

***Nueces River and Corpus Christi and Baffin Bays  
Basin and Bay Area Stakeholders Committee  
(Nueces BBASC)***

***Discussion of Nueces BBEST  
Environmental Flows  
Recommendations Report***

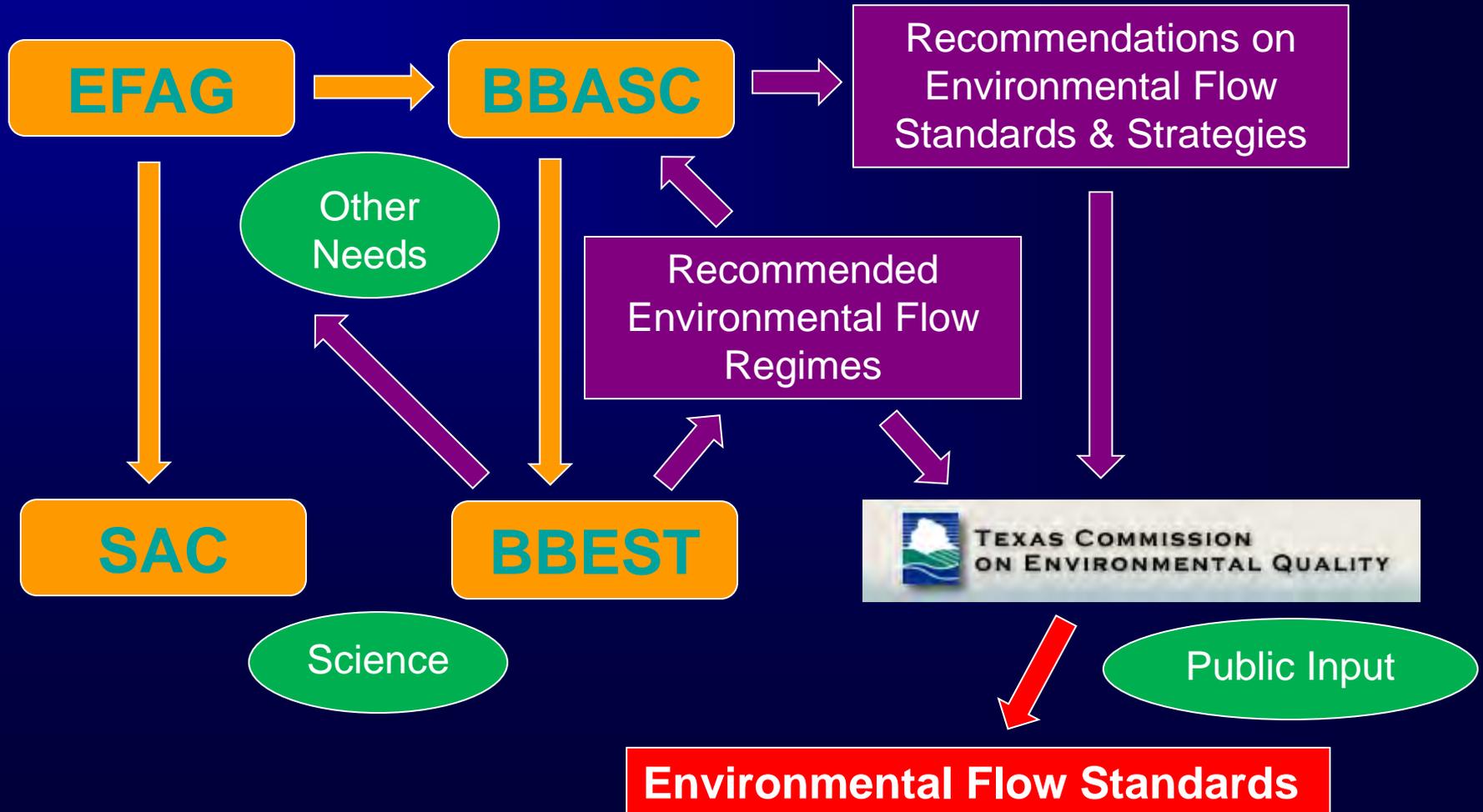


**Sam Vaughn  
January 25, 2012**

# ***Topics of Discussion***

- 1) Follow-up on Science Advisory Committee (SAC) Comments**
- 2) Texas Parks & Wildlife Department (TPWD) Comments**
- 3) Key Nueces BBASC Questions, Comments, and Concerns for Nueces BBEST Response**
- 4) Focal Sites for BBASC Environmental Flow Standard Recommendations**
- 5) Example Application of Environmental Flow Standard Recommendations**

# SB3 Environmental Flows Process



# ***Nueces BBEST Recommendations Report***

- 1) Preamble – Sound Ecological Environment**
- 2) Overview of Watersheds & Bays**
- 3) Instream Flow Analyses**
- 4) Freshwater Inflow Analyses**
- 5) Integration of Instream Flow & Estuary Inflow Regimes**
- 6) Environmental Flow Regime Recommendations**
- 7) Adaptive Management**
- 8) References**

# ***Follow-Up on SAC Review of BBEST Recommendations Report***

- 1) The BBEST has identified SAC comments suggesting that the BBEST provide supplemental clarification to the BBASC.**
- 2) Information for the BBASC responsive to these selected SAC comments is being prepared by the BBEST.**

# ***Follow-Up on TPWD Review of BBEST Recommendations Report***

- 1) Information for the BBASC responsive to TPWD comments of particular interest to the BBASC may be prepared by the BBEST upon request.**

