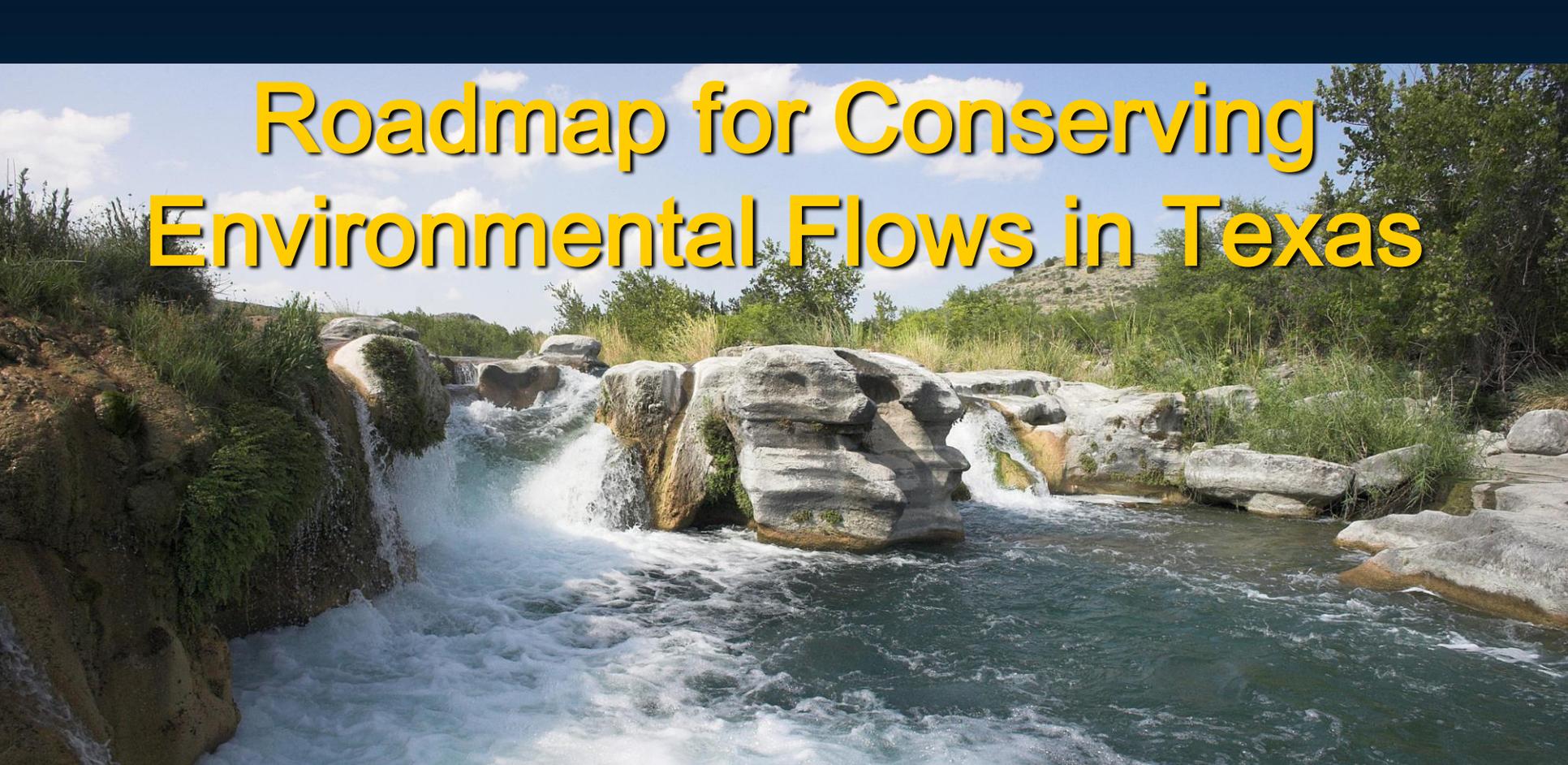


# Roadmap for Conserving Environmental Flows in Texas

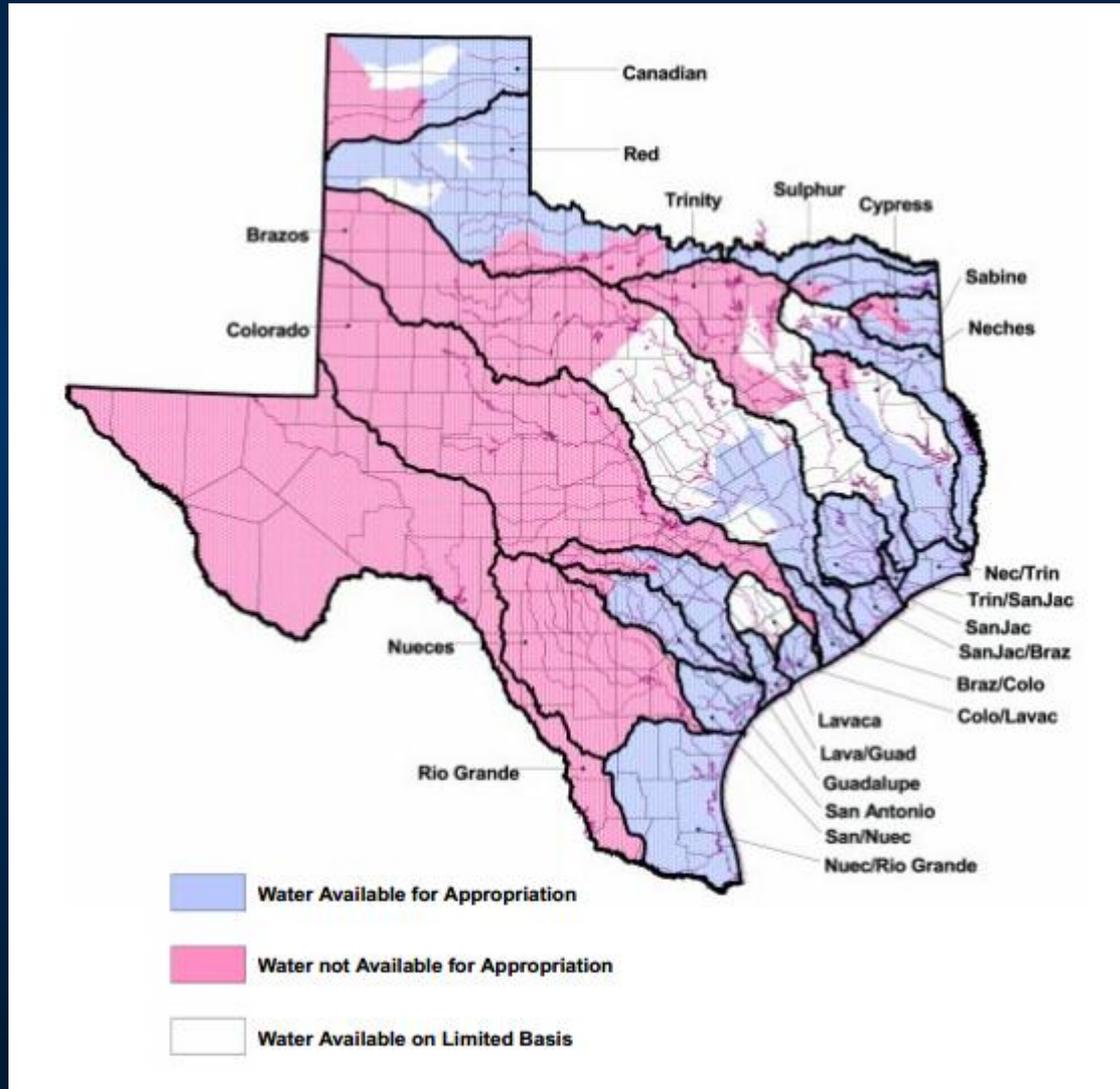


Kevin Mayes  
Texas Parks and Wildlife Department  
April 29, 2015

# Texas Water Rights Primer

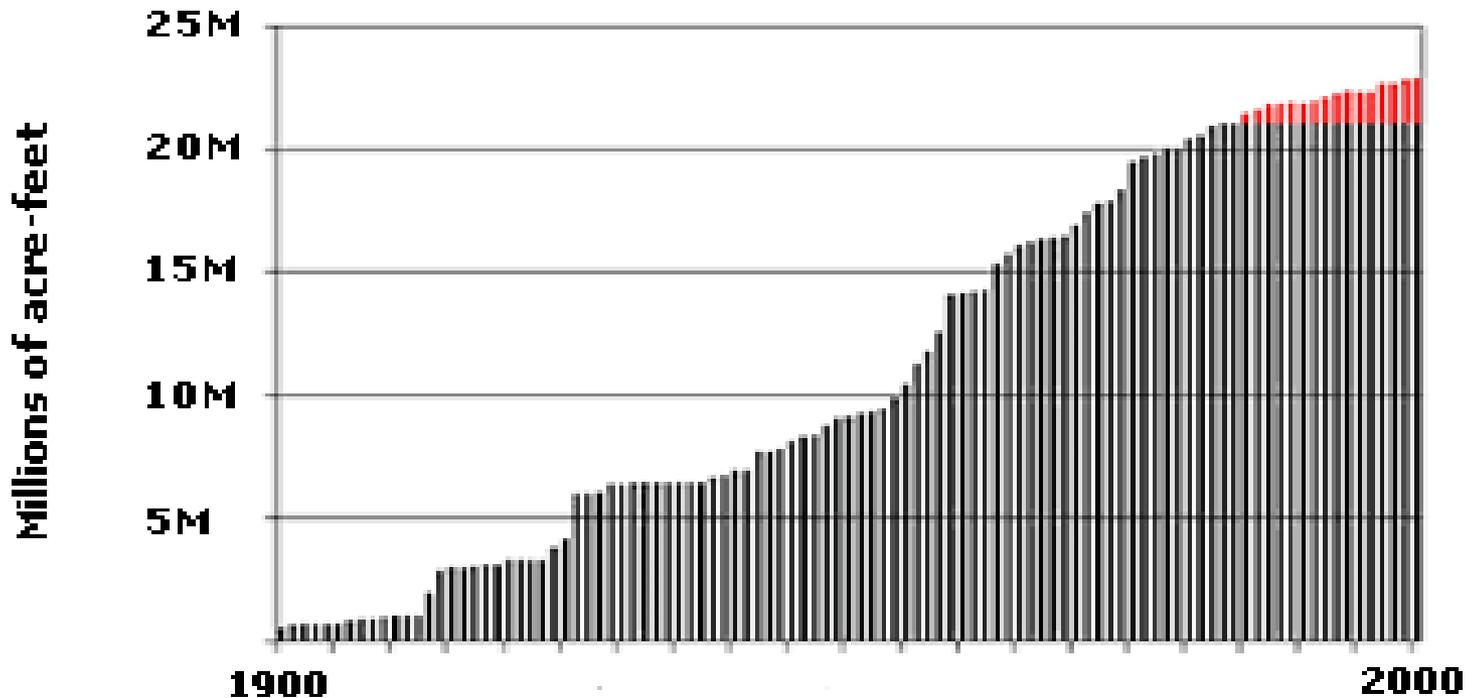
- Surface water rights issued in perpetuity
- Prior appropriation and riparian doctrine
- Since 1985, special conditions added for environmental flow protection
- No new permits can be granted for environmental flows
- Several basins over-appropriated

