

***Nueces River and Corpus Christi and Baffin Bays  
Basin & Bay Expert Science Team***

**Introduction to  
Flow Regime Recommendation  
Implementation Concepts**

**April 29, 2011**

# Flow Regime Recommendation San Antonio River @ Goliad

|                                |  |     |     |   |     |     |   |     |     |   |     |     |
|--------------------------------|--|-----|-----|---|-----|-----|---|-----|-----|---|-----|-----|
| <b>Overbank Flows</b>          | Qp: 23,600 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 273,000<br>Duration Bound is 69 |     |     |   |     |     |   |     |     |   |     |     |
|                                | Qp: 10,600 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 107,000<br>Duration Bound is 45 |     |     |   |     |     |   |     |     |   |     |     |
|                                | Qp: 7,680 cfs with Average Frequency 1 per year<br>Regressed Volume is 73,500<br>Duration Bound is 38      |     |     |   |     |     |   |     |     |   |     |     |
| <b>High Flow Pulses</b>        | Qp: 1,520 cfs with Average Frequency 1 per season<br>Regressed Volume is 12,800<br>Duration Bound is 19    |     |     | Qp: 3,540 cfs with Average Frequency 1 per season<br>Regressed Volume is 30,000<br>Duration Bound is 24 |     |     | Qp: 1,640 cfs with Average Frequency 1 per season<br>Regressed Volume is 11,200<br>Duration Bound is 16 |     |     | Qp: 2,320 cfs with Average Frequency 1 per season<br>Regressed Volume is 17,600<br>Duration Bound is 19 |     |     |
|                                | Qp: 550 cfs with Average Frequency 2 per season<br>Regressed Volume is 3,940<br>Duration Bound is 11       |     |     | Qp: 1,570 cfs with Average Frequency 2 per season<br>Regressed Volume is 11,300<br>Duration Bound is 16 |     |     | Qp: 750 cfs with Average Frequency 2 per season<br>Regressed Volume is 4,450<br>Duration Bound is 10    |     |     | Qp: 780 cfs with Average Frequency 2 per season<br>Regressed Volume is 5,070<br>Duration Bound is 11    |     |     |
| <b>Base Flows (cfs)</b>        | 290  |     |     | 280   |     |     | 220   |     |     | 270   |     |     |
|                                | 200  |     |     | 180   |     |     | 150   |     |     | 200   |     |     |
|                                | 140  |     |     | 130   |     |     | 120   |     |     | 130   |     |     |
| <b>Subsistence Flows (cfs)</b> | 76   |     |     | 60  |     |     | 54  |     |     | 66  |     |     |
|                                | Jan  | Feb | Mar | Apr   | May | Jun | Jul   | Aug | Sep | Oct   | Nov | Dec |
|                                | Winter   |     |     | Spring  |     |     | Summer  |     |     | Fall  |     |     |

Wet

Avg

Dry

|                    |                    |
|--------------------|--------------------|
| <b>Flow Levels</b> | High (75th %ile)   |
|                    | Medium (50th %ile) |
|                    | Low (25th %ile)    |
|                    | Subsistence        |

Notes:

1. Period of Record used : 1/1/1940 to 12/31/1969.
2. Volumes are in acre-feet and durations are in days.

# ***Hydrologic Conditions***

- 1) Use reservoir storage and/or cumulative flow volumes to define seasonal hydrologic conditions. May select volumes such that dry, average, and wet conditions will apply 25%, 50%, and 25% of the time, respectively.**
- 2) Use of Choke Canyon Reservoir / Lake Corpus Christi System storage and/or 12-month cumulative flow volumes will provide adequate recognition of the persistence of drought and avoid more complex antecedent seasonal computations.**
- 3) Hydrologic conditions may:**
  - a) Be unnecessary;**
  - b) Apply only to base flows; or**
  - c) Apply to base and pulse flows.**

# ***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 five tiers of pulses (2/season, 1/season, 1/year, 1/2–years, and/or 1/5–years) are potentially applicable in a season.*