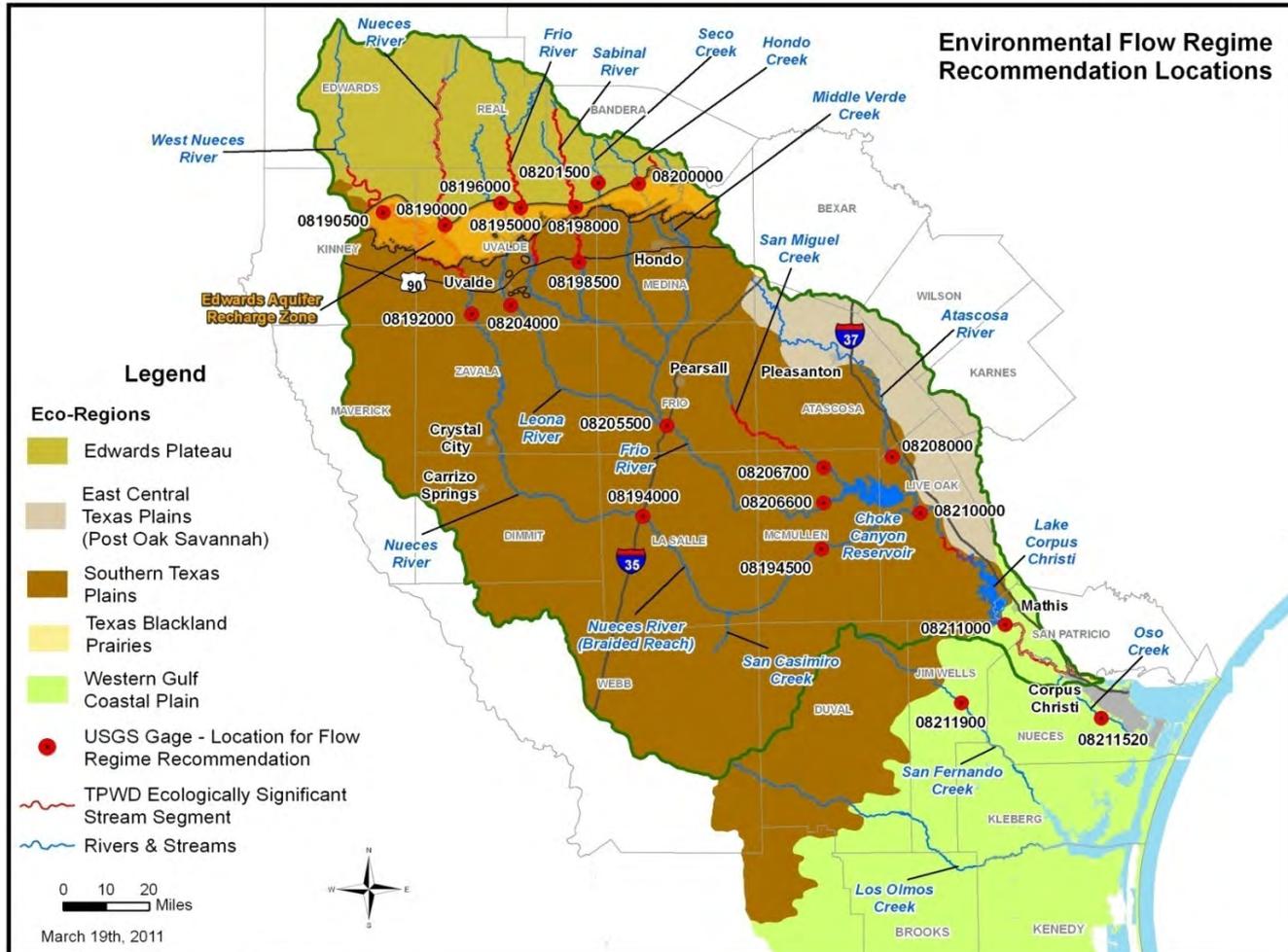
# ***Key Nueces BBASC Questions, Comments, and Concerns for Nueces BBEST Response***

- 1) Pursuant to SAC review.**
- 2) Pursuant to TPWD review.**
- 3) Pursuant to BBASC discussion during 1/25/2012 meeting.**
- 4) Pursuant to subsequent written inquiry by BBASC member through the Texas Commission on Environmental Quality (TCEQ) care of Cory Horan ([Cory.Horan@tceq.texas.gov](mailto:Cory.Horan@tceq.texas.gov)).**

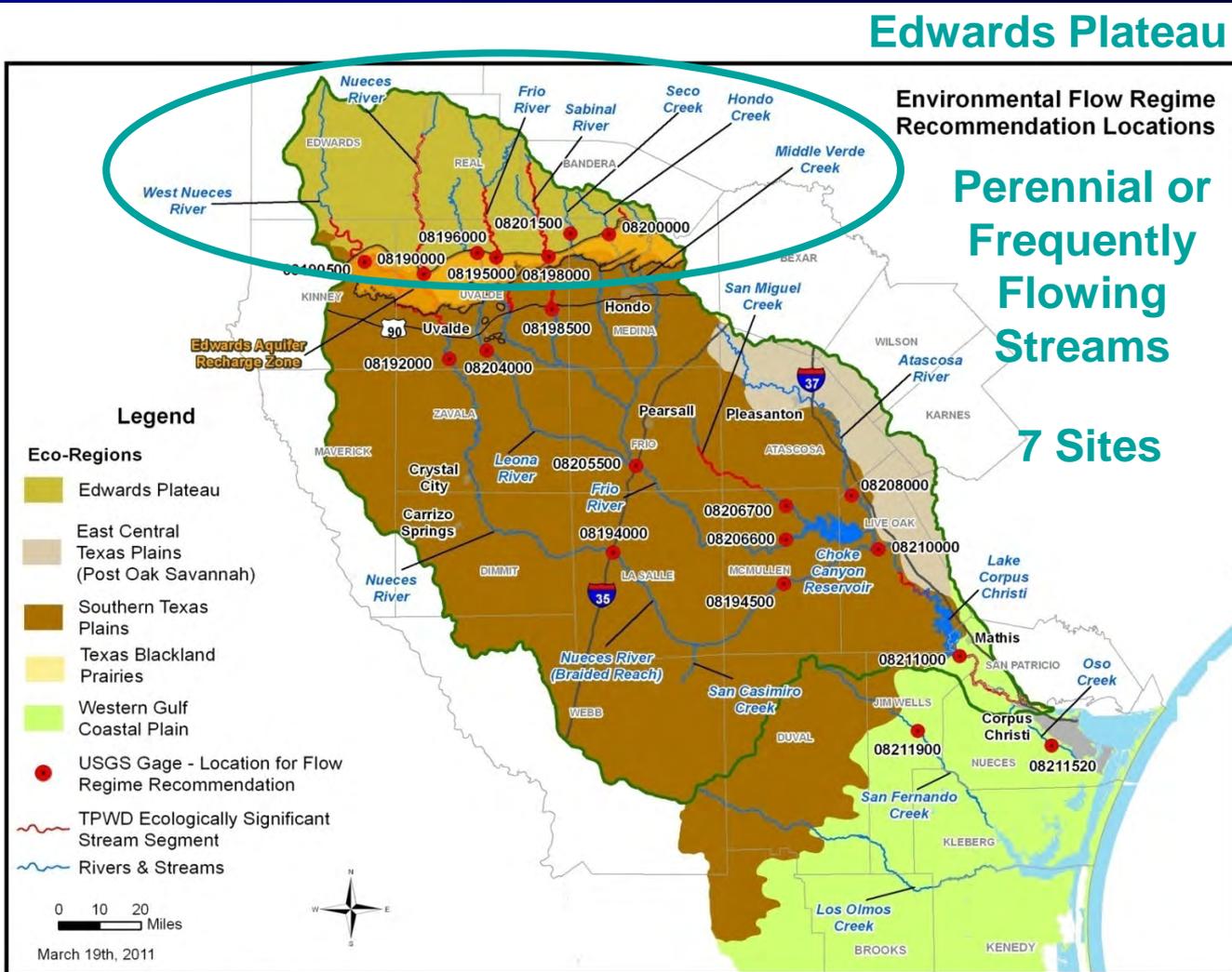
# ***Example Questions from Nueces BBASC Regarding the BBEST Recommendations***

