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**Regional Water Planning 101  
Workshop  
March 9, 2016**



# **Environmental Flows**

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Branch Chief**



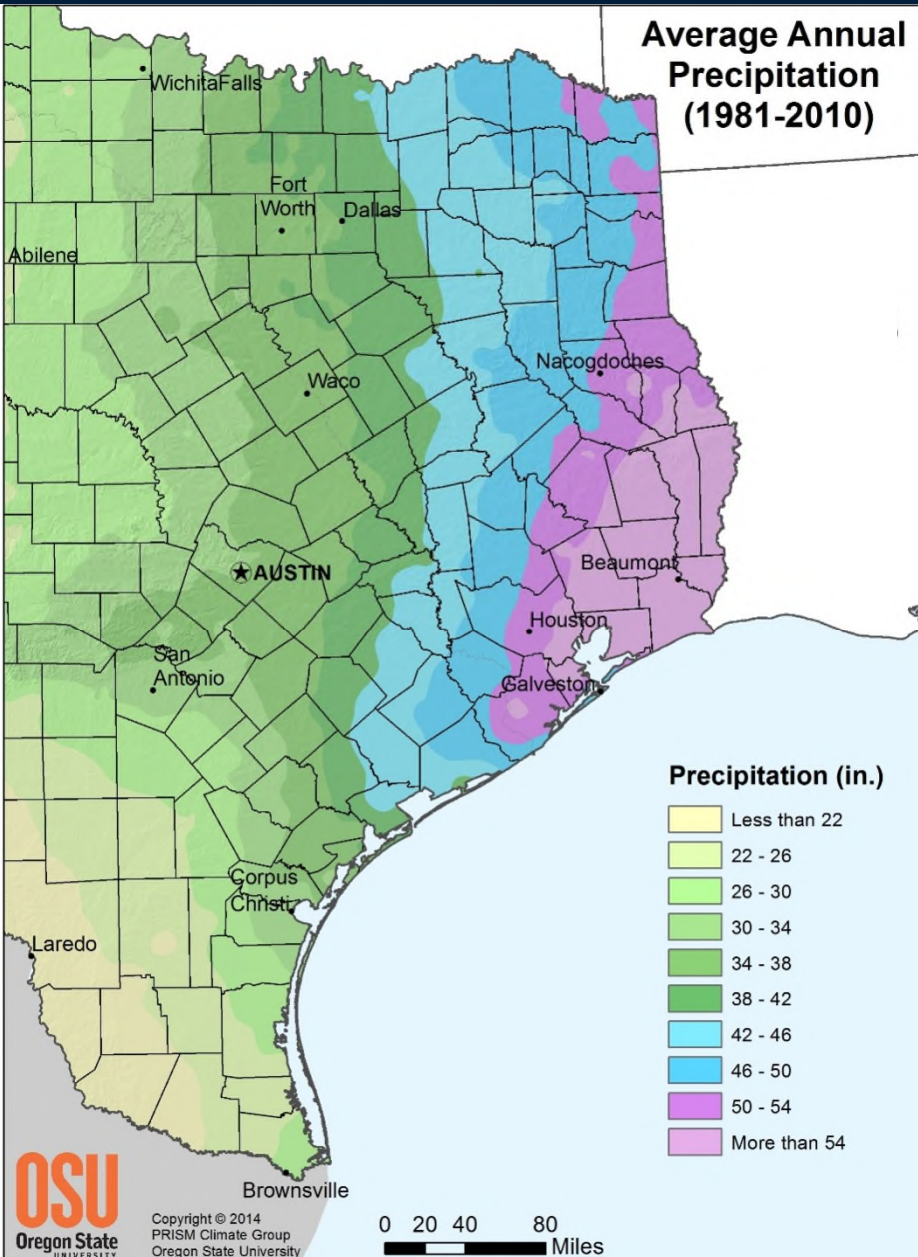


# TPWD's Role

- TPWD has a responsibility to protect fish and wildlife resources in Texas. We review regional and state water plans and to provide information and assistance upon request to identify potential impacts in order to avoid and minimize impacts to fish and wildlife.
- TWDB coordinates with TPWD and other agencies when developing and updating planning guidance principles and population and water demand projections.
- Senate Bill 1 requires TPWD representative to serve as a non voting member of each regional water planning group.

