

# TWDB WAM Analysis Preliminary Results

Trinity and San Jacinto Rivers and Galveston  
Bay Basin and Bay Area Stakeholder  
Committee Meeting  
March 18, 2010

# 4 Scenarios at 3 Gage Sites

## USGS Gage Data

- “Development Data”
  - Different at each site
- “Recent Data”
  - 1981-2008

## WAM Data

- WAM 3
  - 1941-1996
- WAM 9a
  - 1941-1996

Gage Sites: **Carrollton, Conroe, and Oakwood**

# Carrollton: Peak, Volume, and Duration

	Development Data 1908-1952		Recent Data 1981-2008		WAM 3 Data 1941 - 1996		WAM 9a Data 1942 – 1996	
	Total	% of Time	Total	% of Time	Total	% of Time	Total	% of Time
Overbank	18	40%	2	7%	4	7%	19	35%
Annual High 1	24	53%	7	25%	3	5%	18	33%
Annual High 2	11	24%	1	4%	0	0%	4	7%
Winter High	13	29%	10	36%	2	4%	10	18%
Winter Low 1	30	67%	9	32%	20	36%	36	65%
Winter Low 2	19	42%	6	21%	8	14%	17	31%
Spring High	1	2%	0	0%	0	0%	2	4%
Spring Low 1	19	42%	12	43%	3	5%	19	35%
Spring Low 2	8	18%	6	21%	0	0%	3	5%
Summer High	22	49%	5	18%	2	4%	10	18%
Summer Low 1	30	67%	5	18%	7	13%	39	71%
Summer Low 2	17	38%	1	4%	1	2%	23	42%
Fall	19	42%	5	18%	6	11%	11	20%
Total Number of Pulses	231		69		56		211	
Number of Years for this Condition	45		28		56		55	

# Carrollton: Peaks Only

	Development Data 1908-1952		Recent Data 1981-2008		WAM 3 Data 1941 - 1996		WAM 9a Data 1942 - 1996	
	Total	% of Time	Total	% of Time	Total	% of Time	Total	% of Time
Overbank	25	56%	2	7%	5	9%	23	42%
Annual High 1	33	73%	7	25%	2	4%	25	45%
Annual High 2	23	51%	3	11%	1	2%	8	15%
Winter High	16	36%	16	57%	3	5%	21	38%
Winter Low 1	28	62%	22	79%	23	41%	48	87%
Winter Low 2	15	33%	16	57%	8	14%	39	71%
Spring High	6	13%	1	4%	0	0%	3	5%
Spring Low 1	29	64%	15	54%	4	7%	29	53%
Spring Low 2	11	24%	9	32%	0	0%	8	15%
Summer High	26	58%	7	25%	2	4%	20	36%
Summer Low 1	32	71%	13	46%	8	14%	49	89%
Summer Low 2	17	38%	4	14%	1	2%	36	65%
Fall	23	51%	15	54%	7	13%	32	58%
Total Number of Pulses	284		130		64		341	
Number of Years for this Condition	45		28		56		55	

# Conroe: Peaks, Volume, and Duration

	Development Data 1941-1973		Recent Data 1981-2008		WAM 3 Data 1941-1996		WAM 9 Data 1941-1996	
	Total	% of Time	Total	% of Time	Total	% of Time	Total	% of Time
Overbank	2	6%	0	0%	2	4%	1	2%
Annual High 1	20	61%	14	50%	24	43%	24	43%
Annual High 2	16	48%	10	36%	13	23%	13	23%
Winter High	9	27%	11	39%	11	20%	12	21%
Winter Low 1	23	70%	20	71%	36	64%	40	71%
Winter Low 2	13	39%	11	39%	26	46%	29	52%
Spring High	7	21%	2	7%	4	7%	4	7%
Spring Low 1	22	67%	19	68%	26	46%	31	55%
Spring Low 2	7	21%	10	36%	16	29%	17	30%
Summer High	17	52%	12	43%	25	45%	25	45%
Summer Low 1	18	55%	8	29%	17	30%	17	30%
Summer Low 2	8	24%	3	11%	5	9%	5	9%
Fall	17	52%	16	57%	23	41%	25	45%
Total Number of Pulses	179		136		228		243	
Number of Years for this Condition	33		28		56		56	