- 1) How were seasons chosen for flow regime recommendations?**
- 2) How did the BBEST deal with dry creeks with many days of zero flows?**
- 3) Why are there three (3) levels of base flows?**
- 4) Why are there multiple high pulsed events, sometimes up to eight (8) for one stream segment?**
- 5) How did the BBEST come up with subsistence flows and what does this mean for the BBASC?**
- 6) Why were the Nueces Bay and Delta found not to be a sound ecological environment?**

# Environmental Flow Standard Recommendations by Eco-Region

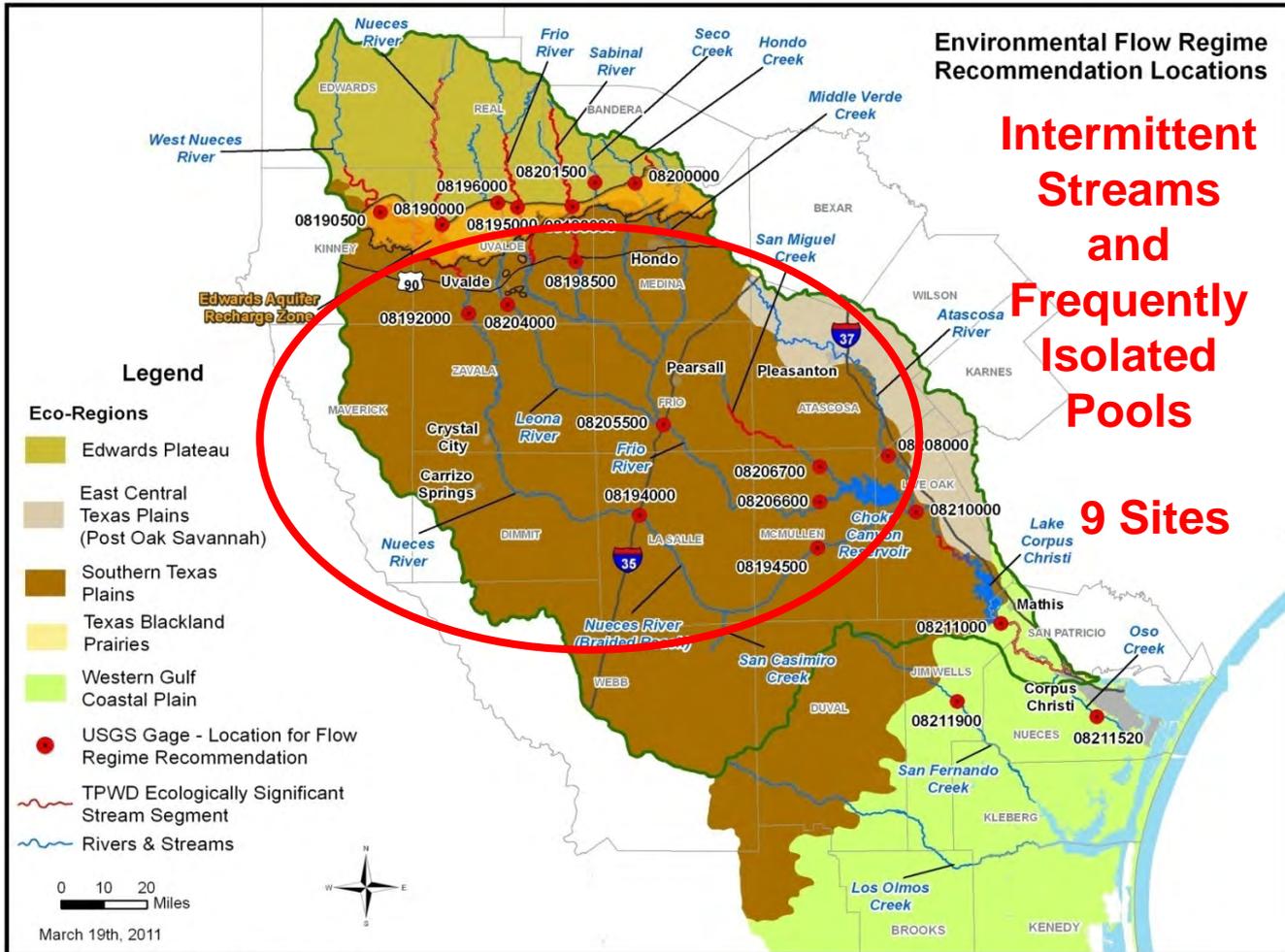


# Environmental Flow Standard Recommendations by Eco-Region



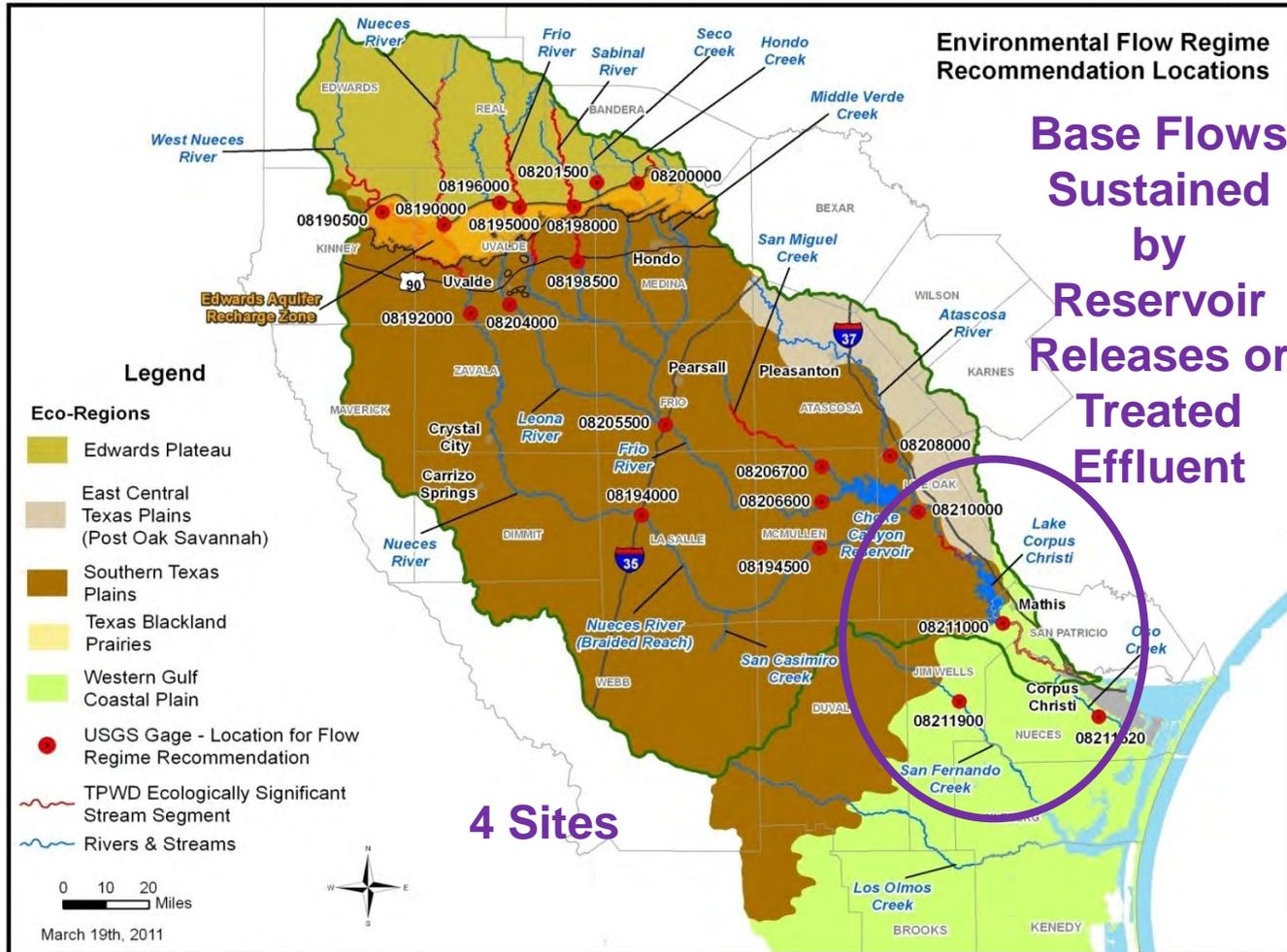
# Environmental Flow Standard Recommendations by Eco-Region

