

The 2000 Session
of the
Texas Water
Monitoring Congress
P R O C E E D I N G S

University of Texas At Austin
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Sponsored
by the
Texas Water
Monitoring Council

Statement of Purpose

The Texas Water Monitoring Council is a broad-based collaborative body formed to help achieve effective and efficient collection, interpretation and dissemination of basic data and processed information for use in addressing issues, policies, and management of Texas waters. TWMC operates through consensus building among its members, and addresses the full range of water resources, physical, chemical, and biological, including ground- and surface-waters, in freshwater and estuarine environments.

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Texas Water Monitoring Council Members

**Texas Water Development Board
Texas Natural Resource Conservation Commission
Texas Parks and Wildlife Department
Texas A&M Agricultural Extension Service
Texas Watch
United States Geological Survey
United States Army Corps of Engineers
Brazos River Authority
Sabine River Authority
Texas Alliance of Groundwater Districts
National Weather Service
United States Environmental Protection Agency
Lower Colorado River Authority
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Executive Summary

The Texas Water Monitoring Council sponsored the 2000 Texas Water Monitoring Congress (TWMC), which was held September 18-20, 2000 in Austin. The Congress focused on effective communication, cooperation, and collaboration among individuals and organizations involved in water monitoring in Texas. Approximately 175 individuals from various water-related backgrounds attended the Congress. Participants were given the chance to meet with their peers to discuss ideas related to monitoring.

In 1996, the Texas Water Monitoring Congress was held for the first time with the purpose of bringing water-resource professionals from around the State together to address the problems of data collection and dissemination and to find ways to work more efficiently together to improve the usefulness of water information in Texas. Topics of discussion including the availability of consistent guidance for entities with data-collection programs, development of systematic collection and dissemination of water data, and approaches and responses to future water data needs of the State. Specific recommendations were made at that Congress relating to coordination and continued support of water-resources data programs, creation of a Texas Water Monitoring Coordination Council, and access to the collected data.

In 1998, the second Texas Water Monitoring Congress was held in Austin, Texas during September 21-23, 1998. Texas State Legislators, along with personnel of state and federal agencies, addressed the status of water-resource legislation, accomplishments made in water monitoring since the 1996 Congress, and new and on-going challenges faced by water-resource professionals in the State. Four focus groups met in day-long sessions to discuss topics including Water Data Collection Networks, Data Management, Quality Assurance, and Public Outreach. The results and recommendations are in the 1998 TWMC Proceedings.

This year the Congress covered new ground and brought participants up to date on topics discussed in 1996 and 1998. Topics included providing guidance to entities with data collection programs, developing systematic water data collection and dissemination methods, new technology and challenges for water monitoring, and approaches and responses to future water data needs of the State. The Congress invited speakers from both the public and private sector to provide information on water monitoring activities in Texas. The Council continued the tradition of focus groups. Four focus groups met in half-day sessions to discuss topics including Water Data Collection Networks, Data Management, Public Outreach, Quality Assurance, and Technological Solutions. The results and recommendations for each focus group were presented to the entire Congress and are summarized in these proceedings.

2000 Session of the Texas Water Monitoring Congress Focus Group Recommendations

Data Collection Focus Group

Restore discontinued stream gauge stations, operate and maintain stream gauge and small water supply reservoir stations, increase staff for monitoring agencies, request funding for Total Maximum Daily Load (TDML) monitoring, and establish funding for a comprehensive statewide non-point source monitoring program.

Data Management Focus Group

Data should be accessible via the web for novice to expert users, data sets should be available in raw and processed formats, and standardize data formats, descriptive data, and spatial data. Other recommendations included creating complete metadata for all data sets, establishing StratMap as the standard base layer for water monitoring data.

Public Outreach Focus Group

TNRCC and EPA should establish administrative reporting requirements for volunteer monitoring efforts, which would provide for adequate documentation while minimizing the resource demands for these requirements and still maximize the resources available for outreach.

Technology and Technological Solutions Focus Group

Data quality objectives must be known before selecting monitoring technology, clean metals techniques are required to accurately assess naturally low ambient metals concentrations, and efficient and cost-effective methods for new bacterial indicators should be implemented.

Quality Assurance Focus Group

Adopt a statewide accreditation program, providing resources to assist labs in conforming to the accreditation standards, providing public access to lab certification or audit reports, creation of a new TWMC subcommittee to make recommendations regarding quality control samples and records retention, development of a data validation, coding, and management system relating water quality samples to their individual QC samples, and certification of stream monitoring staff.

Agency Presentations

Keynote Address

Innovative Monitoring Activities of the U.S. Geological Survey

Jess D. Weaver, Texas District Chief, United States Geological Survey

The U.S. Geological Survey has been in the business of collecting hydrologic data since 1889. The first streamflow measurements were taken in January of that year at the Rio Grande River near Embudo, New Mexico. Here in Texas, the USGS currently monitors more than 600 stations collecting water quantity and water quality data and displays a majority of them on the Internet.

A recent advancement in measuring streamflow now being utilized is the use of an Acoustic Doppler Current Profiler (ADCP). As the name implies, this instrument uses sound to measure velocity based on the Doppler shift principle. Eighty of these devices are in use by the USGS throughout the country and the Texas District has six. Remote deployment of these instruments allows the Survey to address safety considerations and could enable our technicians to measure streamflow solely based on non-contact means in the near future.

The latest developments in our National Water-Quality Assessment Program here in Texas include the use of paleolimnological techniques to describe natural and anthropogenic changes in water quality in drainage basins of reservoirs. The techniques include radiochemical dating of sediment cores, measurement of major, minor, and trace elements, chlorinated organic compounds and polycyclic aromatic hydrocarbons (PAHs); and interpretation of various sedimentological and geomorphic properties in cores.

Another important emphasis in current water-quality monitoring is the examination of hydrophobic contaminants. Many toxic chemicals are adsorbed to sediment in concentrations orders of magnitude greater than their concentrations in whole water. Previous sampling emphasis on traditional water column sampling methods for hydrophobic contaminants often resulted in non-detections and a significant underestimation of total loads.

Ground-Based Observational Data Networks used in National Weather Service Hydrologic Operations

Ben Weiger, Chief, Hydrologic Services Branch, National Weather Service Southern Region

This presentation will provide a short overview about the mission and structure of the National Weather Service (NWS) Southern Region. Afterwards, the various ground-based observational networks that are used in the NWS field office operations to generate various types of hydrologic products and services for NWS partners and customers will be discussed. The presentation will primarily focus on NWS ground-based observational networks.

Surface Water Availability Models

Jim Patek, WAM Technical Manager, Parsons Engineering Science

The statewide drought of 1996 exposed a number of problems in Texas' overall framework for water resources planning and management and provided a wake-up call for State leaders to focus on

water resources issues. As a result, the Texas Legislature in 1997 enacted Senate Bill 1 (SB1), which, among its many provisions, directed the Texas Natural Resource Conservation Commission (TNRCC) to develop new surface water availability models. In response to the requirements of SB1, the TNRCC initiated the Water Availability Modeling (WAM) Project to provide a framework for the development of the new water availability models. Once developed, new models will replace outdated water availability models for eight of the State's 23 river basins and, for the first time, will provide water availability modeling capability for the other basins. The models, which are being developed, based on stakeholder input and other expertise, will also facilitate water planning efforts by allowing planners to better account for all needs and uses in a basin. This will help protect existing water rights and the environmental needs of a river basin, as well as provide information for developing water supply alternatives.

Groundwater Availability Models

Robert Mace, Groundwater Availability Modeling Section, Texas Water Development Board

Numerical groundwater flow models are valuable tools for evaluating conceptual models of groundwater flow and predicting how aquifers might respond to continued pumping or changes in climate. The predictive capabilities of numerical groundwater flow models are especially useful for estimating the future availability of groundwater and assessing the potential impacts of droughts. The versatility of numerical models allows many different availability and climatic scenarios to be easily explored and evaluated.

Senate Bill 1 requires Regional Water Planning Groups in Texas to plan how to conserve water supplies, meet future water-supply needs, and respond to future droughts. For many regions, this planning process involves predicting how groundwater will respond to future pumping and possible droughts. In most cases, the best tools for assessing the complex interaction of pumping, groundwater flow, hydraulic properties, and recharge for water planning are numerical groundwater flow models.

In the past, many numerical groundwater flow models have been developed for the major aquifers of Texas. For example, at least 17 models have been developed for all or parts of the Ogallala aquifer in Texas, and at least 15 models have been developed for all or part of the Edwards (Balcones Fault Zone) aquifer. However, these models and others developed for other aquifers in the state are of different vintages, modeling techniques, and purposes. Models of older vintage may have large cell sizes and difficult interfaces representative of limited computer power available at the time. Furthermore, older models may not reflect the current understanding of groundwater flow and aquifer parameters in the modeled aquifers. Because many of the older models were developed by different agencies over a long period of time, the models use a wide array of modeling techniques and software packages, some which are now archaic. Many of the models were developed for different purposes, which may not have included assessing groundwater availability. Earlier models tended to focus on developing and testing conceptual models of groundwater flow in the aquifers. Results of these models are extremely important for the development of accurate groundwater availability modeling.

As new questions arise and new information on the aquifers is collected, new models are being developed. At present, there are several new models being constructed for aquifers across the state, most in response to Senate Bill 1. The Texas Water Development Board is currently working on numerical models of the Trinity aquifer in the Hill Country area and the Gulf Coast aquifer in the Lower Rio Grande Valley. Regions A, K, and N are developing models for the Ogallala aquifer, Barton Springs segment of the Edwards (Balcones Fault Zone) aquifer, and part of the Gulf Coast aquifer, respectively, to assist with water planning. Regions O and G have also employed numerical models. The U.S. Geological Survey is developing a model for the Hueco Bolson aquifer in cooperation with Mexico. Other regions (such as Regions O, L, and H) are using existing models to help constrain groundwater availability.

Several new models to address groundwater availability in Texas are planned for the future as part of the Groundwater Availability Modeling (GAM) program. The GAM program is an unprecedented effort to develop consistently organized groundwater availability models for the major aquifers in Texas. In conjunction with the models being developed for Senate Bill 1 planning discussed above and a new model of the San Antonio segment of the Edwards (Balcones Fault Zone) aquifer planned by the Edwards Aquifer Authority, the Texas Water Development Board will oversee the development of numerical groundwater flow models for the southern portion of the Ogallala, the Carrizo-Wilcox, the Gulf Coast, the Edwards-Trinity Plateau, the northern segment of the Edwards (Balcones Fault Zone), the northern segment of the Trinity, the Seymour, and the Pecos Alluvium aquifers. The new models will build upon the results of previous efforts and substantially enhance existing information on aquifer structure and hydraulic properties. All spatial data will be organized in a geographic information system. Each of the models will be thoroughly documented and available to the public over the Internet.

Atmospheric Availability Models

William A. Dugas, Resident Director, Blackland Research and Extension Center, Texas Agricultural Experiment Station, Texas A&M Agriculture Program

Atmospheric monitoring in Texas, which, for this discussion, includes surface weather and surface vegetation conditions, is being directed by numerous agencies and is not effectively coordinated. This has significant economic costs to the state. Efforts are underway to plan and implement a statewide network to bring about consistency and coordination for weather data collection. The required station density in this or other networks depends upon the particular applications of the weather data and upon the elements being used in the application. In addition, new technologies are being developed whereby statewide, real-time weather data (e.g. temperature, radiation, and precipitation) can be estimated from remotely sensed information, although the accuracy of these estimates remains to be quantified. Real-time weather data can be applied, using research tools, to quantify crop and livestock production risks. In addition, remote sensing data can be used to quantify the "health" of vegetation statewide. Examples of the latter will be presented.

