphasized.

After all tests are completed and the volunteers are comfortable with the monitoring procedures, the volunteer and trainer review and sign the Phase I Monitoring Form. This signed form signifies the volunteer's successful completion of Phase I training for

the parameters specified and indicates their understanding and commitment to following all safety procedures. The Volunteer Training Packet with all signed forms is retained by the volunteer through their Phase III session.

Phase II Training

During Phase II, volunteers demonstrate the monitoring procedures they learned during Phase I training in the field. Safe monitoring procedures and selection of a site with safe access is emphasized. Whenever possible the water body used for Phase II testing should be similar to the sites the volunteers will eventually monitor. If the training location is appropriate the volunteers also learn how to measure water transparency using the Secchi disk.

During the Phase II training, volunteers conduct tests with the limited assistance of the trainer. The trainers carefully observe the volunteers' procedures, answering any questions that the volunteers may have, and correcting any obvious mistakes. Assuring the quality of the monitoring information is also discussed.

After all questions have been answered and the volunteer finishes reporting information on the Monitoring Form, the volunteer and the trainer discuss the volunteer's strong points and weak points with respect to testing procedures. The volunteer then signs the Phase II Monitoring Form and the trainer reviews and signs the Phase II Monitoring Form indicating completion of Phase II training for the parameters specified. The signed Monitoring Form is then returned to the Volunteer Monitor Training Packet to be retained by the volunteer for use at the Phase III training session.

Phase III Training

Phase III training takes place at the volunteer's approved monitoring site within 6 months of completing Phase II training. The trainer and volunteer check to ensure the sampling site is the same location indicated in the Monitoring Plan. The trainer observes and conducts the tests from a trainer's test kit as the volunteers conduct the monitoring tests at the site. By this time the volunteers should be able to work through the tests and complete the Monitoring Form with minimal direction from the trainer.

After the monitoring event, all safety and data quality assurance concerns are discussed. The volunteer and trainer then sign the Phase III Monitoring Form and complete the Phase III evaluation on the back of the Volunteer Monitor Training Packet. If the trainer

believes the volunteer monitor has successfully completed the three training sessions for the parameters specified, the trainer signs the front page of the Volunteer Monitor Training Packet. When the Volunteer Monitor Training Packet is completed and includes a signed Volunteer Waiver and Acknowledgment form, signed Monitoring Forms from Phase I, Phase II and Phase III training sessions, and the Phase III trainer's signature, the volunteer is then considered a Texas Watch Certified Water Quality Monitor. The Packet is retained by the trainer and sent to Texas Watch for processing.

Texas Watch Quality Assurance Certification Program

Texas Watch Trainer:

Upon approval, Certified Texas Watch Water Quality Monitors may receive additional certification as a Texas Watch Water Quality Monitor Trainer after completing the requirements described below:

- Trainees must assist or coordinate a training session with a Certified Trainer
- Trainees must coordinate and lead a training session assisted by a Certified Trainer

To Perform Quality Control Site Visits Only:

Certified Trainers and Water Quality Monitors can be authorized to perform Quality Control (QC) site visits upon approval of a Texas Watch Quality Assurance Officer (QAO). Texas Watch suggests observing a field QC performed by a QAO, followed by leading a field QC with a QAO present.

QAO Certification:

Upon approval, Certified Texas Watch Water Quality Monitors may receive additional certification to conduct both lab and field QC sessions as a certified Texas Watch QAO.

If the QAO trainee is a Texas Watch Certified Trainer the following QAO training standards will apply:

- Trainees must assist or coordinate a lab or field QC session with a Certified QAO that includes each of the parameters specified in the trainees training packet
- Trainees must coordinate and lead a lab or field QC session assisted by a QAO that includes each of the parameters specified in the trainees training packet
- All Trainees must demonstrate the ability to use and communicate the Data Quality Objectives Table (see page 22) with volunteer monitors

If the individual is not a Certified Trainer, the following QAO training standards will apply:

- Trainees must assist or coordinate a lab QC session with a certified QAO that includes each of the parameters specified in the trainees training packet
- Trainees must coordinate and lead a lab QC session assisted by a QAO that includes each of the parameters specified in the trainees training packet

1.7 Quality Control

Certification

Once the training packets are completed, the Texas Watch Partner issues a Texas Watch Certificate and submits all the paperwork to Texas Watch. Once received by Texas Watch, the training information is processed and a file is established. All Texas Watch data are collected within an approved quality assurance project plan (QAPP). A QAPP document outlines the procedures a monitoring project will use to ensure that the samples and data are of high enough quality to meet project needs.

