Environmental Flows Process in Texas

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Association of Western States Engineers
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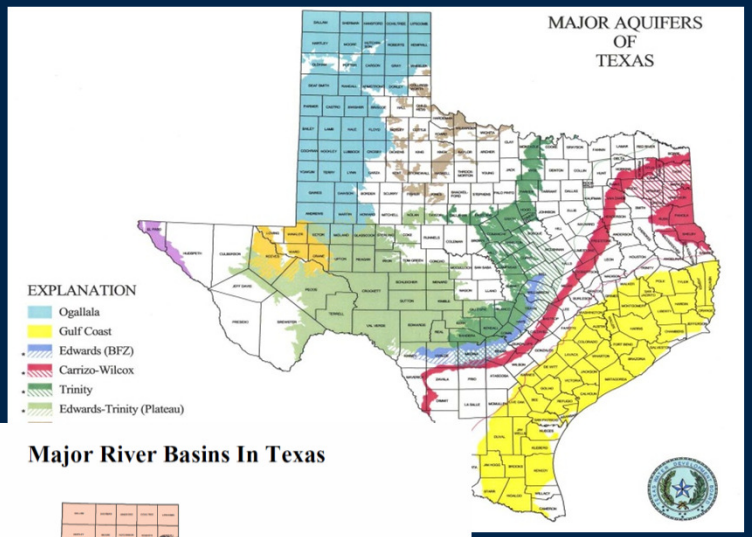
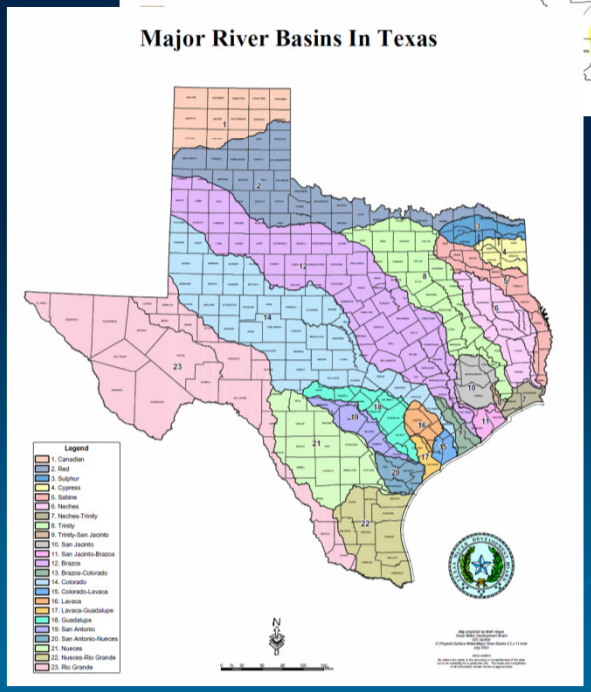
Texas Water Rights

- 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/tceqhistory.html

A Look Back at Key Milestones…

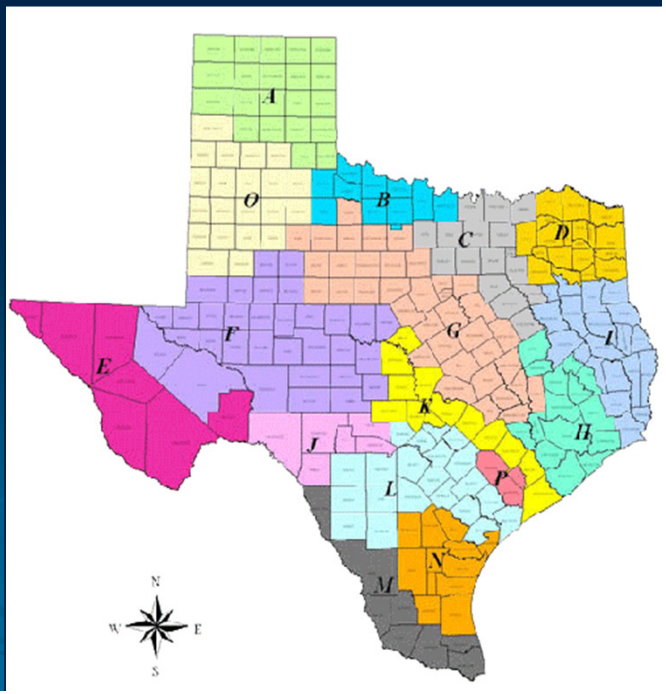
- Originally, no statutory requirements for environmental flows included
- In 1975, impacts to bays and estuaries were required to be considered
- In 1985, legal requirements were added to the permitting process:
  - To maintain beneficial inflows to the bays and estuaries
  - Applications to be evaluated 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