Data for Drought and Flood Management

Pete Juble, Project Manager, Corps Water Management System, United States Army Corps of Engineers

To meet the Nation's 21st century needs for improved real-time water management support for 700+ multipurpose reservoirs, control structures, and thousands of miles of levees, the Corps of

Engineers has been developing a comprehensive Corps Water Management System. The Corps Water Management System, utilizing real-time gauged stream flow and precipitation data, coupled with radar estimated precipitation, historical event information, and precipitation forecasts, is able, on the fly, to continuously model the performance of the entire hydrologic system within a watershed.

This modernized system integrates: continuous live data acquisition and database, real-time on demand model generated predictions of watershed runoff, project inflow, reservoir storage and operational management scenario evaluation, basin wide detailed river flow, velocity and water surface profiles, high resolution GIS inundated area prediction, damage analysis, flow impact assessment, and automated information dissemination. All this is rolled into a single comprehensive suite of software.

The National Hydrographic Dataset: The Common Hydrography Network
Erika Boghici, StratMap, Texas Natural Resources Information System

The Texas Strategic Mapping Program (StratMap) is in the process of building information that is mission-critical to Texas. The layers created through this cost-sharing program are Digital Elevation Models (DEMs), hypsography, soils, transportation, political boundaries, digital orthoimagery, and hydrography. When available, they will provide a common frame of reference for activity throughout the state. These activities include monitoring of wetlands and sensitive habitats, identifying historical and archaeological features, determining land use, and locating hazardous waste facilities, oil and gas wells, pipelines, and other energy related facilities. These data layers are a basic need of state agencies. GIS technology is a powerful tool that can significantly improve the ability of public entities to meet the demands placed on them. Future digital data acquisition programs will be a matter of updating existing information rather than creation of original material.

The hydrography layer will be updated to a new data model: the National Hydrographic Dataset (NHD), that provides a variety of stream-related data, including flow direction and U.S. Environmental Protection Agency (USEPA) reach (stream segments) information. In addition, this layer will serve as the basis for integrating and attaching other water-related information (planning, water quality, water availability, water monitoring) to support long-term water planning. NHD was specifically designed nationwide as a mechanism to build and attach surface water databases and spatial information in a manner that is useful for research, modeling, analysis and data access.

The NHD is a comprehensive set of digital spatial data that contains information about surface water features such as lakes, ponds, streams, rivers, springs and wells. Within the NHD, surface water features are combined to form "reaches," which provide the framework for linking water-related data to the NHD surface water drainage network. These linkages enable the analysis and display of these water-related data in upstream and downstream order.

The NHD is based upon the content of U.S. Geological Survey (USGS) Digital Line Graph (DLG) hydrography data integrated with reach-related information from the EPA Reach File Version 3 (RF3). The NHD supersedes DLG and RF3 by incorporating them, not by replacing them. Users of DLG or RF3 will find the National Hydrography Dataset both familiar and greatly

expanded and refined. The DLG files contribute a national coverage of millions of features, including water bodies such as lakes and ponds, linear water features such as streams and rivers, and also point features such as springs and wells. These files provide standardized feature types, delineation, and spatial accuracy. From RF3, the NHD acquires hydrographic sequencing, upstream and downstream navigation for modeling applications, and reach codes. The reach codes provide a way to integrate data from organizations at all levels by linking the data to this nationally consistent hydrographic network.

Total Maximum Daily Loads, Monitoring Efforts
Roger Miranda, Texas Natural Resource Conservation Commission

Surface water quality monitoring within the context of Total Maximum Daily Loads (TMDL) is used for three major purposes: Listing and de-listing impaired water bodies on the Section 303(d) List, data collected for use in TMDL development, and post-TMDL monitoring. Water quality data used by the TNRCC for assessment of water bodies under Sections 305(b) and 303(d) of the Clean Water Act (CWA), which consist primarily of routine chemical and bacteria monitoring reported on a quarterly basis, is often augmented by targeted monitoring designed to further define an apparent impairment. In some instances, a physical, chemical and ecological evaluation of the water body itself may be warranted for a more precise evaluation/application of state surface water quality standards. Water quality data obtained for the purposes of establishing a TMDL is often collected by local organizations as well as the state. The data requirements associated with a TMDL study or model development may only warrant more frequent monitoring of routine parameters at specific locations or it may include the collection of physical and chemical parameters not normally included in routine monitoring. Post-TMDL monitoring efforts will typically be more intensive than routine monitoring efforts and will focus on the parameters of concern associated with each TMDL. It is important to recognize that all surface water quality monitoring in the State of Texas can contribute to assessments and TMDLs under Section 303(d) of the CWA.

Basic Hydrologic and Water-Quality Data Collected by the U.S. Geological Survey
Raymond Slade, United States Geological Survey

The U.S. Geological Survey has collected, reviewed, published and computer stored much basic hydrologic and water-quality data for streams, reservoirs, and aquifers throughout Texas. The type of stations (underscored) and their associated data for the basic data-collection network in Texas are summarized below.

Water-Quantity Stations and Data

Continuous-record streamflow stations produce unit water levels (gage-heights) and unit streamflow discharges (generally 15-minute increments), and daily-mean streamflow discharges. Continuous-record stage-only stations produce unit gage heights and daily-mean gage heights.

Partial-record streamflow stations include: *flood hydrograph stations* which produce unit gage heights, unit streamflow discharges, and daily-mean streamflow discharges exceeding a specific discharge;

crest-stage streamflow stations which produce peak stages and peak discharges; and *low-flow stations* which produce periodic gage heights and periodic streamflow discharges, or, daily-mean gage heights and daily-mean streamflow discharges less than a specific discharge. Annual-peak gage heights and annual-peak streamflow discharges are computed for continuous-record, flood hydrograph, and crest-stage streamflow stations.

Continuous-record reservoir-content stations produce unit water-level elevations (generally 60-minute increments), daily-mean water-level elevations, and daily-mean storage contents. *Daily reservoir-content stations* produce daily values (one value per day) for water-level elevation and storage content.

Continuous-record ground-water level stations produce unit water levels (altitude and depth below land surface) and daily-mean water-levels or daily water levels (one value per day). *Periodic ground-water level stations* produce periodic water levels.

Water-Quality Stations and Data

Periodic streamflow water-quality stations produce periodic water quality data for many physical and chemical constituents.

Daily streamflow water-quality stations produce unit values (generally 60-minute increments) and daily-mean values for constituents that could include specific conductance, total dissolved solids, dissolved oxygen, pH, temperature, and suspended sediment loads and concentrations. Daily-mean concentrations and loads for total-dissolved solids and a few other inorganic chemical constituents are calculated for the stations with specific-conductance values.

Periodic reservoir water-quality stations produce periodic water-quality data for many physical and chemical constituents.

Reservoir-water-quality survey stations produce periodic water-quality data for many physical and chemical constituents for various locations throughout the reservoir.

Periodic ground-water water-quality stations produce periodic water-quality data for many physical and chemical constituents.

Collaborative Efforts of Regional Planning Region H and The Subsidence District
Carole D. Baker, Director of Public Information, The Subsidence District

In the Texas House Natural Resources, "*Report on Managing Groundwater for Texas' Future Growth*," it was stated that water is "the single most important factor for the future economic viability of Texas."

Learning from the past is the key to being prepared. Droughts, particularly in Texas, drive water management. After the 30's drought, the Soil Conservation Service was created to help farmers prevent erosion and use water more efficiently.

After the drought of 1950, many river authorities and local entities began constructing water supply reservoirs. The drought conditions in 1996 brought about Senate Bill 1 and long term Regional Water Planning Groups (RWPGs) and Drought Contingency Plans.

Stretching existing water supplies to meet growing and changing demands will be the central challenge for Texas. Conservation will be the least-cost alternative to expensive new forms of supply. State energy regulators have begun to see the wisdom of pursuing conservation as an alternative for developing new supplies. Responsible water management agencies should do no less. An agency with a well-documented water development plan that includes a well thought out conservation component stands a much better chance of persuading water users that the program is both necessary and sensible and not simply regulators out to take their water. Region H, made up of thirteen counties, is an economic powerhouse crucial to the Texas and national economies. Adequate water supplies are essential to continued economic health and to the region's future growth. The RWPG has defined surface water supplies as dependable supplies that should be available in a "drought of record." For most of Region H, that means a drought comparable to the drought from the early to mid-1950s. The Region H RWPG considered a variety of strategies for meeting the projected shortages and solicited input from the public before adopting a management plan. The process addressed specific shortages and then developed associated strategies.

Cooperative Efforts: What Are We Learning?

Cindy Loeffler, Water Resources Team Leader, Texas Parks and Wildlife Department

Two years have passed since the last Texas Water Monitoring Congress. What have we learned? As one of only a handful of states with an active water monitoring council, Texas has plenty to be proud of. But there is more to be done. Much more. Thanks to phenomena of statewide significance, namely population growth, the drought and Senate Bill 1, more people than ever before are thinking and talking about water, and asking questions. Where will our water come from? Will it be fit to drink? Will it be fit to swim in? How much will it cost? What about the fish? These questions cannot be answered without timely and accurate water monitoring data. Cooperative efforts, not the least of which include this Council, have been created to address this need. Progress, and lack thereof, since the 1998 Texas Water Monitoring Congress were discussed.

The Texas Water Information Network Optimization Program

Robert G. Bradley, Chief, Network Optimization Unit, Texas Water Development Board

The Texas Water Development Board is charged with development of a statewide water resource data collection and dissemination network. The Texas Water Information Network Optimization Program is leading a coordinated effort with all levels of government and other interested parties in developing this program. Cooperative agreements along with equipment loans are used to facilitate the collection and dissemination of water resources data. The core product of this network is based in a web site for centralized data access for basic and value-added water resources data. Currently there are 13 signed cooperators, which consist of two river authorities, one state agency, and 10 ground-water conservation districts. Additionally, the program cooperates with federal, state, and local agencies through individual interaction and through two guiding councils.

Focus Group Breakout Sessions

Data Collection Networks Focus Group

Chair: Miles Hall, Sabine River Authority

Data Collection Networks

The objectives of the Data Collection Networks focus group were to develop:

- More complete list of who's monitoring what and where.
- Better understanding of how and why entities are monitoring.
- Improved communications between monitoring entities.

The Data Collection Networks focus group continued to gather information on who's monitoring what and where. Those attending the focus group were asked to complete a form providing information on the group they represented and the type of monitoring being conducted. The information will be available on the Texas Water Monitoring Council web site.

Presentations were made by representatives from the U. S. Environmental Protection Agency (EPA), the National Weather Service (NWS), the Texas Natural Resource Conservation Commission (TNRCC), the Lower Colorado River Authority (LCRA), and the Texas Parks and Wildlife Department (TPWD). The presentations were on the objectives and methodologies of the various collecting entities. Summaries of the presentations follow.

State Water Quality Monitoring Strategies - *Phil Crocker, EPA*

Mr. Crocker presented an overview of the EPA guidance for the development of monitoring strategies at the state level. The strategy should be considered as a planning tool and updated every two years. The focus should be on the reporting requirements of the 305(b) report and the monitoring design and indicators needed to meet the reporting requirements. The strategy should include a plan for the comprehensive assessment of all waters. In addition to the assessment of all waterbody types, the assessment should include a multi-indicator approach (physical, chemical, and biological). Other strategy components should include clean methods for analyzing metals in water, quality assurance for all monitoring procedures, and a means of addressing emerging issues that could cause water quality problems in the future.

Precipitation Estimates - *Ben Weiger, NWS*

Mr. Weiger presented information on the precipitation estimate grid from the NWS. In addition to weather forecasts and severe weather alerts, the NWS provides river forecasts for rivers. The River Forecast Centers (RFC's) issue stage and crest forecasts to the local NWS Offices. The local offices then use this information to issue flood warnings and statements for specific forecast points within their Hydrologic Service Area. There are 13 RFC's nationwide, 4 within the Southern Region. Besides issuing river forecasts, the RFC's are involved with radar and rainfall observation quality control and product mosaicing, model calibration, local procedure development, and coordination

with other government agencies. The West Gulf River Forecast Center (WGRFC) is located in Fort Worth, Texas and can be found on the Internet at <http://www.srh.noaa.gov/wgrfc/>. The WGRFC area of responsibility is defined by the numerous Gulf of Mexico draining river basins of Texas along with the New Mexico, Colorado, and Mexico portions of the Rio Grande basin. The WGRFC area of responsibility covers more than 315,000 square miles (815,000 square kilometers) of land in the United States and over 87,000 square miles (225,000 square kilometers) in Mexico.