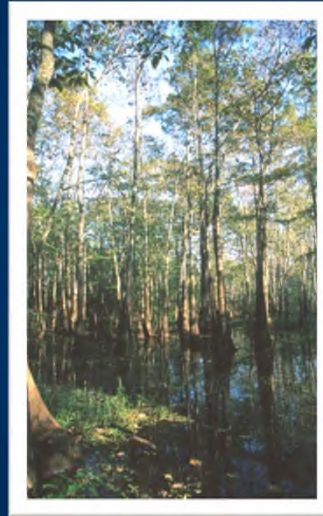
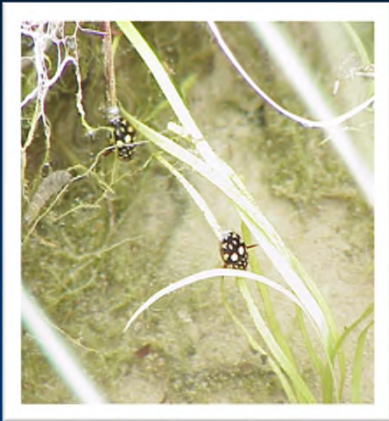
# Texas' climate gradient

...creates a diverse system of springs, streams, rivers, lakes and estuaries.



# Environmental Flows

Flows that remain in the stream and provide for aquatic and riparian habitat; water quality protection; recreation; navigation; and freshwater inflows to bays and estuaries