# Water Availability Map (2000)



# Appropriated Surface Water Volumes

## Texas Water Rights Timeline

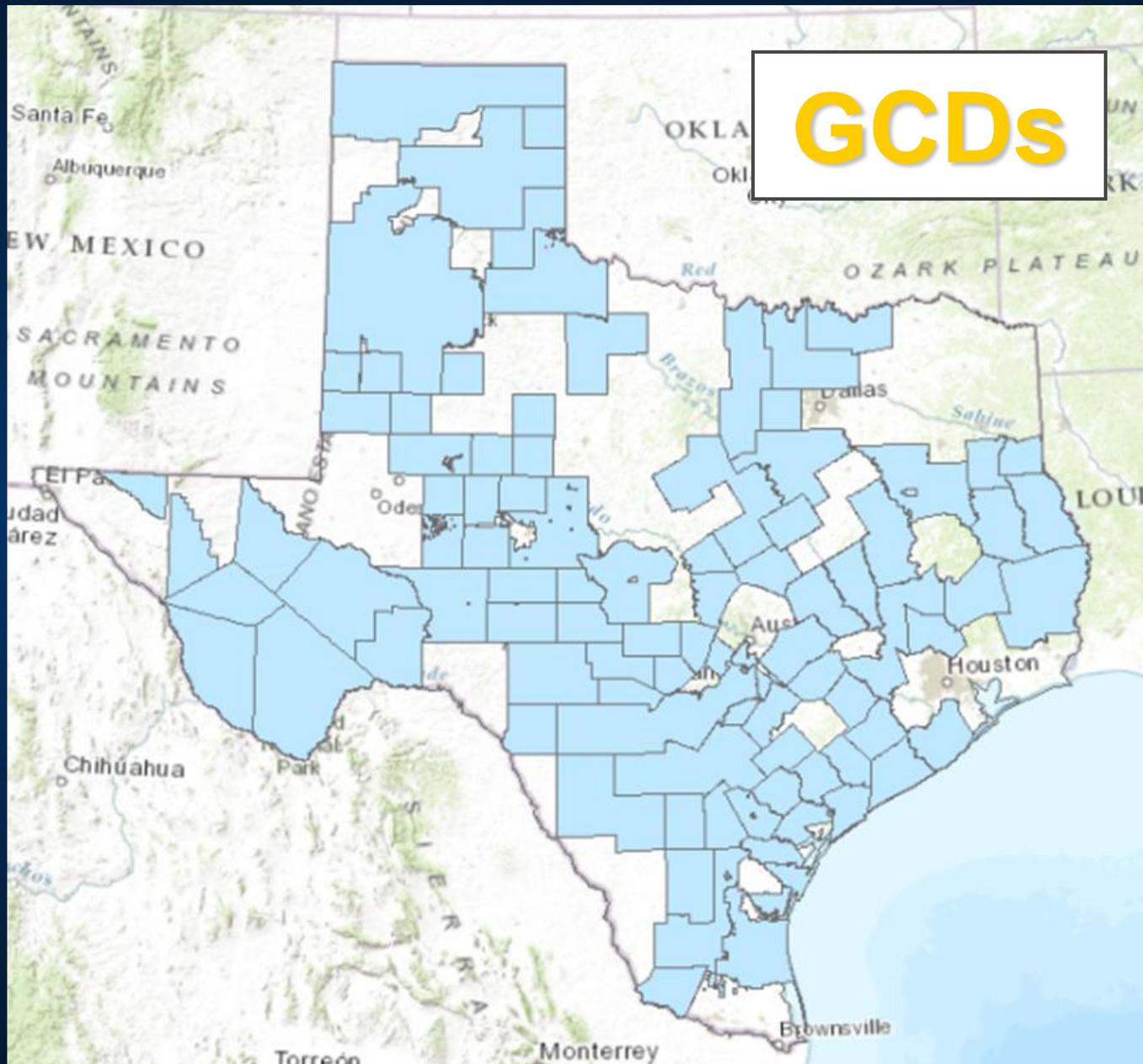


**Black: water rights with no environmental conditions**  
**Red: water rights with environmental conditions**

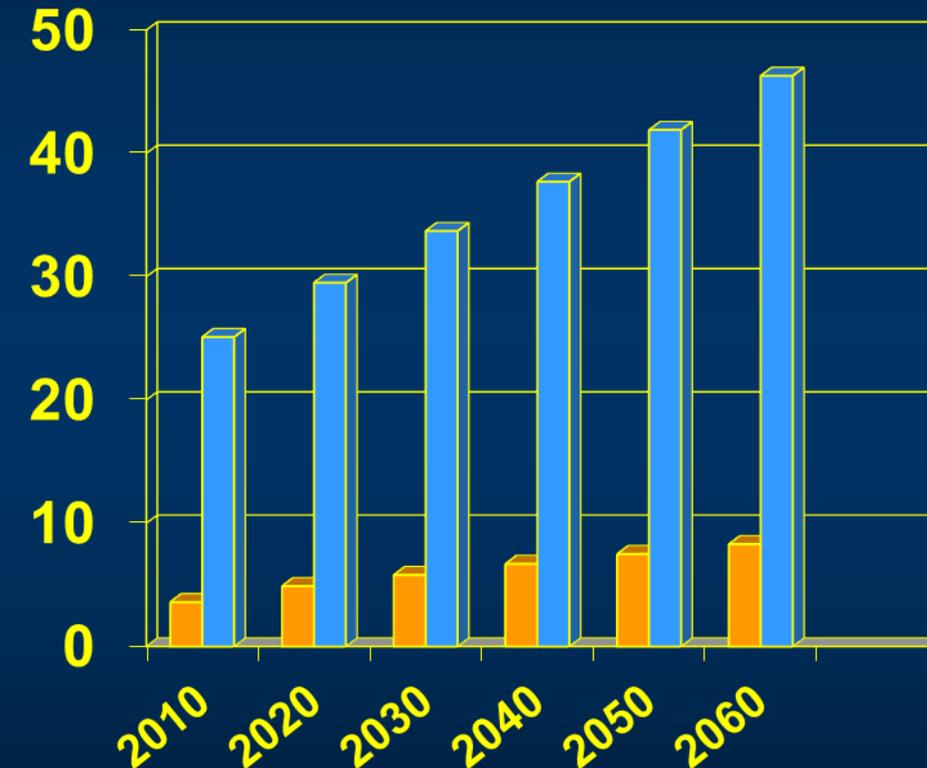
# Texas Water Rights Primer

- Groundwater pumped under “rule of capture”  
– no connection to surface water rights permitting
- Groundwater Conservation Districts set up by legislature in some areas of the state – not all parts of all aquifers
- Some aquifers over-drafted severely (e.g. Ogallala)

# GCDs



# Texas Population Growth and Water Demands



■ water needs (millions of acre-ft/year)

■ population (millions of people)