# Dry Hydrologic Condition Base Flow Application Example

## Situation

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

*\*BBEST recommendations vary.*

## 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



# ***Average Hydrologic Condition 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**



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

## **Situation**

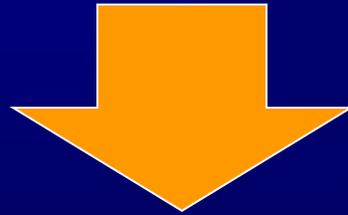
- a)  $Q < B$
- b)  $P_i > Q > B$
- c)  $Q > P_i$

## **Inflow Pass-Through**

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

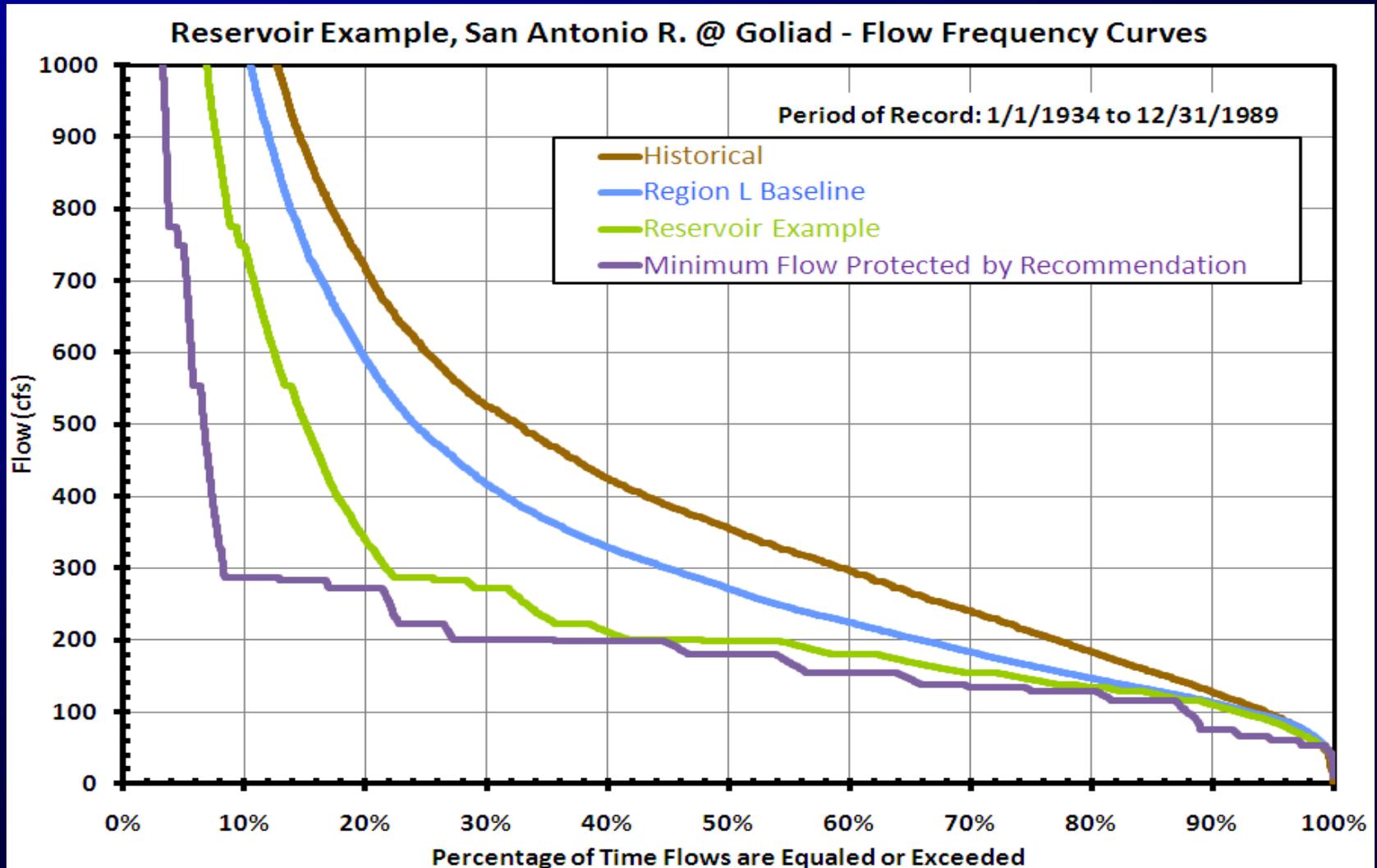


***The Flow Regime Application Tool (FRAT)  
May be Used to Perform Example  
Applications of Potential Instream Flow  
Regime Recommendations***

