Assessing Instream Flow Recommendations in the Context of Water Availability Models for the Trinity and San Jacinto River Basins (Status Report)

Texas Water Development Board
Surface Water Resources

February 23, 2010

Requested Analysis:

Evaluate the T-SJ BBEST's Instream Flow Recommendations in the context of (present and future) water availability for human use and for water planning purposes.

Question:

Do existing and future river flows accommodate the recommended instream flow targets at the selected gage locations?

METHODOLOGY :: Observed and Future River Flow Scenarios

OBSERVED	WAM RUN 8	WAM RUN 3	WAM RUN 9
Gaged flows	2009 version	2009 version	2004 version + strategies
Period depends on gage location	Current use	Full use	
	Current return flows	No return flows	
	Term rights	No term rights	

<u>Translation of Monthly WAM Output into a Daily Flow Record</u>

Trinity River daily flow patterns based on gaged flow record after February 1, 2005

San Jacinto River daily flow patterns based on gaged flow record after July 1, 2003.

Data Required for this Analysis

- Hydrologic Environmental Flow Regime
- Published USGS Daily Discharge

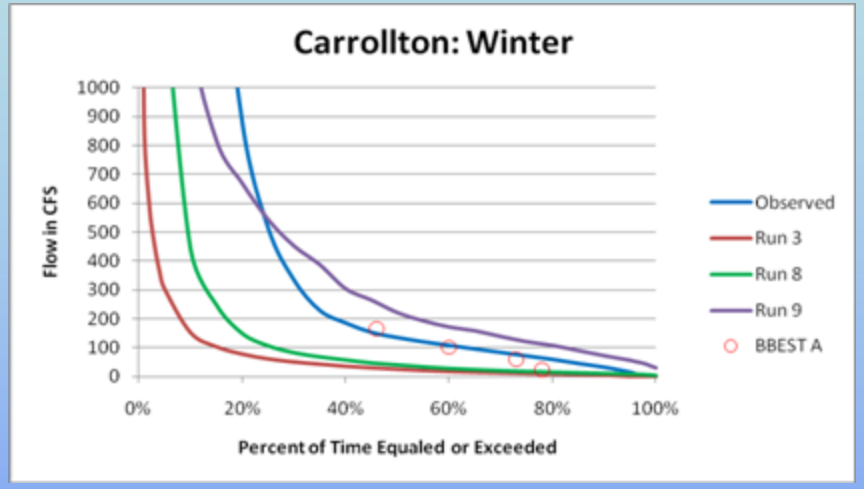
- WAM Model and Associated Inputs

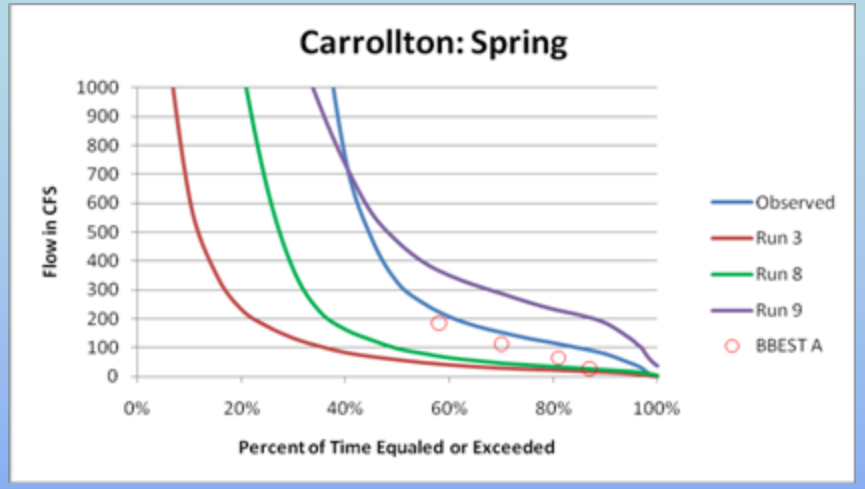
- Daily Flows Derived From WAM Model Runs