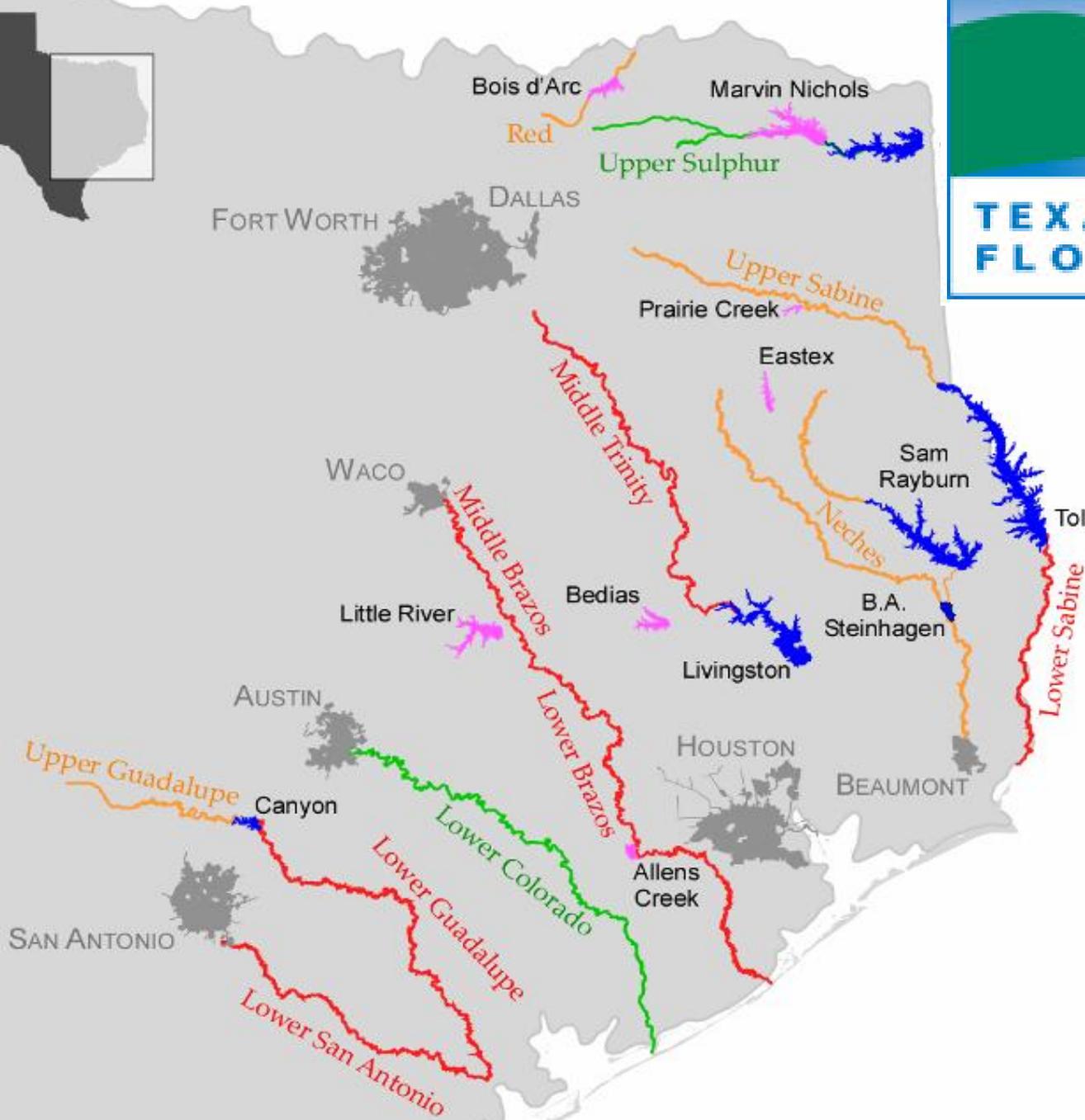
- The population of Texas is expected to nearly double in 50 years
- Urban areas will continue to grow most rapidly
- Human water needs will also increase

# Texas Instream Flow Program

In 2001, Senate Bill 2 directed (but did not fund) TCEQ, TPWD & TWDB to:

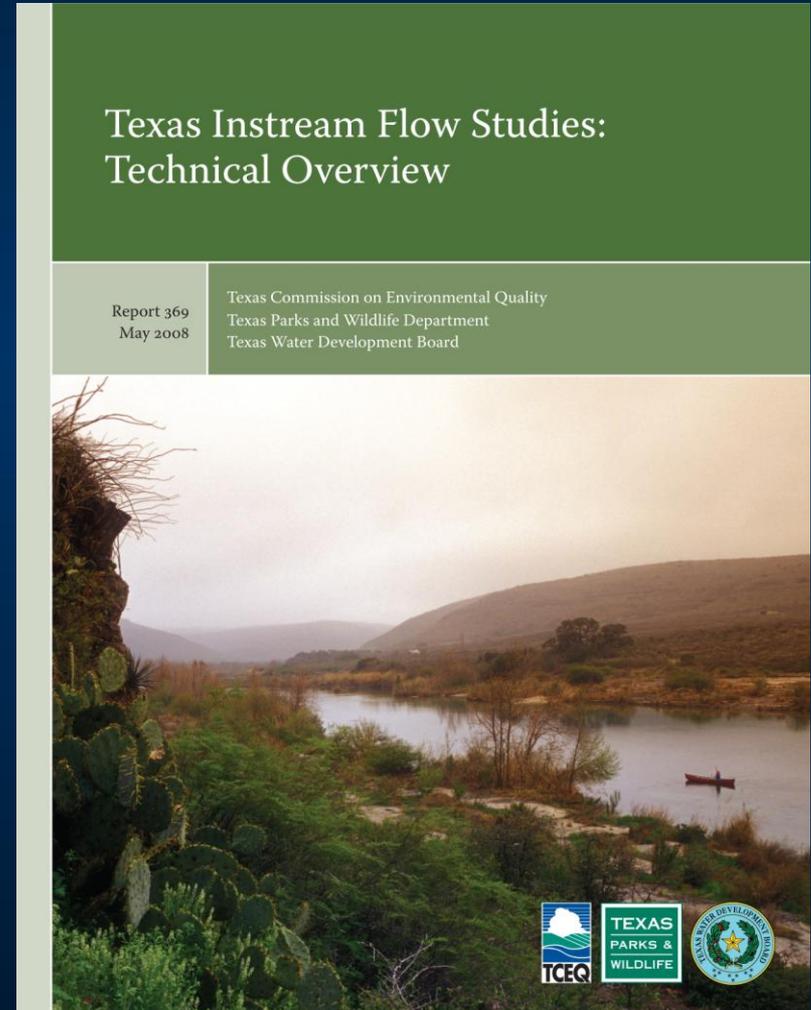
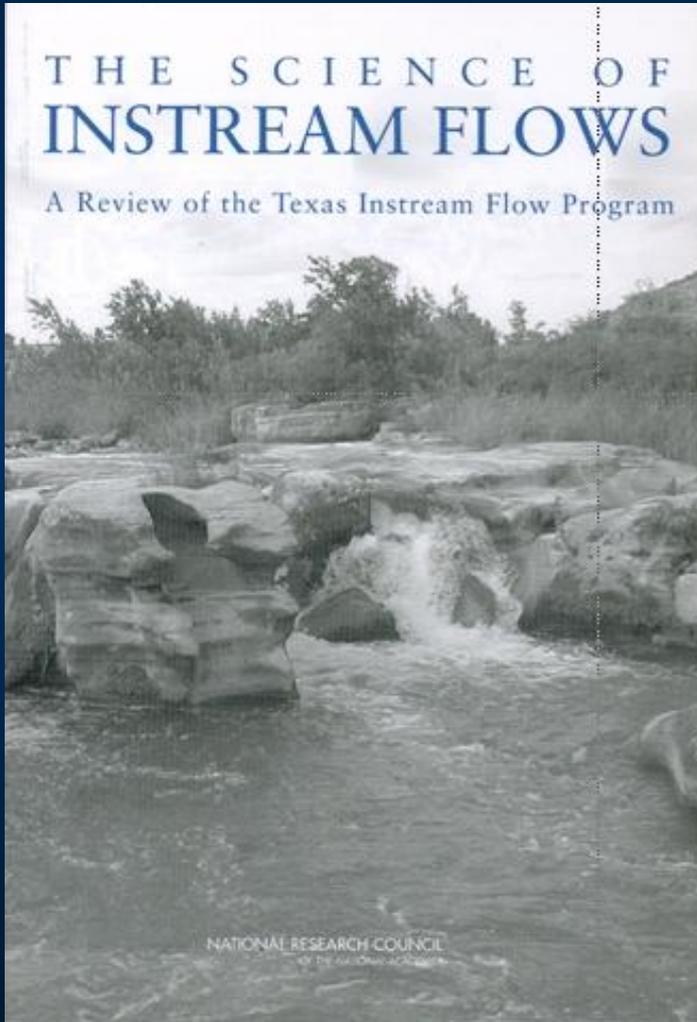
- Establish data collection & evaluation program
- Determine “appropriate methodologies” to identify flow conditions necessary to support a sound ecological environment