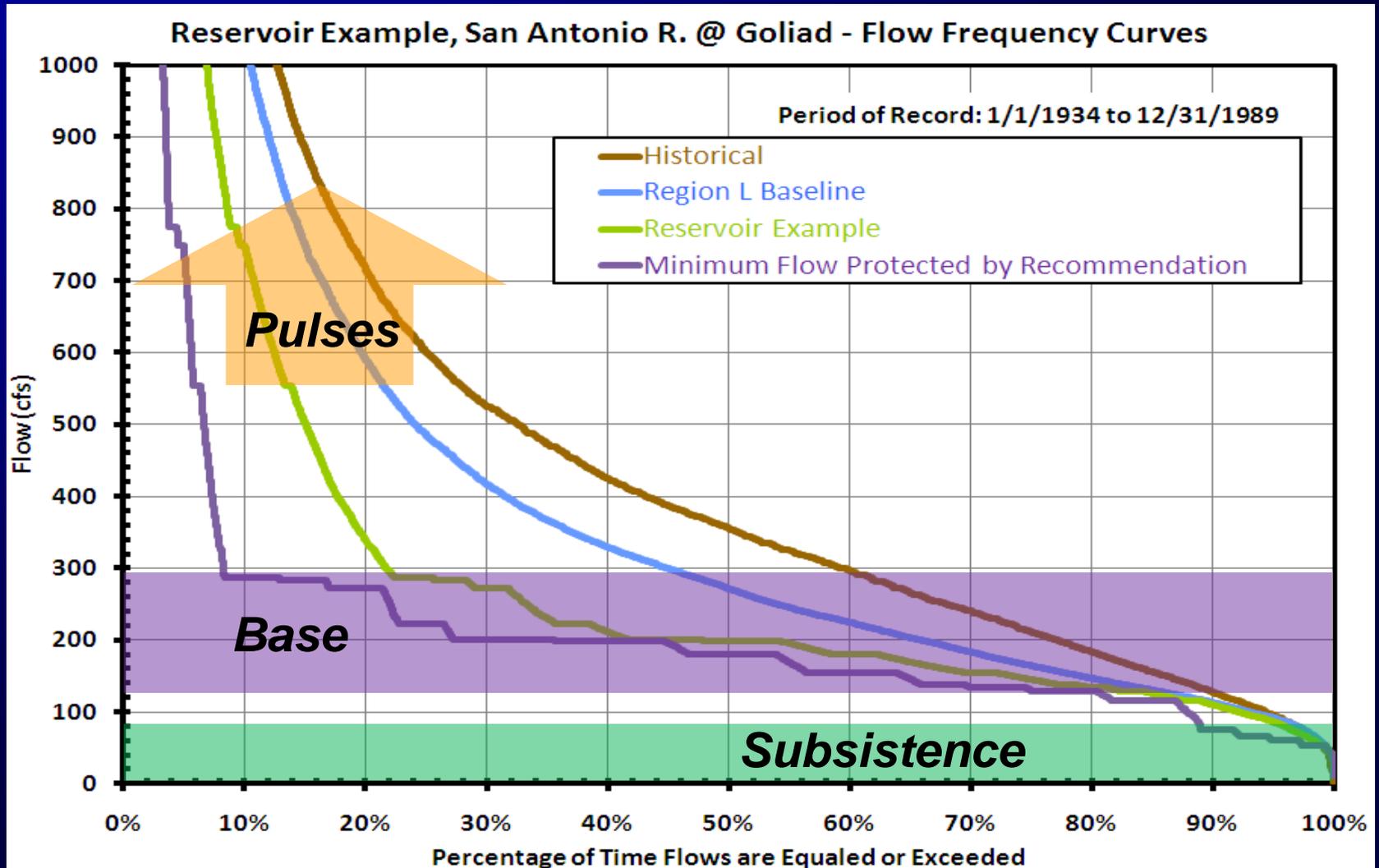


***The BBEST May Consider Resulting Flows  
to Assess Adequacy to Support a Sound  
Ecological Environment***

# Example Application of Instream Flow Regime Recommendations



# Flow Regime Components



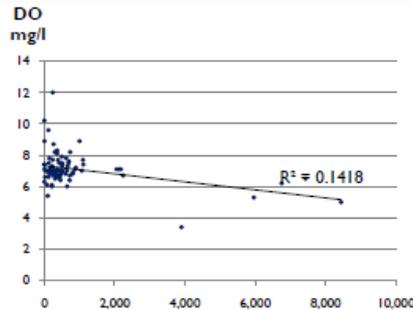
