Texas Water Rights

- Historical Background
- Key Milestones
- Recent Initiatives
- Current Activities
- Going Forward

“Whiskey is for drinking, and water is for fighting.” ~Mark Twain
Two Separate Paths

- **Groundwater**
  - “Rule of capture” allows pumping of any groundwater beneath property

- **Surface water**
  - Riparian Doctrine
  - Prior Appropriation Doctrine

http://www.tceq.texas.gov/about/tceghistory.html
A Look Back at Key Milestones...

- Originally, no statutory requirements for environmental flows included

- In 1975, impacts to bays and estuaries were required to be considered

- In 1985, legal requirements were added to the permitting process:
  - To maintain beneficial inflows to the bays and estuaries
  - Applications to be evaluated on a case-by-case basis using special permit conditions if necessary
  - To maintain existing instream flow uses, water quality, and fish and wildlife habitats
Most rights were issued prior to 1985 and have no environmental protection

Over 200 major reservoirs in Texas; only a handful have releases for environmental flows

Prior Appropriation; perpetual permits; only one chance to address environmental impacts

Burden falls to post 1985 rights to protect environmental flows; piecemeal basis
In 1997, Senate Bill 1 established a regional water planning process:
- Consensus-driven local and regional stakeholder participation
- 16 regional planning groups

- Included evaluations for potential effects on the environment
- Established Texas Water Trust program to hold water rights dedicated for environmental purposes.
Regional Planning Groups

(A) Panhandle
(B) Region B
(C) Region C
(D) Northeast Texas
(E) Far West Texas
(F) Region F
(G) Brazos G
(H) Region H
(I) East Texas
(J) Plateau
(K) Lower Colorado
(L) South Central Texas
(M) Rio Grande
(N) Coastal Bend
(O) Llano-Estacado
(P) Lavaca
On-going Regional Planning Activities

- Evaluating water management strategies and preparing regional plans, including:
  - Developing current and projected population and water demand over a 50-year planning horizon
  - Quantifying current water supplies
  - Evaluating plan impacts on water quality
- Recommending regulatory changes
- Adopting the plans, including public participation

http://www.twdb.state.tx.us/wrpi/rwp/rwp.htm
In 2001, Senate Bill 2 directed State water and environmental agencies to:

- Establish a data collection and evaluation program (Texas Instream Flow Program)
- Conduct studies to determine flow conditions necessary to support a sound ecological environment in Texas rivers and streams
- Complete priority scientific studies by December 31, 2016
Sound Ecological Environment

“A resilient, functioning ecosystem characterized by intact, natural processes, and a balanced, integrated, and adaptive community of organisms comparable to that of the natural habitat of a region.”

Conserve Biodiversity
- fish, invertebrates,
- mussels, plants ...
- riparian diversity

Maintain Ecological Integrity
- processes & functions that create & maintain habitat & other physicochemical conditions that support survival, growth, & reproduction
Texas Instream Flow Program

- State methodology peer reviewed by a National Research Council panel
- Members included Texas scientists
- Favorable report published in 2005
Instream Science: A Changing Paradigm

- Single flow value throughout the year (7Q2)
- Flow variability based on a percentage of monthly median flows (Lyons Method)
- Hydrology-based flow regime: using hydrologic record with annual variation

- Instream Flow Study: boots in the water study linking hydrology, biology, water quality, geomorphology, physical processes
How do you include environmental flows in the permitting process?
Senate Bill 3 Introduces New Environmental Flow Process

- Passed by Texas Legislature in 2007
- Enlarged field of participants
  - grass roots participation, statewide oversight, and state agency action

Diagram:
- Governor
- Lt. Governor
- House Sp.
- Environmental Flows Advisory Group
- Basin/Bay Stakeholder Committees
- Basin/Bay Expert Science Teams
  (Roles for TPWD, TWDB, and TCEQ)
Environmental Process through Senate Bill 3

- Permitting will no longer be a one point in time examination of the instream uses at a particular water right location
  - Now includes a full river basin and bay system examination
  - Environmental needs identified through public proceedings
  - Standards promulgated through notice and comment rulemaking
- Does not impact water rights in existence prior to September 1, 2007
- Includes “adaptive management” including re-opener provisions for new standards and limited adjustments
Environmental Flows Advisory Group (EFAG)

- Group of representatives from Texas Legislature, TCEQ, TWDB and TPWD
- EFAG appoints a statewide Science Advisory Committee (SAC) and regional Bay and Basin Area Stakeholder Committees (BBASCs)
- Study public policy implications
- Conduct public hearings on issues such as:
  - Granting permits for instream flows
  - Texas Water Trust
  - Other issues of importance
Science Advisory Committee

★ Objective scientific body to advise on environmental flow protection issues
★ Develop recommendations to help provide overall direction, coordination, and consistency relating to:
  ✷ Methodologies for bay/estuary (freshwater inflow) and instream flow studies;
  ✷ Environmental flow programs at State agencies; and
  ✷ Work of the Basin and Bay Expert Science Teams (BBESTs).

