Basic Law and Management of Texas Waters



Purpose

The purpose of this presentation is to present basic summary information regarding Texas water law and Texas water management.

Hyperlinks within this presentation (presented in this color) provide detailed or additional information for issues presented on the slides. Click on the links to view their information (Internet connection required to view link contents).

Within this presentation TWDB represents the Texas Water Development Board and TCEQ represents the Texas Commission on Environmental Quality

Presentation organization

History of Natural Resource Protection in Texas Water law

- Introduction and history
- Texas Administrative Code and Water Code
- Water Planning
- Texas Water Plan
- River Authorities
- Groundwater Districts

Recent Water Planning

- Regional water planning
- Surface water availability modeling and planning
- Groundwater availability modeling and planning

Specific laws and rules

References for additional information

Each of these section titles are presented in the colors shown above and third order headings are presented in blue



History of natural resource protection in Texas

The history of natural resource protection by the State of Texas is one of gradual evolution from protecting the right of access to natural resources (principally surface water) to a broader role in protecting public health and conserving natural resources for future generations of Texans.

Natural resource programs were established in Texas at the turn of the 20th century, motivated initially by concerns over the management of water resources and water rights. Many of the protection programs are initiated or mandated by Federal requirements.

A time line presenting the history of natural resource protection is presented at

http://www.tceq.state.tx.us/about/

tceqhistory.html







The complexity of the Texas law of water rights stems from its combination of Hispanic elements with traditional English common law, as well as from its legal fragmentation of the hydrologic cycle.

Water-rights law determines who is entitled to use the available water supply, in what quantities, and for what purposes, and often specifies when and where the water may be used.

Unlike scientists, who usually regard all water as part of the endless hydrologic cycle, a natural whole, Texas courts divide water into unrelated legal classes with different rules of law governing the ownership and use of each class.

A summary of Texas water law is presented at http://www.tshaonline.org/handbook/online/articles/WW/gyw1.html

In Texas, surface water and ground water are property rights

Surface water belongs to the state

Permits to appropriate surface waters are granted by the Texas Commission on Environmental Quality (TCEQ).

- Ground water is an individual property right, established by case law.
 - However, state law empowers local or regional groundwater management authorities and states that Groundwater Conservation Districts are the preferred method of groundwater management.



Texas Administrative Code and Water Code

Texas Administrative Code

The TAC is a compilation of all state agency rules in Texas. There are 16 titles in the TAC. Each title represents a category and relating agencies are assigned to the appropriate title.

Click on link to view http://info.sos.state.tx.us/pls/pub/readtac\$ext.viewtac

- Title 30 covers environmental quality and apply to the TCEQ. These rules also are available on TCEQ homepage at <u>http://www.tceq.state.tx.us/rules/indxpdf.html</u>
- Title 31 part 10 covers the TWDB <u>http://info.sos.state.tx.us/pls/pub/readtac\$ext.ViewTAC?tac_vie</u> <u>w=3&ti=31&pt=10</u>
- Title 31 part 2 covers the Texas Parks and Wildlife Department
- regarding water resource protection <u>http://info.sos.state.tx.us/pls/pub/readtac\$ext.ViewTAC?tac_vie</u> <u>w=3&ti=31&pt=2</u>



Texas Water code



Sec. 1.001. PURPOSE OF CODE. (a) This code is enacted as a part of the state's continuing statutory revision program, begun by the Texas Legislative Council in 1963 as directed by the legislature in Chapter 448, Acts of the 58th Legislature, Regular Session, 1963 (Article 5429b-1, Vernon's Texas Civil Statutes). The program contemplates a topic-by-topic revision of the state's general and permanent statute law without substantive change.

Click on link to view

http://tlo2.tlc.state.tx.us/statutes/wa.toc.htm



The Texas Water Development Board maintains a "Water Resource Planning and Information" link containing the State water plan, regional water planning, planning data, water use survey, and flood mitigation planning at

http://www.twdb.state.tx.us/wrpi/index.htm

Also the TCEQ and TWDB operate Drought Planning and Management sites at

TCEQ:

http://www.tceq.state.tx.us/nav/util_water/drought.html

TWDB:

http://www.twdb.state.tx.us/DATA/DROUGHT/ drought_toc.asp

Additionally the TCEQ maintains a site for emergency response to spills and storms at

http://www.tceq.state.tx.us/response/

Texas Water Plan















Comparison of groundwater and surface water use by county



Projected Water Supply/Demand and Population for Texas

Note: water demand exceeds water supply beginning 2010



Previous Texas Water Plans





1984 State Water Plan



1997 State Water Plan



1990 State Water Plan



2002 State Water Plan



2007 (current) State Water Plan

The 2007 State Water Plan was adopted by the Board on November 14, 2006.