## South Texas Plains (Brush Country & Wild Horse Desert)



# Environmental Flow Standard Recommendations by Eco-Region

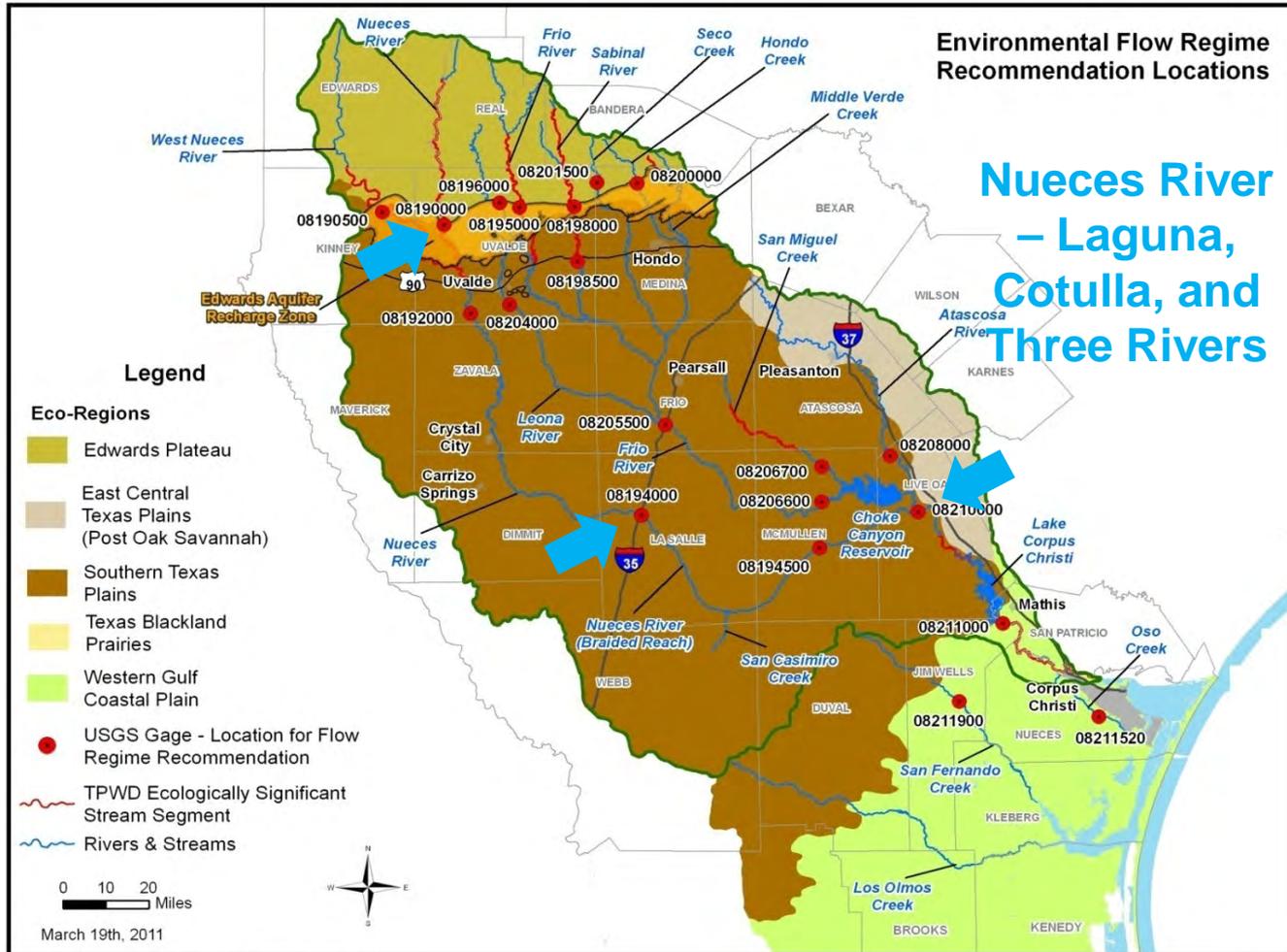
## Western Gulf Coastal Plain





# Potential Focal Sites for BBASC

## Instream Flow Standard Recommendations



# ***Example Application of Environmental Flow Regime Recommendations***

- 1) Run-of-River Diversion (up to 400 cfs) from the Nueces River near Laguna with and Off-Channel Storage Reservoir (44,000 acft).**
- 2) This is a theoretical project for illustrative purposes only. No such project is recommended in any current regional or state water plan.**

# Instream Flow Regime Recommendation

Overbank Events	Qp: 15,600 cfs with Average Frequency 1 per 5 years Regressed Volume is 124,000 Duration Bound is 107											
	Qp: 4,750 cfs with Average Frequency 1 per 2 years Regressed Volume is 38,600 Duration Bound is 64											
	Qp: 2,220 cfs with Average Frequency 1 per year Regressed Volume is 18,400 Duration Bound is 46											
	Qp: 390 cfs with Average Frequency 2 per year Volume Bound is 11,300 Duration Bound is 26											
	Qp: 48 cfs with Average Frequency 1 per season Volume Bound is 1,000 Duration Bound is 7			Qp: 390 cfs with Average Frequency 1 per season Volume Bound is 6,070 Duration Bound is 17			Qp: 170 cfs with Average Frequency 1 per season Volume Bound is 3,100 Duration Bound is 14			Qp: 50 cfs with Average Frequency 1 per season Volume Bound is 800 Duration Bound is 5		
High Flow Pulses				Qp: 99 cfs with Average Frequency 2 per season Volume Bound is 1,560 Duration Bound is 9								
	92			76			92					
Base Flows (cfs)	65			48			65					
	51			32			41					
Subsistence Flows (cfs)	14			16			14					
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Winter			Spring			Summer			Fall			
Flow Levels	High (75th %ile)											
	Medium (50th %ile)											
	Low (25th %ile)											
	Subsistence											

Wet  
Avg  
Dry

Pulse volumes are in units of acre-feet and durations are in days.  
Period of Record used : 1/1/1924 to 12/31/2009.