# Ecological Significance - Subsistence

## Water Quality

**12791** June - August

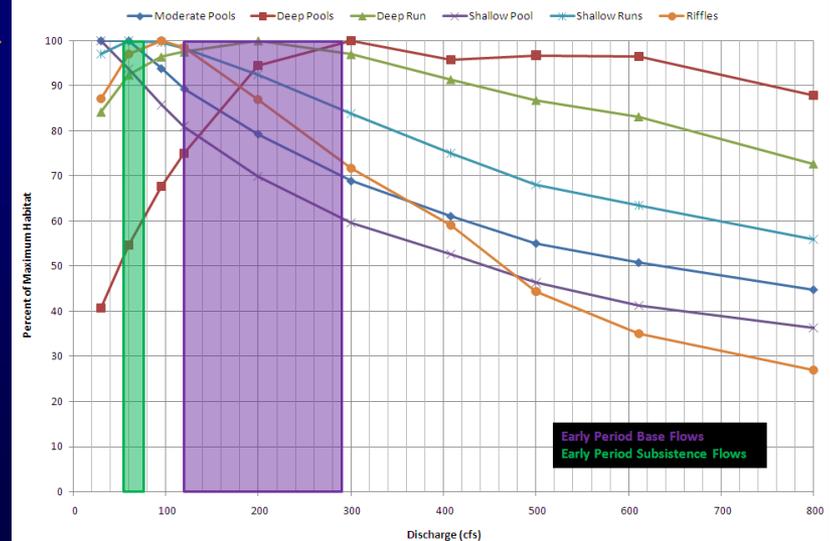
**San Antonio River at Goliad**  
08188500

12791 SAN ANTONIO RIVER AT US 77-A  
SAN ANTONIO RIVER BRIDGE ON US 77-A AND 183 SOUTHEAST  
OF GOLIAD  
same as page location 08188500 San Antonio Rv at Goliad