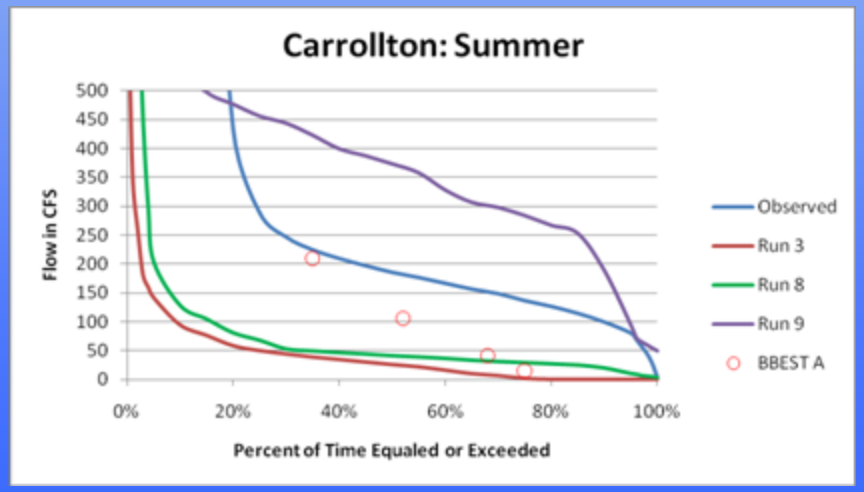
Selected Gage Locations + Period of Record for WAM and Observed Runs

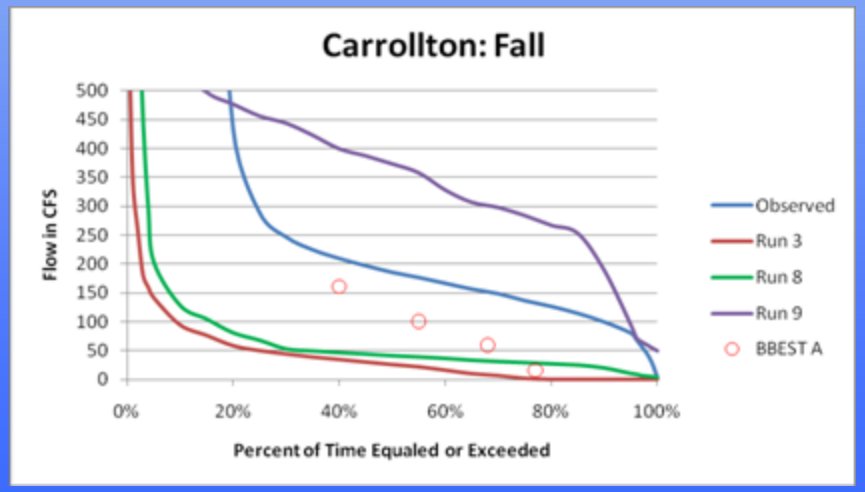
River Location	USGS Reference Gage	Observed Period of Record	WAM Control Point	WAM Period of Record
Trinity River Basin				
Rosser	8062500	1989-2008	TRRS	
Oakwood	8065000	1989-2008	TROA	
Grand Prairie	8049500	1989-2008	WTGP	
Carrollton	8055500	1989-2008	B2457C	
Romayor	8066500	1989-2008	TRRO	
Dallas	8057000	1989-2008	TRDA	1940-2008
San Jacinto River Basin				
Conroe	8068000	1974-2008	WSCN	
Spring	8068500	1940-2008	SPSP	
Cleveland	8070000	1940-2008	ESCL	
Brays Bayou at Houston	8075000	1984-2008	BRHO	
Buffalo Bayou at Piney Point	8073700	1988-2008	A5257Z	

Elm Fork Trinity River at Carrollton (DRAFT)