# Environmental Flows Benefits



Maintenance of native and rare species, biodiversity,



Flood attenuation



Water quality and assimilative capacity



Channel maintenance

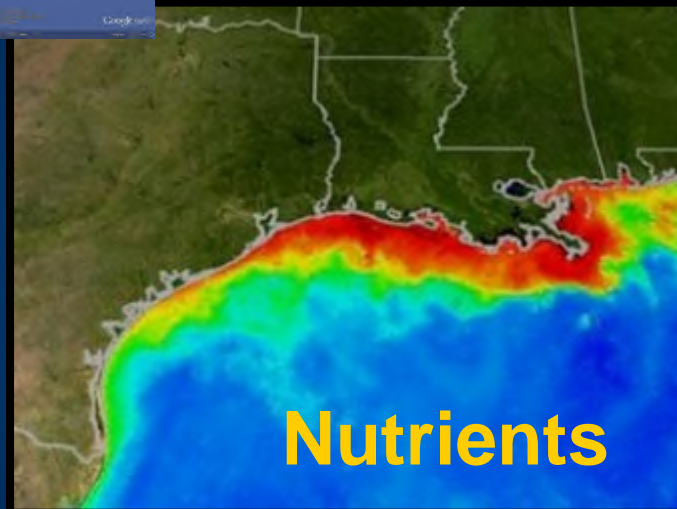
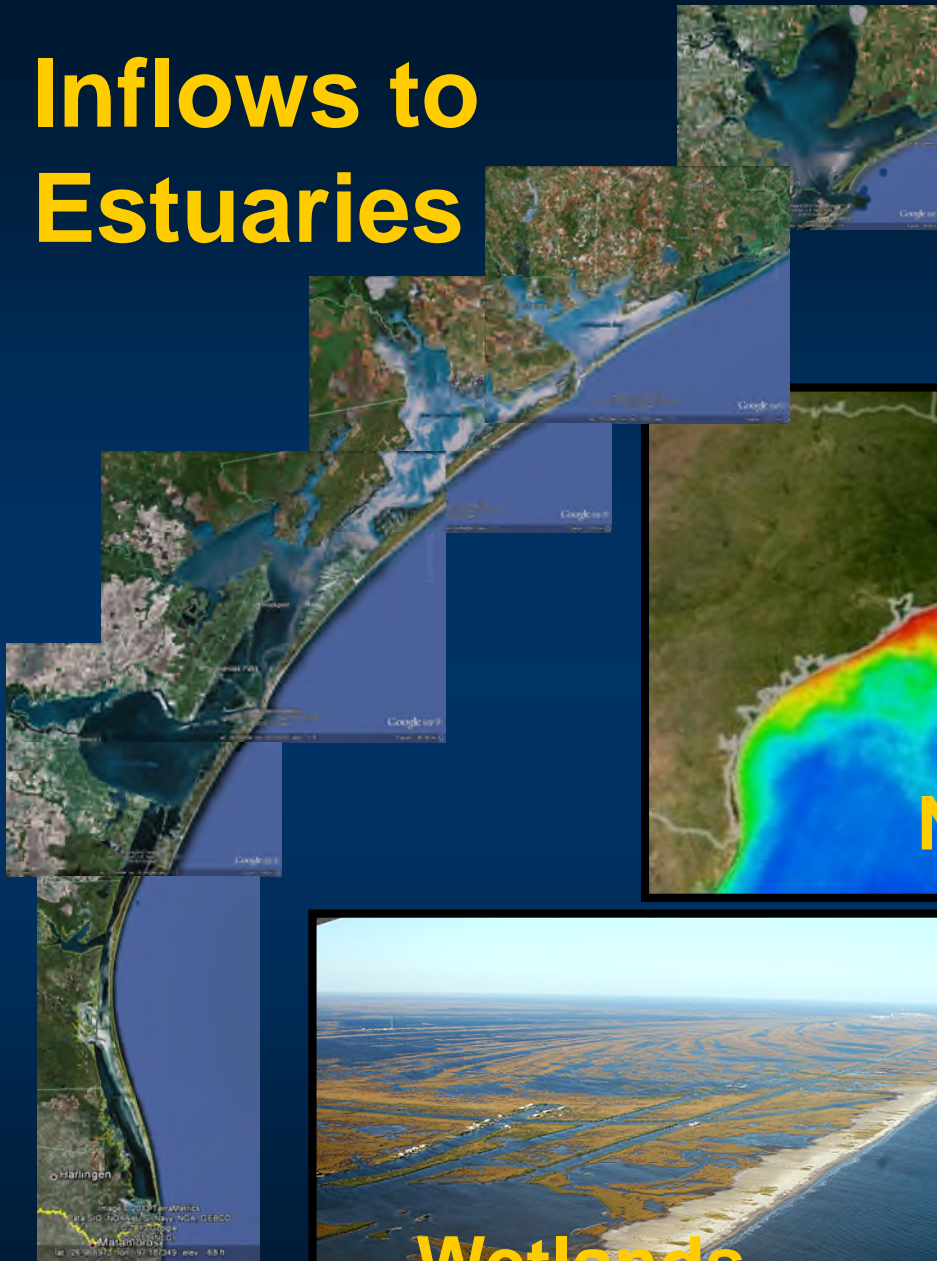


Recreation

Commercial Fishing



# Inflows to Estuaries



....create and sustain estuaries.