Hydrometeorological data is collected in each Hydrologic Service Area and sent to the RFC. The data is entered into hydrologic computer models. The model output is in the form of hydrographs. The river forecasters interpret the hydrographs and pass this information on to the forecasters at the Weather Forecast Offices. These forecasters then deliver hydrologic information in the form of forecasts, watches and warnings to the public that live within their Hydrologic Service Area.

Surface Water Quality Monitoring Network - *Steve Twidwell*, TNRCC

Mr. Twidwell presented a summary of the TNRCC Surface Water Quality Monitoring (SWQM) program. The SWQM Program provides for an integrated evaluation of physical, chemical, and biological characteristics of Texas surface water systems in relation to human health concerns, ecological condition, and designated uses. Surface water quality monitoring data provide a basis for establishment of effective TNRCC management policies that promote the protection, restoration, and wise use of Texas surface water resources. Data collected in the SWQM program and for special projects are used to characterize existing water quality and emerging problems, define long-term trends, determine water quality standards compliance, and describe seasonal variation and frequency of occurrence of selected water quality constituents. Data are also used to produce the State of Texas Water Quality Inventory required by Section 305(b) of the Clean Water Act. This assessment enables the public, local governments, state agencies, the Texas Legislature, the EPA, and Congress to evaluate water quality in Texas and make water quality management decisions.

Water Monitoring in the Lower Colorado Basin - *Jerry Guajardo*, LCRA

Mr. Guajardo presented a summary of the LCRA water monitoring programs. These programs include the Reservoir and Stream Sampling (RSS), the Aquatic Resource Characterization (ARC), and the Bay Monitoring Program. LCRA also supports a volunteer monitoring program called the Colorado River Watch Network. The Clean Rivers Program also sponsors other water quality monitoring programs in the basin.

The RSS program was created to act as a general surveillance and trend assessment tool. The goal of this type of monitoring is to determine general levels of water quality over a broad spatial area and to serve as an early warning system for extreme pollution problems. The RSS Program currently monitors 62 locations for chemical constituents every other month. A variety of field parameters are measured and samples are collected for laboratory analyses at each site.

The ARC project was started in 1995 to assess and characterize smaller perennial streams within the Colorado River Basin. These streams have not been monitored through the RSS Program and they

do not have specific water quality standards assigned to them. The ARC program monitors chemical, physical, and biological parameters. The primary goal of this project is to protect the long-term ecological integrity of small streams in the lower Colorado River basin.

The LCRA Bay Monitoring Program includes seven continuous monitoring sites, including three tidal gage sites throughout the Matagorda Bay system. Multi-probe water quality instruments record hourly measurements for salinity, dissolved oxygen, pH, temperature and height of tide. Average daily salinity is calculated for each of monitoring station and compared to freshwater inflow targets.

Texas Water - *Cindy Loeffler*, TPWD

Mrs. Loeffler presented information on the Texas Parks and Wildlife Department's Water Data Access project. The Water Data Access project allows historical aquatic resource data from the Coastal Fisheries Division, Inland Fisheries Division, and Resource Protection Division of the Texas Parks and Wildlife Department to be accessible, through a web-based interface. Public access to water data has been mandated by the Texas Legislature through Senate Bill 1. The information is accessible both graphically (using maps or graphs) and textually. The available topics are listed below:

Coastal Fisheries

- Catch Rates by Bay - Identifies the number of species caught per hour for a chosen species, gear (equipment) and time span.

Inland Fisheries

- Presence/Absence Lake Level - Identifies which lakes a chosen species is found in, or which species can be found in a chosen lake.

Resource Protection

- Kills and Spills Events - Identifies pollution events of a chosen area for a chosen cause and type.

Issues and Recommendations

- After the presentations, there was a panel discussion of the presenters and other participants in the Data Collection Network focus group. Several issues were identified during the discussion and recommendations were developed for presentation to the congress. The issues included:

Biological Monitoring

- There was a consensus among all participants that biological monitoring needs to be conducted as part of any water quality monitoring program. Additional protocols for the biological monitoring will need to be developed also.

Funding & Staff Resources (FTE's)

- To achieve the goals of water monitoring, additional resources will be necessary including new funds and full time employees.

Continuing Coordination on Monitoring Priorities, Strategies, Protocols

- The present coordination between monitoring entities has been very successful and efforts to expand this coordination should be continued.

Reservoir Monitoring of Smaller Water Supply Lakes

- No water monitoring has been conducted on many of the smaller reservoirs in the state, although many are used for drinking water supplies.

Stream Flow Monitoring

- Flow measurements have never been conducted on many of the smaller streams in the state.

Probabilistic Sample Design to Supplement Existing Monitoring Efforts

- Additional monitoring needs to be conducted at locations determined by statistical analyses.

Resources for New Standards Development (*nutrients, sediments, UAA*)

- Additional resources will be required to develop new standards and new protocols for determining standards attainment.

Development of Additional Biological Criteria (*Reservoirs, estuaries, large rivers*)

- Existing biological monitoring protocols were designed for wadable streams and new protocols will be needed for larger streams and lakes.

Resources for Development for Instream Flow Requirements

- Flow requirements need to be developed to determine the minimum flow necessary for aquatic habitats in small streams.

Increased Focus on Biological Health of Aquatic Ecosystems (*potential for endangered species listing*)

In addition to biological monitoring to determine the health of aquatic communities, protocols need to be developed to determine the potential for species to be listed as endangered.

Addressing Declines in Water Quality through Trend Analysis

Trend analyses need to be developed to determine declining water quality before serious water quality problems develop.

The recommendations to the congress included:

- Request Funding to Restore Discontinued Stream Gage Stations to Aid Assessment of Drought and Extreme Flow Conditions

Many of the USGS stream gages have been discontinued due to reductions in funding.

- Request Funding to Operate and Maintain Stream Gage and Small Water Supply Reservoirs Stations

Additional stream gages, as well as reservoir levels for small water supply reservoirs are necessary to adequately track flow conditions.

- Request Funding and Staff (FTE's) for Monitoring Agencies

Many of the current goals as well as new goals for water monitoring can not be met without additional resources, particularly additional full time employees.

- Encourage Data Collection Partnerships

Cooperative monitoring efforts have been very successful and additional partnerships will reduce duplication of efforts and can provide better monitoring coverage without additional resources.

- Demonstrate the Effectiveness of Past Partnership Efforts and Highlight the Remaining Funding Needs and Seek Stakeholder Support

The effectiveness of cooperative monitoring efforts and the need for additional resources must be demonstrated to the legislature. Stakeholder support in this effort is essential.

- Request Funding for Monitoring to Verify TMDL Implementation and Other Programs Effectiveness

Although funds are available to conduct programs such as TMDL's, no funds have been made available to verify the effectiveness of the programs after they have been completed.

- Establish and Fund a Comprehensive Statewide Non-point Source Monitoring Program

A statewide monitoring program must be established and funded to deal with non-point source pollution.

- Continue to Support the TWMC Coordination Efforts

The Texas Water Monitoring Council has been successful in bringing together all of the entities in the state involved in water monitoring and providing a forum for effective communication, cooperation, and collaboration.

- Develop an Education Package for the Legislature for Reasons to Monitor

The Texas Water Monitoring Council needs to develop an education package to present to the legislature listing all of the various reasons the different types of monitoring must be conducted.

- Request a Budget Rider to Carry Over Funding Between Biennia

Programs such as the Clean Rivers Program are funded for two-year periods and funds not used during that period do not automatically get moved to the next two-year period for that program. Since these are on-going programs, budget riders are needed to carry over the funds to the next biennia.

Data Management Focus Group

Chair: *Denis Qualls*, P.E., Brazos River Authority

Denis Qualls served as moderator, and introduced the session, giving a brief description of the purpose of the discussion and listing some of the organizations represented.

Mr. Qualls began the session by reviewing data management recommendations developed at the focus group's 1998 meeting. The first recommendation was that a data distribution "clearinghouse" be established that would provide agencies, divisions, and other interested parties with a central resource they could contact, that would then refer them to the organization(s) having custody of the data for which they were searching. Since that time, the Texas Water Information Network (TxWIN) and the Texas Water Information Integration Committee (WIIC) were instituted, enabling State agencies to share data statewide and beyond. Mr. Qualls cited these programs as demonstrating how recommendations made at focus group meetings are acted upon and often result in useful and effective solutions to data management issues.

Another recommendation made at the 1998 meeting was the development of a list server. Since that time, little progress has been made on the server, due to efforts being concentrated on the establishment of a web board on which agencies and other entities could post information relating to events, issues, and other items of interest to the water industry. The web board was initiated by the Sabine River Authority and resides on their web site.

A third recommendation from the 1998 meeting was that a pilot project be initiated to foster cooperation between agencies. The project has yet to be initiated, but Mr. Qualls again expressed to the participants the progress on the other recommendations as evidence of the importance of the group's actions and deliberations.

Mr. Qualls conveyed the goals of the current focus group session to be: (1) updating the participants on progress made since the last meeting; (2) identifying and prioritizing data

management concerns to be addressed in the ensuing two years before the next conference, and;
(3) to meet and network with other data managers from around the State.

Texas Water Information Integration Committee (WIIC)
Cindy Loeffler, Texas Parks and Wildlife Department

Ms. Loeffler stated that the original concept of the WIIC was to be a data repository for the State agencies that would provide the regional water planning groups with information they need to do effective water planning. In 1997, a Memorandum of Agreement (MOA) was signed by three State water entities: the Texas Water Development Board, the Texas Natural Resource Conservation Commission, and the Texas Parks & Wildlife Department. One element of the MOA fostered the establishment of the WIIC, which would provide a "package" of information to the regional water planning groups. The package would include data on water availability, water usage, population projections, and environmental water needs for each region. This information was posted on the WIIC page of the TWDB's web site in fairly short order (Fall of 1998), though there were some limitations due to incompatibilities in the formats used by the various submitting agencies. This impracticality led to an abandonment of the original idea of WIIC being a central repository of the various files on one site, and its eventual redirection into a referral resource for data.

In the two years since, the regional water planning groups have completed their SB 1 plans, and the urgent need for the data has subsided. Ms. Loeffler said the Committee now sees itself as moving to the next level (i.e., a long-term water data clearinghouse). She provided the participants with a handout that listed information available at the WIIC web site (www.twdb.state.tx.us/data/wiic/wiic_toc.htm).

Ms. Loeffler then asked Mr. Kim Ludeke, also of the TPWD, to speak on funding plans for the Committee. Mr. Ludeke stated that the WIIC project is now being called the Water Information Integration and Distribution Initiative. Though plans originally called for the Committee to seek continuation funds through the Texas legislature, the TNRCC has now assumed a leadership role in the implementation of the initiative, and is using internal funding in the near-term, with plans eventually to pursue Federal (EPA) funding. Mr. Ludeke said the Committee plans to use the power of the Internet and GIS technologies to make more of the agencies' geographically referenced data generally available. Mr. Ludeke reported that all three State water entities are working to provide funding for the initiative. The TWDB is issuing a Legislative Appropriations Request for several million dollars. TPDW is supporting the effort through general revenues, and the TNRCC is working to include funding for the initiative with funds for appropriately related projects.

Texas Water Information Network (TxWIN)
Robert Bradley, Texas Water Development Board

Mr. Bradley used a laptop computer to demonstrate the network by logging onto the TxWIN web site (www.texaswaterinfo.net). The site presented links to various agencies' sites. Mr. Bradley said his organization searches for useful data among cooperating entities and attempts to make it available through the web site. To the extent practical, TxWIN puts the actual data on the site. In other cases, the site provides links to web site(s) having the desired data.