<http://www.twdb.texas.gov/surfacewater/flows/instream/index.asp>

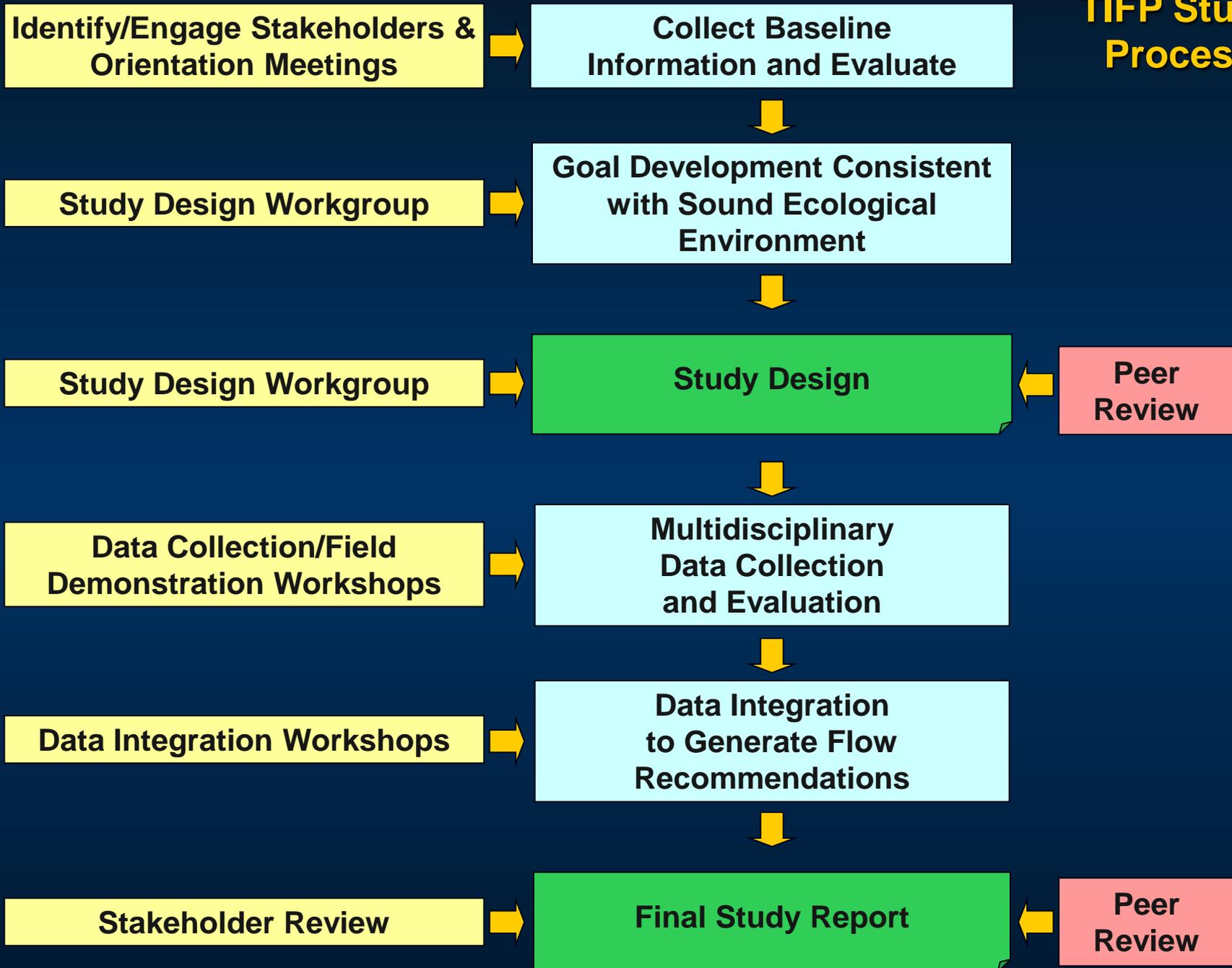


-  Priority Study
-  2<sup>nd</sup> Tier
-  Special Study
-  Existing Reservoir
-  Proposed Reservoir