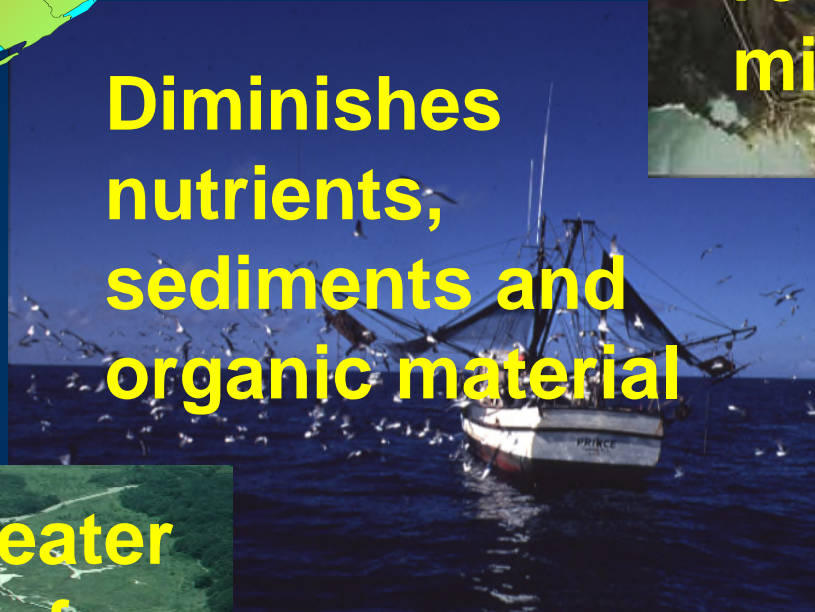
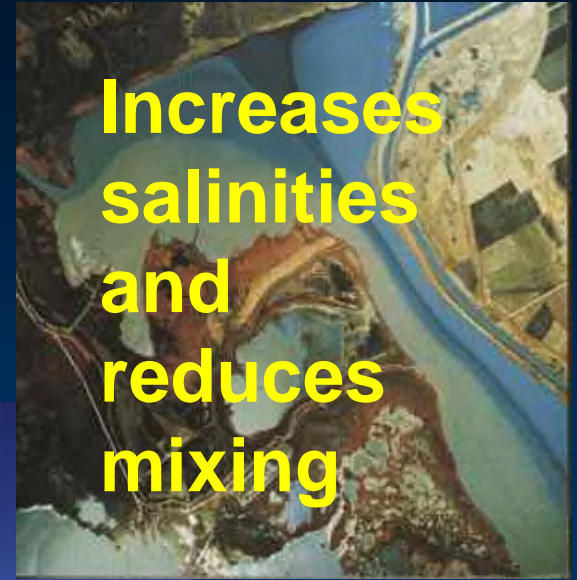
**Reduced Freshwater  
Inflow...**

**Increases  
salinities  
and  
reduces  
mixing**

**Diminishes  
nutrients,  
sediments and  
organic material**

**Allows greater  
intrusion of  
predators,  
parasites  
and diseases**

**...Changes the  
Estuarine  
Ecosystem**





# Reduced Freshwater Inflows Impact Bays and Estuaries



- Reduced freshwater inflows during 2011 led to record high salinities in Texas estuaries that contributed to a coast-wide red tide harmful algal bloom event.
- The 2011 bloom started in September and lasted into 2012. Fish mortality was estimated at 4.4 million.
- Oysters have been impacted by parasites and diseases – the commercial oyster season closed in 2011. Total economic loss was estimated at \$7.5 million.



# Existing Signs of Decline



- Increased water demands
- Climate extremes
- Altered freshwater inflows
- Hypoxic zones
- Harmful algal blooms
- Fish kills
- Invasive species
- Habitat fragmentation
- Loss of coastal wetlands
- Species declines





# SB 1 Water Planning Rules



Evaluations of potentially feasible water management strategies shall include:

**a quantitative reporting of:**  
*environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico;*





# SB 1 Water Planning Rules



Evaluations of potentially feasible water management strategies shall include:

Evaluations of effects on environmental flows will include **TCEQ adopted environmental flow standards, site specific information or environmental planning criteria** after coordinating with TPWD to ensure that water management strategies are adjusted to provide for environmental water needs.

# Senate Bill 3 Environmental Flows (2007- present)



Environmental flow regimes were developed and recommended by expert science teams working with technical support from state agencies and academic institutions; recommendations based solely on best available science.



# Environmental Flow Regime Development



Environmental flow regimes were developed and recommended by the expert science teams working with technical support from state agencies and academic institutions, based solely on best available science

Environmental flow regimes were then adopted by the stakeholder committees, and submitted to TCEQ for formal adoption as commission rules.