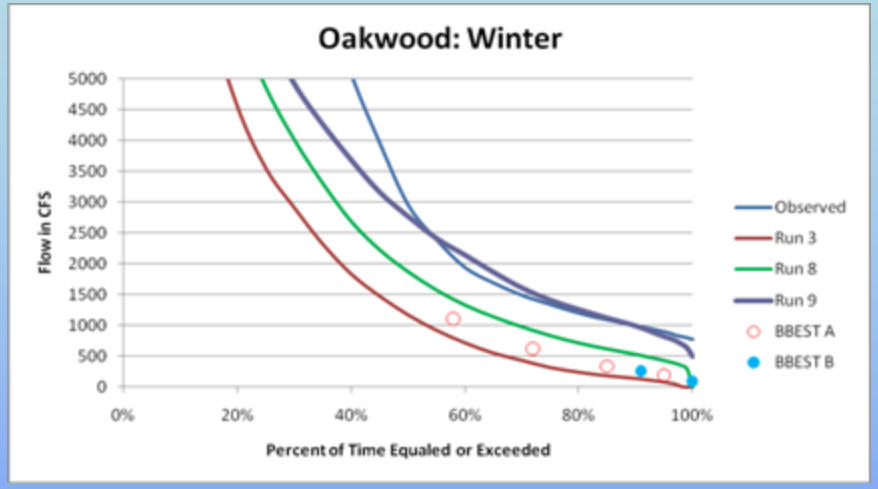


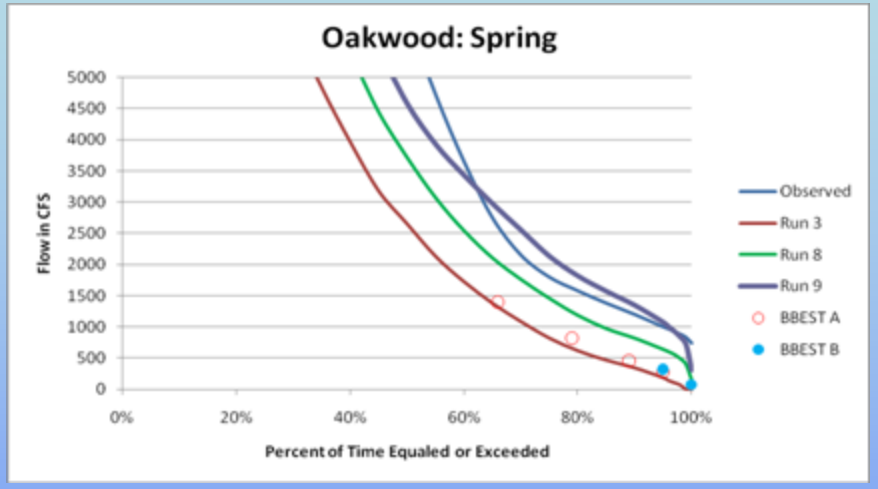


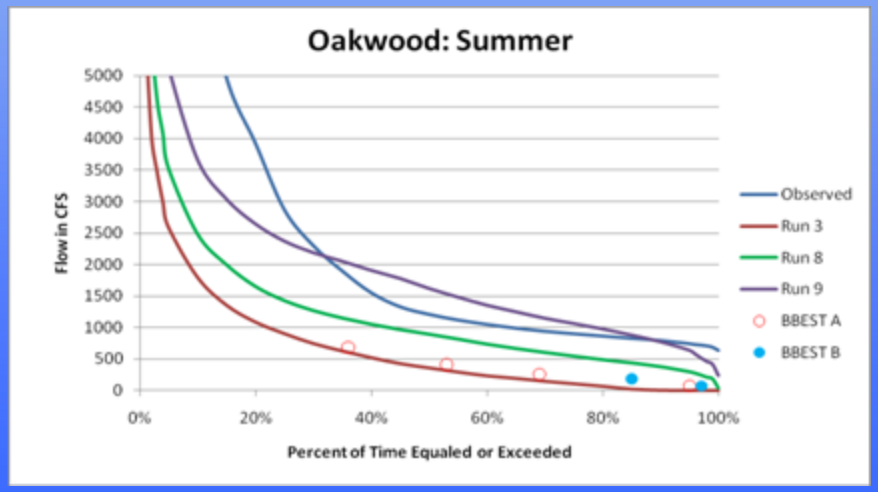


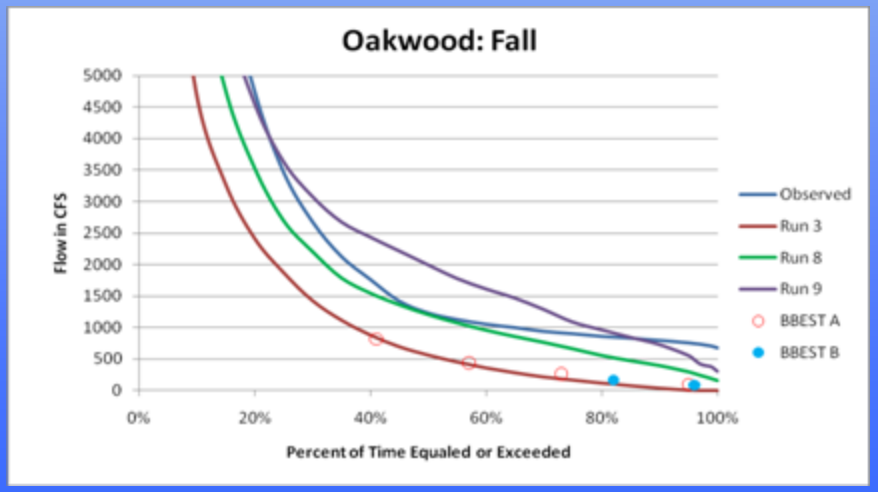


Trinity River at Oakwood (DRAFT)