Water Rights Permitting

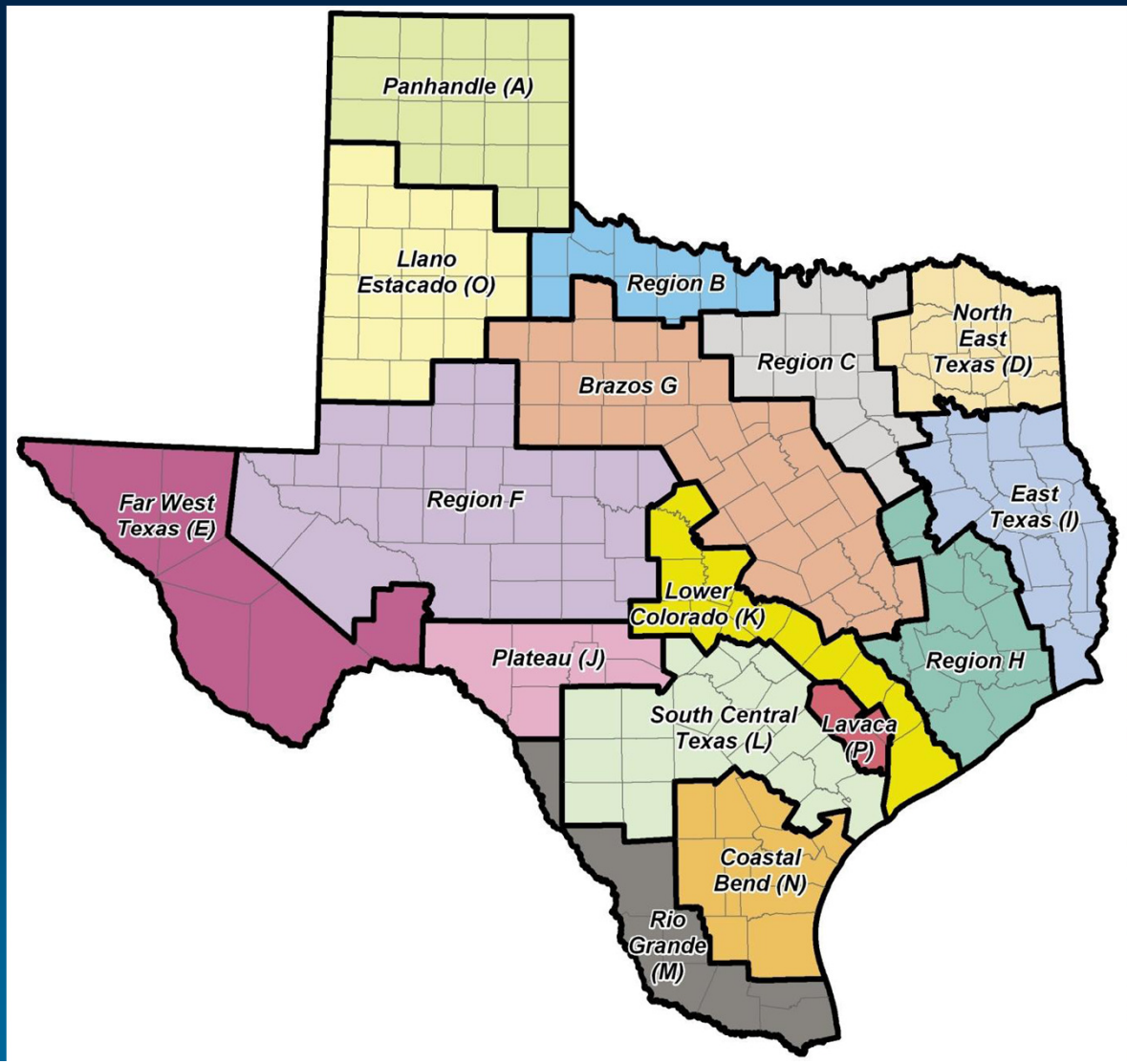
- Most rights were issued prior to 1985 and have no environmental protection
- Over 200 major reservoirs in Texas; only a handful have releases for environmental flows
- Prior Appropriation; perpetual permits; only one chance to address environmental impacts
- Burden falls to post 1985 rights to protect environmental flows; piecemeal basis

Senate Bill 1 – A Regional Water Planning Approach

- 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.



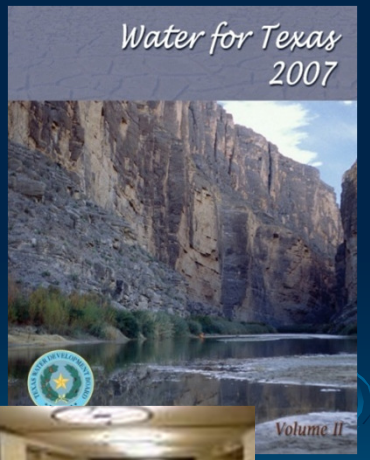
Regional Planning Groups



(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

Incorporating Instream Flows

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."