# Environmental Flow Regime Definition



“Environmental flow regime” means a schedule of flow quantities that reflects seasonal and yearly fluctuations shown to be adequate to support a sound ecological environment and to maintain the productivity, extent and persistence of key aquatic habitats.

# Sound Ecological Environment

## Conserves Biodiversity

- fish, invertebrates, mussels, plants
- riparian diversity



## Maintains Ecological Integrity

- processes & functions that create & maintain habitat & other physicochemical conditions that support survival, growth, & reproduction



# Environmental Flows Process



Each Bay/Basin Committee reviewed findings of Expert Science Team and recommended environmental flow standards and strategies to meet those standards for submission to TCEQ

TCEQ conducted rulemaking processes to adopt appropriate environmental flow standards. TCEQ did not establish environmental flow “set asides”.

# Environmental Flows Process



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.

# Texas Environmental Flow Standard Locations

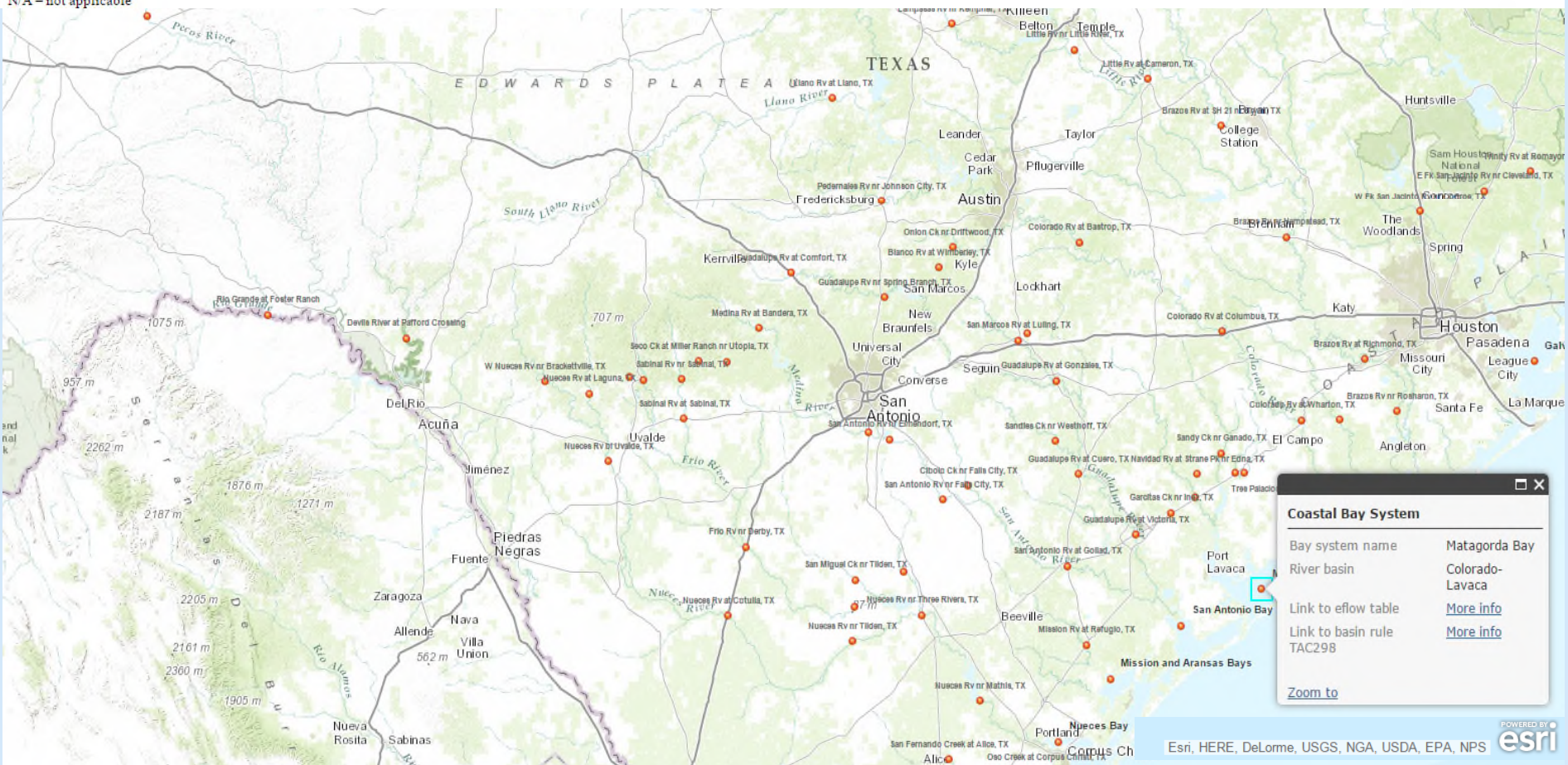


Figure: 30 TAC §298.330(a)(2)

Bay and Estuary Freshwater Inflow Standards for Matagorda Bay Inflows from the Colorado River Basin

Inflow Regime	Monthly Minimum Quantity (af)	Spring Season Quantity (af)	Fall Season Quantity (af)	Intervening Season Quantity (af)	Long-Term Annual Strategy Quantity (af)	Annual Strategy Frequency
Monthly Threshold Inflow	15,000	N/A	N/A	N/A	N/A	100%
Level 1	N/A	114,000	\$1,000	105,000	N/A	90%
Level 2	N/A	168,700	119,900	155,400	N/A	75%
Level 3	N/A	246,200	175,000	226,800	N/A	60%
Level 4	N/A	433,200	307,800	399,000	N/A	35%
Annual Average	N/A	N/A	N/A	N/A	1,400,000	N/A

af = acre-feet  
N/A = not applicable