## Nueces River @ Laguna (NRL)

# ***Hydrologic Conditions***

- 1) Use cumulative streamflow volumes for the preceding 12 months to define hydrologic conditions for the following season. Set trigger volumes such that Dry, Average, and Wet conditions will apply 25%, 50%, and 25% of the time, respectively.**
- 2) Subsistence hydrologic conditions are a sub-category of Dry hydrologic conditions with trigger volumes set such that Subsistence conditions apply 10% of the time.**
- 3) Hydrologic conditions apply to base flows and determine when passage of only Subsistence flows may be allowable.**

# ***Instream Flow Regime Recommendation Application Example***

**Flow Regime**



**Permit Conditions**

## **Nomenclature**

**Q = Inflow (varies daily)**

**S = Subsistence Flow (varies w/ season)**

**B = Base Flow (varies w/ season & hydrologic condition)**

**P<sub>i</sub> = Pulse Flow (varies w/ season & applicable tier)\***

\* Up to six tiers of pulses (2/season, 1/season, 2/year, 1/year, 1/2–years, and/or 1/5–years) are potentially applicable at Laguna in a season. Up to eight tiers (4/season, 3/season, and those listed above) are potentially applicable at some other sites.

# ***Subsistence Hydrologic Condition Base Flow Application Example***

## **Situation**

- a)  $Q < S$
- b)  $B > Q > S$
- c)  $P_i > Q > B$
- d)  $Q > P_i$

## **Inflow Pass-Through**

- a)  $Q$  (inflow)
- b)  $S$  (subsistence flow)
- c)  $B$  (base flow)
- d)  $\text{Min}(P_i \text{ or } Q)$  until volume or duration has passed



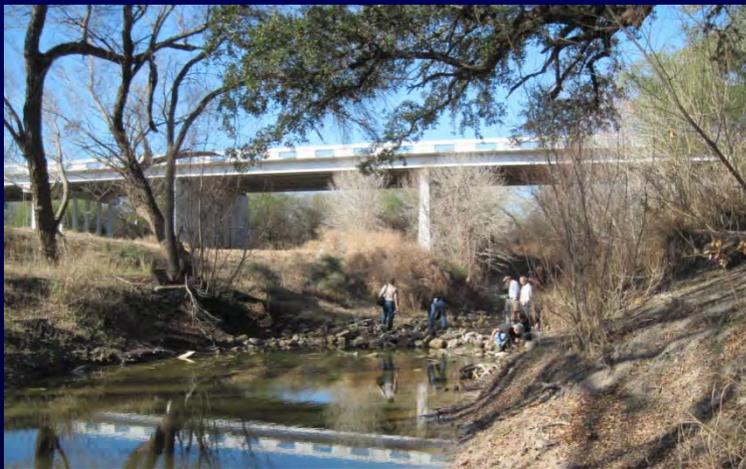
# ***Dry Hydrologic Condition Base Flow Application Example***

## **Situation**

- a)  $Q < S$
- b)  $B > Q > S$
- c)  $P_i > Q > B$
- d)  $Q > P_i$

## **Inflow Pass-Through**

- a)  $Q$  (inflow)
- b)  $Q$  (inflow)
- c)  $B$  (base flow)
- d)  $\text{Min}(P_i \text{ or } Q)$  until volume or duration has passed



# ***Average or Wet Hydrologic Conditions Base Flow Application Example***

## **Situation**

- a)  $Q < B$
- b)  $P_i > Q > B$
- c)  $Q > P_i$

## **Inflow Pass-Through**

- a)  $Q$
- b)  $B$
- c)  $\text{Min}(P_i \text{ or } Q)$  until  
volume or duration  
pass