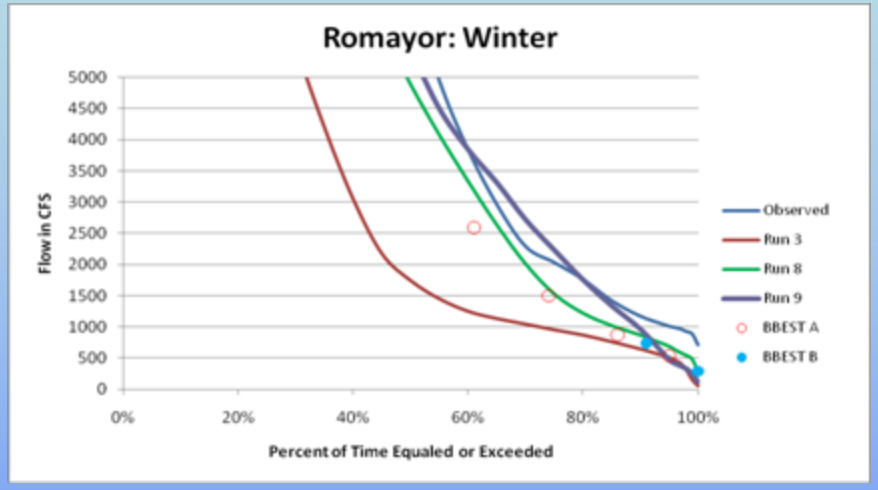


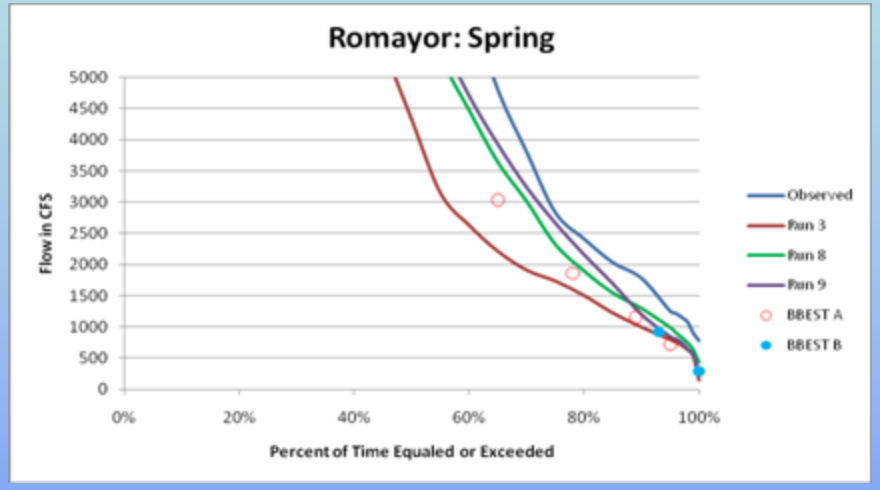


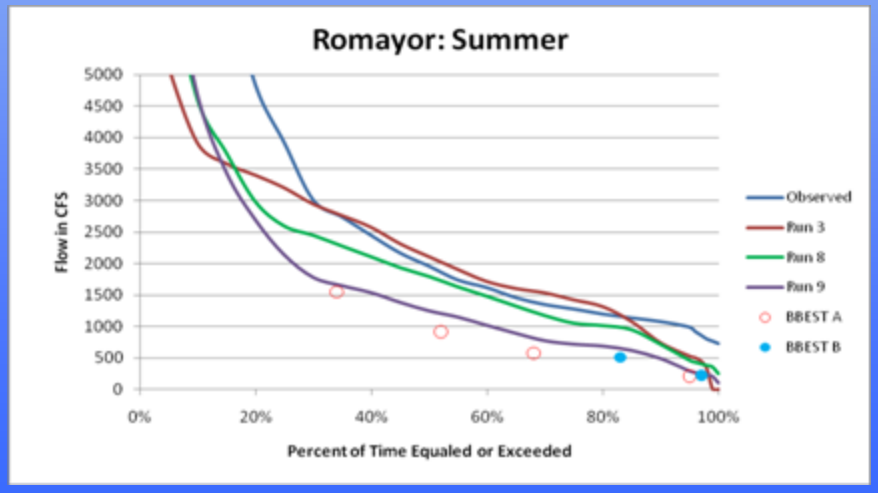


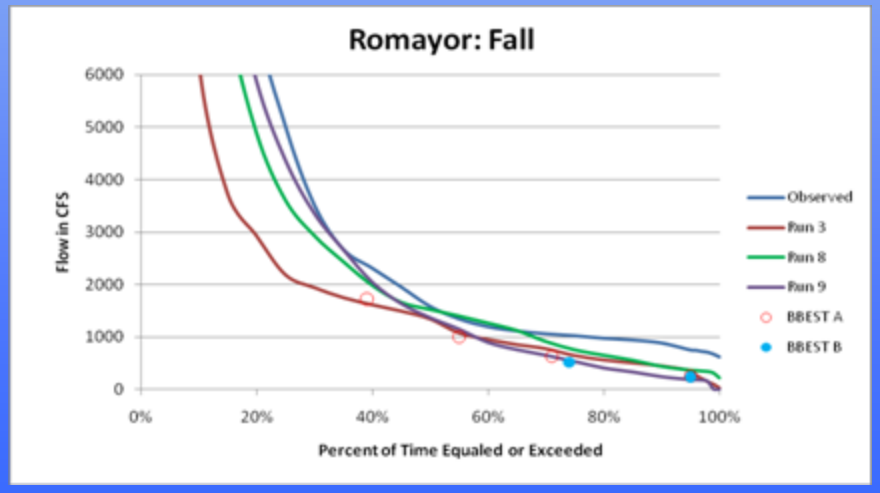


Trinity River at Romayor (DRAFT)