Texas Watch monitors currently collect data using the approved Integrative Quality Assurance Project Plan (IQAPP) or the Project-Specific Quality Assurance Project Plan (PSQAPP). The goals of the group and Texas Watch's support capabilities determine which plan volunteers are monitoring within. IQAPP intended data uses include: education, research, screening and problem identification, and other uses deemed appropriate by resource managers and the TNRCC. PSQAPP intended data uses include: TMDL development, stream standards modifications, permit decisions, water quality assessments, education, research, screening and problem identification and other programs deemed appropriate by the TNRCC.

Because of intensive data validation techniques that must be utilized to document and approve PSQAPP data and monitors, Texas Watch has limited participation to a manageable number of sites. Generally, Texas Watch PSQAPP participants are veteran monitors who can commit to consistent monthly sampling for one year or more.

Quality Control Sessions

Texas Watch suggests monitors attend one QC session per year after successful completion of their

Phase III training. Volunteers participating in the PSQAPP must attend a field quality assurance session at their monitoring site at least once per year. All other volunteers participating in the quality assured program may attend either a laboratory session or field session.

Led by either a certified Texas Watch Trainer or QAO, these sessions are designed to ensure data collected by the monitors accurately represent environmental conditions at the time of monitoring. Results of these reviews show how precisely and accurately the monitors make their measurements. Monitors must bring their monitoring kits and equipment to these QC sessions. The monitoring kits are checked to ensure all safety equipment, goggles and gloves are available, all reagents are up-to-date, and all other monitoring equipment is functioning properly.

At each QC session volunteers perform their routine sampling procedures and compare their values to those produced by a Certified Trainer or QAO for each of the parameters specified in their training packet. Completed Monitoring Forms are submitted to Texas Watch, and the Texas Watch database is updated to indicate successful completion of the QC session. This information is used to verify data quality.

1.8 Safety Considerations

General Precautions

1. Read all instructions to familiarize yourself with the test procedures before you begin. Note any precautions in the instructions.
2. Read the label on each reagent container before use. Some containers include precautionary notices or you may refer to material safety data sheets (MSDS), which provide important safety information. Copies of these MSDS sheets are located at the back of this manual.
3. Keep all equipment and chemicals out of the reach of young children.
4. In the event of an accident or suspected poisoning, immediately call the Poison Control Center at (800)222-1222. Be prepared to give the name of the

reagent in question and its manufacturer's code number. LaMotte reagents are registered with POISINDEX, a computerized poison control information system available to all local poison centers.

5. Texas Watch recommends you always sample with another person.

Protecting Yourself and Your Equipment

1. Avoid contact between chemicals and skin, eyes, nose, mouth and clothes.
2. Always wear safety goggles or glasses and rubber gloves when handling chemicals.
3. Use the test tube caps or stoppers, not your fingers, to cover test tubes during shaking and mixing.
4. When dispensing a chemical from a plastic squeeze bottle, hold the bottle upside-down in a vertical position (not at an angle) and squeeze it gently (if a gentle squeeze does not suffice, the dispensing cap or plug may be clogged).
5. Wipe up any chemical spills, liquid or powder, as soon as they occur. Rinse area with a wet sponge, then dry.
6. Thoroughly rinse sampling containers and vials before and after each test preferably with deionized, or distilled water (tap water is acceptable if the other two are unavailable). Dry the outside of the containers.
7. After use, tightly close all chemical containers. Do not switch caps.
8. Store the chemicals and equipment indoors at room temperature. Do not expose chemicals and equipment to direct sunlight for long periods of time and protect them from extremely high or low temperatures. Avoid storing your equipment in an automobile or truck.
9. Safely dispose of all out-of-date or waste chemicals by flushing them down a sanitary sewage system drain with plenty of water. Do not dispose of chemicals into a septic waste system, water body, or onto the ground.

Site Safety

1. Park your vehicle safely off roads and out of the way of traffic. Be cautious of traffic when unloading or loading monitoring equipment and accessing your site.
2. Sample your site from bridges with pedestrian walkways, from docks, or from stream banks whenever possible. If you must enter the water, always have a partner on the shore nearby and be certain to wear a life jacket if wading is necessary.
3. Approach your site carefully! Watch out for traffic on bridges and when crossing roads. Be on the lookout for snakes, fire ants, wasps, poison ivy, Africanized honey bees, wild animals, broken bottles, debris, or briars.
4. If using a boat to sample your site, learn and observe all U.S. Coast Guard and State of Texas regulations. Boat operators should complete a boating safety course.