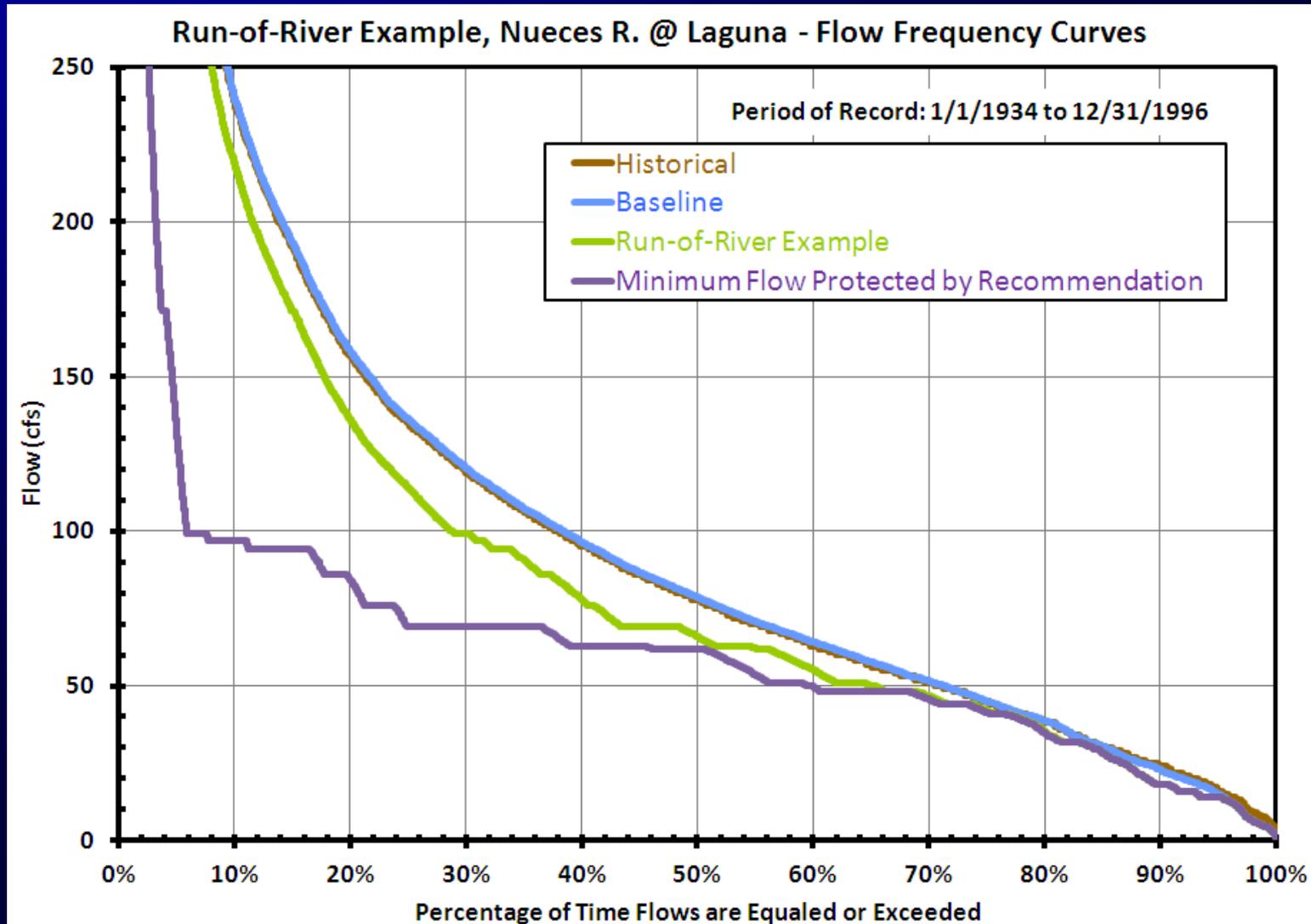


***The Flow Regime Application Tool  
(FRAT) May be Used to Perform  
Example Applications of Potential  
Instream Flow Regime  
Recommendations***