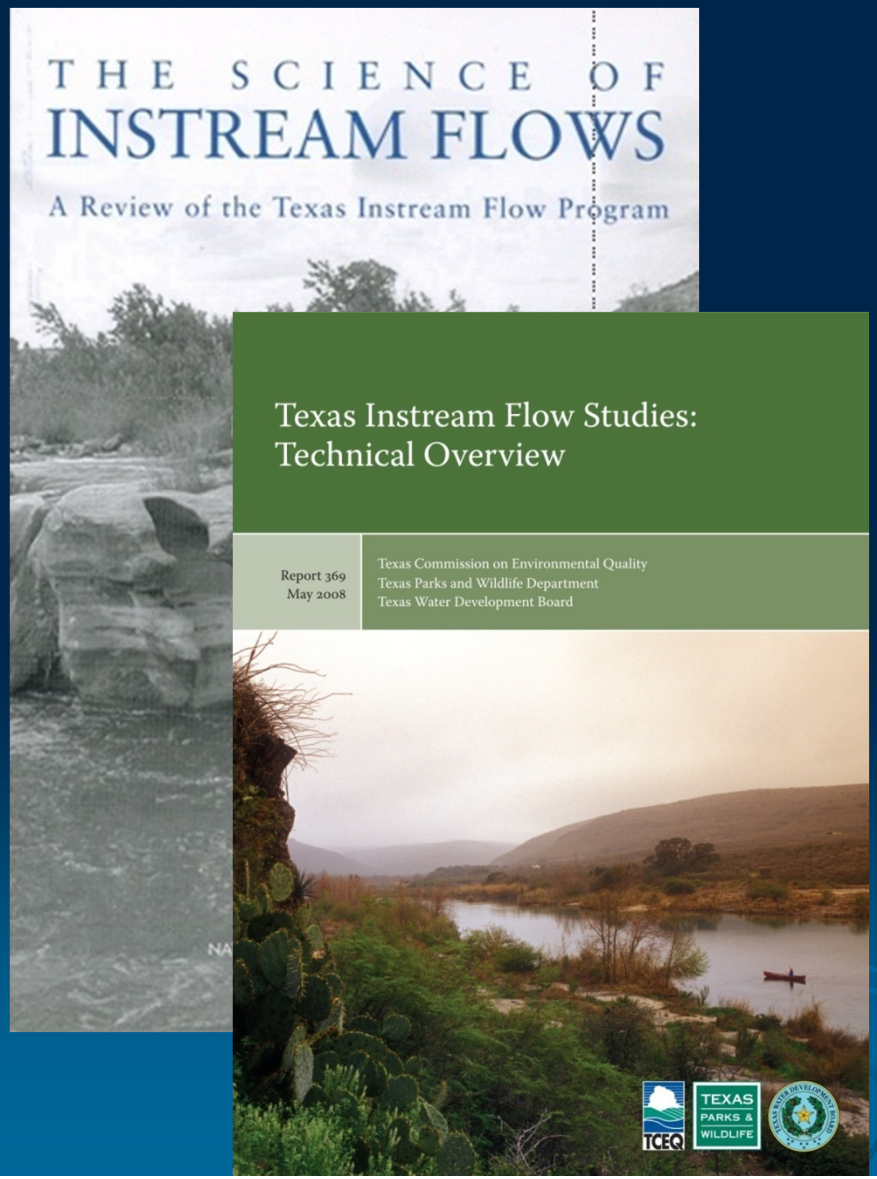
Conserve Biodiversity

- fish, invertebrates,
- mussels, plants …
- riparian diversity

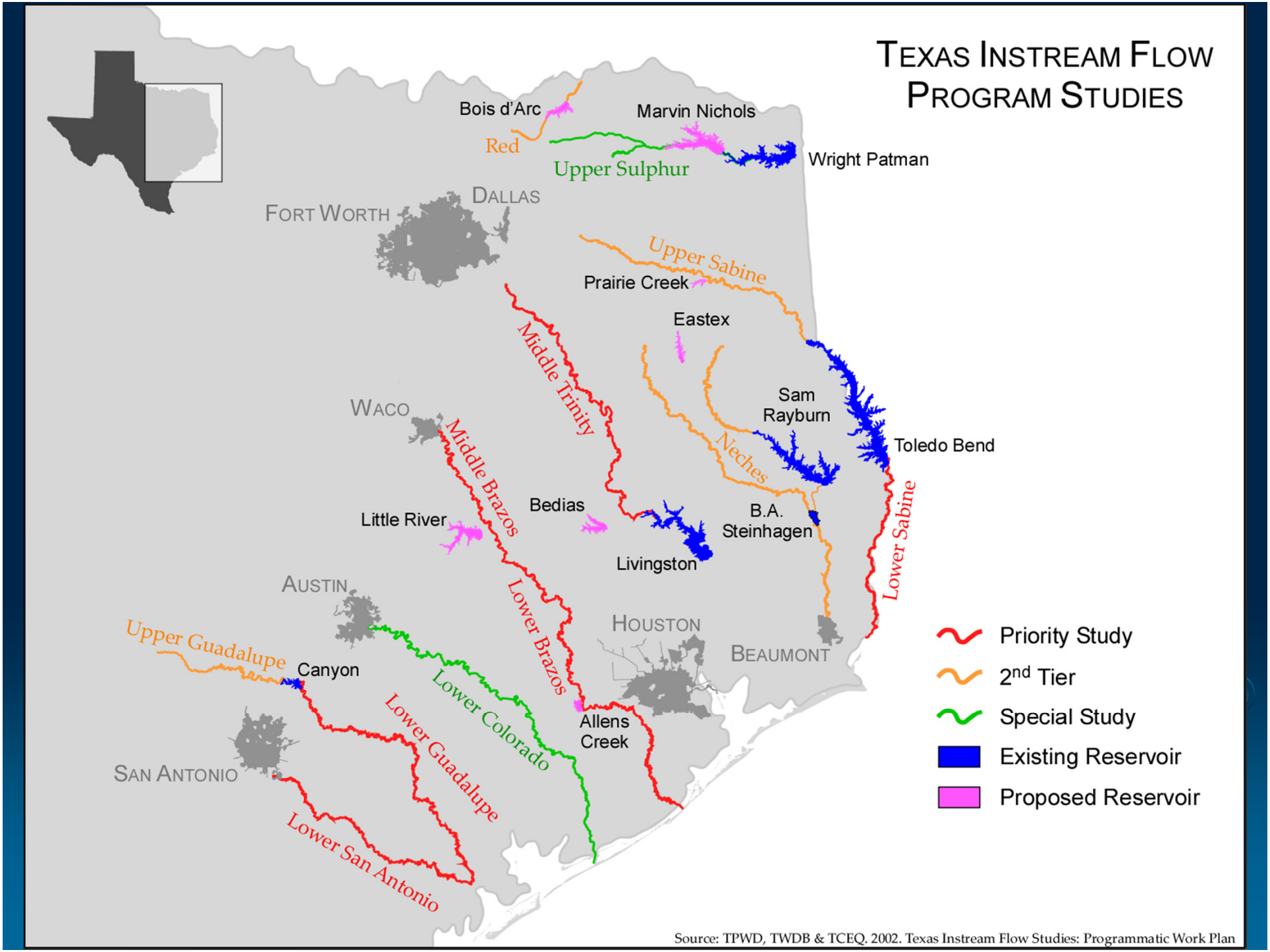
Maintain Ecological Integrity

- 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
- Technical Overview Report published in 2008

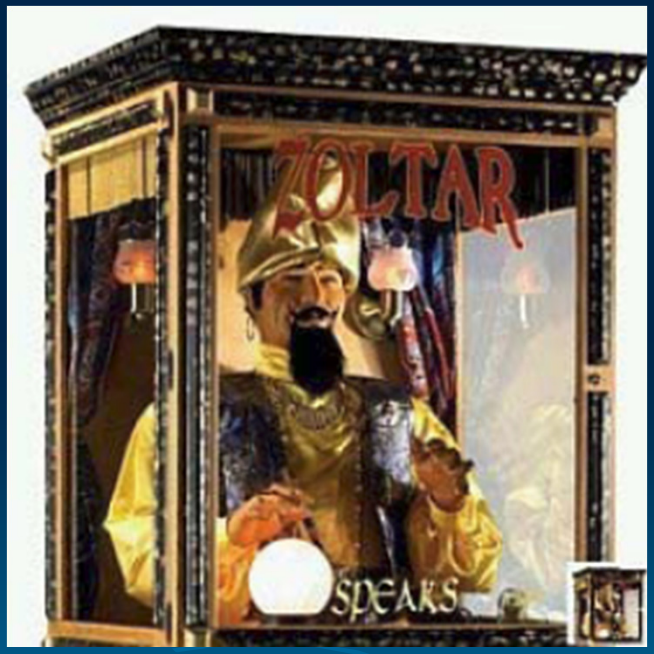

TEXAS INSTREAM FLOW PROGRAM STUDIES
Bois d'Arc
Red
Marvin Nichols
Upper Sulphur
Wright Patman
DALLAS
FORT WORTH
Upper Sabine
Prairie Creek
Eastex
Middle Trinity
Sam Rayburn
Toledo Bend
WACO
Middle Brazos
Neches
Bedias
Little River
B.A. Steinhagen
Livingston
Lower Sabine
AUSTIN
Lower Brazos
HOUSTON
BEAUMONT
Upper Guadalupe
Canyon
Lower Colorado
Lower Guadalupe
Allens Creek
SAN ANTONIO
Lower San Antonio
Priority Study
2nd Tier
Special Study
Existing Reservoir
Proposed Reservoir
Source: TPWD, TWDB & TCEQ. 2002. Texas Instream Flow Studies: Programmatic Work Plan