Mr. Bradley told the participants that, in addition to other information, the TxWIN site provides access to two categories of water data: water monitoring data, and water planning data. Selecting the Water Monitoring subject line, Mr. Bradley showed how the site provides data subcategories of Ground Water, Surface Water, and Meteorology/Climatology. Users who select Ground Water are taken to the TWDB's groundwater database, and are provided with links to other agencies' databases, such as the TNRCC.

Selecting Surface Water, other appropriate links were shown, including links to the U.S. Army Corps of Engineers, the U.S. Geological Survey, and the U.S. Bureau of Reclamation web sites.

Mr. Bradley showed the Meteorology/Climatology data category to provide information and links relating to ambient water conditions (i.e., the condition of water and water supplies). He said that currently one of the most popular products of the site is the Palmer Drought Severity Index, which depicts the severity of drought conditions around the State.

Mr. Bradley said that the Initiative has a goal of eventually going to a graphical user interface. This interface will provide all the water information for a desired county in a single page or presentation, rather than referring the user to a number of different databases for various types of information.

Another coming feature that Mr. Bradley described was a Texas Department of Licensing and Regulation system that will eventually provide all information on new well applications as they are submitted by drilling contractors, on the TxWIN web site.

Hydrologic Unit Codes

Steve Bednarz, USDA Natural Resources Conservation Service

The 12-digit hydrologic unit code for the study areas will range in size from 10,000 to 40,000 acres, and are currently undergoing delineation by Mr. Bednarz's associate, Mr. Dennis Williamson and his staff. The presentation focused on work at the Temple-based, Blackland Research Center (BRC), where a variety of agriculture-related agencies are co-located, providing an environment that is unusually well suited for interagency cooperation. Mr. Bednarz told the participants that the mission of the BRC is to develop crop-growth models based on the use of fertilizers, water, tillage, and pesticides, and forecasting crop production. The BRC has produced a number of models common to the industry such as Environmental Policy Integrated Climate (EPIC) and Simulator for Water Resources in Rural Basins (SWRB), most of which were tested at the Center's farm near Riesel, Texas, east of Waco. These models have continued to evolve and expand their scales of applicability from only single fields to multiple fields, watersheds, and even river basins.

He further expressed an expectation that the advent of NexRad radar would greatly assist in the modeling of stormwater flow and run-off by providing more information on precipitation events that may occur between monitoring stations. Mr. Bednarz said that use of the NexRad data eventually could allow modelers to go from a daily time step in their models, to hourly or even quarter-hourly time steps.

Mr. Bednarz went on to describe a number of modeling projects that the BRC's Water Resources

Assessment Team (Water RATs) conducted on behalf of various river authorities, water districts, and other entities. These included extensive sub-basin simulations relating to sedimentation abatement and the effects of brush removal on water supply. In talking about these projects, he described the old, cumbersome method of sub-basin delineation for these projects using USGS 7.5-minute quadrangle maps transferred to acetate, and then scanning them into a computer. Mr. Bednarz felt that once the 12-digit hydrologic codes become available, this would greatly reduce the time and expense associated with producing new models. Mr. Bednarz also told the participants that although most of the modeling software is UNIX-based at this time, his group was moving toward designing future software in a form suitable for the Windows-based PC environment.

In response to a question about the type of information or attributes that will be a part of the hydrologic unit codes, Mr. Bednarz said that discussions remain on-going regarding the type of information that should be represented in the delineations. However, for the BRC's work, simply having the watershed and sub-watershed boundaries delineated in 10,000- to 40,000-acre units was of great use to them. He also said that the better resolution being used in producing these delineations should help in identifying non-contributing areas of watersheds, which is an element of modeling that current Surface Water Availability Tool (SWAT) modeling software does not handle well.

Data Availability and Access Panel Discussion
Robert Bradley, Texas Water Development Board

Mr. Bradley led off the discussion by providing the participants with a list of information available through the TWDB. He then logged onto the TWDB web site (<http://www.twdb.state.tx.us>) and demonstrated how to access the listed types of information on the Internet.

Jack Davis, Texas Natural Resource Conservation Commission

Mr. Davis distributed copies of information and databases available from the TNRCC. He explained how the Production Control and Reporting Services (PC&RS) section is the single point of contact for retrieving information from the TNRCC's automated file. Users who contact the PC&RS are quickly linked to the database holding the desired information. At that time, a PC&RS staff member will retrieve the data for the user and supply it as a data file or hard copy report. Requests for information placed by for-profit organizations are charged for the reports. Mr. Davis recommended that users first explore the TNRCC's web site (<http://www.tnrcc.state.tx.us>) to see if the information they require can be retrieved there. He then gave a tour of the web site.

At the end of Mr. Davis' presentation, Mr. Qualls briefly discussed the TNRCC's Data Viewer Project. As he described it, the project will use a geographically based software system to provide users with a convenient means to view the data that the TNRCC uses in making specific assessments. This would give citizens and researchers added insight into the assessment process.

Kim Ludeke, Texas Parks and Wildlife Department (TPWD)

Mr. Ludeke presented information on the TPWD's Water Data Access Project, which began two years ago to make water data available to the regional planning groups. As with the WIIC, the

project initially grew out of efforts to support Senate Bill 1-mandated water planning, but now aims to offer TPWD water data on the Internet, and in a GIS-type format. Mr. Ludeke logged onto the TPWD's web site (<http://www.tpwd.state.tx.us>), and demonstrated how to navigate through the site to find a variety of water, park, and wildlife data maintained by the Department. As examples, he selected a number of the site's pages, including the page for "kills and spills," demonstrating the ability of the site to provide data by date and several other event parameters.

Hugh Bender, Texas Natural Resource Information System (TNRIS)

Mr. Bender logged onto the TNRIS web site (<http://www.tnris.state.tx.us>), and briefed the participants on his organization, which serves as a statewide clearinghouse of base map and foundation data set products. He said TNRIS is a part of the TWDB, but deals with the Texas Geographic Information Council. This is a group of 48 organizations that meet quarterly to coordinate the generation and exchange of geographic data within Texas, and up to 100 miles into Mexico.

Mr. Bender then gave a presentation on the Texas Geographic Mapping Program, which began as a part of the SB 1 water planning effort. The \$40 million program will produce a seven-layer digital map of Texas with a guaranteed resolution of 10-meters, but with an effective resolution between two-and-a-half and four meters.

Mr. Bender described the content of the seven layers, including digital orthoimagery, topographical contours, hydrological features, soil surveys, transportation, regional boundaries, and a digital elevation model. He also demonstrated a zooming feature of the web site that allows users to zoom in on any area to view it at a greater resolution. Mr. Bender told the attendees that as recently as six months ago, TNRIS would have supplied requestors with digital data via CDs, at up to about \$200,000 (\$100,000 for State agencies) for the whole State. But thanks to new data compression technologies (MrSid), they are now able to supply county-size StratMaps at one-meter resolutions on the Internet at little or no cost to the user. Other agencies are also working to place their data on the Internet in similar fashion.

Mr. Bender cautioned attendees who use GPS units for locating features to frequently validate or calibrate their units by comparing the unit's readout to a known point and checking for accuracy.

Jess Weaver, United States Geological Survey

Mr. Weaver accessed the USGS web site (<http://www.usgs.gov>) and highlighted a number of types of available data. Two of the most popular data categories offered of interest to attendees are real-time and historical stream flow information from a series of 558 reporting stations around the State. He stated that the USGS also has materials that can be used for teaching in schools.

Frank Bell, National Weather Service's Fort Worth office

Mr. Bell provided a detailed description of the types of data currently offered by the NWS. The available data includes climatic data, grided radar-estimated precipitation estimates and forecasts,

and three categories of radar and ground sensor data. The highest of these levels - stage three - provides researchers with hourly data that has undergone quality control for accuracy and consistency.

Steve Bednarz, Natural Resource Conservation Service

Mr. Bednarz gave the final presentation of the panel segment, continuing the discussion of hydrologic unit codes. Mr. Bednarz said the delineation of these coded areas is continuing in collaboration with the USGS, and that a large number of these units along the Texas border and elsewhere already have been delineated, certified and made available. He also stated that the NRCS has several levels of soil survey data, including data on national and state-sized scales. The NRCS also has soil data for much of the State on a county-by-county basis. All of this data is offered on the NRCS web site (<http://www.nrcs.usda.gov>).

Mr. Qualls reviewed the issues identified on the data management issues survey, which was completed by participants. They were:

1. Adopt data formats that are compatible (standardized) and provide them to cooperators
2. Managing databases on the web to provide a way for downloads and storage
3. Data upload, download and access via the web
4. Integrate watershed data for water quality purposes
5. Data integration to promote a watershed approach
6. Data availability statewide
7. Management issues (broad range)
8. Make data available in a "layman-friendly" format
9. Building GIS coverages
10. Consistent formatting of data
11. Central location for storage of data
12. Completeness of metadata standards
13. Tech transfer linkages
14. Data access between partners and the general public
15. Need for better location information
16. Internet map services
17. Texas Aquatic GAP
18. Geographical interfaces that do not require programmers
19. Better access to geospatial data and development of metadata

Following the listing of issues received, the session entered into a general discussion of data formats, which seemed to be a recurring issue in the survey results. Mr. Qualls expressed satisfaction with the TWDB's pipe-delimited (|) file format, and other attendees and panelists discussed a variety of other data format preferences and options, including ASCII and Microsoft Access. The group also discussed the difficulties of establishing a common or standard data format, when both text and geo-referenced data files are involved.

Mr. Ludeke related how, in past discussions within the data steering team, some team members

thought it premature to be concerned with a standard format, until the various cooperating agencies could look at their own databases internally to standardize terms, verify geographical data, etc., before putting them out for general distribution. He said representatives from these agencies envisioned a four-year program for this purpose, with the intent of going to the legislature for funding. Now, however, these agencies are planning to do this kind of data quality control using monies already budgeted, whenever possible.

The group then entered into an open-forum discussion of the various issues mentioned in the surveys, with the object being to choose a few issues on which the participants could focus their efforts in the next two years. The group consolidated similar issues for more efficient consideration. Items that were deemed too vague or general were removed from consideration.

The following issues were selected by the Data Management Focus Group for consideration. They are in order of priority.

1. *Make data accessible to upload and download via the web for diverse users* - This issue recognizes that data are used by a wide spectrum of users with varying levels of familiarity and expertise, from a lay person or the general public needing data that has already been analyzed and is in final form, to researchers and others who require the raw data. Data and access to it should be convenient to all levels of users, to the extent practical.
2. *Implement standardization of data formats* (i.e., file types) - This does not mean imposing one type of application (e.g., WordPerfect, QuattroPro, etc.) on cooperating agencies. Rather, the objective is to make files (descriptive or spatial) available in one or two formats that are standard and offered from web site-to-web site (e.g., descriptive data in ASCII and spatial data by TGIC guidelines). These standard formats only need to be options offered on the cooperators' web sites. Other formats more suitable for specific purposes could also be included on the sites.
3. *Make metadata complete and available* - Metadata describes the content, quality, condition, history and other characteristics of the data. Agencies need to ensure that the metadata for the data they have is available, accurate, and complete.
4. *Determine appropriate geographic scale for reporting and requesting data* - Experience with the TxWIN project has indicated that, with the data clearinghouse concept, it is desirable to have a standard geographical unit (watershed, county, HUCs, etc.) to which the data are related. This would enable users to select that geographical unit (e.g., a county) and then be shown a listing of all the data available for it and where/how the data can be accessed.
5. *Establish StratMap layers as standard base map layers* - There is a need for some common GIS coverages everyone can use. Making coverages compatible with StratMap would enhance and broaden their utility. StratMap layers include political boundaries, transportation, water features, soil surveys, digital elevation models, contours, and digital orthoimagery.

6. *Provide user friendly geographical interfaces* - The TxWIN project is seeking ways to make it easier for water entities that have little or no access to programmers or other hardware/expertise to upload their data to the web and to other sites. This is especially aimed at small scale operations such as water districts who have data others may need, but who do not currently have the means to get it out to a site.