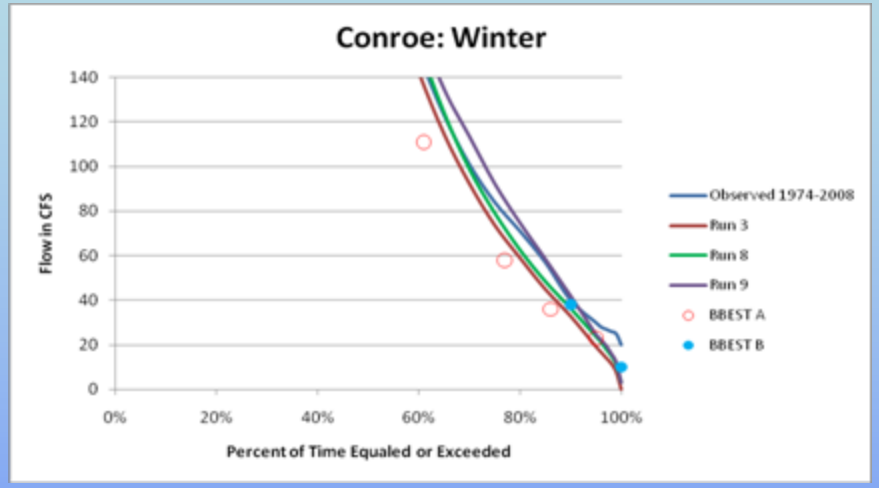


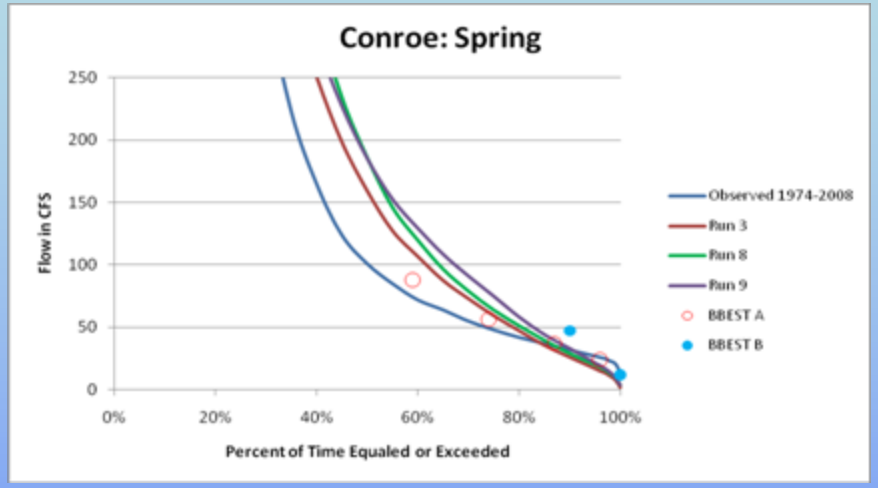


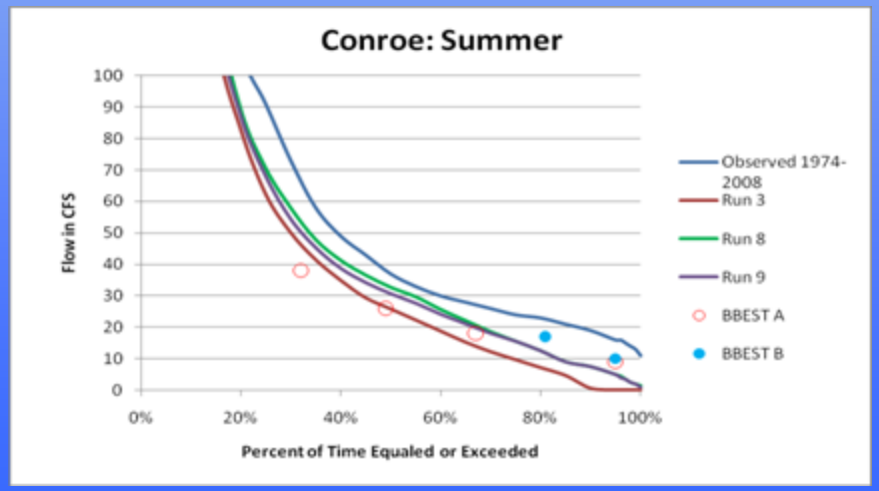