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

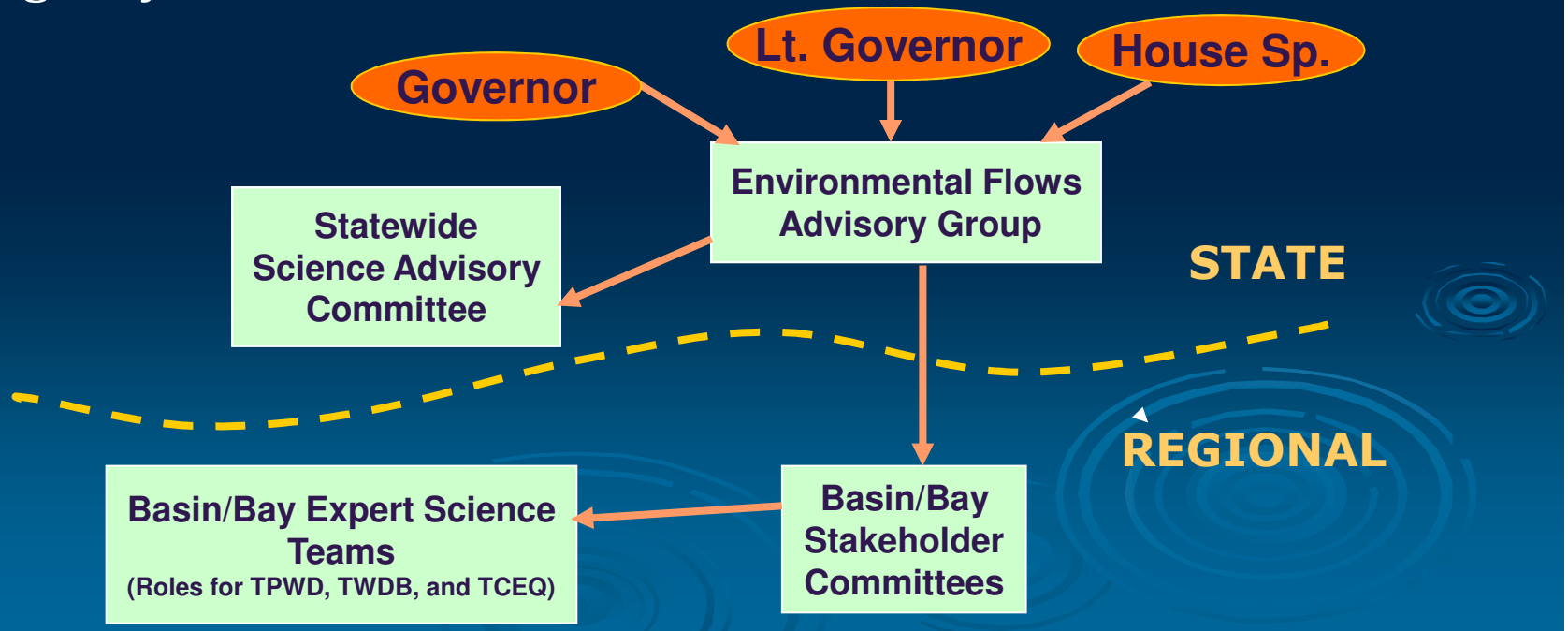
- Instream Flow Study: boots in the water study linking hydrology, biology, water quality, geomorphology, physical processes

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



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

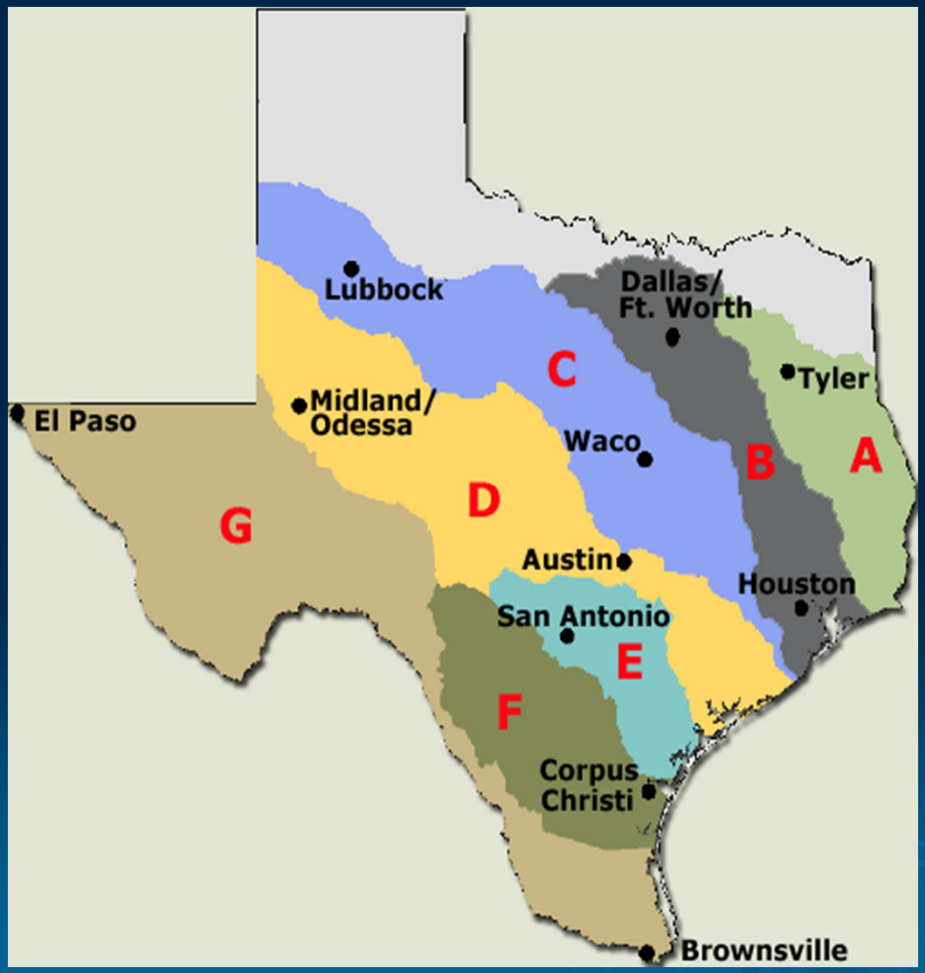
Science Advisory Committee

- 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).
- http://www.tceq.state.tx.us/permitting/water_supply/water_rights/eflows/txenvironmentalflowssac.html