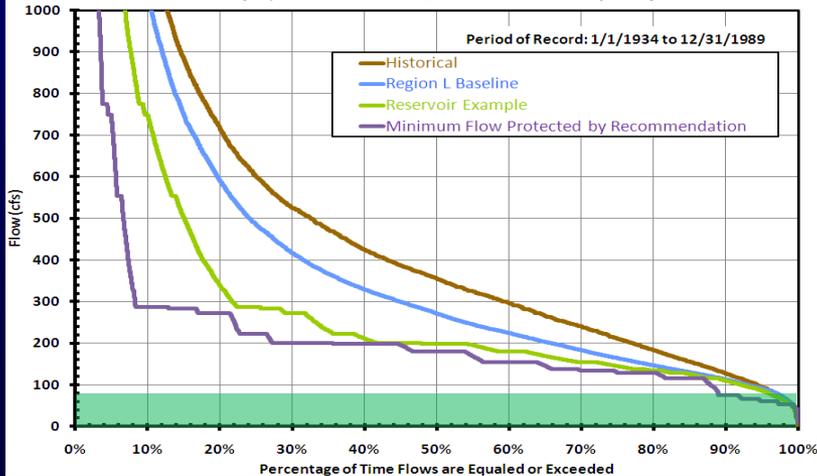


## Aquatic Habitat

San Antonio @ Goliad - LSAR Guild Results

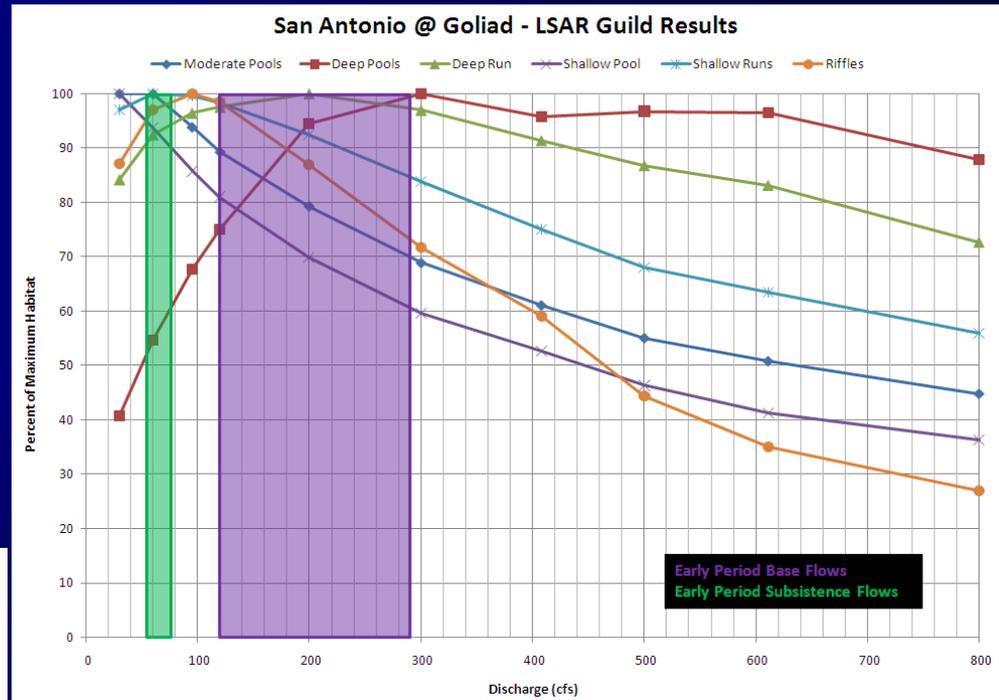
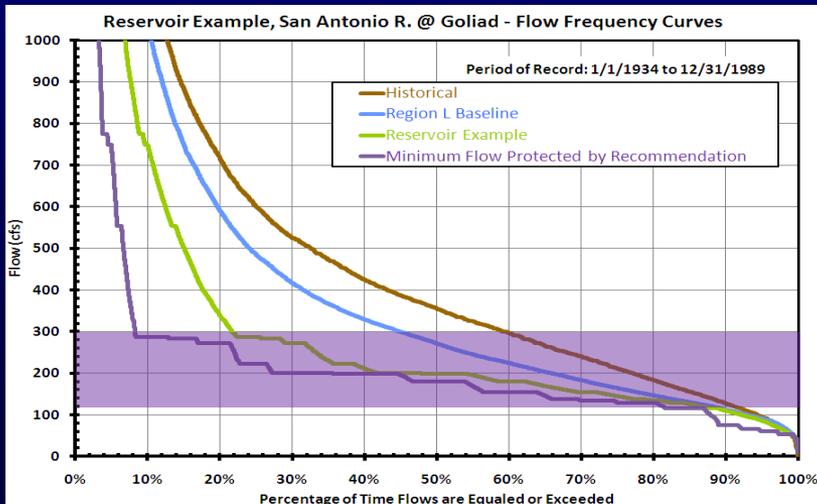