# Conroe: Peaks Only

	Development Data 1941-1973		Recent Data 1981-2008		WAM 3 Data 1941-1996		WAM 9 Data 1941-1996	
	Total	% of Time	Total	% of Time	Total	% of Time	Total	% of Time
Overbank	8	24%	6	21%	8	14%	8	14%
Annual High 1	23	70%	24	86%	39	70%	40	71%
Annual High 2	19	58%	17	61%	23	41%	23	41%
Winter High	11	33%	16	57%	20	36%	24	43%
Winter Low 1	22	67%	24	86%	40	71%	45	80%
Winter Low 2	9	27%	17	61%	26	46%	29	52%
Spring High	9	27%	10	36%	7	13%	10	18%
Spring Low 1	21	64%	24	86%	35	63%	39	70%
Spring Low 2	9	27%	13	46%	12	21%	17	30%
Summer High	19	58%	17	61%	31	55%	32	57%
Summer Low 1	22	67%	9	32%	18	32%	15	27%
Summer Low 2	11	33%	4	14%	9	16%	8	14%
Fall	18	55%	22	79%	28	50%	31	55%
Total Number of Pulses	201		203		296		321	
Number of Years for this Condition	33		28		56		56	

# Oakwood: Peak, Volume, and Duration

	Development Data 1925-1964		Recent Data 1981-2008		WAM 3 Data 1941-1996		WAM 9a Data 1941-1996	
	Total	% of Time	Total	% of Time	Total	% of Time	Total	% of Time
Overbank	19	48%	16	57%	26	46%	29	52%
Annual High 1	26	65%	13	46%	21	38%	26	46%
Annual High 2	11	28%	4	14%	4	7%	8	14%
Winter High	12	30%	5	18%	8	14%	5	9%
Winter Low 1	27	68%	18	64%	30	54%	36	64%
Winter Low 2	18	45%	9	32%	17	30%	23	41%
Spring High	3	8%	0	0%	1	2%	1	2%
Spring Low 1	25	63%	7	25%	20	36%	26	46%
Spring Low 2	8	20%	2	7%	6	11%	3	5%
Summer High	19	48%	7	25%	9	16%	12	21%
Summer Low 1	30	75%	6	21%	14	25%	17	30%
Summer Low 2	17	43%	1	4%	3	5%	4	7%
Fall	21	53%	6	21%	22	39%	20	
Total Number of Pulses	236		94		181		210	
Number of Years for this Condition	40		28		56		56	

# Oakwood: Peaks Only

	Development Data 1925-1964		Recent Data 1981-2008		WAM 3 Data 1941-1996		WAM 9a Data 1941-1996	
	Total	% of Time	Total	% of Time	Total	% of Time	Total	% of Time
Overbank	24	60%	20	71%	28	50%	39	70%
Annual High 1	32	80%	23	82%	24	43%	39	70%
Annual High 2	17	43%	17	61%	7	13%	25	45%
Winter High	14	35%	12	43%	9	16%	16	29%
Winter Low 1	24	60%	16	57%	36	64%	41	73%
Winter Low 2	15	38%	7	25%	25	45%	24	43%
Spring High	5	13%	5	18%	2	4%	6	11%
Spring Low 1	23	58%	20	71%	25	45%	43	77%
Spring Low 2	12	30%	12	43%	11	20%	21	38%
Summer High	22	55%	14	50%	22	39%	31	55%
Summer Low 1	31	78%	3	11%	6	11%	10	18%
Summer Low 2	16	40%	1	4%	1	2%	4	7%
Fall	24	60%	15	54%	28	50%	39	70%
Total Number of Pulses	259		165		224		338	
Number of Years for this Condition	40		28		56		56	



# Alternate Pulse Counting Method



Overbank	
High Annual Pulse 1	High Annual Pulse 2
High Seasonal Pulse	
Low Seasonal Pulse 1	Low Seasonal Pulse 2

# Examples: Alternate Pulse Counting Method

## **Example 1**

### 1 Overbank Winter Pulse

would count as:

- Overbank
- High Annual Pulse (1)
- High Winter Pulse
- Low Winter Pulse (1)

## **Example 2**

### 1 High Annual Pulse

would count as:

- High Annual Pulse (1)
- High Winter Pulse
- Low Winter Pulse (1)

# A Possible Methodology for Moving Forward

- 1) Select an accounting method for pulses.
- 2) Select a base condition: WAM 8 (1940-1996)?
- 3) Program the naturally occurring pulses into the WAM base data set.
- 4) Run WAM 9 and/or other WAM conditions and determine effects of Environmental Flows on Water Yield.
- 5) Convert the WAM monthly values to daily values (to ensure the pulses occur at similar frequencies as they occur in the base condition).