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

E. Guadalupe, San Antonio, Mission, & Aransas Rivers/Mission, Copano, Aransas & San Antonio 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

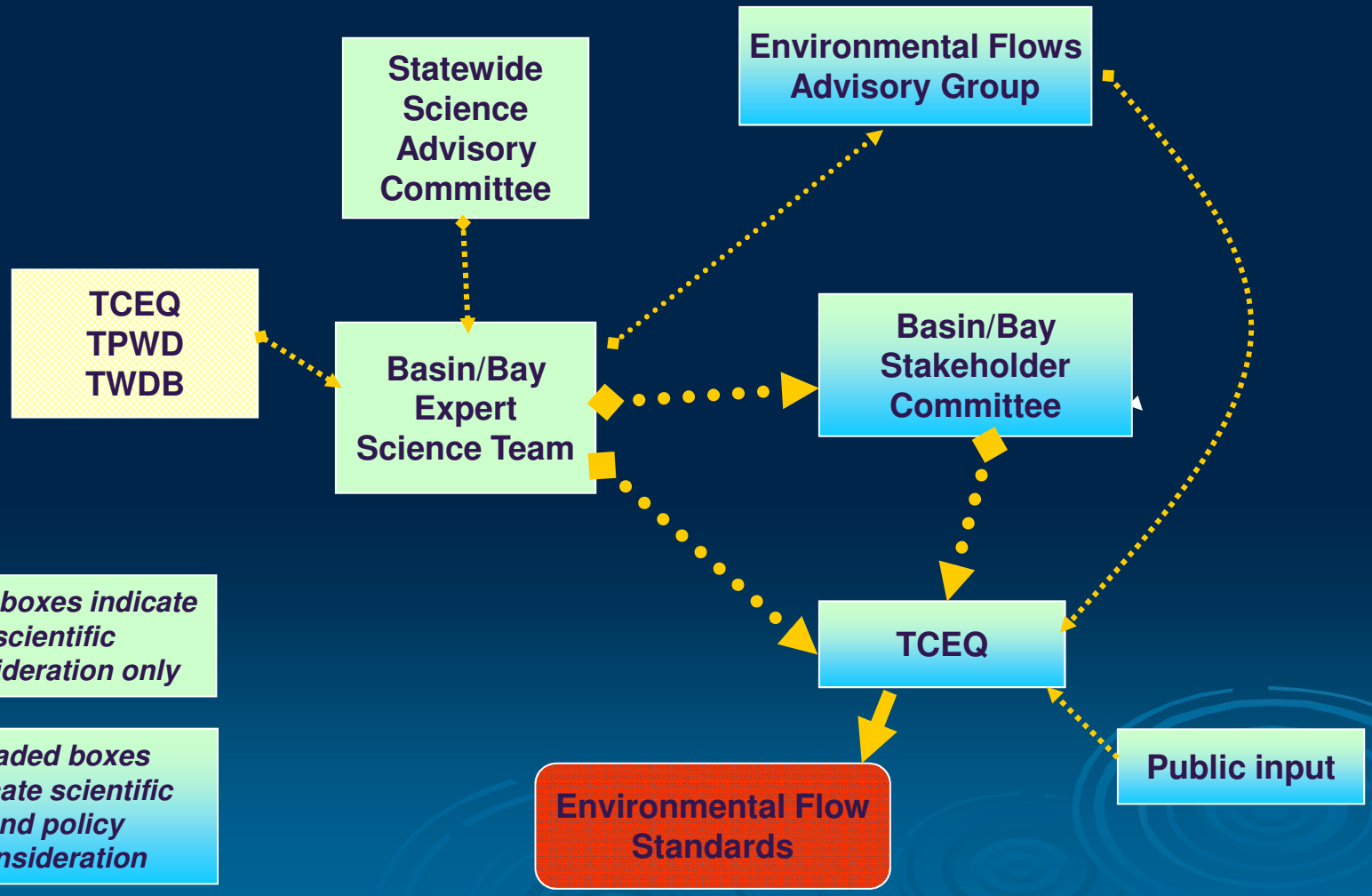
Basin/Bay Area Stakeholder Committees – Diverse Members