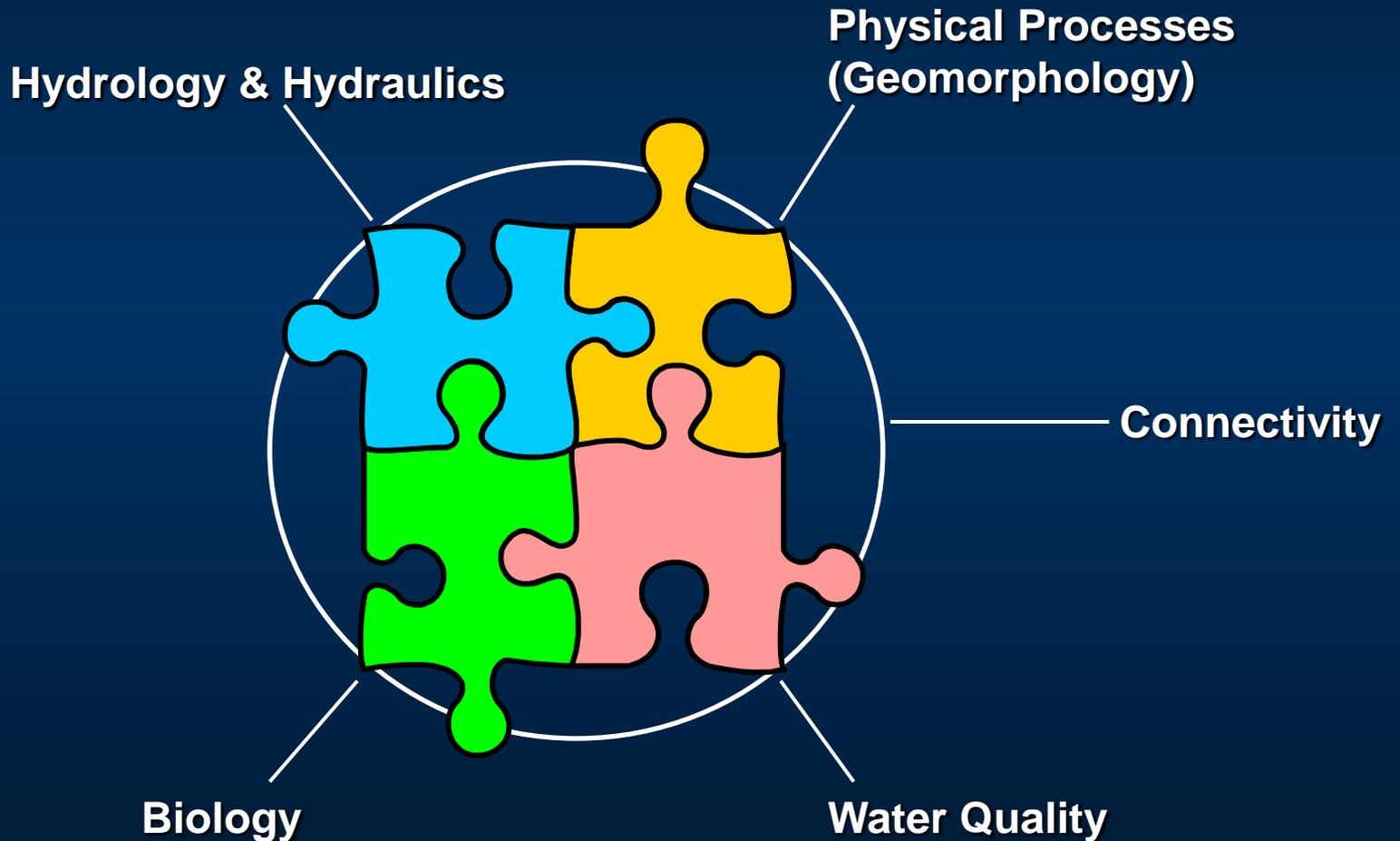
# Peer Review



# TIFP Study Process

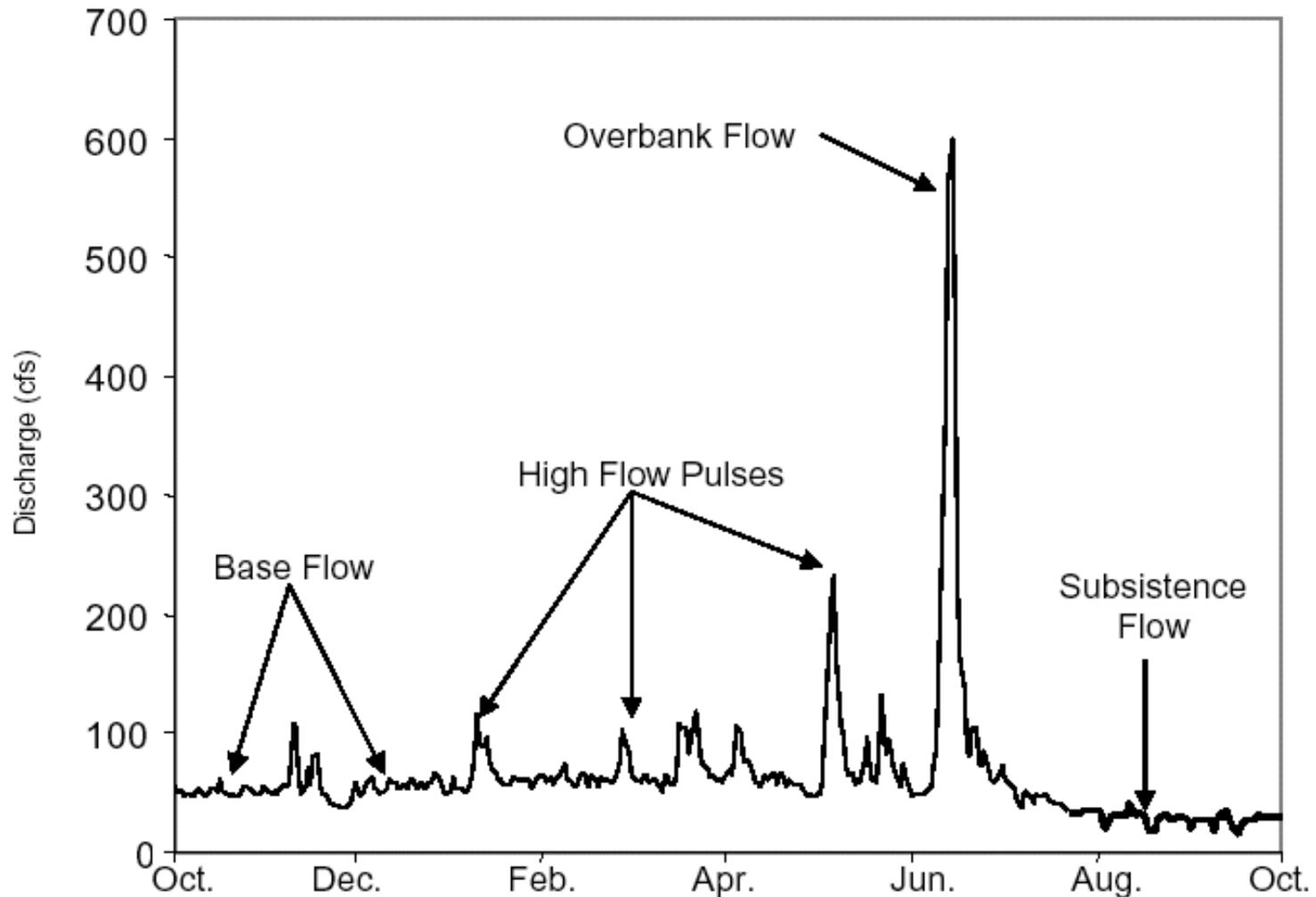


# Primary Disciplines

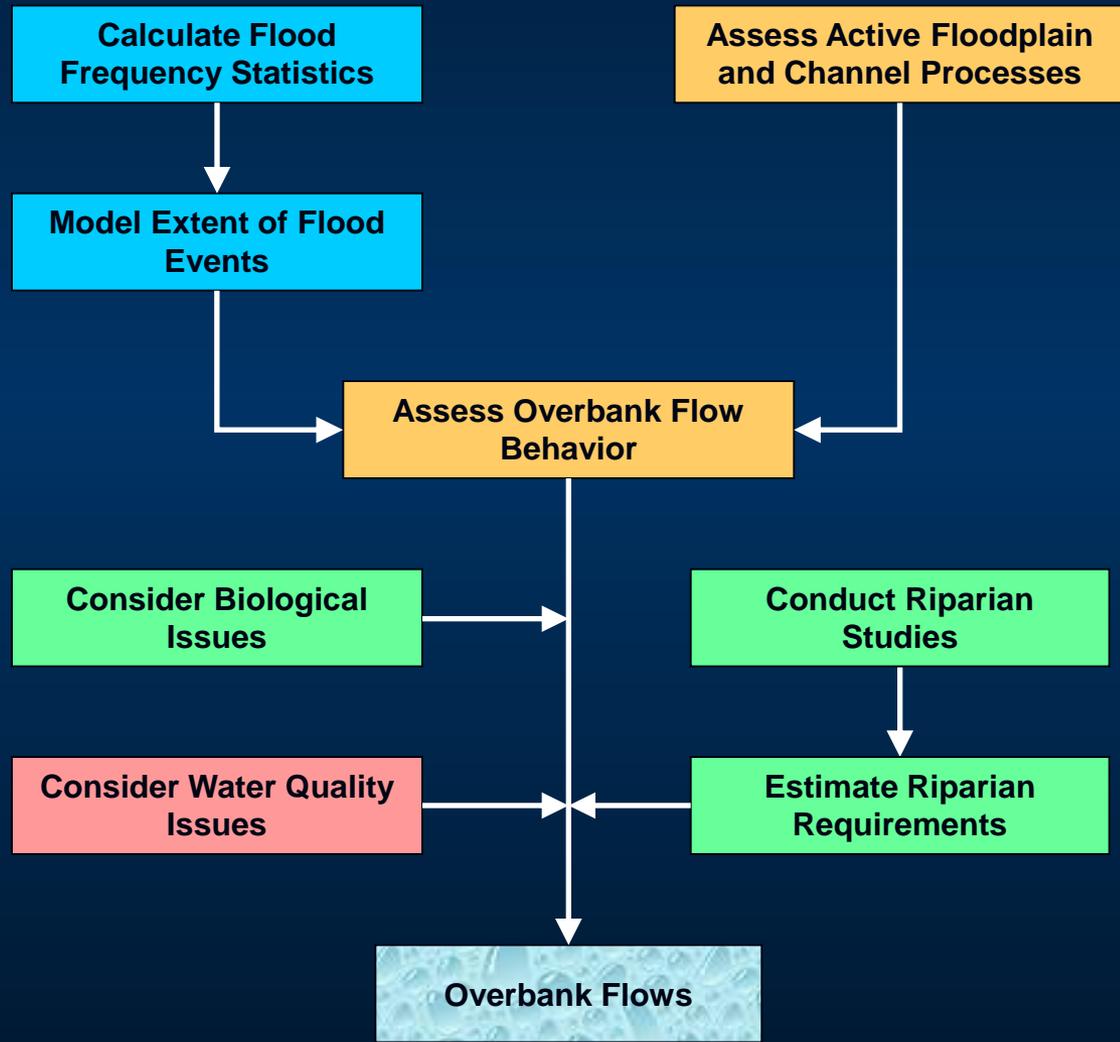
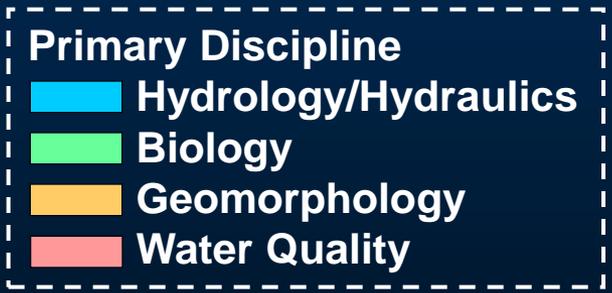
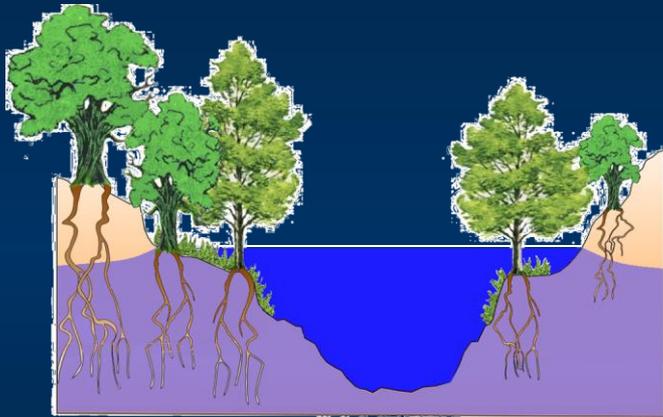


# Instream Flow Components

(as recommended by National Research Council 2005)