Quality Assurance Focus Group

Chair: Eric Mendelman, Southwest Texas State University, Texas Watch

Facilitator: Eric Mendelman, Texas Watch Program, Southwest Texas State University

*Panelists: Laurie Curra, Texas Natural Resource Conservation Commission
Debbie Magin, Guadalupe Blanco River Authority
Anne Rogers, Texas Natural Resource Conservation Commission*

The goals of the QA Focus Group remain unchanged since its first meeting in 1996:

- Implement federal recommendations to more completely merge and, therefore, better utilize federal and state water quality data.
- Improve and standardize Quality Assurance/Quality Control (QA/QC) methods among water quality monitoring entities.

This year, 13 participants attended the QA Focus Group to address these goals and examine QA issues currently faced by entities collecting water quality data. The group first reviewed recommendations from the 1998 Texas Water Monitoring Congress. Panelists then provided information about current QA/QC issues, facilitated group discussion, and generated new recommendations.

Laboratory Consistency

1998 QA Focus Group Recommendation

Adopt a laboratory certification program for Texas (such as the National Laboratory Accreditation Program (NELAP)) that will ensure the capability of the laboratories to generate environmental data of known quality.

2000 QA Focus Group Update and Recommendation

TNRCC is not authorized to regulate the labs that produce data used to demonstrate compliance with federal and state environmental laws. Confidence in the data generated from laboratories can be enhanced through an accreditation program. The National Environmental Laboratory Accreditation Conference, a voluntary association of state and federal agencies, has developed national standards and an accreditation process that states may adopt and implement.

Since the 1998 meeting of the TWMC, the 76th Texas Legislature mandated the Texas Department of Health (TDH), which currently conducts a certification program for drinking water analysis, to develop a statewide laboratory certification program. The 76th Legislature directed the TDH to formulate and provide to the 77th Legislature, recommendations for the design and implementation of a Texas certification program. In 1999, two components of a certification program were developed by TDH. These included written rules and an application package for NELAP Certification for drinking water and waste water laboratories.

In September 2000, the Sunset Advisory Commission issued a report assessing the Texas Natural Resource Conservation Commission (TNRCC). This report included a presentation of the current status of laboratory certification including recommendations for implementing the statewide certification program through TNRCC.

Sunset Commission Status Report

The Sunset Commission Report summarized the current status of laboratory performance and accreditation as follows:

- Oversight of environmental labs providing data to the State is inconsistent and divided between agencies.
- Unregulated, unaccredited labs are more likely to produce inaccurate data for agency decision-making, resulting in increased risk to public health and the environment, and increased agency costs.
- Uniform standards provided by a national accreditation program would allow Texas labs to effectively compete with accredited labs in other states.

Sunset Commission Recommendations

- Require TNRCC to adopt rules to implement a voluntary environmental laboratory accreditation program consistent with national standards.
- Transfer the Safe Drinking Water Lab Assessment Program from the Texas Department of Health to consolidate it with the new accreditation program at TNRCC.
- Require TNRCC to accept only data and analyses from accredited labs for all decisions affecting permitting, compliance, enforcement, and corrective action.
- Exempt on-site or in-house labs from the accreditation requirement.
- Authorize the agency to assess laboratory accreditation fees sufficient to recover program administration costs.

The Texas Legislature will decide which portion of these recommendations will be adopted as law

in the Spring 2001 legislative session.

QA Focus Group Recommendations

- Support statewide laboratory accreditation as developed and recommended by the Sunset Commission Report, September 2000.
- TNRCC provide resources to assist labs in conforming to the new standards, especially small labs. For example, the Commission could provide education about the use of data assessment checklists. Services such as those provided by TNRCC's Small Business Assistance Program could serve as a model.
- TNRCC make available to the general public information about laboratory performance, e.g. audit reports.

Quality Assurance Framework Development

1998 QA Focus Group Recommendation

- Develop a consistent, consensus-based framework for the development of QA/QC programs and plans in Texas.

2000 QA Focus Group Update and Recommendations

Quality Assurance Project Plan (QAPP) Shell Document

TNRCC has developed and implemented a consistent, consensus-based QA framework for surface water quality assessment through the Clean Rivers Program (CRP). A QAPP shell document was developed and distributed last year among CRP Planning Partners. As it nears completion of its first trial run as a program document, the QAPP shell has been favorably received by CRP Partners and TNRCC Project Management staff who have indicated the document has helped streamline and make more consistent QAPP development, review, and approval.

The TNRCC is now developing a QAPP "generic" shell document for use in surface water quality monitoring programs. The majority of elements will be covered under the "program QAPP." Project specific work will be addressed in addenda. The effort to develop this document is part of a comprehensive initiative to provide project managers with a suite of objectives, allowing multiple types of monitoring and data quality objectives to be included in one QAPP.

QA Focus Group Recommendations

- Continue with the development of QAPP shell documents.

Data reporting checklists

TNRCC recognizes significant amounts of data used by the agency for decision-making are of unknown quality. To address this issue, a TNRCC work group is looking for ways to make data reporting more consistent across the agency. A checklist, with a heavy emphasis on waste data, has been developed in the agency. The TNRCC work group is circulating the checklist to determine which issues need to be addressed before the list can apply across programs.

QA Focus Group Recommendations

- Create a universal checklist that can be used with all programs.
- The checklist should include criteria associated with NELAP.
- Program specific language should be removed from the list. For example, the waste oriented list, which is currently under review, contains the term "method quantitation limit" which pertains to waste programs. The term "lower limit of quantitation" is more generic and can apply to a wider range of analyses.
- The TNRCC work group should determine the following:
 - 1) Whether or not the checklist duplicates data quality checks performed in the lab.
 - 2) Whether or not the checklist should be filled out for each analysis or for multiple analyses.
 - 3) How the checklist would be completed if the program is performing multiple analyses.
 - 4) Consider the experience of TNRCC surface water quality monitoring programs that already have a checklist. The lab portion of the checklist was removed because the information was too cumbersome to manage.
 - 5) Determine who decides the type of corrective action when errors are found in the checklist.
- Retain information about sample control (i.e. chain of custody, holding times, etc.)
- To improve efficiency in using the checklist:
 - 1) Have checks on individual analysis be part of lab review and not part of sample reporting (e.g., fill out checklist on a percentage basis or for projects of a certain minimum size).

- 2) Customer selects period for filling out checklist.
 - 3) List could be filled out based on previous lab performance (i.e. do not require for every individual analysis but perform the checks on a risk basis or some other selective approach).
- Produce an electronic version of the checklist.
 - Integrate electronic checklist with the Laboratory Information Management System (LIMS) system.
 - Reconcile existing data management checklist with laboratory review checklists to avoid duplication

Blank and duplicate tracking

The workgroup addressed the issue of blank and duplicate tracking and considered the following questions:

- 1) How do we better document data quality?
- 2) What is the best way to match blanks and field duplicates to water quality samples?
- 3) What are blanks and field duplicates telling us and how does this impact a sample?
- 4) When do we disqualify a sample?
- 5) What do we do with the results?
- 6) What is an appropriate measure for QC on samples?
- 7) What is the appropriate frequency for pulling duplicates?
 - a) Current SWQM metals in water requirement - 1 in ten or one per day, whichever is more.
- 8) How are field duplicates taken?

QA Focus Group Recommendations

See recommendations after Records Retention.

Records retention

There is little or no consistency on records retention schedules among entities reporting data to TNRCC. Because water quality assessments are performed with data from a 5-year period, assessment suffers when records retention schedules fail to consistently provide data from a 5-year period.

QA Focus Group Recommendations

- Form a subcommittee to make recommendations to the TWMC regarding:

- 1) Field quality control sample requirements and record retention, which supports the achievement of the implementation of TNRCC/EPA programs. This might include recommendations on sampling frequency, technique or method of collection, reporting scheme, and standardized retention system.
- 2) A data validation system or coding/data management system, which ties a set of water quality samples back to their QC samples.
- 3) A system for both adding different methods to the TNRCC database and approving methods that do not have STORET codes and adding them to the database, e.g. e-coli, only has one STORET code and numerous methods.

Reconciling the disconnect between "Standard Methods" and the Federal Code

TNRCC authority for sample analysis related to the assessment of Texas Surface Water Quality Standards is tied to three sources:

- 1) 40 CFR part 136 which cites the 18th edition of "Standard Methods".
- 2) The most recent edition of "Standard Methods" the standards (currently the 20th edition).
- 3) Other methods approved by the TNRCC.

Confusion exists in the fact that new editions of Standard Methods are being issued; yet they don't appear in the Federal Code. Furthermore, there's a lag time with EPA approving Standard Methods.

QA Focus Group Recommendations

- Water quality programs should use the most current published Standard Methods.

Certification of stream monitoring staff

Certification is now restricted to lab personnel, through the Texas Water Utilities Association. Should there be a certification of field staff? What should be included in the training requirements? How should training be documented? Should it be auditable? Should there be performance testing of some kind? Is proper sample collection happening? Integrity of sampling is based on how the sample is taken. How can performance testing evaluate the sample collection method? Can it cover biological monitoring too? What can be included in a QAPP?

QA Focus Group Recommendations

- TNRCC should establish a regularly scheduled training program. Schedule more

training sessions on the TNRCC Surface Water Quality Monitoring Program (SWQM) procedures, especially when procedures are updated.

- Expand QAPP requirements for training field personnel.

TWMC Public Outreach Focus Group

Chair: Dee Lurry, United States Geological Survey

The Public Outreach session of the 2000 Texas Water Monitoring Congress was attended by 25 participants on Tuesday, September 19, 2000. Six attendees were present at the last Outreach session held at the 1998 Congress. During introductions participants were asked why they chose to attend the Outreach breakout. The reasons cited included:

- 1) To learn how to better respond to media requests
- 2) To find ideas on how to balance outreach with technical tasks/objectives
- 3) To possibly develop goals and objectives for an educational position
- 4) Connect with the "uninvolved"
- 5) To develop an effective communication strategy

These were acknowledged as ambitious objectives for a 1-day breakout.

The planned agenda was based on council input. The previous outreach group attendees were asked for ideas but none were received. Therefore, the September 19 agenda was based 6 different perspectives on various outreach activities within agencies such as Texas Water Development Board, U.S. EPA, Region 6, and the Texas Natural Resource Information System's Stratmap initiative.

A member of Texas Watch at LCRA, Steven Hubbell discussed the limited resources available to document volunteer monitoring "in-kind" contributions. This documentation is required for program oversight and is considered burdensome and repetitive. Discussions in the session between TNRCC personnel and Texas Watch personnel produced a couple of recommendations to alleviate some of these issues.

USEPA employee, Randy Rush, gave a presentation on ways to localize outreach activities from examples of his work with the State of Hawaii. Attendees saw creative ways to educate and involve the public in water resource issues.

Sean Moran with TNRIS' Stratmap program provided examples of Stratmap partnership building he has accomplished with various cooperators across the state and in other Federal agencies.

Sarah Hart with TWDB discussed external customer relation activities at TWDB.

Michele Blair of TNRCC gave an overview of their efforts to convey water-quality information over the Internet.

Dee Lurry briefed the group on the Texas approach to Public Information Officer and Outreach duties at USGS.

During the discussions of the agenda items, participants concluded that the desired outcome of all outreach activities could be expressed in the following statement:

"To foster appropriate action by the general public, various interest groups and the regulated community by effectively communicating state and local water-related issues, data, and information."

The session participants also felt several general outreach guidelines could be noted. There are as follows:

- 1) Every employee has outreach opportunities. Outreach needs to be considered at the onset of each project and incorporated into the way we do business.
- 2) To the extent practical, outreach efforts should be targeted to local areas and issues and relevant to local populations.
- 3) Outreach efforts should develop partnerships to leverage resources.
- 4) Enhanced technology-based (Internet) outreach mechanisms need to be developed and promoted (most cost-effectively where available).
- 5) Internet access is not universal; therefore more traditional mechanisms are also needed (particularly for rural areas).
- 6) Outreach efforts should include soliciting input from the general public as well as the regulated community and interest groups.