- 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

SB 3 Process for Environmental Flow Regime Development



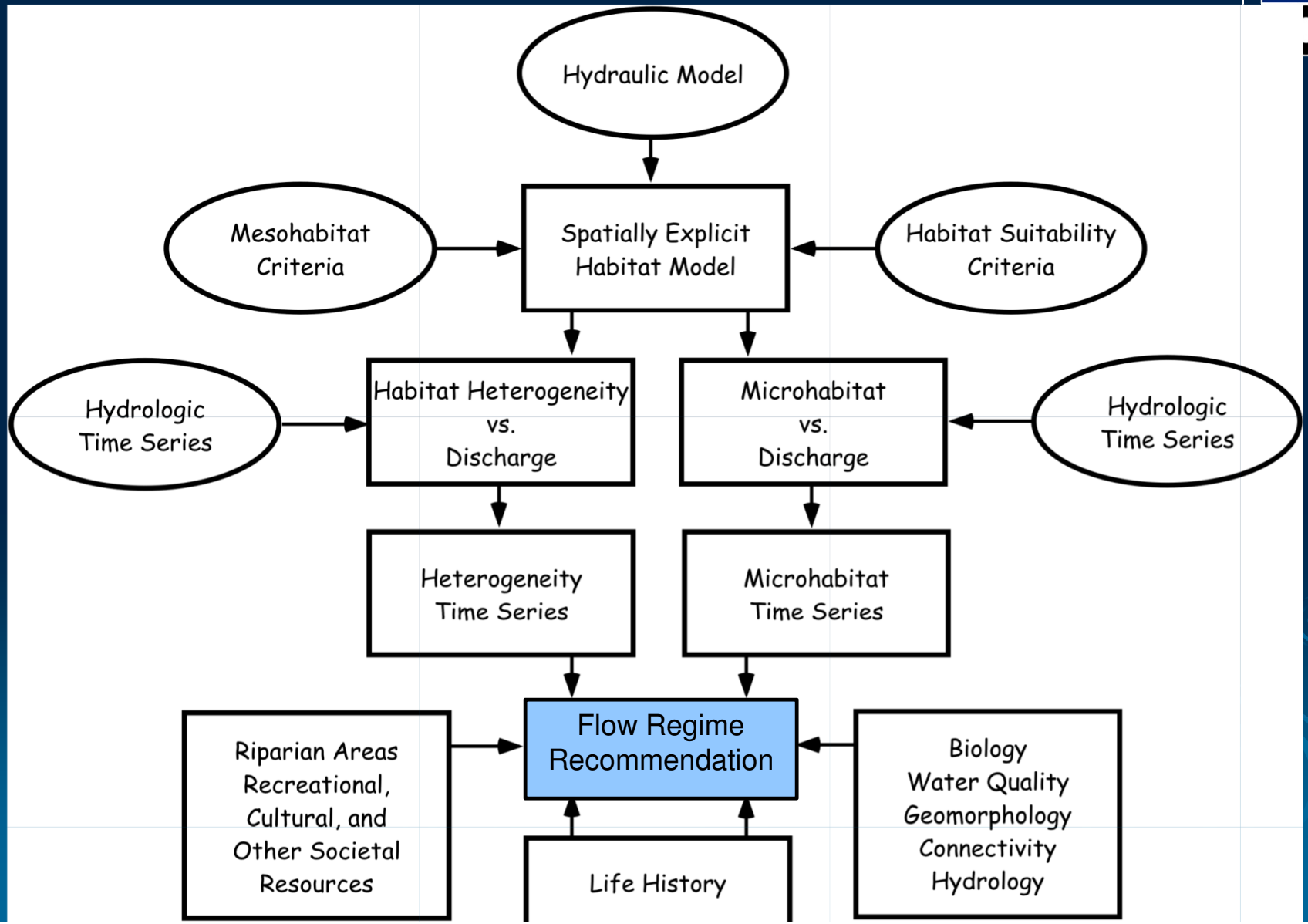
TCEQ Environmental Flow Standards

- 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

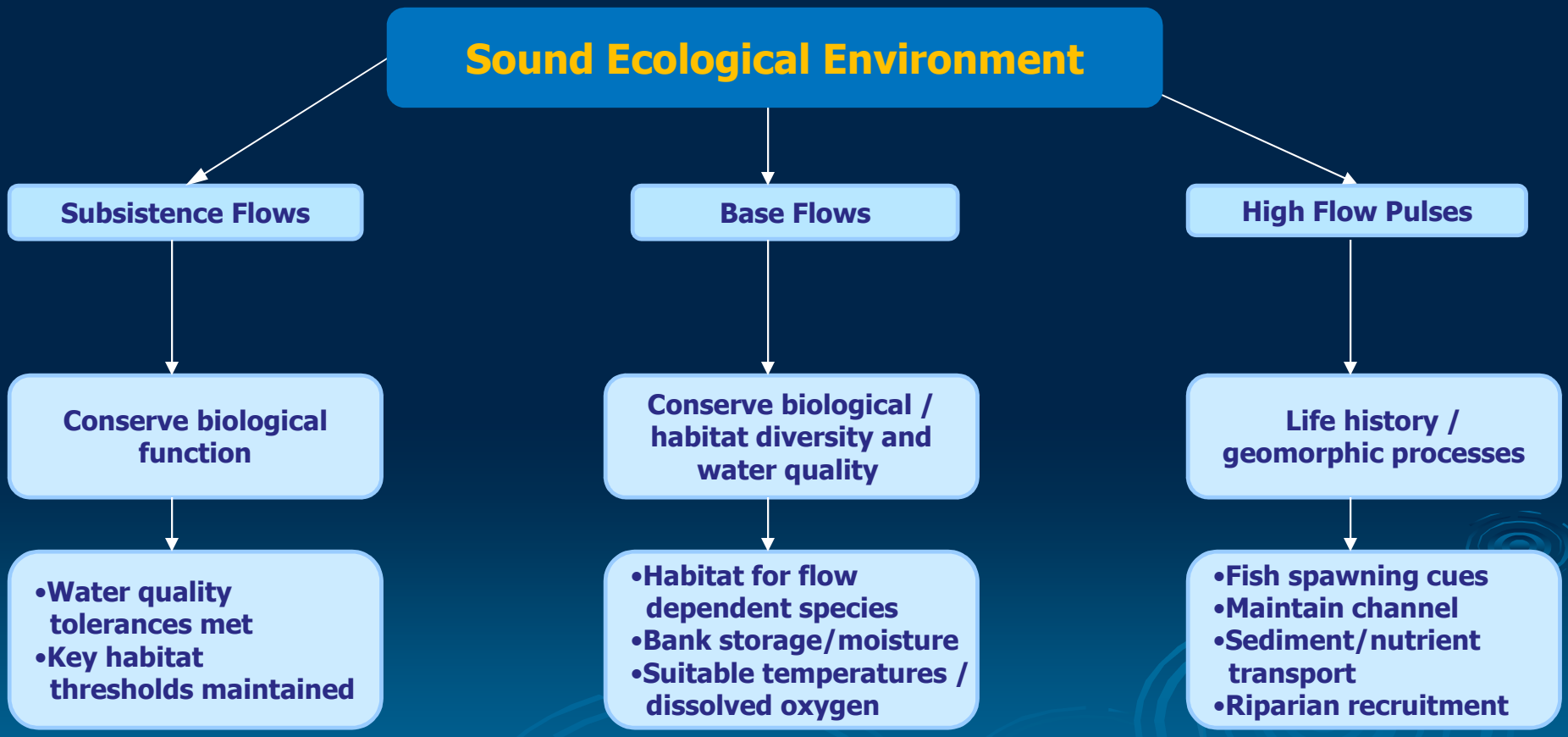
TCEQ Environmental Flow Regimes

- 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

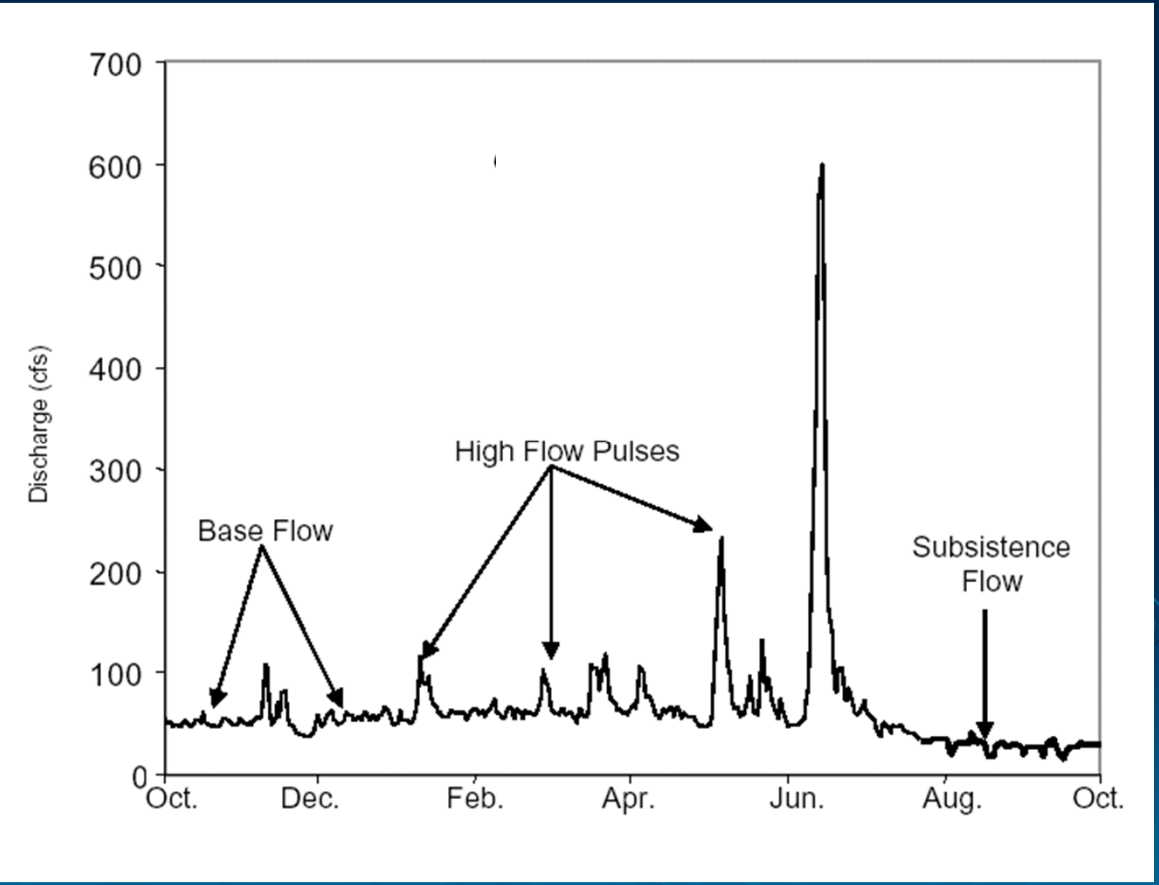


Ecosystem Focus of a Sound Ecological Environment



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

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

Integration of Flow Components

A sample environmental flow matrix

	Winter	Spring	Summer	Fall
High Flow Pulses	**2000 cfs** for 4 days 2 per season Sediment transport Lateral connectivity Fish spawning	**4000 cfs** for 4 days 2 per season Sediment transport Lateral connectivity Fish spawning	**1800 cfs** for 2 days 2 per season "Big River fish" spawning	**1600 cfs** for 4 days 2 per season Sediment transport Lateral connectivity Fish spawning