Basin and Bay Area Stakeholder Committee (BBASC)

- Appoints a Bay and Basin Expert Science Team (BBEST) to conduct analyses
- Provides TCEQ with comments on BBEST analyses, strategies, and recommendations for appropriate environmental flow standards:
- Creates a work plan that establishes periodic review of environmental flow standards:
  - Short-term research studies
  - Focused long- or short-term surveys
  - Long-term monitoring programs
Basin and Bay Areas and Timelines

A. Sabine & Neches Rivers/Sabine Lake Bay Area, 2007-2011
B. Trinity & San Jacinto Rivers/Galveston Bay Area, 2007-2011
C. Brazos River/Bay & Estuary Area, 2010-TBD
D. Colorado & Lavaca Rivers/Matagorda & Lavaca Bays Area, 2009-2012
F. Nueces River/Corpus Christi & Baffin Bays Area, 2009 – TBD
G. Rio Grande/Rio Grande Estuary & the Lower Laguna Madre Area, 2010 -TBD
Basin/Bay Area Stakeholder Committees – Diverse Members

- Agricultural water users (irrigators, free range livestock ranchers, concentrated animal feeding operations)
- Recreational water users (coastal recreational anglers and businesses supporting recreation)
- Municipalities
- Soil and water conservation districts
- Industrial water users (refining, chemical manufacturing
- Electricity generation, production of paper products and timber)
- Commercial fisherman
- Public interest groups
- Regional water planning groups
- Groundwater conservation districts
- River authorities and other districts with jurisdiction over surface water
- Environmental interests
Basin and Bay Expert Science Team (BBEST)

- Conducts environmental flow analyses and develops an environmental flow regime recommendation based solely upon the best available science.
- Provides BBASC with results, strategies, and recommendations for environmental flow standards:
  - Rivers and streams – instream flows
  - Bays and estuaries – freshwater inflows
TCEQ Environmental Flow Standards

- Specifically for each river basin and bay system
- Adequate to support a “sound ecological environment”
- Considering other public interests and relevant factors
- Include “unappropriated water” set asides considering human water needs
- Include procedures to implement adjustments for permits or water right amendments
TCEQ Environmental Flow Regimes

- Environmental flow standards must consist of a schedule of flow quantities:
  - Based on best available science
  - Seasonal and yearly fluctuations
  - Vary geographically by specific location in a river basin and bay system
  - Shown to be adequate to support a sound ecological environment
  - Able to maintain the productivity, extent and persistence of key aquatic habitats
Flow Regime Determinations

Hydraulic Model

Mesohabitat Criteria

Spatially Explicit Habitat Model

Habitat Suitability Criteria

Habitat Heterogeneity vs. Discharge

Microhabitat vs. Discharge

Hydrologic Time Series

Heterogeneity Time Series

Microhabitat Time Series

Flow Regime Recommendation

Riparian Areas
Recreational, Cultural, and Other Societal Resources

Life History

Biology
Water Quality
Geomorphology
Connectivity
Hydrology
Ecosystem Focus of a Sound Ecological Environment

- **Subsistence Flows**
  - Conserve biological function
    - Water quality tolerances met
    - Key habitat thresholds maintained

- **Base Flows**
  - Conserve biological / habitat diversity and water quality
    - Habitat for flow dependent species
    - Bank storage/moisture
    - Suitable temperatures / dissolved oxygen

- **High Flow Pulses**
  - Life history / geomorphic processes
    - Fish spawning cues
    - Maintain channel
    - Sediment/nutrient transport
    - Riparian recruitment

- **Sound Ecological Environment**
Instream Flow Components

- **Subsistence Flow**
  - Infrequent, low flows during drought periods

- **Base Flow**
  - Average flow conditions with variability

- **High Flow Pulse**
  - In-channel, short duration, high flows associated with storm events
## Flow Regime Functions Related to Physical Processes