# LCRA 2015 Water Management Plan

- Combination of Firm and Interruptible Stored Water (Lakes Travis and Buchanan) used to help meet environmental flow needs, as determined by most recent site-specific studies.
- March-June Environmental Flow Criteria based on March 1 Combined Storage;
- July-February Environmental Flow Criteria based on July 1 Combined Storage.
- Environmental Flow Criteria are generally consistent with adopted SB 3 standards.

# LCRA 2015 Water Management Plan Instream Flow Criteria and Triggers

Table 4-4 presents the applicable instream flow criteria for this WMP. In the event of a pro rata curtailment of Firm Water supplies, the applicable instream flow criteria will be subject to the same percentage reduction as imposed on LCRA's Firm Water customers.

**Table 4-3. Subsistence and Base Flow Criteria by Gauge (cubic feet per second)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Austin												
Subsistence	50	50	50	50	50	50	50	50	50	50	50	50
Bastrop												
Subsistence	208	274	274	184	275	202	137	123	123	127	180	186
Base-Dry	313	317	274	287	579	418	347	194	236	245	283	311
Base-Average	433	497	497	635	824	733	610	381	423	433	424	450
Columbus												
Subsistence	340	375	375	299	425	534	342	190	279	190	202	301
Base-Dry	487	590	525	554	966	967	570	310	405	356	480	464
Base-Average	828	895	1,020	977	1,316	1,440	895	516	610	741	755	737
Wharton												
Subsistence	315	303	204	270	304	371	212	107	188	147	173	202
Base-Dry	492	597	531	561	985	984	577	314	410	360	486	470
Base-Average	838	906	1,036	1,011	1,397	1,512	906	522	617	749	764	746

**Table 4-4. Instream Flow Triggers and Flow Levels**

When Combined Storage is...	On this date...	Instream Flow Level
Above 1.96 MAF	March 1 or July 1	Base-Average
Between 1.90 and 1.96 MAF	March 1 or July 1	Base-Dry
Less than 1.90 MAF	March 1 or July 1	Subsistence