- Previous versions of the State Water Plan involved Statewide planning conducted by the TWDB.
- The 2007 Plan is based on a "bottom-up" consensus-driven approach to water planning that involves 16 regional water planning groups This process is described later in the Recent Water Planning section.
- Within TWDB guidelines, each regional planning group reviews water use projections and water availability volumes in dry or drought-ofrecord conditions.
- When a water need is identified, the planning groups recommend water management strategies to meet the need.
- Once the planning group adopts the regional water plan, the plan is sent to the TWDB for approval. The TWDB then compiles information from the regional water plans and other sources to develop the state water plan.

Texas Water Plan table of contents

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Front cover & title pg | Back cover

1.0 Highlights of the 2007 State Water Plan

Good resource for water data, maps and photos

2.0 Regional Summaries: Region A | Region B | Region C | Region D | Region E | Region F | Region G | Region H | Region I | Region J | Region K | Region L | Region M | Region N | Region O | Region P

- 3.0 Fifty Years of Water Planning in Texas
- 4.0 Population and Water Demand Projections
- 5.0 Climate of Texas
- 6.0 Surface Water Resources
- 7.0 Groundwater Resources
- 8.0 Water Reuse
- 9.0 Water Supply Needs
- 10.0 Water Management Strategies
- 11.0 Plan Implementation Funding
- 12.0 Challenges and Uncertainties in Water Supply Planning
- 13.0 Planning Group Policy Recommendations

http://www.twdb.state.tx. us/wrpi/swp/swp.htm

Water Planning and Water Use Survey Maps

The water use survey presents historic maps for surface and groundwater use for various water use categories (i.e. municipal and irrigation use).

The water planning tool presents, for future years, maps of projected population, water needs and unmet needs, and water availability, demands, and supply.

A glossary for planning terms is at <u>http://www.twdb.state.tx.us/assistan</u> ce/rwpg/DB02/glossary.asp

Click on link to view data and map http://wiid.twdb.state.tx.us/ims/WIID/ Viewer.asp?MapService=wuswp



River Authorities















River Authorities (cont)

TITLE 5. SPECIAL LAW DISTRICTS of the Texas Water Code contains CHAPTER 152. RIVER AUTHORITIES ENGAGED IN DISTRIBUTION AND SALE OF ELECTRIC ENERGY

- River Authorities are created by the Texas Legislature
- In 1929 The Legislature created the first river authority (Brazos River Authority).

Fourteen Texas river authorities help protect and monitor more than 70 percent of the state's surface water. River authorities receive most of their revenue from services sold to customers, usually water or electricity. They also may receive federal, state or private grants, which are often designated for specific purposes such as planning, wastewater treatment or conservation. Some authorities also draw revenue from parks and recreation facilities. Authorities can levy taxes, but usually do not, and can issue revenue bonds — with voter approval — or obtain loans from the Texas Water Development Board.



Groundwater Districts













Groundwater Districts (cont)

Legislature can give special powers to districts to address specific water problems

The Texas State Legislature in 1949 authorized the creation of Groundwater Conservation Districts to perform certain prescribed duties, functions, and hold specific powers as set forth in Article 7880-3c, Texas Civil Statutes, changed to Chapter 52 of the Texas Water Code, currently Chapter 36 of the Texas Water Code.

Texas Alliance of Groundwater Districts http://www.texasgroundwater.org/



Creation of Groundwater Conservation Districts

Action of the Legislature

- Petition by Property Owners
- Initiation by the TWDB priority groundwater management areas
- Adding territory to an Existing District

Based on the philosophy of

- Iocal management of groundwater resources
- through groundwater conservation districts



Special Districts created to protect groundwater

- Harris-Galveston
 Subsidence District (1975)
- Ft. Bend Subsidence District (1989)
- Edwards Aquifer Authority (1993)









Recent Water Planning



- 1996 Texas drought
 - Governor Bush asks "how much water do we have? How much are we using? How much do we need?" -- Ooops. No good answers!
- 1997 Senate Bill 1 passed by Legislature
 - Regionalizes water planning in Texas and establishes surface water availability modeling
- 2001 Senate Bill 2 passed by Legislature
 - Establishes groundwater availability modeling and initiates instream flow assessment

Note: Instream flow represents the flow rate to sustain a healthy habitat, biology, and geomorphology in the stream

Regional water planning

 With passage of SB 1, the Legislature put in place a "bottom up" water planning process designed to ensure that the water needs of all Texans are met as Texas enters the 21st century.

• SB 1 allows individuals representing 11 interest groups to serve as members of 16 Regional Water Planning Groups (RWPG) to prepare regional water plans for their respective areas. These plans will map out how to conserve water supplies, meet future water supply needs and respond to future droughts in the planning areas.