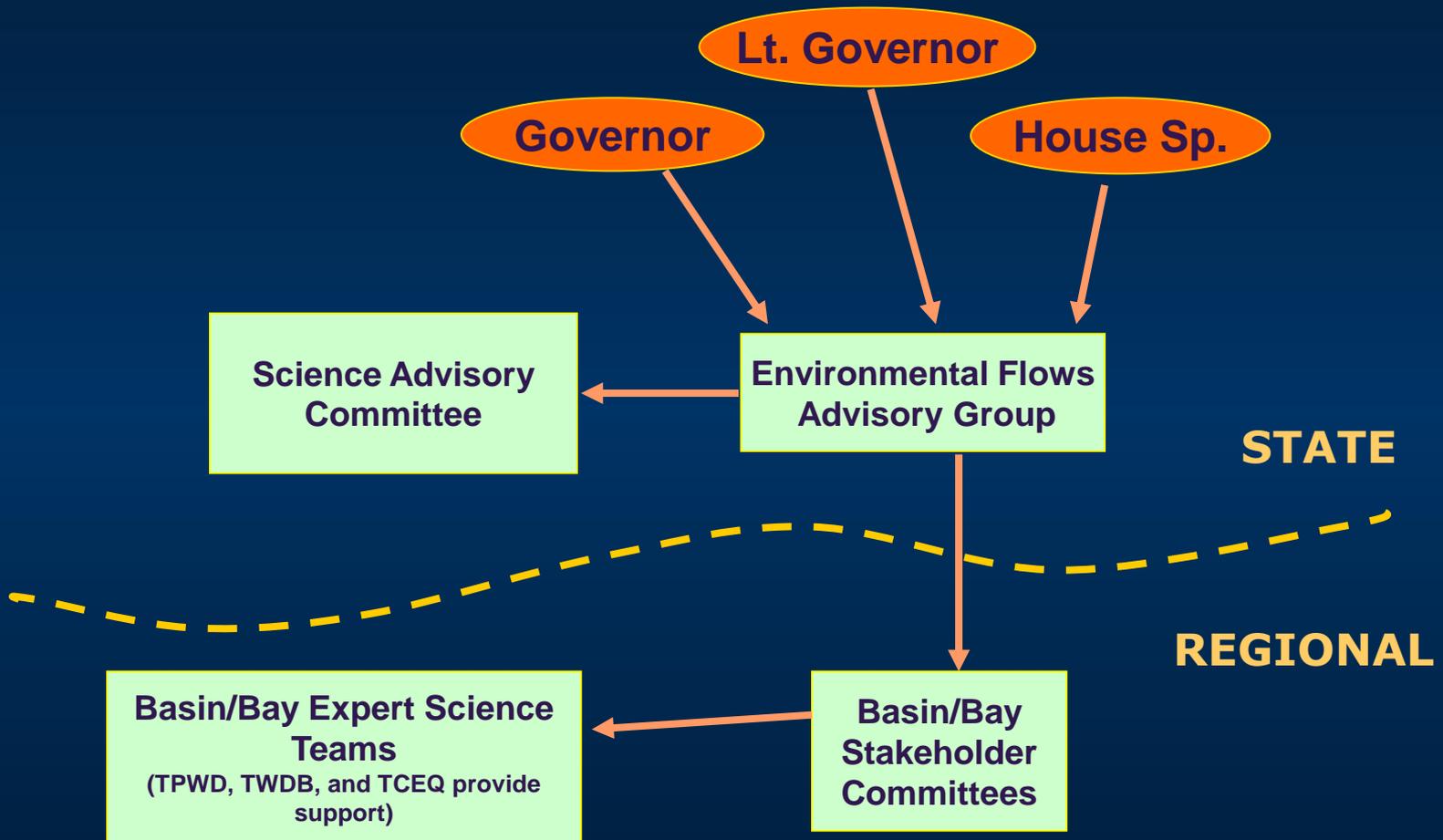
# Overbank Flows



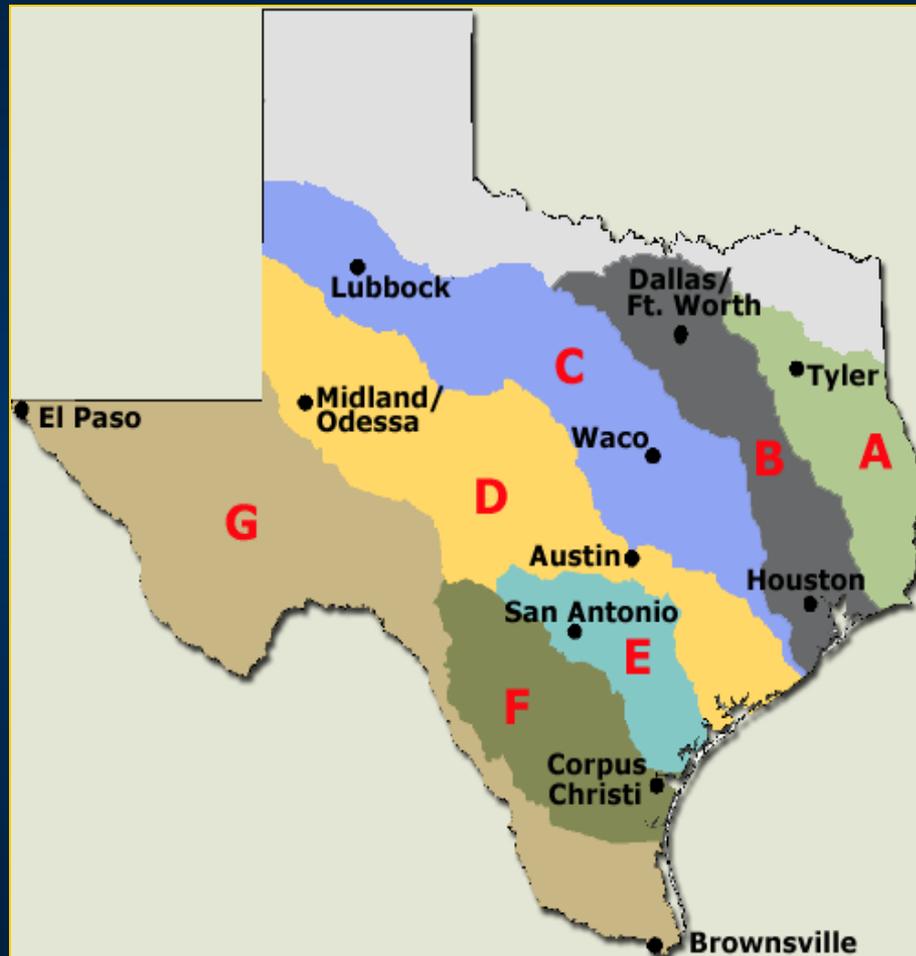
# Integration of Flow Components

Overbank Flows	<p><b>4,000-10,000 cfs</b> for 2-3 days Once every 3-5 years Channel Maintenance Riparian Connectivity, Seed dispersal Floodplain habitat</p>				<p>Wet year Average year Dry year</p>
High Flow Pulses	<p><b>700-1500 cfs</b> for 2-3 days 2-3 X per year every year Sediment transport Lateral connectivity Fish spawning</p>		<p><b>1800 cfs</b> for 2 days 1 X per yr every other year "Big River fish" spawning between Jul 15 - Aug 15</p>		
Base Flows	<p><b>300-450 cfs</b> maintain biodiversity and longitudinal connectivity</p>				
	<p><b>100-150 cfs</b> Fish habitat</p>	<p><b>150-300 cfs</b> Spring spawning</p>	<p><b>40-50 cfs</b> Fish habitat</p>	<p><b>90-100 cfs</b> Fish habitat</p>	
Subsistence Flows	<p><b>35 - 55 cfs</b> Maintain water quality (35 cfs) and key habitats in May (55 cfs)</p>				
	<p>JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC</p>				

# SB 3 (2007) E-flow Allocation Process



# The Timeline



**A.** Sabine & Neches Rivers/Sabine Lake Bay Area (light green) 2008-2010

**B.** Trinity & San Jacinto Rivers/Galveston Bay Area (grey) 2008-2010

**C.** Brazos River/Bay & Estuary Area (2010-2012)

**D.** Colorado & Lavaca Rivers/Matagorda & Lavaca Bays Area (yellow) 2009-2011

**E.** Guadalupe & San Antonio Rivers & San Antonio Bay Area (aqua) 2009-2011

**F.** Nueces River/Corpus Christi & Baffin Bays Area (dark green) 2008-2012

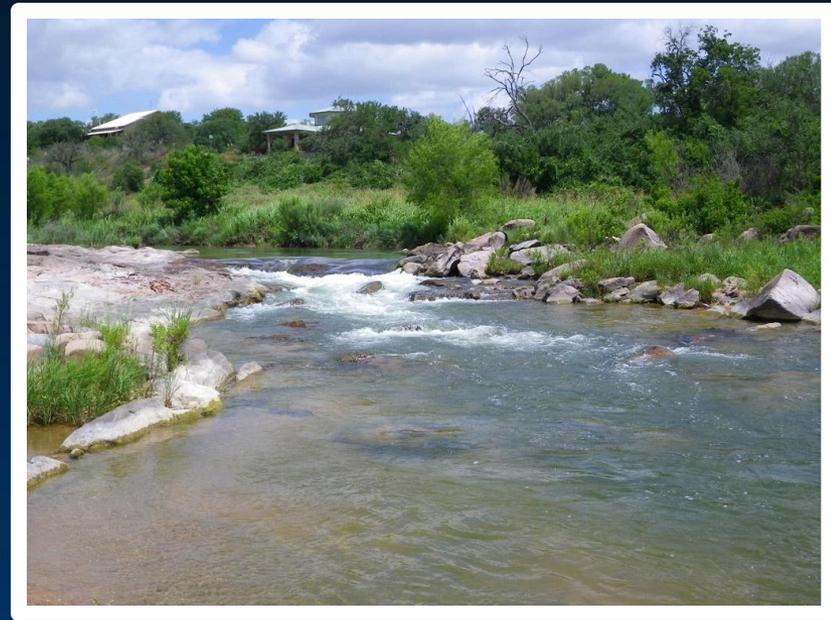
**G.** Rio Grande/Rio Grande Estuary & the Lower Laguna Madre Area (tan) 2010-2012

# Basin and Bay Expert Science Team (BBEST)



Environmental flow regimes are to be developed and recommended by the bay/basin expert science teams working with technical support from state agencies and academic institutions; recommendations shall be based solely on best available science

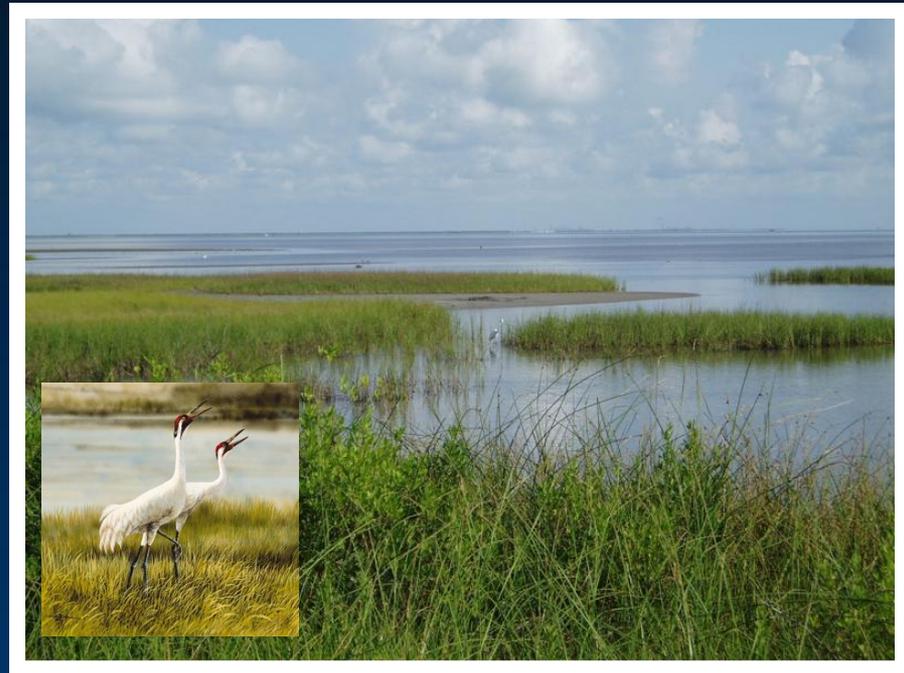
# Stakeholders and Texas Commission On Environmental Quality



Each Basin/Bay Area Stakeholders Committee (BBASC) reviews findings of Expert Science Team and recommends environmental flow regimes to TCEQ

Through rulemaking, TCEQ adopts environmental flow standards and establishes an environmental flow “set aside” if unappropriated water is available; rulemaking process allows for broad public input