Base Flows	**1900 cfs** Fish habitat Water Quality	**1500 cfs** Spring spawning Water Quality	**600 cfs** Fish habitat Water Quality	**500 cfs** Fish habitat Water Quality
Subsistence Flows	**250 cfs** Water quality	**300 cfs** Water quality	**200 cfs** Water quality	**250 cfs** Water quality

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

Environmental Flows Time Line

- 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 2**: Colorado and Lavaca rivers and Matagorda and Lavaca Bays, and the Guadalupe, San Antonio, Mission, and Aransas rivers and Mission, Copano, Aransas, and San Antonio bays.
  - **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

TCEQ Environmental Flow Standards

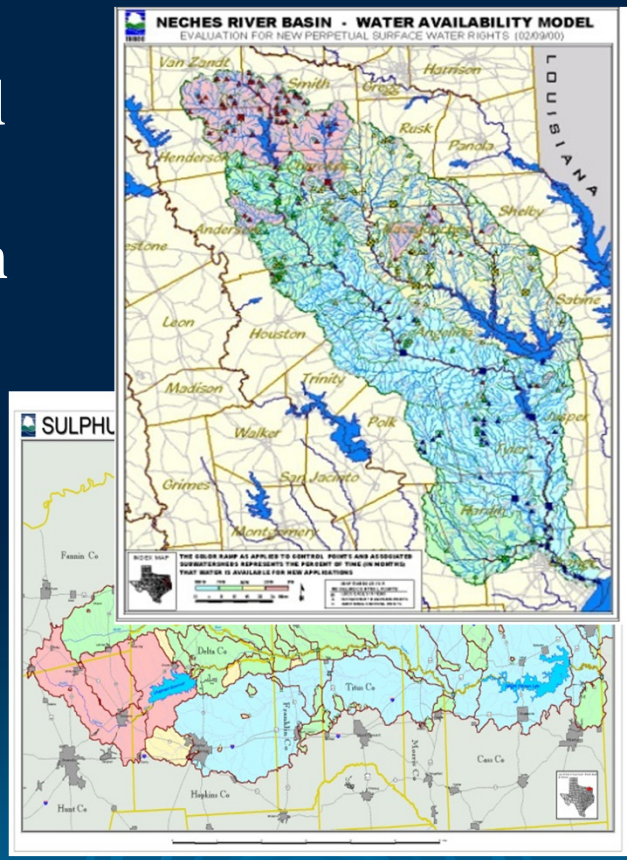
- On April 20, 2011, the proposed rules for environmental flow standards were approved by TCEQ
- First basins/bays to have rules promulgated:
  - Sabine River
  - Neches River
  - Trinity River
  - San Jacinto River
  - Galveston Bay
- http://www.tceq.state.tx.us/rules/indxpdfhtml#298