# LCRA 2015 Water Management Plan Freshwater Inflow Criteria\* and Triggers

**Table 4-5. MBHE Three-Month Freshets into Matagorda Bay**

Inflow Category	Seasonal Three-Month Freshet (acre-feet)	
	Spring	Fall
MBHE-4	433,200	307,800
MBHE-3	246,200	175,000
MBHE-2	168,700	119,900
MBHE-1	114,000	81,000

**Table 4-6. Operational and Threshold Criteria for Colorado River Freshwater Inflows to Matagorda Bay**

Inflow Category	Two-Month Operational Criteria (acre-feet) applicable in the individual months			Monthly (acre-feet)
	Spring March-June	Fall July-Oct	Intervening Nov-Feb	
OP-4	289,000	205,000	133,000	-
OP-3	164,000	117,000	76,000	-
OP-2	112,000	80,000	52,000	-
OP-1	76,000	54,000	35,000	-
Threshold	-	-	-	15,000

\*Additional limitations including annual or multi-year caps apply to FWI Criteria.

**Table 4-7. Freshwater Inflow Triggers and Flow Levels**

When Combined Storage is...	On this date...	Freshwater Inflow Criteria
Greater than 1.95 MAF	March 1 or July 1	OP-4/ MBHE-4
Less than 1.95 MAF	March 1 or July 1	OP-3 / MBHE-3
Less than 1.50 MAF	March 1 or July 1	OP-2 / MBHE-2
Less than 1.30 MAF	March 1 or July 1	OP-1 / MBHE-1
Less than 1.00 MAF	March 1 or July 1	Threshold Only

# Blue Sucker Tracking Study in the Lower Colorado River, TX

Dakus Geeslin<sup>1</sup> and Matthew Acre<sup>2</sup>

1-Texas Parks and Wildlife Department, Water Resources Branch, 4200 Smith School Road, Austin, TX 78744

2-Texas Cooperative Fish and Wildlife Research Unit, Department of Natural Resources Management, Texas Tech University, Lubbock, TX 79409 -



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# Why Blue Suckers

(*Cycleptus elongatus*)



- State-listed **threatened species** due to Reduced abundance and shrinking range
- **Vulnerable** throughout its entire range
- **Indicator** of river health
- Sensitive to habitat alterations
- LCRA Water Management Plan includes Blue Sucker spawning flows Feb-Mar to help ensure spawning habitat is maintained.

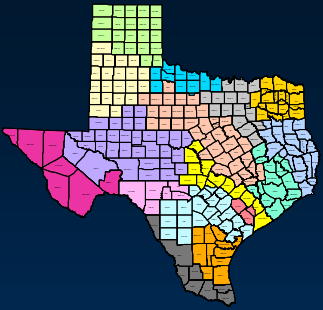






# Preliminary Findings

- Spawning migrations begin in early spring
- Late spring returns to original capture location
- Movements correlated with temperature and discharge
- Fish movements cease  $>80^{\circ}$  F

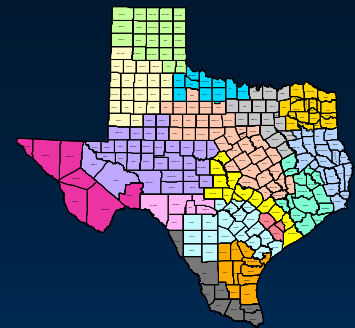


# River and Stream Segments of Unique Ecological Value



A RWPG may recommend a river or stream segment as being of unique ecological value if the segment meets one or more of the following criteria:

- Biological function
- Hydrologic function
- Riparian conservation areas
- Unique or critical habitats and exceptional aquatic life uses
- Unique or extensive natural communities including threatened and endangered species habitat