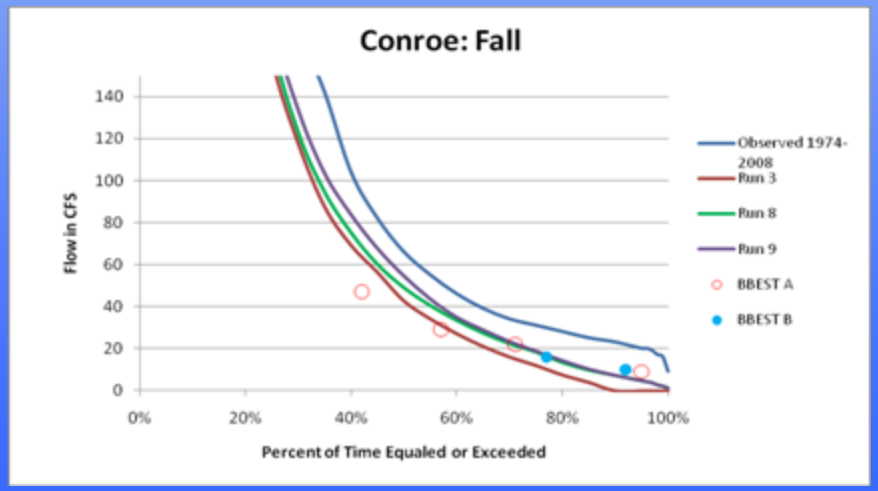


West Fork San Jacinto River near Conroe (DRAFT)