• The Texas Water Development Board (TWDB) approved and incorporate the regional water plans into a comprehensive state water plan in 2002. The water plans will be updated every five years.

http://www.twdb.state.tx.us/wrpi/rwp/rwp.htm

Regional Planning Rules

Adopted TWDB Rules are published under <u>Title</u> <u>31, Part 10 of the Texas Administrative Code</u> on the Secretary of State's website.

- <u>Chapter 355</u> Research and Planning Funding
- Chapter 356 Groundwater Management
- <u>Chapter 357</u> Regional Water Planning Guidelines
- <u>Chapter 358</u> State Water Planning Guidelines
- Chapter 363 Financial Assistance Programs

http://www.twdb.state.tx.us/wrpi/rwp/rules.htm

Location of the 16 Regional Water Planning groups



11 Interests represented on each Planning Group

- » Member of the Public at Large
- » Counties
- » Municipalities
- » Industries
- » Agricultural Interests
- » Environmental Interests
- » Small Business
- » Electric Generating Utilities
- » River Authorities
- **» Water Districts**
- » Water Utilities



Regional Water Planning Steps - 1

- Determine water demands
- Determine water supplies during low flows
- Determine surplus or need
- Determine impact of not meeting needs
- Develop alternatives, strategies, and any unmet needs

Regional Water Planning Steps - 2

- Identify ecologically unique streams and rivers
- Identify unique reservoir sites
- Coordinate with neighboring regions
- Propose regulatory, administrative or legislative recommendations to improve water resource management in the state



Products from Regional Planning

- The Regional Planning homepage is at

http://www.twdb.state.tx.us/wrpi/rwp/rwp.htm

The latest Regional Plans are online at

http://www.twdb.state.tx.us/wrpi/rwp/previous.htm







Surface Water Availability Modeling and Planning

















Approach for Surface Water Availability Modeling and Planning

- Determine available water during drought conditions
- Evaluate impacts of reuse on existing water rights
- Evaluate impacts of cancellation on existing water rights
- Determine firm yields of major reservoirs
- Use as a permitting tool

Water Availability Modeling in Texas Pursuant to 1997 Senate Bill 1

Water Rights Analysis Package (WRAP) model developed at Texas A&M University and adopted for Texas WAM System

Water Availability Modeling (WAM) System implemented by TNRCC/TCEQ, its partner agencies, and contractors pursuant to Senate Bill 1 (SB1) enacted by the Texas Legislature in June 1997

Water Availability Modeling

- A water availability model is a computer-based simulation predicting the amount of water that would be in a river or stream under a specified set of conditions.
- The model of a specific river basin consists of two parts:
- the modeling program, called "WRAP", short for Water Rights Analysis Package
- a text file that contains basin-specific information for WRAP to process (these text files are called input files)
- Details for water availability modeling are presented on the TCEQ website at:

http://www.tceq.state.tx.us/permitting/water_supply/water_rights/ wam.html



Water Availability Models – flow definitions

- Naturalized Flows flows that would have occurred in the absence of human activity
- Regulated Flows actual flow at a given point in the basin
- Unappropriated Flows the amount of flow available for appropriation



Naturalized Flows ?



Naturalized Flows

WRAP is Based on Naturalized Flows

$$NF = GF + \Sigma D_i - \Sigma RF_i + \Sigma EP_i + \Sigma \Delta S_i$$

EP

GF

NF

D

- **NF** naturalized flow
- **GF** gaged flow
- **D** water supply diversions upstream
- **RF** return flow upstream
- **EP** reservoir evaporation minus precipitation **RF**
- **△S** change in storage in upstream reservoirs
- Used to predict reliabilities (water availability)

Additional details for use of the model

- Water Availability Models are used to determine whether water would be available for a newly requested water right or amendment.
- TCEQ staff uses two models in evaluating applications:
- the Full Authorization simulation, in which all water rights utilize their maximum authorized amounts, is used to evaluate applications for perpetual water rights and amendments.
- the Current Conditions simulation, which includes return flows, is used to evaluate applications for term water rights and amendments.
- If water is available, these models estimate how often the applicant could count on water under various conditions. For example, would water be available only one month out of the year, half the year, or all year? And would that water be available in a repeat of the drought of record?
- In evaluating applications for a new appropriation of water and some applications for amendments to existing water rights, TCEQ staff must consider recommended environmental flow needs. Environmental flow needs include instream flows and freshwater inflows to bays and estuaries.
- The water availability models provide information that assists TCEQ staff in determining whether to recommend the granting or denial of an application.

Groundwater Availability Modeling and



Planning









Groundwater Availability Modeling and Planning (cont)

GAM's Mission:

to provide reliable, timely data on groundwater availability to the citizens of Texas to ensure adequacy of supplies or recognition of inadequacy of supplies throughout the 50 year planning horizon.