# TWC Section 16.051



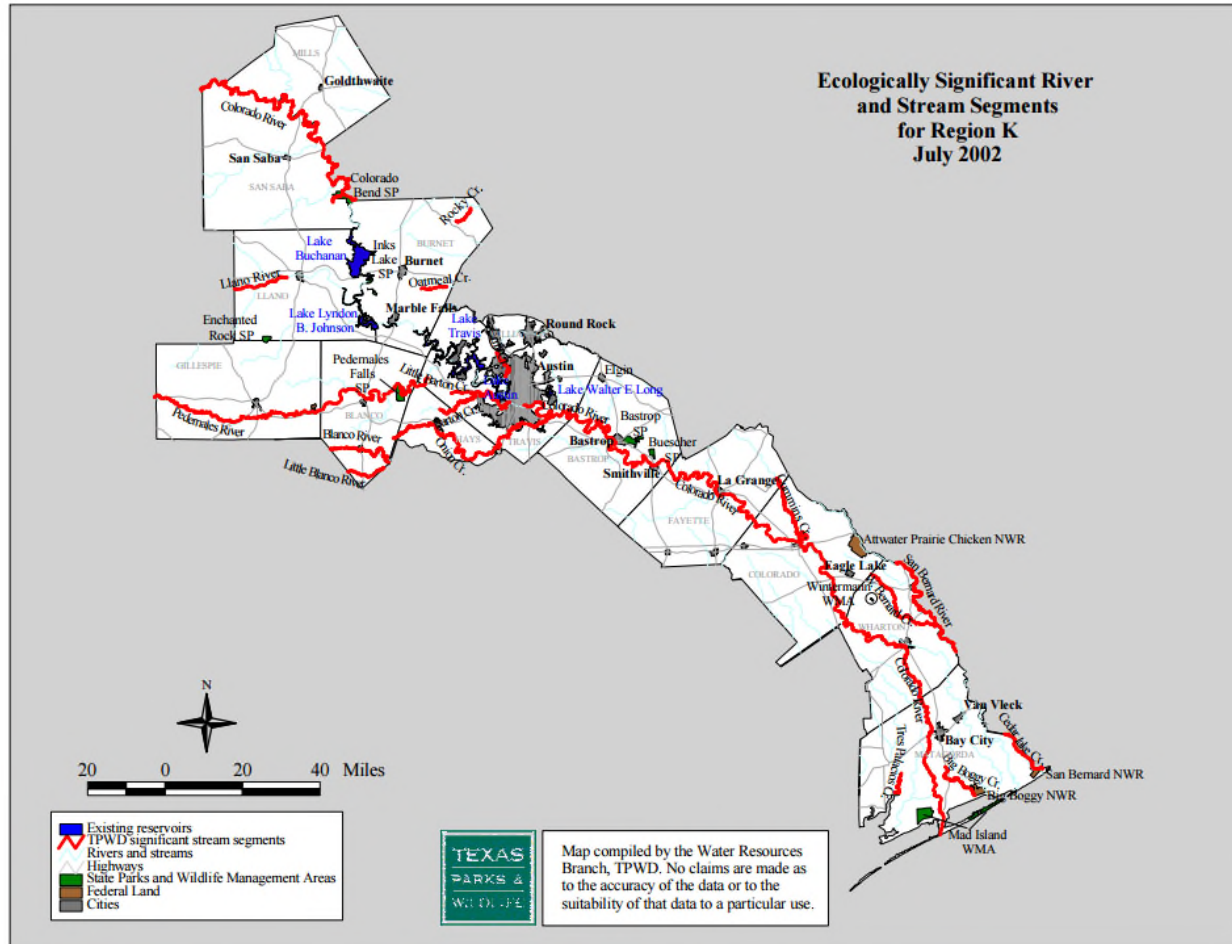
(f) The legislature may designate a river or stream segment of unique ecological value. This designation means solely that a state agency or political subdivision of the state may not finance the actual construction of a reservoir in a specific river or stream segment designated by the legislature under this subsection.



# TWC Section 16.051

- (g) A state agency or political subdivision may not obtain a fee title or an easement that would:
  - (1) *destroy the unique ecological value of a river or stream segment designated by the legislature...*
  - (2) significantly prevent the construction of a reservoir on a site designated by the legislature...

# Region K ecologically significant stream segments



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