# Environmental Flows Management

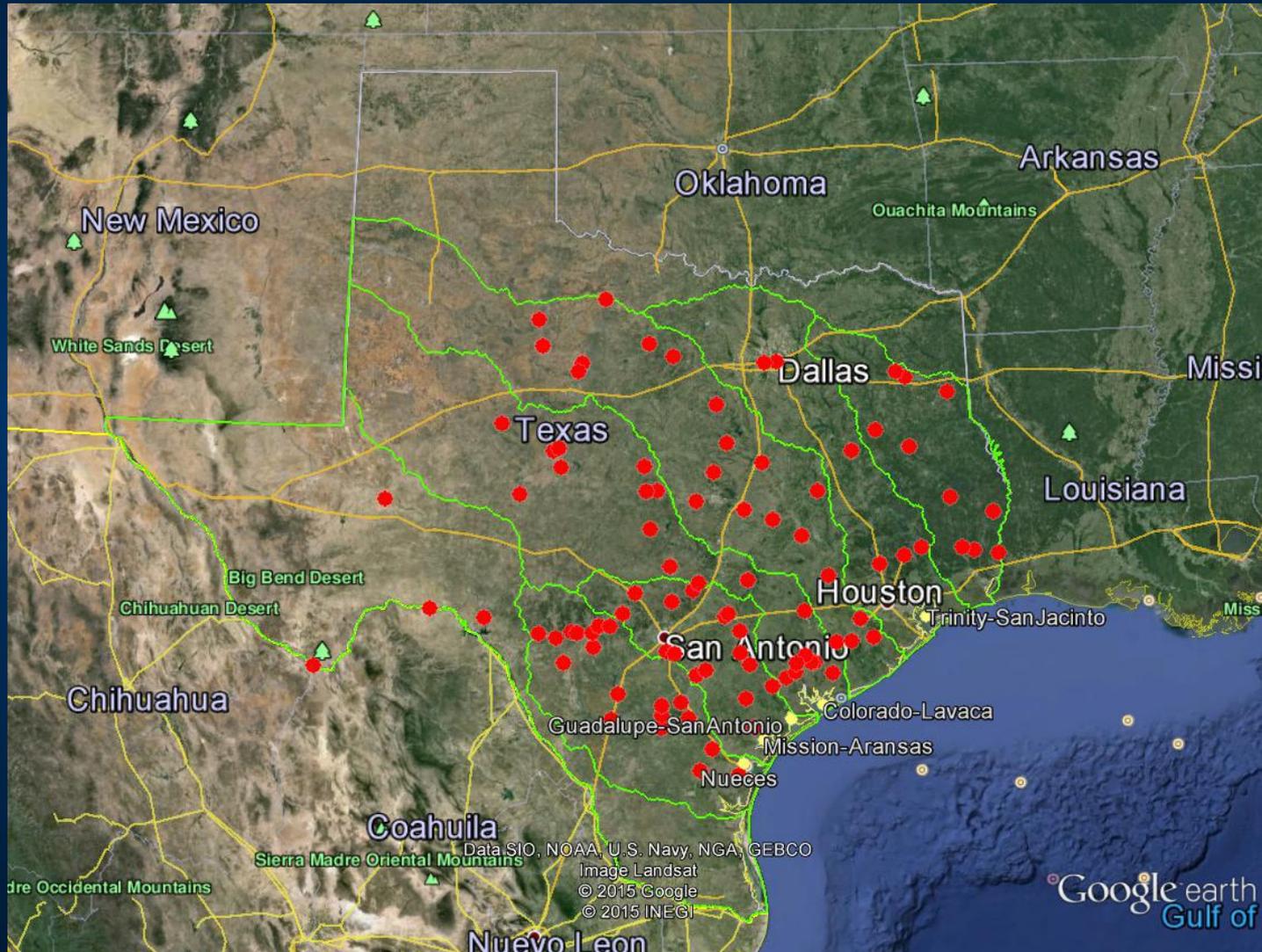


Environmental flow standards and implementation strategies are subject to “adaptive management,” meaning that the success and/or failure of management measures will be assessed and adjusted as new science and information becomes available. Flow standards will be subject to periodic review and revision.

# Challenges

- Time limited (one year for expert science teams)
- Rely on existing information and data
- Although qualitative data relatively abundant, quantitative flow-ecology relationships and basin-specific data limited = uncertainty
- Science and Politics...

# TX E-flow Standards Adopted



International Boundary and Water Commission  
Gage 08-4494.00, Devils River at Pafford Crossing near Comstock

Season	Hydrologic Condition	Subsistence	Base	Seasonal Pulse (1 per season)	Annual Pulse (1 per year)
Winter	Subsistence	84 cfs	175 cfs	N/A	Trigger: 3,673 cfs Volume: 34,752 af Duration: 13 days
Winter	Dry	N/A	175 cfs		
Winter	Average	N/A	200 cfs		
Winter	Wet	N/A	243 cfs		
Spring	Subsistence	91 cfs	160 cfs	Trigger: 558 cfs Volume: 17,374 af Duration: 7 days	
Spring	Dry	N/A	160 cfs		
Spring	Average	N/A	207 cfs		
Spring	Wet	N/A	253 cfs		
Fall	Subsistence	87 cfs	166 cfs	Trigger: 1,872 cfs Volume: 27,781 af Duration: 9 days	
Fall	Dry	N/A	166 cfs		
Fall	Average	N/A	206 cfs		
Fall	Wet	N/A	238 cfs		

cfs = cubic feet per second

af = acre-feet

N/A = not applicable

# Potholes

- Majority of permitted water with no e-flow provisions
- Many basins are over-appropriated or nearly so
- Strategies to meet standards did not materialize
- No set-asides or reservations of water for e-flows (instream flow & freshwater inflows to bays)
- No new permits and no incentives for converting rights to e-flow
- “Rule of capture” upheld by court and legislature
- Big gaps in GCD coverage; don’t cover all aquifers
- Funding limited

# Roadmap

- Continue to strengthen science foundation
- Engage... recruit... educate...
- Expand the range of e-flow standards
- Develop basin-specific strategies to meet standards
- Fill gaps in GCD coverage
- Improve GCD resources and capabilities
- Develop decision support tool to guide voluntary water right agreements
- Tap water markets



**TEXAS**

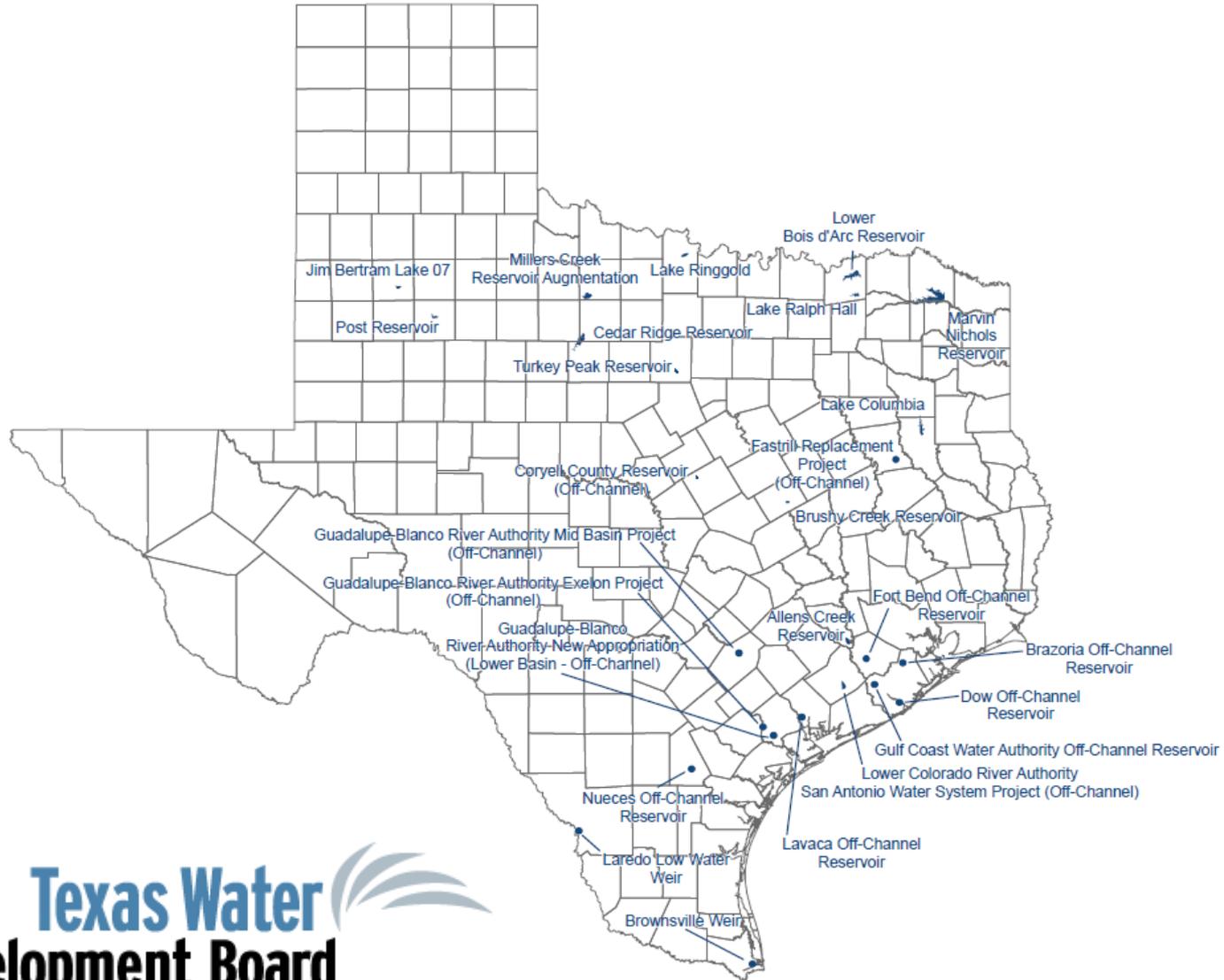
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**PARKS &**

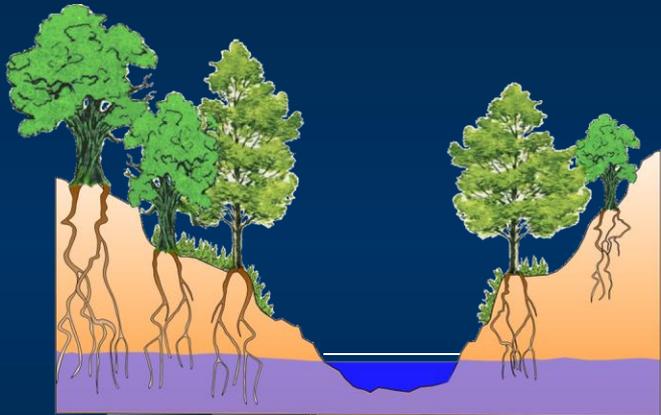
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**WILDLIFE**