GAM will result in publicly available numerical groundwater flow models for the major and minor aquifers of Texas.

http://www.twdb.state.tx.us/gam/

• <u>Purpose:</u> to develop tools that can be used to help Groundwater Conservation Districts, Regional Water Planning Groups, and others assess groundwater availability.

GAM

- <u>Public process:</u> you get to see how the model is put together.
- Freely available: standardized, thoroughly documented, and available over the internet.
- Living tools: periodically updated.

GAMs and Groundwater Availability

 A GAM is a <u>tool</u> that can be used to assess groundwater availability once Groundwater Conservation Districts and Regional Water Planning Groups decide how to define groundwater availability (typically based on specified limits of groundwater decline from future pumpage, maintaining springflows, etc).

How do we use GAM?

- The model
 - predict water levels and flows in response to pumping and drought
 - effects of well fields
- Data in the model
 - water in storage
 - recharge estimates
 - hydraulic properties
- GCDs and RWPGs can request runs

Groundwater models are data hungry:

- geology
- structure
- digital elevation models
- water levels
- water-level variations
- soil maps
- precipitation
- water quality

- stream flows
- spring flows
- lake levels
- hydraulic properties
- pumping
- cultural references
- satellite imagery
- geophysical mapping
- well information

How does GAM work?

- The aquifer is modeled by dissecting or dividing it into blocks.
- Each block is called a "grid cell".
- Water flowing in and out of each grid cell is calculated and balanced by the computer.
- Inflows and outflows can include:
 - cross formational flow (up and down flows),
 - lateral inflow and outflow (side to side),
 - pumping (water taken out of aquifer),
 - recharge (water being added to aquifer),
 - evapotranspiration, and
 - stream inflows and outflows.

Cutout of aquifer dissected into grid cells

Flow in one grid cell

Example GAM run: Simulated saturated thickness for the Ogallala aquifer in the Texas Panhandle Year: 2005

Note: black areas—no Ogalala water

Click to next slide and back to view difference in saturated thickness from 2005 to 2050

Example GAM run: Simulated saturated thickness for the Ogallala aquifer in the Texas Panhandle Year: 2050

Availability and Use by aquifer

Results of GAMs for major aquifers

A summary and report on the model for each aquifer is available by clicking on any aquifer within the link at http://www.twdb.state.tx.us/gam/

Minor aquifers modeled by GAM

http://www.twdb.state.tx.us/gam/

Specific laws and rules

- Overview of Laws Regarding the Navigation of Texas Streams <u>http://www.tpwd.state.tx.us/publications/nonpwdpubs/water_issu</u> <u>es/rivers/navigation/riddell/</u>
- Public access to streams
- <u>http://www.tpwd.state.tx.us/publications/nonpwdpubs/water_issu</u> es/rivers/navigation/riddell/publicaccess.phtml
- If A River Runs Through It, What Law Applies? http://www.tpwd.state.tx.us/publications/nonpwdpubs/water_issu es/rivers/navigation/kennedy/kennedy_faq.phtml
- Texas surface water quality monitoring required by the Federal Clean Water Act <u>http://www.tceq.state.tx.us/compliance/monitoring/water/quality/d</u> <u>ata/wqm/305_303.html</u>

A map presenting the location of the segment numbers for the monitoring is at

http://www.tceq.state.tx.us/assets/public/gis/docs/seg2000.pdf

Specific laws and rules (cont)

• Building or destroying dams or reservoirs

http://www.tceq.state.tx.us/compliance/field_ops/dam_safety/dam safetyprog.html

• Instream use program

http://www.tceq.state.tx.us/permitting/water_supply/water_rights/i nstreamusesprogram.html

• TCEQ conservation programs

http://www.tceq.state.tx.us/nav/util_water/conservation.html

• TCEQ water advisory groups

http://www.tceq.state.tx.us/nav/advise/water_index.html

• TCEQ cleanup programs

http://www.tceq.state.tx.us/nav/cec/cleanups.html

References for additional information

 Texas Environmental Almanac from Texas Environmental Center and Texas Center for Policy Studies

Chapter 1: Water quantity

http://www.texascenter.org/almanac/QUANTITYCH1P1.HTML

Chapter 2: Water Quality

http://www.texascenter.org/almanac/QUALITYCH2P1.HTML

- Texas Water Matters http://www.texaswatermatters.org/
- A Texans guide to water and water-rights marketing <u>http://www.twdb.state.tx.us/publications/reports/WaterRightsMarket</u> <u>ingBrochure.pdf</u>
- Hydrology and Texas Water Law: ...A Logician's Nightmare by Otis W. Templer <u>http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1049&context=greatplainsresearch</u>