The previous recommendations from the 1998 Outreach Congress session were recapped and endorsed as recommendations for TWMC 2000. They are:

- Through a centralized web site, develop a dynamic inventory of contacts and water resources information. This product also will be made available in printed format.
- Promote an umbrella organization to coordinate water-related educational activities.

These activities may be funded through the Senate Bill 1 Regional Water Planning Groups, Clean Rivers Programs and other programs.

- Develop new partnerships to restore/enhance adequate resources and support for volunteer involvement opportunities like citizen water-quality monitoring because these activities are essential to effective water resources management.
- Survey specific groups (i.e., citizens, teachers, policymakers, special interest groups, professionals, and others) to identify water information and data needs.

The survey results will be available to guide the outreach efforts of data providers. The group suggested the possibility of tracking the progress of a TWDB "market survey" that was mentioned in the presentation by Sarah Hart, TWDB.

The following recommendations were suggested as part of the 2000 Outreach session in response to the discussions of the day:

- TNRCC and EPA should establish administrative reporting requirements for volunteer monitoring efforts, which while providing adequate documentation minimize the resource demands for these requirements and maximize the resources available for outreach.
- TNRCC will establish standards for the use of volunteer monitoring data for regulatory purposes.

TNRCC will work with Texas Watch and their partners to develop guidelines for other uses of volunteer monitoring data.

Technology and Technological Solutions Focus Group

Chairs: Christine Kolbe and Jill Csekitz, Texas Natural Resource Conservation Commission (TNRCC)

A brand-new focus group, Technology and Technological Solutions, was introduced at this year's Texas Water Monitoring Congress (TWMC). The session drew a large crowd of greater than 30 participants, indicating a strong interest in monitoring technology among TWMC attendees. The objective of this session was to identify existing technology which would facilitate monitoring in the wake of the revised Texas Surface Water Quality Standards (TSWQS). Six main topics related to new monitoring challenges were discussed during the session. About half of the session was devoted to the monitoring needs of the TSWQS, while the other half was devoted to the technology available to meet these needs. Presenters were asked to provide solutions to questions raised as a result of monitoring for regulatory purposes. Members of regulatory, academic, and research communities; as well as vendors of monitoring technology presented diverse perspectives for monitoring water quality in the Year 2000.

The session began with Jim Davenport of the TNRCC Water Quality Standards Team giving a summary of the revised TSWQS. New bacteria indicators, human health/toxic criteria, and the requirement for 24-hour dissolved oxygen (D.O.) means to determine attainment of aquatic life use were highlighted as the major revisions to the TSWQS. Patrick Roques, team leader of the TNRCC Surface Water Quality Monitoring Team, followed Jim with a discussion on the appropriate uses of data. Patrick emphasized that defining data quality objectives before conducting monitoring is essential, especially when monitoring to support regulatory standards. He pointed out that accurate assessments depend on quality data, and the regulatory implications for assessed water bodies not meeting their designated use are serious.

Paul Boothe of Albion Environmental, Inc. presented examples of how to collect quality metals data to support TSWQS. The clean metals methodology significantly reduces false positives, and is necessary to accurately assess naturally low ambient metals concentrations.

The session re-convened during the afternoon with initiatives to adopt real-time monitoring. Rick Hite discussed the TNRCC Air Monitoring Program's 145 real-time monitoring sites. The TNRCC plans to adapt this technology to the surface water quality monitoring program. Two leading water quality monitoring vendors, YSI and Hydrolab, gave overviews of the technology available for real-time monitoring, and discussed maintenance/calibration issues. Both vendors emphasized that equipment needs and designs are related to monitoring objectives. Dr. Tom Waller of the University of North Texas (UNT) Institute of Applied Sciences presented some of UNT's success with applying real-time technology in conjunction with non-traditional indicators. This provided examples on the "how to" of using real-time technology to improve monitoring programs and collect quality data.

Methods to detect *E. coli* and *Enterococcus*, the new TSWQS required indicators, were presented by IDEXX. Paul Jensen of PBS&J Consulting reviewed studies showing that fecal coliform is not correlated with waterborne illness, thus supporting the switch from monitoring fecals to *E. coli* and *Enterococcus*.

Since the Technology and Technological Solutions Focus Group was first introduced during this year's Congress, there were no recommendations to discuss from previous Congress sessions. The following recommendations were suggested by the 2000 Technology and Technological Solutions Focus Group:

- Monitors need to know their data quality objectives before selecting monitoring technology. This is especially important for monitors collecting data for regulatory purposes.
- Clean metals techniques are required to accurately assess naturally low ambient metals concentrations. Clean techniques significantly reduce false positives by controlling contamination in both the laboratory and field, and also by employing sensitive analytical methods in the laboratory.
- TNRCC is leading a real-time water quality initiative and will seek cooperators. Readily available real-time technology may play a significant role in water quality monitoring in the near-future.
- Implement efficient and cost-effective methods for the new bacterial indicators, *E. coli* and *Enterococcus*.

Closing Remarks

Patrick Roques, Chair, Texas Water Monitoring Council

I am here to wrap up and reflect on the last 3 days. I am very pleased with the success we've had over the last three days, and with the progress we've made as a group in the four years since we've been working together with the Council. As Miles Hall pointed out in his summary of the data networks session, this is the only Texas organization or conference that brings together all water monitoring agencies and staff.

Our objective this year for the plenary session was a focus on technical issues. Jess Weaver, the keynote speaker pointed out some of the reasons for pursuing new technologies. As he noted we are always looking for new technologies, methods, and data analysis tools that will provide better and more accurate data; lower costs per measurement; more certainty about the range of environmental conditions through more measurements; and new parameters or indicators that will allow us to characterize the water environment. Jess gave us some examples, new flow measurement instrumentation, use of sediment cores to look at past water quality, and large-volume filtration to look at suspended sediment - an important part of the water environment that we know little about. Our other speakers on Monday followed this lead and spoke about atmospheric monitoring networks, ground water networks, surface water networks, and the use of models and mapping tools.

Tuesday we heard from two speakers that talked about cooperative efforts to gather and share water monitoring information. Both of these initiatives developed out of last legislative sessions, Senate Bill 1 (SB1) legislation. Carol Baker talked about long-standing efforts in the Houston area to address water needs and recent initiatives through the Regional Planning District. Robert Bradley talked about the Texas Water Information Network. This clearinghouse will use all of the new data management tools we have heard about over the last few days. The network will be Internet-based and have local ownership of the data and water information.

Cindy Loeffler, our former Chair, showed off the Texas Water Monitoring Council web site. We need suggestions for communication both within and outside the Council. She stressed the importance of building on the experience we've had in water resource management and use of shared information. She identified as an important outcome of conference, simply the information exchange made over three days. Cindy stressed the importance of continuing to work together throughout the year after this congress.

Our break out sessions identified a number of issues we all need to have as a focus in the next several years. These include:

Biological monitoring, direct measurements for assessing the protection of aquatic life; sampling presents challenges to monitoring agencies, especially in providing needed staff resources; there is a need to develop assessment criteria to allow assessments of all types of water bodies.

New approaches to monitoring networks need to be pursued - statistically based sampling designs; the application of new technologies; and the need to address nonpoint sources of pollution.

Again this year we have heard about how effective the Internet has been, and will be, for water information and data exchange. We have all been fortunate in the last four years to use the new and rapidly expanding technologies of the Internet and electronic mail. Almost all of the agencies have been able to expand this capability through software and staff, trained to provide this capability.

Another dominant theme has been, know your data users and define your data quality objectives. Metadata, describing the purpose of the monitoring, methods used and quality, must also be provided so users can make decisions about the use of the data. Providing metadata has been a major challenge for data managers. Many existing databases and formats are not equipped to store and provide metadata.

This year we had a new workgroup at the Congress, Technology. They focused on the need for new technology required to implement recent changes in the Texas Surface Water Quality Standards, the state's regulatory mechanism for protecting water quality. The workgroup identified three technologies that need to be implemented now by monitoring programs in Texas, clean metals sampling and analysis, new bacterial indicators, and the need to pilot real-time monitoring and reporting of water quality by building on existing networks and technology for flow and air quality.

The Quality Assurance Workgroup identified the effectiveness of a partnership between the customers for monitoring data, the laboratories that provide the data, and the auditors that ensure data quality. This partnership must include provisions for training, model documents, checklists and general policies required by regulatory programs using the water monitoring data and information.

The Public Outreach Workgroup emphasized that an important role of all monitoring entities is to provide water data and information. All monitoring programs and agencies have an audience that they must identify and serve. To reach the entire audience, information must be provided through all of the available technologies, traditional surface mail, Email, telephone and the Internet.

Reflecting on the Congress this morning, I realized the success of this Congress came about through the efforts of the Council members and the support of their agencies. I would like to recognize some key contributors, our former Chair, Cindy Loeffler, who you heard from Tuesday; Ronn Brock, my co-chair, who has been introducing our speakers; and our five leads for the workgroups, who have reported to you this morning. Thank you must also go to the Texas Water Development staff who have assisted the Council throughout this year and particularly in planning this Congress, Robert Bradley, Russell Pankratz, Lon Langley, Deb Schultz and Patsy Waters.

We have identified a pretty ambitious set of objectives over the last three days. I know that all of us want to accomplish these in the near future. This will only work if you put your efforts into supporting the Council over the next year. As a final charge, remain connected to your monitoring friends and cooperators here in Texas. The Council members and their agencies will be working to keep the lines open between now and the next congress. Visit our web site periodically, send us a

suggestion, and perhaps expect a call from one of the workgroup leads. We have work to do in order to accomplish the recommendations we have heard this morning.

Thank you all for participating.

Congress Evaluation

The 2000 Session of the Texas Water Monitoring Congress had an attendance of approximately 195 individuals representing a wide range of interests. All attendees were given the opportunity to provide feedback in order to assess the success of the Congress Goals. Ninety-four attendees, representing approximately 48% of the total number of attendees, filled out surveys. Over 90% of those who provided feedback thought the Congress was successful in meeting their needs and that the format was appropriate. Almost all (95%) of respondents felt that they had made contacts with people that would be helpful in conducting future work. The overwhelming feeling was that the work of the Congress was extremely important and that it emphasized the need for continued communication and contact between entities involved in water monitoring at all levels.

The following tabulation provides a summary of the Congress evaluation survey.