<table>
<thead>
<tr>
<th>Component</th>
<th><strong>Hydrology</strong></th>
<th><strong>Geomorphology</strong></th>
<th><strong>Biology</strong></th>
<th><strong>Water Quality</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subsistence Flows</strong></td>
<td>Infrequent, low flows during drought periods</td>
<td>Increased deposition of fine &amp; organic particles</td>
<td>Restricted aquatic habitat Limited connectivity</td>
<td>Elevated temp Reduced levels of DO</td>
</tr>
<tr>
<td><strong>Base Flows</strong></td>
<td>Average flow conditions with variability</td>
<td>Maintain soil moisture &amp; groundwater table Maintain diversity of habitats</td>
<td>Suitable aquatic habitat Connectivity along channel corridor</td>
<td>Suitable in-channel water quality</td>
</tr>
<tr>
<td><strong>High Flow Pulses</strong></td>
<td>In-channel, short duration, storm event flows</td>
<td>Maintain channel &amp; substrate characteristics Prevent encroachment of riparian vegetation</td>
<td>Recruitment events for organisms Connectivity to near-channel water bodies</td>
<td>Restore in-channel water quality after prolonged low-flow</td>
</tr>
</tbody>
</table>
# Integration of Flow Components

A sample environmental flow matrix

<table>
<thead>
<tr>
<th></th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Flow Pulses</strong></td>
<td>2000 cfs for 4 days 2 per season Sediment transport Lateral connectivity Fish spawning</td>
<td>4000 cfs for 4 days 2 per season Sediment transport Lateral connectivity Fish spawning</td>
<td>1800 cfs for 2 days 2 per season “Big River fish” spawning</td>
<td>1600 cfs for 4 days 2 per season Sediment transport Lateral connectivity Fish spawning</td>
</tr>
<tr>
<td><strong>Base Flows</strong></td>
<td>1900 cfs Fish habitat Water Quality</td>
<td>1500 cfs Spring spawning Water Quality</td>
<td>600 cfs Fish habitat Water Quality</td>
<td>500 cfs Fish habitat Water Quality</td>
</tr>
<tr>
<td><strong>Subsistence Flows</strong></td>
<td>250 cfs Water quality</td>
<td>300 cfs Water quality</td>
<td>200 cfs Water quality</td>
<td>250 cfs Water quality</td>
</tr>
</tbody>
</table>

JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
Environmental Flow Evaluations

- Basin by basin evaluations will require multiple years to cover all basins in Texas
- Time limited by basin (one year for BBEST studies)
- Flexibility + Complexity = Many Decisions
- Qualitative data is relatively abundant, but quantitative basin-specific data is limited
  - e.g., Instream flow assessments are uncommon
- Science v. politics
Priority order for environmental flow recommendations and adoption of standards by basin/bay area:

- **Group 1**: Trinity and San Jacinto rivers and Galveston Bay, and the Sabine and Neches rivers and Sabine Lake Bay.
- **Group 3**: Nueces River and Corpus Christi and Baffin bays; the Rio Grande, the Rio Grande estuary and the Lower Laguna Madre; and the Brazos River and its associated bay and estuary system.

Other basin/bay area schedules will be set by EFAG.
On April 20, 2011, the proposed rules for environmental flow standards were approved by TCEQ.

First basins/bays to have rules promulgated:
- Sabine River
- Neches River
- Trinity River
- San Jacinto River
- Galveston Bay

http://www.tceq.state.tx.us/rules/indexpdfhtml#298
Environmental Flows in the Permit Evaluation Process

★ A technical review of the proposed project and assessment of environmental impacts is conducted
  ✷ Existing data, literature or site-specific studies
★ Determination of the level of required protection of instream resources is made
★ Permit conditions imposed consistent with protection required
  ✷ For example, limiting diversion of water unless a certain quantity or flow passes a reference point
TCEQ’s Water Availability Model (WAM)

- A computer simulation suite of tools predicting the amount of water that would be available under specified conditions
- Incorporates prior appropriation based on priority dates for water accounting
- Based on historical period of about 50 years of monthly data
- Includes capabilities to evaluate instream flows for permit evaluations
- 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
Permitting Simulations

★ Two types of simulations are performed
  - **Full Use Authorization** - used to evaluate applications for perpetual water rights and amendments
  - **Current Conditions (Historical Max Use)** - used to evaluate applications for term water rights and amendments

★ Hybrid simulations can be performed for special conditions
★ Incorporates environmental flow criteria for the basin
Water Availability Model 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
For more information...

- Ron Ellis: ron.ellis@tceq.texas.gov
- Kathy Alexander: kathy.alexander@tceq.texas.gov
- TCEQ Rules
  - [http://www.tceq.texas.gov/rules/adopt.html#07049](http://www.tceq.texas.gov/rules/adopt.html#07049)
- Environmental Flows Process
- Texas Instream Flow Program
  - [http://www.twdb.texas.gov/instreamflows](http://www.twdb.texas.gov/instreamflows)