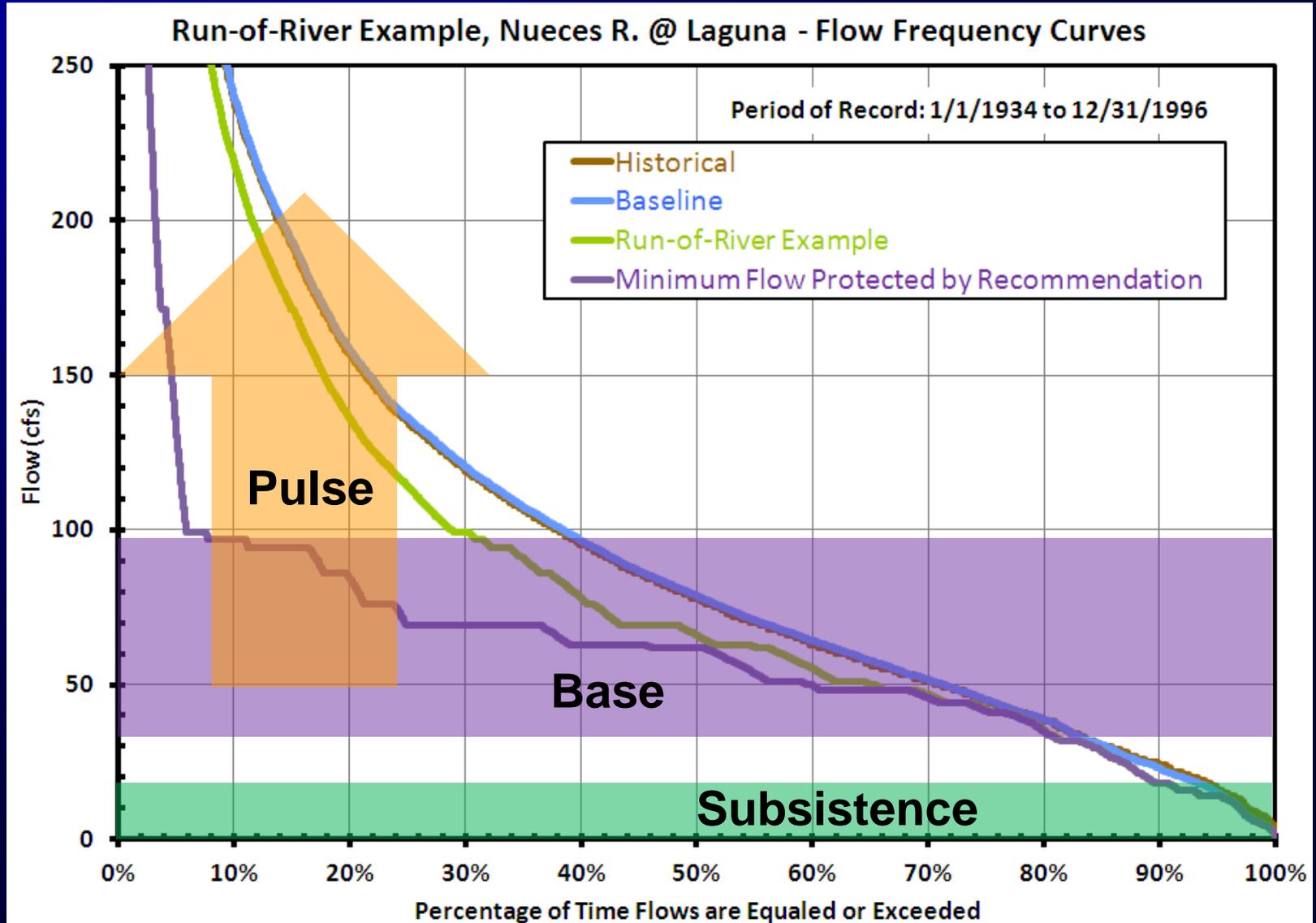


***The BBEST Considers Resulting Flows  
to Assess Adequacy to Support a  
Sound Ecological Environment***

# Example Application of Instream Flow Regime Recommendations

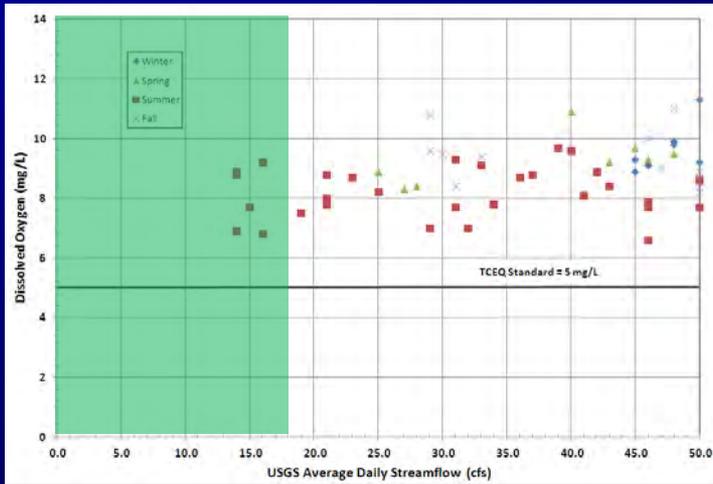


# Flow Regime Components

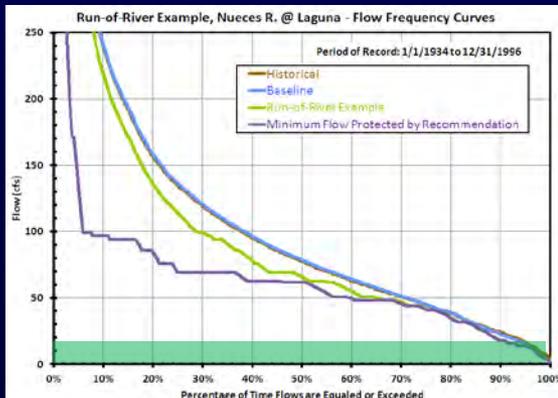
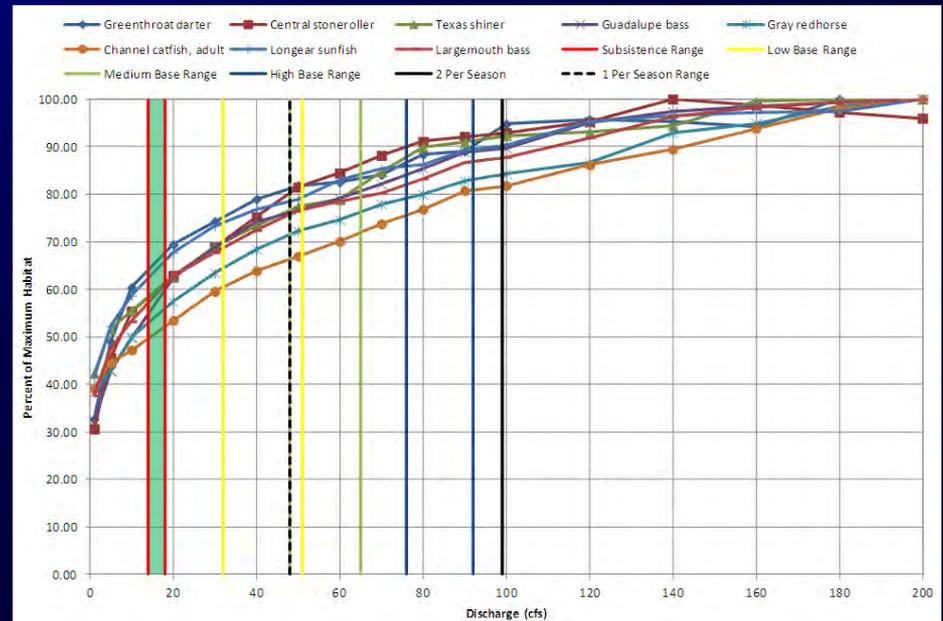


# Ecological Significance - Subsistence

## Water Quality

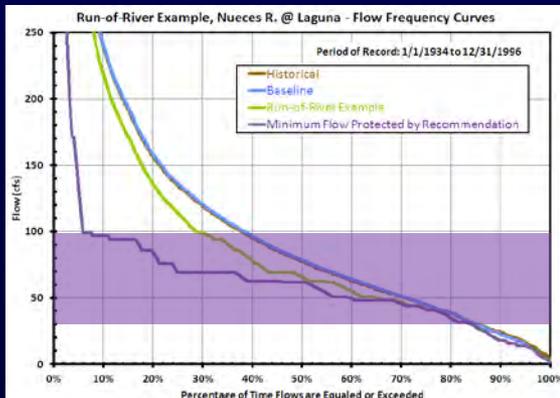
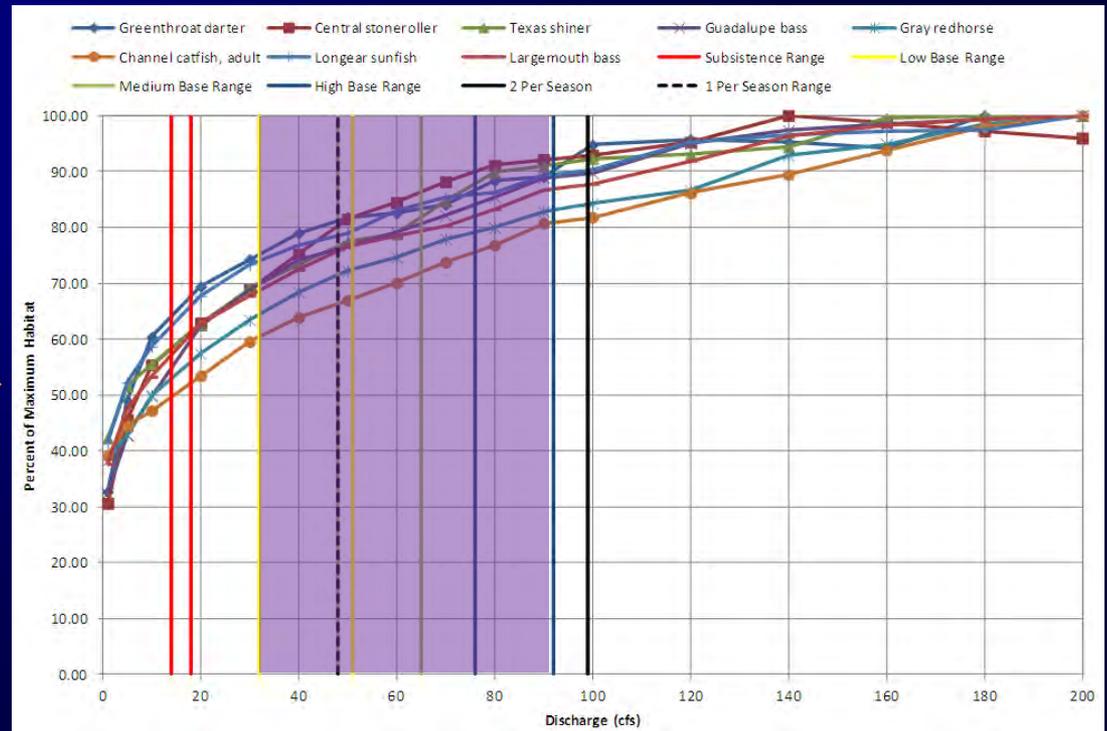