Question	Total	Percent	Total	Percent
	Yes	Yes	No	No
Did the Congress meet your needs?	86	91%	8	9%
Did you like the format?	88	94%	6	6%
Did you meet people that you can/will contact in the future?	89	95%	5	5%
Would you like to see the addition of focus groups?	30	32%	64	68%
Would you like the addition of topics for focus groups?	28	30%	66	70%
Was the length of the Congress?	Just Right	Too Short	Too Long	Other
	73	2	11	8
	78%	2%	12%	9%

Kinds Of Focus Groups That Participants Would Like To Have

- Add groundwater to one of the focus groups
- Biological methods or fieldwork
- Biological monitoring
- Biological/Habitat Monitoring, Legislative recommendations (or some group to take the issues of resource needs forward at a state level)
- Current events/ hot issues
- Funding resources
- Government cooperation- how to coordinate federal, state, regional, and local water planning
- Ground water and data collection techniques
- Ground-water monitoring issues
- Interbasin transfer issues
- Laboratory method requirements

- Legislative Liaison (maybe this is the Council?!)
 - Maybe one with a group of users
 - Monitoring (specific to telemetry)
 - More emphasis on ground-water component of Texas water use and supply
 - More GIS
 - More water Quantity
 - Research/Water Conservation
 - Resource speakers, Funding resources
 - Something on a clearinghouse for data
 - Surface versus groundwater discussions
 - Target more ground water
 - Technology Transfer
 - Telemetry Issues
 - The applications on new technologies to measure flow and stage
 - Trend detection
 - Underground water level testing
 - Want to participate in more than one focus group add another day-same speakers, different audience
 - Water availability issues/competing water demands
 - Water resources/quantity

Topics That Participants Want Added To Present Focus Groups

- Commercial Software
- Coordinated funding strategies through legislature
- Current technical problems and possible solutions
- Ground water emphasis
- Have focus groups develop subcommittees to work to develop the recommendations that come from the Congress
- Include groundwater, water quantity issues in Data Collection Focus Group
- Let's collaborate on outreach product - like a good stewardship handbook or education package for Legislature "Reasons to Monitor"
- Monitoring techniques
- More anecdotes of specific ??? Or findings that help the focus groups be less abstract
- More fisheries, wildlife impacts issues
- More of an emphasis on ground-water resources
- More time spent on [instruments]
- Photos of monitoring sites
- Reduce the time allowed for vendors or discourage sales pitch information. Most were very much on topic, but a few were not
- Software Resources (relevant to topics)
- Sorry, I can't think of anything right now
- Source water monitoring

- Specifically, how can we get the metadata for as many data collectors as possible and web location to send us to their web locations
- Surface water covered, what about ground water
- Technology - maybe more talks from those implementing "new" technology - maybe learn do's and don'ts and seek cooperators
- The "Public Outreach" could focus more on strategies and methods that can be used to most effectively communicate important environmental/water resources information. This information could include: watershed-related concepts, NPS, water quality and quantity
- Tools of the trade (software)
- Training and documentation, standardization of reported data NELAC
- Underground water monitor and information for public use
- Water quantity (surface and ground) and quality within data collection and management groups.
- Working with the public in volunteer monitoring. Engaging volunteers retaining, revitalizing a program, public outreach

General Comments on the Congress

- 2 days. Announce no cell phones or beepers!
- 2 full days rather than 2-half days and 1 full day. If concurrent sessions /focus group format is to continue, either send agenda far in advance, or time the sessions to allow participation in different focus groups. Emphasis might be placed on a more "cooperative" partnership efforts of all participation groups, rather than emphasis on conforming to a single agency's agenda. While regulatory and permitting purposes are extremely important, those purposes should not exclude their monitoring goals, priorities or focus of all other participating data and monitoring groups.
- 2 days. Starting the program in the morning would allow travelers of some distance a chance to arrive refreshed and better able to listen and participate. For example, from Wichita Falls area, it is about 5 1/2 to 6 hour drive, then to come in and sit for 4 hours works out to be a long, long day. You may say come a day early- some employers don't like springing for that extra day.
- - FTE's and funding for state agencies are important, however, this does not help other entities (water districts, river authorities) in addressing staff needs for meeting program (CRP) requirements that are not permanent!
- Although facility is appropriate for meeting, would it be possible to consider a location on the order of the meeting site at Bandera. This would allow participants to stay together after formal meeting times and interact more completely. At this time, once the brief social period is over, folks go their own way and networking is restricted. This is not to specifically suggest Bandera, but a similar facility nearer Austin if that is a concern.

- Discuss and show results for TWMC from 2 previous sessions (concrete results). Don't forget that the vast majority of water used in the state is withdrawn from the ground. Because this resource is "out of sight" it "out of mind". Conversely, surface water isn't. If the ground-water resource (like surface water) "is not protected by proper monitoring and usage, the ground-water resource could be severely damaged or contaminated.
- Discuss with the overall group recommendations/suggestions from the previous Congress that were implemented and any resulting benefits. More information on what is being done in-between Congress sessions. With data being made available more discussion is needed on appropriate/inappropriate use of data by external customers. Discuss any new legislation, standard revisions etc and how these will effect our current direction and recommendations.
- Efforts to incorporate sharing of data between cooperators and agencies is appreciated. Adopting a common database and protocol for documenting collected data would minimize conflict for incorporation data collected by different agencies. One common database utilized by all agencies would eliminate storet code, location, and computer language conflicts between agencies.
- Expand the list of attendees to include more stakeholders, (labs need to be here).
- First year to attend, very informative. Looking forward to next session.
- Great Job!
- Have general session (everyone attends) with presentations highlight focus groups = many people unable to attend all focus group presentations of interest (=concurrent sessions). Focus groups not adequately covered in the Congress agenda as well people not aware of focus group. With concurrent sessions need to have set schedules on time so people can easily move from focus group to focus group.
- Have the soft-spoken speakers use extra microphones so you can hear them.
- Having the Congress occur on two consecutive full days would be better for me to reduce lost travel time in the office. The public outreach focus group primarily gave presentations on Internet web pages. This took too much time and too little time was used to address integrating all of this information into a unified public outreach program. Web pages only inform Internet users that have a direct interest or inquiry in water quality. We need to direct public outreach to the general public who are uninformed about water quality and quantity issues. Look at programs that have worked like Keep Texas Beautiful, Beach Clean-up etc. Need to pursue the standardized QAPP with great speed.
- I believe there should be themes for the Congress based on water monitoring priorities at the time. In between Congresses, we need more subcommittees to meet and address

specific issues (i.e. TxWIN) to complete tasks in the state. The focus groups require more focus. Senate Bill 1 [1997] or other criteria should be used to further refine the focus of the work groups. I believe there should be less presentation and more brainstorming during the focus groups. The presentations on modeling were interesting, however, the focus should be on water monitoring since data collection and management support modeling efforts.

- I recommend that we spend less time on presentations on the first day. Used the saved time in focus groups. We should use more time to deal with issues and recommendations. In addition, expand your mailing lists.
- I think [the] Congress would be more efficient if there were fewer presenters. Too much information for time allotted. More importantly, try to allow attendance to at least two focus groups. Many people where [wear] multiple "hats" within agencies and attendance to only one focus group leaves individuals out of a lot of good discussions. Overall, though, I enjoyed it and gained a lot of good information from it.
- I think the Council needs to emphasize the past recommendations and the progress made towards achieving these recommendations. We need to convince the Legislature and state, local, and federal agencies that the Congress is an important source of grass roots information. I also believe it is the Council's job to see that the recommendations get to the heads of all agencies and state legislators. Follow-up is essential for success.
- I thought this Congress was a bit heavy on the water quality issues. I expected more on the movement of water and it's data (i.e. flows, storage, and information relating to such like ratings/capacity curves), maybe something from COE as to when, why, how they determine to maintain a balance between pools.
- Include copies of slides from last day in proceedings. Include slides from presentations throughout the congress in proceedings. Keep balance in water quality and quantity, surface [water], groundwater, and climatology.
- Keep up the good work. Would like to see a larger group. Possibly media/public.
- Larger font on nametags.... Still are difficult to read at about 5-10 feet. Specify short-range and long-range goals. Need clearer definition of TWMC ultimate goals, (possibly a mission statement).
- Limit presentation to topics directly related to surface/ground water issues, Allow more time or repeat sessions for focus group input.
- Lunch was a little haphazard. It was not up to the Commons normal standards.
- Make the presentation more interesting, more competitive! 1. Best paper award, 2. Best GIS paper award, 3. Cutting edge tech[nology] award. We need to invite software

vendors with products used in developing databases accessing databases, programming databases, programming databases for use in web remote access, etc. Anything that would spark interest and catch attention.

- Make this a two-day session. This can easily be accomplished by not having topics in the focus groups and have the focus groups concentrate on action items. Also make the breaks for only 15 minutes and the lunch 45 minutes to 1 hour since you have a catered buffet. Also start the first day at 11:00 am and not 1:00 pm as a state congress, all participants can arrive by 11:00 am without having to arrive the day before, and everyone can get back home after a 5:30 pm Congress ending on the second day. Very little focus on sharing data and collaboration with other agencies so we don't duplicate efforts in monitoring. Have each speaker supply a MS Power Point presentation to the Council one-week before so there is continuity among presentations.
- Maybe split groups that are very large. Very informative. Enjoyed lecture format the first day as well as the focus groups the second day. It was also helpful to recap what happened in each focus group on the last day so the entire group could benefit from all the other discussions and topics.
- More participation in the council from Congress attendees.
- Next Congress we should encourage presenters to submit the presentations (power point) ahead of time so that all can be loaded on one laptop. Good job Robert Bradley and Crew! Thanks for all your hard work. You made it look easy.
- Papers on water monitoring projects Congress is ready to move beyond, but still include complete focus on coordination, info [information] exchange mechanisms etc., to a forum for data collected in monitoring projects.
- Post the conference proceedings on the web for all to see, at least 3 months from now!! Keep in mind your "targeted audience" that will be accessing the data, and accessibility for users to retrieve the data.
- Pre-Congress coordination among entities performing monitoring.
- Presentations of focus group reports typically do not take very long. Perhaps schedule two speakers make additional presentations on final day and have conference end at noon.
- Put a list of attendees registered for the Congress in the program. Make the program loose-leaf or in a folder rather than bound. Places to put handouts and keep them together, request email (all contact information) for presenters in the schedule. Collect and publish a list of all the web sites that are mentioned in presentations, they're probably known well in advance.
- Thanks

- The meeting facilities are excellent for this type of meeting. The Pickle Research Center [Campus] is easy to access from many areas within the city of Austin. I would suggest that a mid to late September date for the conference be maintained to allow additional people to attend. I know for me August and early September could be busy with tropical weather and none from our office would be able to attend.
- The meeting seemed a little disjointed to me. While some of the information was good for exposure, I am not sure how it will help in our job functions. I would like a little more up front information on the power of the Congress - Can it really expect to influence legislative activities? There is also a lot of duplication of effort - there is already a lot of monitoring coordination occurring - this meeting seemed to duplicate that work.
- The opportunity to sit and B.S. with people during a couple of breaks during the (a) session.
- This is the first session I attended. I was impressed by the progress made on recommendations from the last meeting.
- To focus more on time frames to emphasize how critical conservation is to Texas
- To promote recommendation by Congress and involvement by legislatures can greater efforts be made to seek attendance of state legislatures and press. EPA presentations regarding MPDES and TMDL implementation how WQ monitoring can be used to affect permitting enforcement, and changes in policy. Possibly try to include presentations by state, federal, or other agencies that have funding and grants to support activities. Logistic notes: larger meeting rooms, more vendors (Campbell Scientific, Druck, Isco Samplers), has EPA been invited (Region 6), involvement by colleges/universities.
- Topics seem to just pop up at each Congress. There needs to be a thread to connect topics from one Congress to another, otherwise it turns into a single brain-storming session with no planning for follow through and update at each Congress. We need specific plans on how to implement these suggestions, who will do it, who will push for funding new initiatives, by when, etc.? More opportunities for entire group to discuss issues. I would have liked to contribute to many different focus groups. Too cold!!
- Turn up the speaker volumes up on the soft-spoken people so you can hear them.
- We obviously need additional ground-water participation, especially within the "focus" groups - This should come from the TWDB and Ground-water Conservation Districts. The fault in this Congress (2000) lies with ground-water attendees, who obviously didn't participate adequately or at least didn't make their input strong enough.

- While the overall Congress was most useful, more time should be spent with dealing with water-quantity issues. Much time was spent with water-quality issues, but as far as addressing water-quantity issues statewide concerning data collection and availability received little attention other than basically the talk by Jess Weaver of the Texas District of the USGS.
- Why do you need a list server? Post current issues to your web site. You have the logical output/outlet. Interested parties can pull up your page to check for news and updates.
- Would like to see more vendors. Let's try to reach out and have more attending users.
- Would like to see shorter presentations with 2 short breaks instead of 1 long break.
- Yes, if you give invitations for some vendors to present - They all should receive the invitation. I am a long time supporter but I don't this was handled.