Reservoir Example, San Antonio R. @ Goliad - Flow Frequency Curves



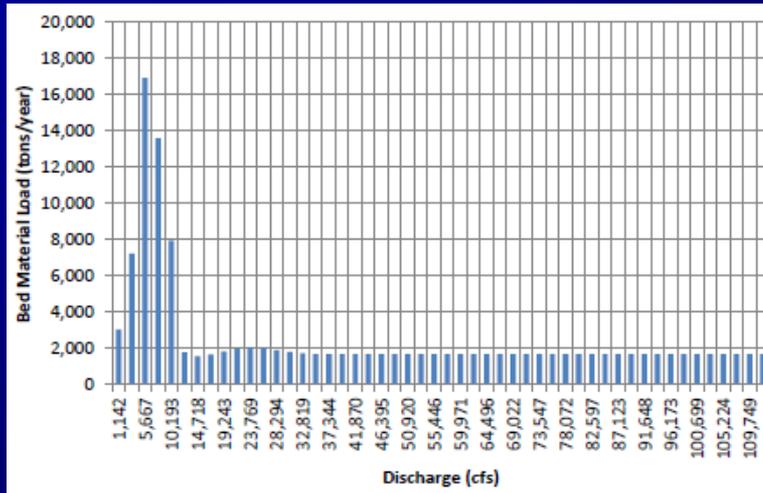
# Ecological Significance - Base

## Aquatic Habitat

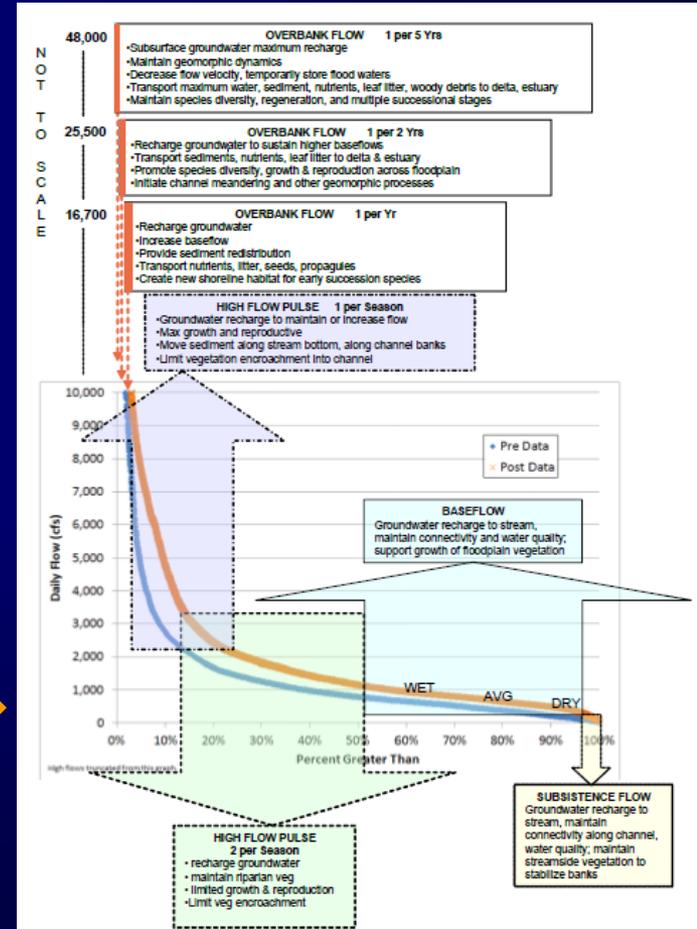


# Ecological Significance - Pulses

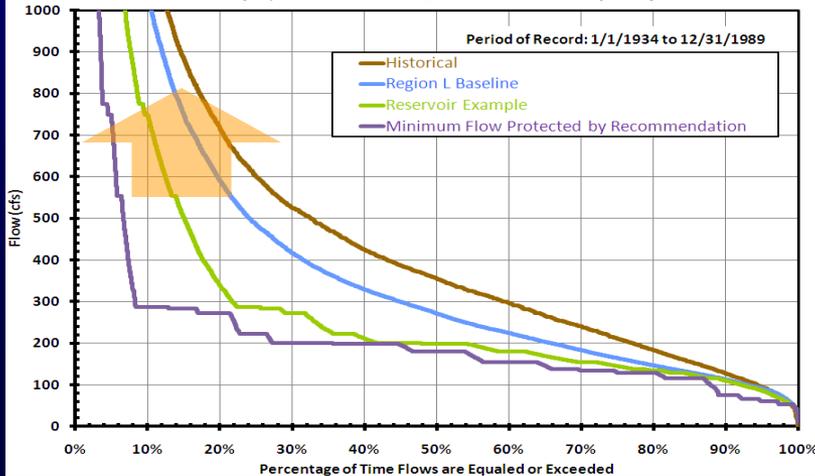
## Geomorphology



## Riparian Biology



Reservoir Example, San Antonio R. @ Goliad - Flow Frequency Curves



# Questions, Comments, & Discussion