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)

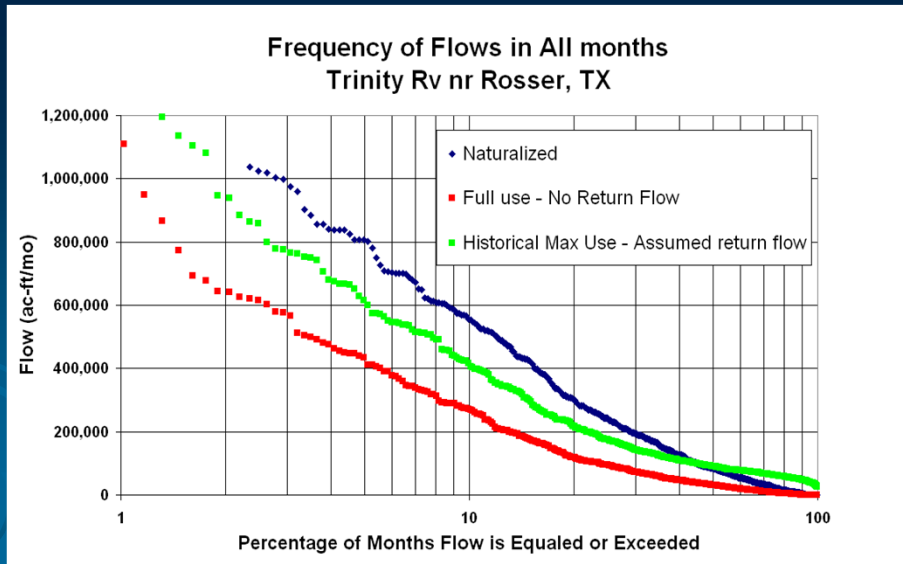
- A computer simulation suite of tools predicting the amount of water that would be available under specified conditions
- Incorporates prior appropriation based on priority dates for water accounting
- Based on historical period of about 50 years of monthly data
- Includes capabilities to evaluate instream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

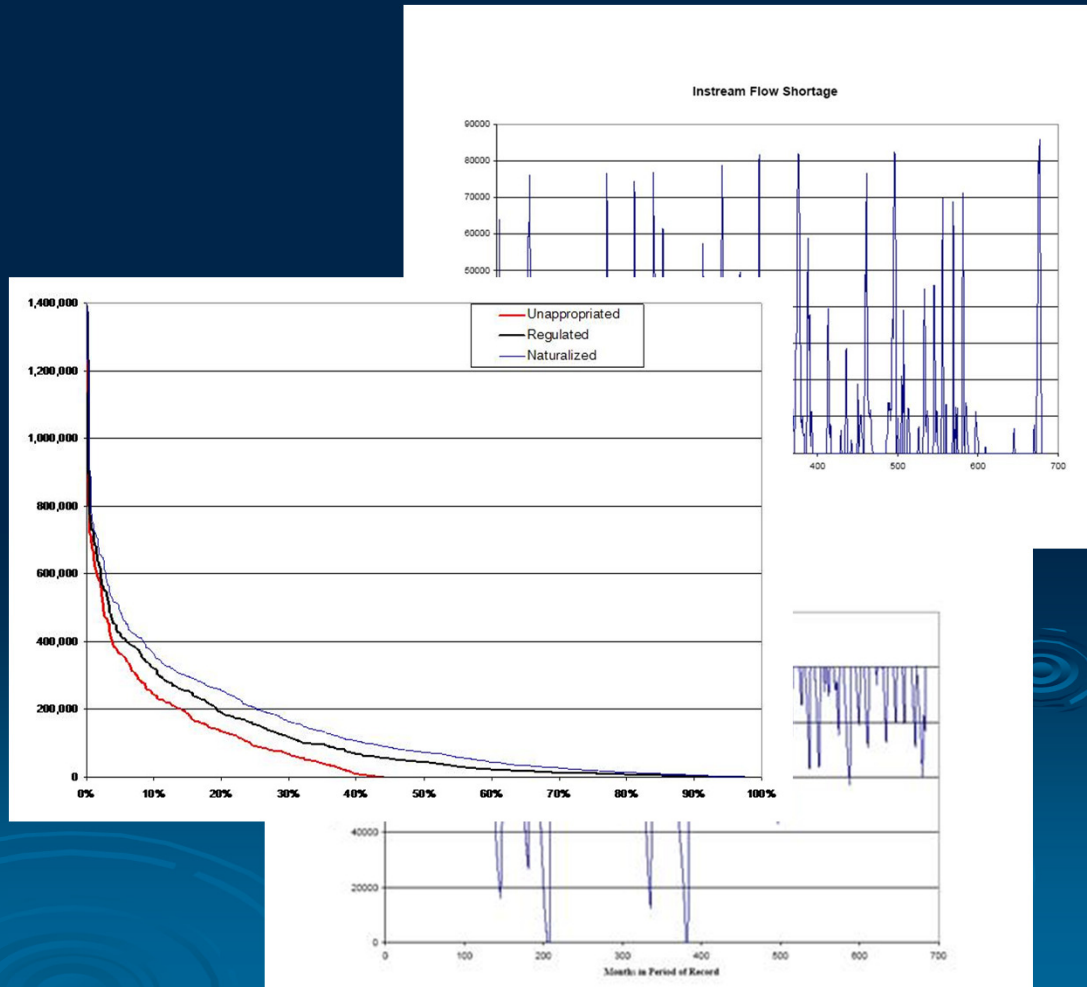
Permitting Simulations

- 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/permitting/water_rights/eflows/rulemaking
  - http://www.tceq.texas.gov/rules/adopt.html#07049
  - http://www.tceq.texas.gov/publications/gi/gi-228.html
- Environmental Flows Process
  - http://www.tceq.texas.gov/permitting/water_righ
- Texas Instream Flow Program
  - http://www.twdb.texas.gov/instreamflows