Comments related to Focus Groups

- A focus group dealing with the important water availability issues being dealt with in the state. Some of these issues include: how much unappropriated water is available for different uses including environmental needs. Also, many water users are developing conjunctive uses with wastewater effluent or ground water. Perhaps having council/Congress members engaging in discussion regarding these issues would assist water managers make important decisions as well educate others. Thanks for a great and informative Congress.
- All the focus groups are important; relevant topics were covered on each agenda. It might help to have people indicate which focus group they're interested in attending; that way we would know what capacity we'd need for rooms. Hopefully, rooms will be labeled with session topic next year. To keep sessions flowing, we should either load presentations in advance for each session, or restrict presenters to using 35mm slides or overheads.
- Ask speakers who discuss projects (like surface-water availability) to share results as well as methods. More opportunities to interact with more than one focus group. Volunteer monitoring needs to be able to interact with quality assurance, data management, technology, and public outreach.
- Divide the group into 3 subgroups: Surface water control, ground water, and water quality. Then have all your presentations specifically for every group (separate). There will always be topics of general interest (e.g. GIS). Those topics can be discussed in a general forum. Water quality took over the congress, and other areas of water resources are as important as that one.

- Expand to have additional day of focus groups
- Joint meeting of data management and public outreach after initial independent meeting/sessions.
- More time for focus groups discussion, less time for presentations. Clearer directions and more time spent on focus group outputs, i.e. concrete projects for TWMC to do, and ideas on how these projects can be done by TWMC. Especially liked TWMC asking presenters of data management session to bring their data source information which the session ?? For all. Issue to add to technological focus group (already noted in network group): Methods useful for supporting nutrient criteria development, particularly methods that assess response variables (e.g. nuisance algae for recreation uses; minimum DO for aquatic live uses).
- Need to keep [focus group] topics general (as is) so as to include a variety of related topics for discussion in each group and not fragment participation. This was my first meeting and a good one I think.
- Recommend breaking out surface water quantity data collection from surface water quality data collection within the data collection network focus group.
- Small group interaction.
- The data management group fit my needs quite well. Good Job. Recommendations for the data management group were not done. If any were to come out of that group, mine would be the continued funding of the StratMap program. This data is very important to many of the state's agencies and provided layers that we can not afford to develop on our own. As a Congress we should show our support. Also, I would suggest the use of a commercial list server, egroups.com works really well. I would be happy to help with this. It is also free.
- Cutbacks have forced municipalities to discontinue funding of important water-quality monitors. Add data-collection recommendations "Provide funding to restore discontinued water-quality monitors"...as well as stream-gauge stations. Also, "Provide funding to increase ground-water level monitoring." Water levels should be monitored in wells completed in each aquifer throughout the state. These data are needed for the Ground-water Availability Models, in addition to local management needs.
- Larger rooms for the focus groups. All participants should have handouts.

TWMC 2000 Participants

Last Name	First Name	Organization
Adami	Robert	Texas Parks and Wildlife Department
Akers	Larry	Evergreen UWCD
Anaya	Gilbert	International Boundary and Water Commission
Atkinson	Karen	TNRCC
Baggett	Scott	City of Longview
Baker	Carole	The Subsidence District
Baldys	Mick	U.S. Geological Survey
Balentine	Sylvia	Lavaca-Navidad River Authority
Barber	Wendell	Colorado River Municipal Water District
Barbie	Dana	U.S. Geological Survey
Beard	Mitch	Earth Soft, Inc.
Bednarz	Steve	USDA-NRCS
Bell	Frank	National Weather Service
Bender	Hugh	Texas Natural Resource Information System
Berbrick	Marcy	Texas Natural Resource Information System
Betz	Cary	TNRCC
Billingsley	Bill	TNRCC
Blair	Michelle	TNRCC
Boghici	Erika	Texas Natural Resource Information System
Boghici	Radu	Texas Water Development Board
Boothe	Dr. Paul	Albion Environmental
Boothe	Janis	Albion Environmental
Botros	John	TNRCC
Bradley	Robert	Texas Water Development Board
Breiten	Kenneth	International Boundary and Water Commission
Brettschneider	Karen	Houston-Galveston Area Council
Broadus	Joe	U.S. Geological Survey
Brock	Ronn	U.S. Army Corps of Engineers
Broderick	Jim	In-Situ, Inc.
Brookins	Linda	TNRCC
Brown	David	U.S. Geological Survey
Brown	Dexter	U.S. Geological Survey
Brown	Karl	U.S. Army Corps of Engineers
Bryant	Greg	TNRCC
Burr	Thomas	Temple-Inland, Inc.
Buscha	Tim	USDA-NRCS
Caldwell	Craig	Texas Water Development Board
Carey	John	Texas Agricultural Extension Service
Choi	Wanjoo	Texas Water Development Board
Clingenpeel	Glenn	Trinity River Authority
Conover	Glenn	Sutron Corporation
Coplin	Laura	U.S. Geological Survey

Last Name	First Name	Organization
Cowan	David	Lower Colorado River Authority
Crocker	Phillip	U.S. EPA
Csekitz	Jill	TNRCC
Curra	Laurie	TNRCC
Davenport	Jim	TNRCC
Davis	Jack	TNRCC
Dean	Linda	Electronic Data Solutions
Dichter	Gil	IDEXX Laboratories Inc.
Dondee	Matt	Lavaca-Navidad River Authority
Duffy	Tim	Harris County Pollution Control
Dugas	Dr. William	Blackland Research Center
Dutton	Alan	University of Texas at Austin
Dvorsky	Charles	TNRCC
Fletcher	Terrell	Design Analysis Assoc., Inc.
Fletcher	William	Design Analysis Assoc., Inc.
Franklin	Gary	Texas Water Development Board
Frisbie	Hilary	U.S. Senator Kay Bailey Hutchison's Office
Garner	Stuart	Hydrolab Corp.
Glover	Randy	Electronic Data Solutions
Guajardo	Jerry	Lower Colorado River Authority
Gunn	Mark	International Boundary and Water Commission
Hall	Miles	Sabine River Authority
Hammond	Raika	Texas Sunset Commission
Hancock	David	Angelina & Neches River Authority
Hardin	Dan	Texas Water Development Board
Harper	Sabrina	City of Longview
Harrington	Bill	Stevens Water Monitoring Systems, Inc.
Harrison	Bill	TNRCC
Hart	Sarah	Texas Water Development Board
Hayes	Mark	Texas Water Development Board
Hendon	Tina	Freese and Nichols, Inc.
Hernandez	Robert	TNRCC
Hite	Rick	TNRCC
Hoepker	Melanie	Harris County Pollution Control
Holub	David	Red River Authority of Texas
Hooper	Patricia	TNRCC
Hopkins	Janie	Texas Water Development Board
Hornig	Evan	U.S. Geological Survey
Howard	Mark	Sabine River Authority
Howard	Randall	Freese and Nichols, Inc.
Hubbell	Steven	Lower Colorado River Authority
Illian	Mark	Synergy Services/Blackwood Land Institute
Jacobs	Searcy	U.S. Geological Survey

Last Name	First Name	Organization
Jensen	Paul	PBS & J
Jones	Ian C.	LBG-Guyton Associates
Jones	Louanne	TNRCC
Jones	Tim	TIAER
Juhle	Pete	U.S. Army Corps of Engineers
Kamm	Bob	Brazos Electric Cooperative
Kasmarek	Mark	U.S. Geological Survey
Kinderwater	Scott	TNRCC
King	Scott	IDEXX Laboratories Inc.
Kolbe	Christine	TNRCC
Kramer	Jack	TNRCC
Langley	Lon	Texas Water Development Board
Lenz	Mark	National Weather Service
Lien	Danny	TNRCC
Loeffler	Cindy	Texas Parks and Wildlife Department
Loft	Chris	TNRCC
Lora	Carlos	U.S. Army Corps of Engineers
Lowe	Larry	National Weather Service
Ludeke	Kim	Texas Parks and Wildlife Department
Lurry	Dee	U.S. Geological Survey
Lynch	Malcolm	C.C. Lynch & Associates
Mace	Robert	Texas Water Development Board
Magin	Debbie	Guadalupe-Blanco River Authority
Mariscal	Rene	TNRCC
May	Jayne	U.S. Geological Survey
McCarthy	Robert	Dallas Water Utilities Department
Melancon	Brian	Angelina & Neches River Authority
Mendleman	Eric	Texas Watch
Mia	Riazul	City of Laredo
Michon	Mark	Texas Water Development Board
Milam	Ingeri	Lower Colorado River Authority
Minton	Shawn	Instrumentation Northwest
Miranda	Roger	TNRCC
Mitchell	Diann	Texas Agricultural Extension Service
Mohr	Ron	Texas Water Development Board
Moore	Allison	Texas Watch
Moran	Sean	Texas Natural Resource Information System
Muller	Chris	Texas Water Development Board
Mullins	Melissa	TNRCC
Nicolau	Terri	Coastal Bend Bays & Estuaries Program
Nixon	Carl	HydroAlert
Nixon	Nancy	HydroAlert
Nyberg	Pete	Sutron Corporation

Last Name	First Name	Organization
Olsen	Leonard	Texas Water Development Board
Ordner	Michael	Texas Department of Health
Ottmers	Don	TNRCC
Pankratz	Russell	Texas Water Development Board
Pantalion	Hollis	Lower Colorado River Authority
Patek	Jim	Parsons ES
Pawlik	Angie	Texas Water Development Board
Payne	John	Sabine River Authority
Peters	Joe	TNRCC
Petrick	David	TNRCC
Petrini	Harald	Texas Water Development Board
Pinchback	Jason	Texas Watch
Pond	Jimmy	U.S. Geological Survey
Preston	Richard	Texas Water Development Board
Price	Jeff	Temple-Inland, Inc.
Price	Paul	Paul Price Assoc., Inc.
Qualls	Denis	Brazos River Authority
Quincy	Roger	Texas Water Development Board
Rakestraw	Ken	International Boundary and Water Commission
Reece	Brian	U.S. Geological Survey
Reed	Mike	USDA-NRCS
Ridgeway	Cindy	Texas Water Development Board
Ritter	Christine	Texas Water Development Board
Ritzky	Sylvia	U.S. EPA
Rodman	Paul	U.S. Army Corps of Engineers
Rogers	Anne	TNRCC
Roques	Patrick	TNRCC
Rush	Randall	U.S. EPA
Rushin	Randy	C.C. Lynch & Associates
Sandlin	Tod	U.S. Geological Survey
Santos	J. Rey	Texas Agricultural Extension Service
Scheffler	Charles	U.S. Army Corps of Engineers
Schultz	Deborah	Texas Water Development Board
Scott	Otis	Brazos River Authority
Sears	Walt	Northeast Texas Municipal Water District
Shirkey	John	TNRCC
Shively	Dale	Texas Parks and Wildlife Department
Siddall	Karen	Irving Public Works/Engineering
Simms	Michael	Science Applications International Corporation
Slade	Raymond	U.S. Geological Survey
Sneck-Fahrer	Debra	U.S. Geological Survey
Solanik	Darrel	Paul Price Assoc., Inc.
Solis	Ruben	Texas Water Development Board

Last Name	First Name	Organization
Spinney	Diane	Lower Colorado River Authority
Spruill	Tommy	Titus Co. FWSD#1
Standen	Allan	LBG-Guyton Associates
Strom	Eric	U.S. Geological Survey
Sunvison	Milton	U.S. Geological Survey
Thomas	Duane	Texas Water Development Board
Thorkildsen	David	Texas Water Development Board
Thornton	Okla	Colorado River Municipal Water District
Twidwell	Stephen	TNRCC
Walker	Van	Brazos River Authority
Waller	Tom	University of North Texas, Institute of Applied Science
Walls	James	Harris County Pollution Control
Wang	Kristin	TNRCC
Waters	Patsy	Texas Water Development Board
Weaver	Jess	U.S. Geological Survey
Weber	Tom	TNRCC
Weiger	Ben	National Weather Service
White	Allen	U.S. Fish & Wildlife Service
Williams	Randy	Texas Water Development Board
Winchell	Julie	City of Cleburne
Wise	Patricia	TNRCC
Wisehart	Brian	Hydrolab Corp.
Worthen	Meredith	TNRCC
Zwarun	Alex	Capital Area Planning Council