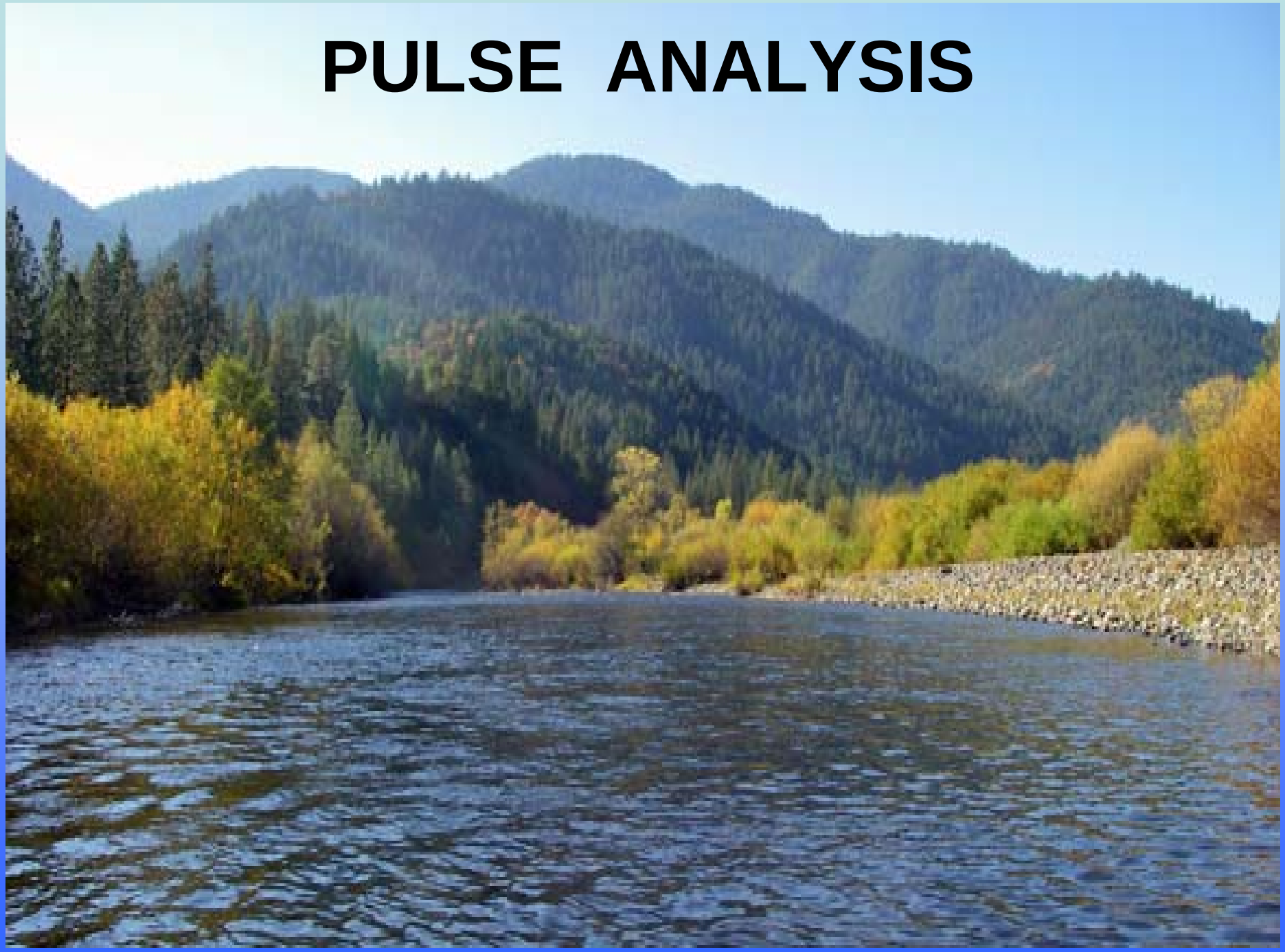








PULSE ANALYSIS



METHODOLOGY :: Overbank Flows and High Pulse Flows Analysis

- Pulse analyzed starting with Overbank Pulse, Annual High flow Pulse, Winter, Spring, Summer, and Fall Pulses
- Pulse selected determines the number days to used in a computational window
- Check computational window to see if meets the peak flow and volume requirements for selected Pulses. If not, move the window 1 day and recheck

Evaluation of Flow Components (DRAFT)

Table 1: Percent of time BBEST criteria were met from December 1940 – November 1996.

		Over Bank Flow	High Annual Pulses	Winter Pulses		Spring Pulses		Summer Pulses		Fall Pulses
				High	Low	High	Low	High	Low	
Carrollton	Total Events	16	42	17	112	13	51	6	53	17
	No. Years Criteria Met	16	18	17	56	13	23	6	25	17
	% of Time Criteria Met	29%	32%	30%	100%	23%	41%	11%	45%	30%
Oakwood	Total Events	32	79	6	112	27	70	40	112	29
	No. Years Criteria Met	32	35	6	56	27	30	40	56	29
	% of Time Criteria Met	57%	63%	11%	100%	48%	54%	71%	100%	52%
Romayor	Total Events	19	76	11	69	25	73	17	-	14
	No. Years Criteria Met	19	34	11	33	25	33	17	-	14
	% of Time Criteria Met	34%	61%	20%	59%	45%	59%	30%	-	25%
Conroe	Total Events	1	48	17	96	11	60	21	90	22
	No. Years Criteria Met	1	21	17	47	11	27	21	41	22
	% of Time Criteria Met	2%	38%	30%	84%	20%	48%	38%	73%	39%

Future Work

- Use more sophisticated Pulse Analysis
- Analyze the Following Conditions
  - Naturalized Flows
  - Observed or Historical Flows 1940-1996
  - RUN 9
  - RUN 8

METHODOLOGY :: Overbank Flows and High Pulse Flows Analysis:

Flow recommendations assign pulse durations (D), volumes (V), and peak flow magnitudes (P), and frequency (given as number per flow period, N, where flow period is 1 year or 1 season) for each overbank flow and high pulse flow. Analysis consists of:

The analysis began by examining the record for overbank flows using a sliding window to classify specific days to overbank flows or not. Starting with the first day of the full flow record, for a given overbank flow, the total flow volume was determined for a window of time equal to duration D. For this day to be classified as an overbank flow, the following must occur:

- Flow volume cannot be less than volume V;
- Daily flow rate within the window must meet or exceed peak flow (P);
- N events must not have already occurred during this flow period (which is one year for overbank flows);
- The duration, or window, cannot extend across flow periods; and,
- Data within the window must not already be assigned to another identified event.

If any of these conditions are violated, then move the sliding window forward one day in the record. Upon reaching the end of the full flow record, if no days qualify for an overbank flow even, then move on to Step 2 – High Flow Pulses and repeat the methodology using the high flow pulse criteria.

If an overbank event is detected, increment the count of events for this flow period (or one year), and eliminate the qualifying days (and flows) within the window from further consideration in the analysis. Slide the window forward past the overbank window, and if the end of the flow record is not exceeded, go to Step 2 – High Flow Pulses.