## Aquatic Habitat



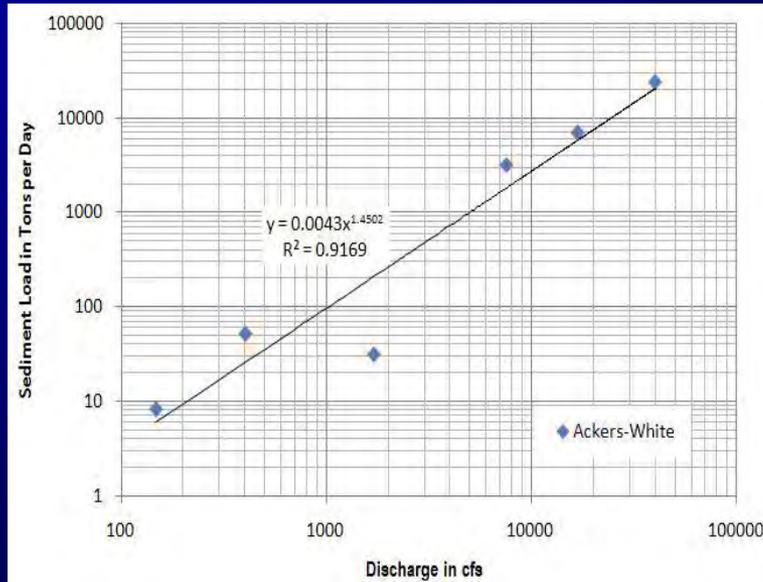
# Ecological Significance - Base

## Aquatic Habitat

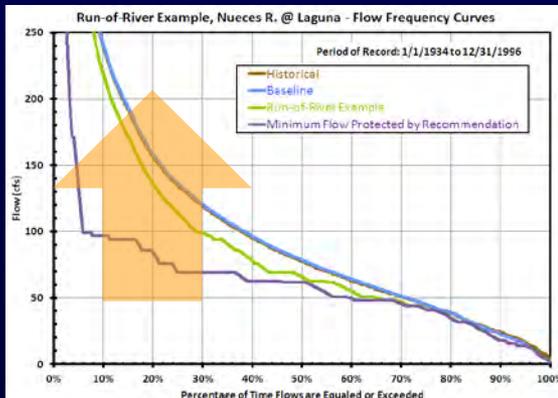
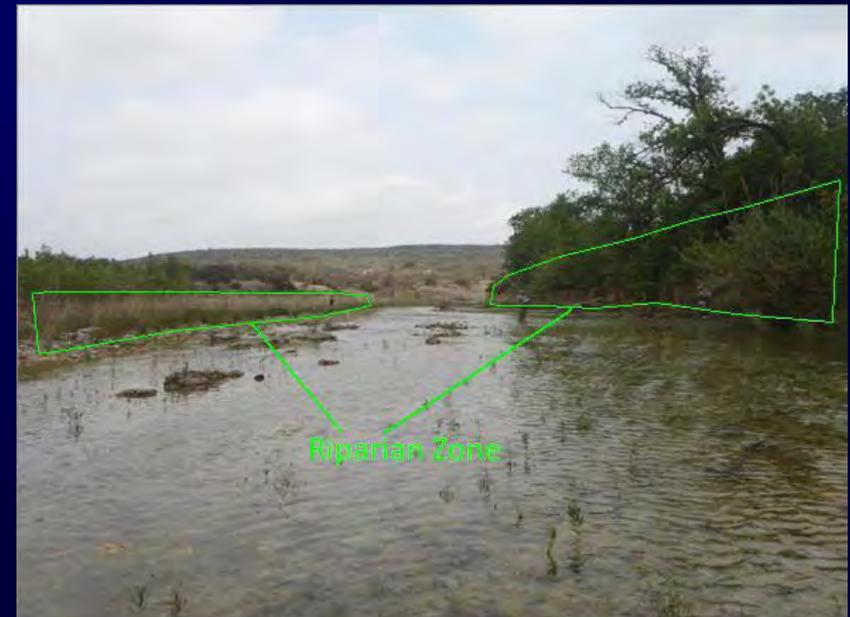


# Ecological Significance - Pulses

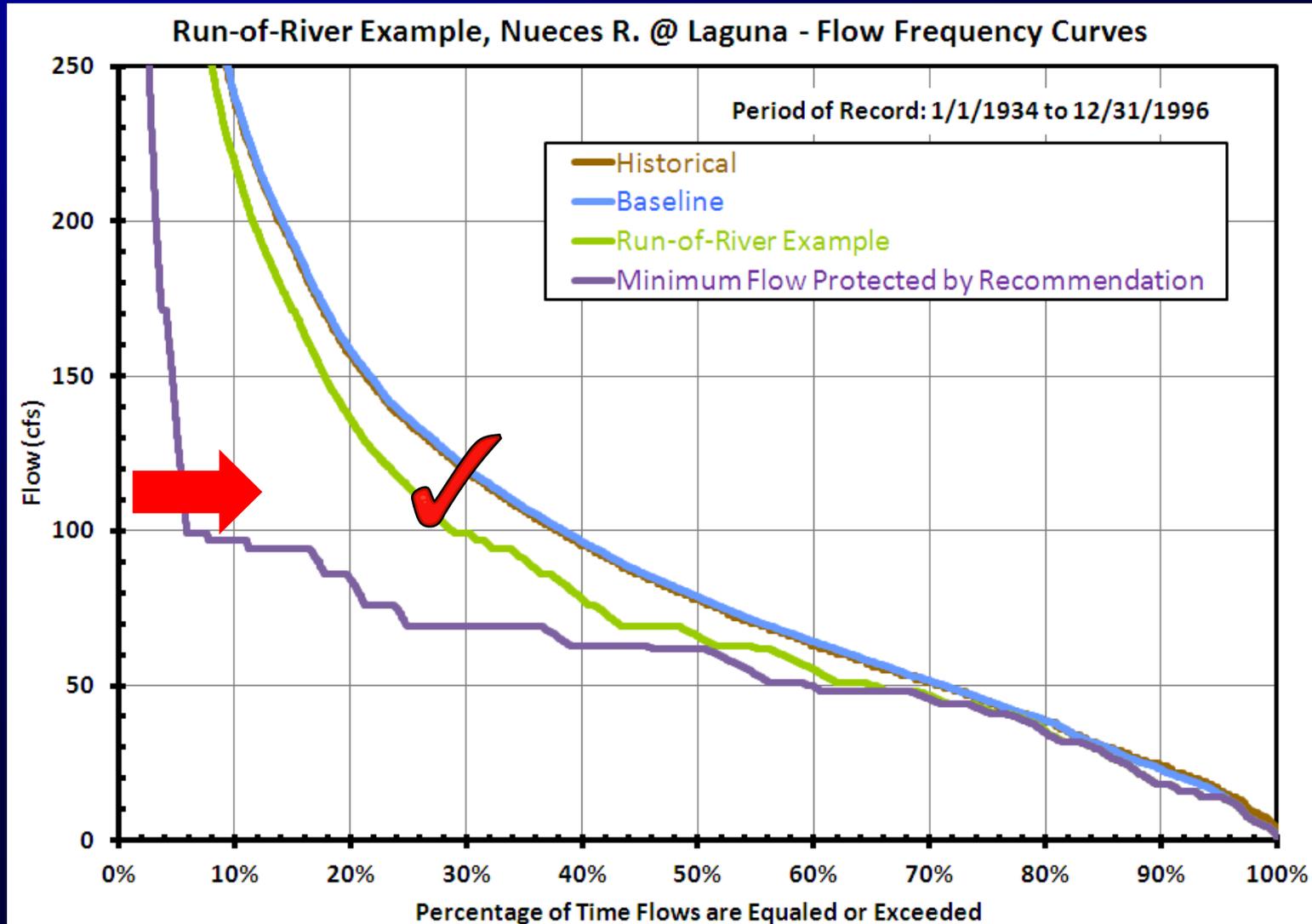
## Geomorphology



## Riparian Ecology



# Example Application of Instream Flow Regime Recommendations



# ***Questions, Comments, & Discussion***