# Recommended New Reservoirs 2012 SWP

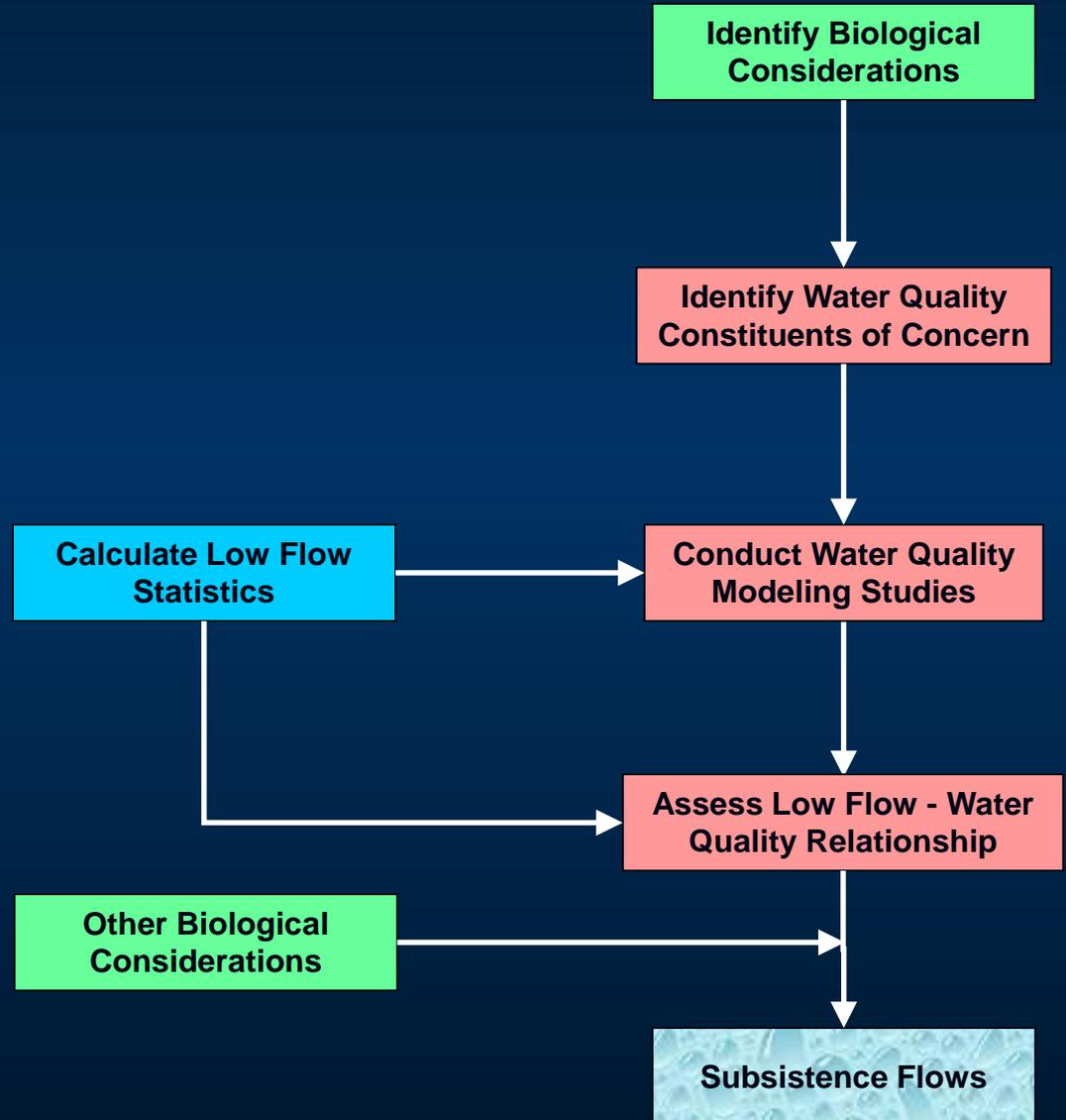


# Subsistence Flows

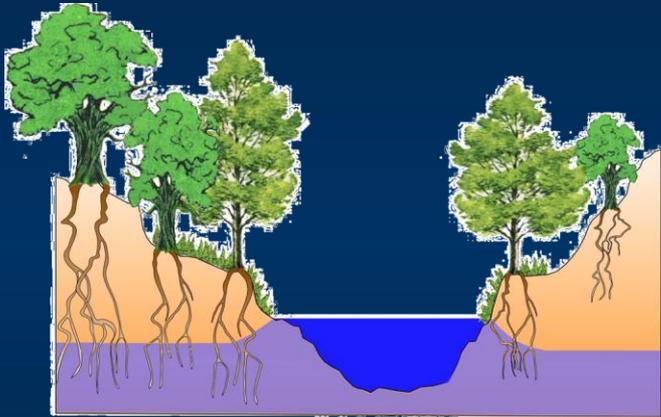


## Primary Discipline

- Hydrology/Hydraulics
- Biology
- Geomorphology
- Water Quality

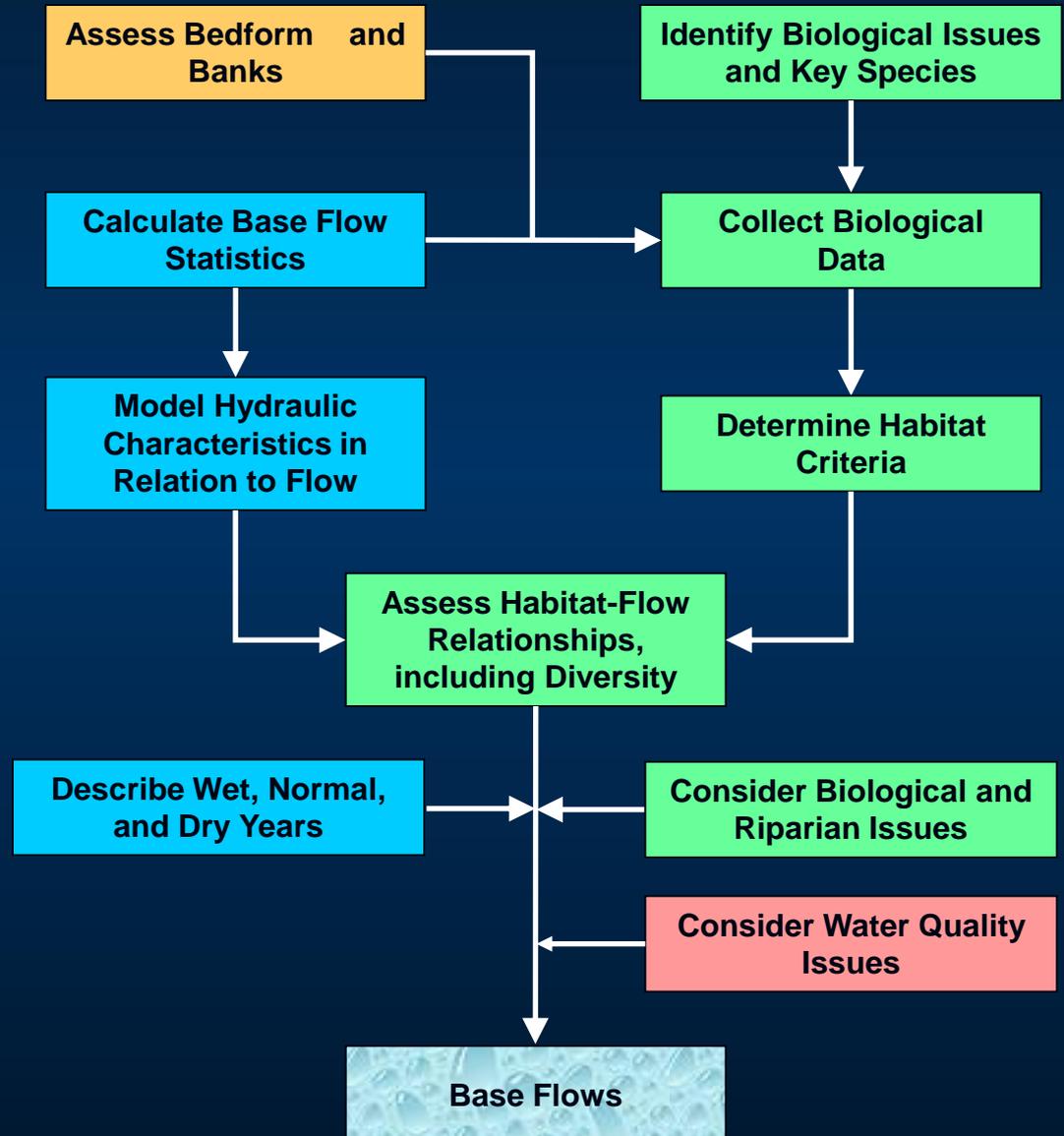


# Base Flows

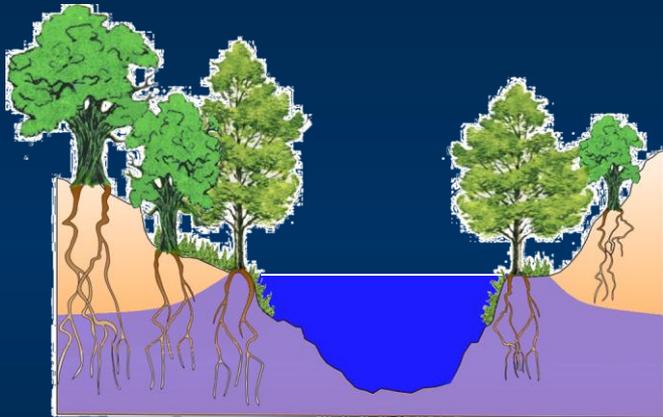


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- Geomorphology
- Water Quality



# High Flow Pulses



Assess Active Channel Processes

Develop Sediment Budgets

Assess Channel Adjusting Flow Behavior

Describe Significant Habitat Conditions

Consider Biological Issues

Calculate High Flow Statistics

Consider Water Quality Issues

High Flow Pulses

## Primary Discipline

Hydrology/Hydraulics

Biology

Geomorphology

Water Quality