# Trinity San Jacinto Basin Environmental Flow Analysis

TWDB Presentation to T-SJ Stakeholders

May 5, 2010

# Trinity San Jacinto -BBASC

- Goal for Today's Presentation
  - Wrap up our analysis on the
- **Question:**
- Do existing and future river flows accommodate the recommended instream flow targets at the selected gage locations?

# Trinity San Jacinto -BBASC

| Development Period | WAM 3 "Full Use" | WAM 8 "Current" | WAM 9 "Future" |
|---|---|---|---|
| • Historical Record of gaged flows<br>• Time period is different at each location depending on when the gage was installed. | • Basis for TCEQ Permits<br>• Full utilization of all permitted diversions, no return flows, and no term rights<br>• 1940-1996 | • Current diversion (based on the past 10-year maximum diversion), current return flows (based on the past 5-year maximum return flow) and term rights<br>• 1940-1996 | • Water management strategies developed in the 2007 State Water Plan, including anticipated future demand and reservoir capacity for 2060<br>• 1940-1996 |

# Trinity San Jacinto -BBASC

- Review the results our WAM analysis
  - San Jacinto
    - WAM 3
    - WAM 8
    - WAM 9
  - WAM 3 run applying Environmental Flow requirements to  a new strategy in San Jacinto Basin
  - Trinity
    - WAM 3 and 8

# Trinity San Jacinto -BBASC

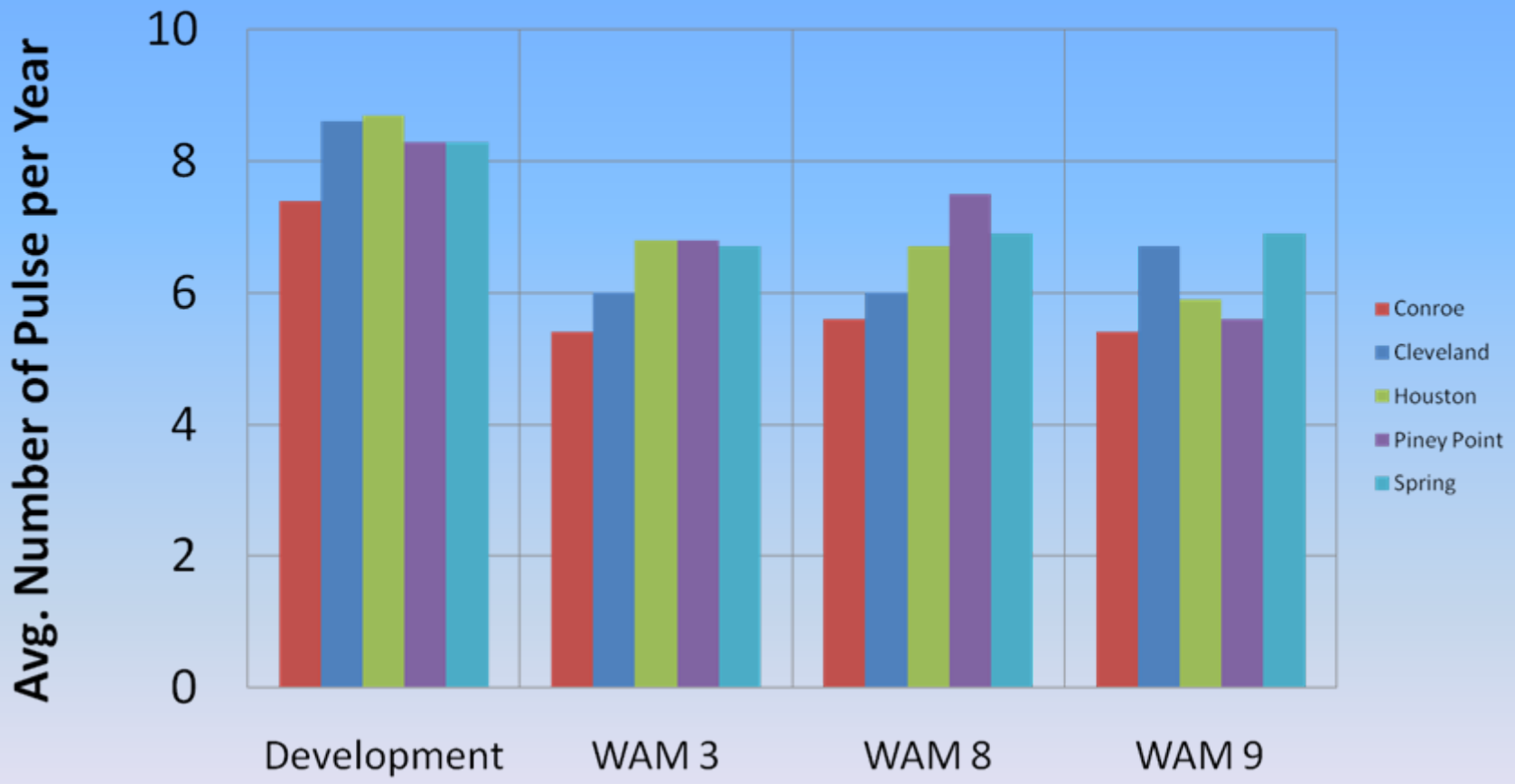
- The first part of this presentation focuses on the amount of water flowing past a gage site using the existing conditions-WAM 8 and WAM 9 developed for planning studies.

- WAM 9 future strategies may or may not be permittable by TCEQ with or without Environmental Flow requirements.

# Attainment Frequencies of Subsistence and Base Flows at Spring

| Season | Condition | Recommended Flow (cfs) | Recommended Frequency | Development 1940-2007 | WAM 3 : FULL 1940-1996 | WAM 8: CURRENT 1940-1996 | WAM 9: FUTURE 1940-1996 |
|---|---|---|---|---|---|---|---|
| Winter | Subsistence | 14 | 95% | 96% | 94% | 98% | 98% |
| | Dry | 22 | 86% | 86% | 83% | 92% | 92% |
| | Average | 36 | 74% | 74% | 70% | 74% | 75% |
| | Wet | 59 | 60% | 60% | 56% | 58% | 59% |
| Spring | Subsistence | 14 | 96% | 96% | 94% | 98% | 98% |
| | Dry | 24 | 86% | 86% | 81% | 89% | 89% |
| | Average | 36 | 72% | 72% | 67% | 74% | 74% |
| | Wet | 52 | 57% | 57% | 53% | 58% | 58% |
| Summer | Subsistence | 6 | 95% | 94% | 93% | 100% | 99% |
| | Dry | 17 | 71% | 71% | 62% | 83% | 83% |
| | Average | 24 | 56% | 56% | 47% | 65% | 64% |
| | Wet | 35 | 39% | 39% | 31% | 42% | 41% |
| Fall | Subsistence | 6 | 95% | 95% | 93% | 100% | 100% |
| | Dry | 17 | 75% | 75% | 66% | 84% | 84% |
| | Average | 24 | 61% | 61% | 52% | 68% | 68% |
| | Wet | 37 | 45% | 45% | 38% | 45% | 45% |

# San Jacinto
# Average Annual Pulse Count

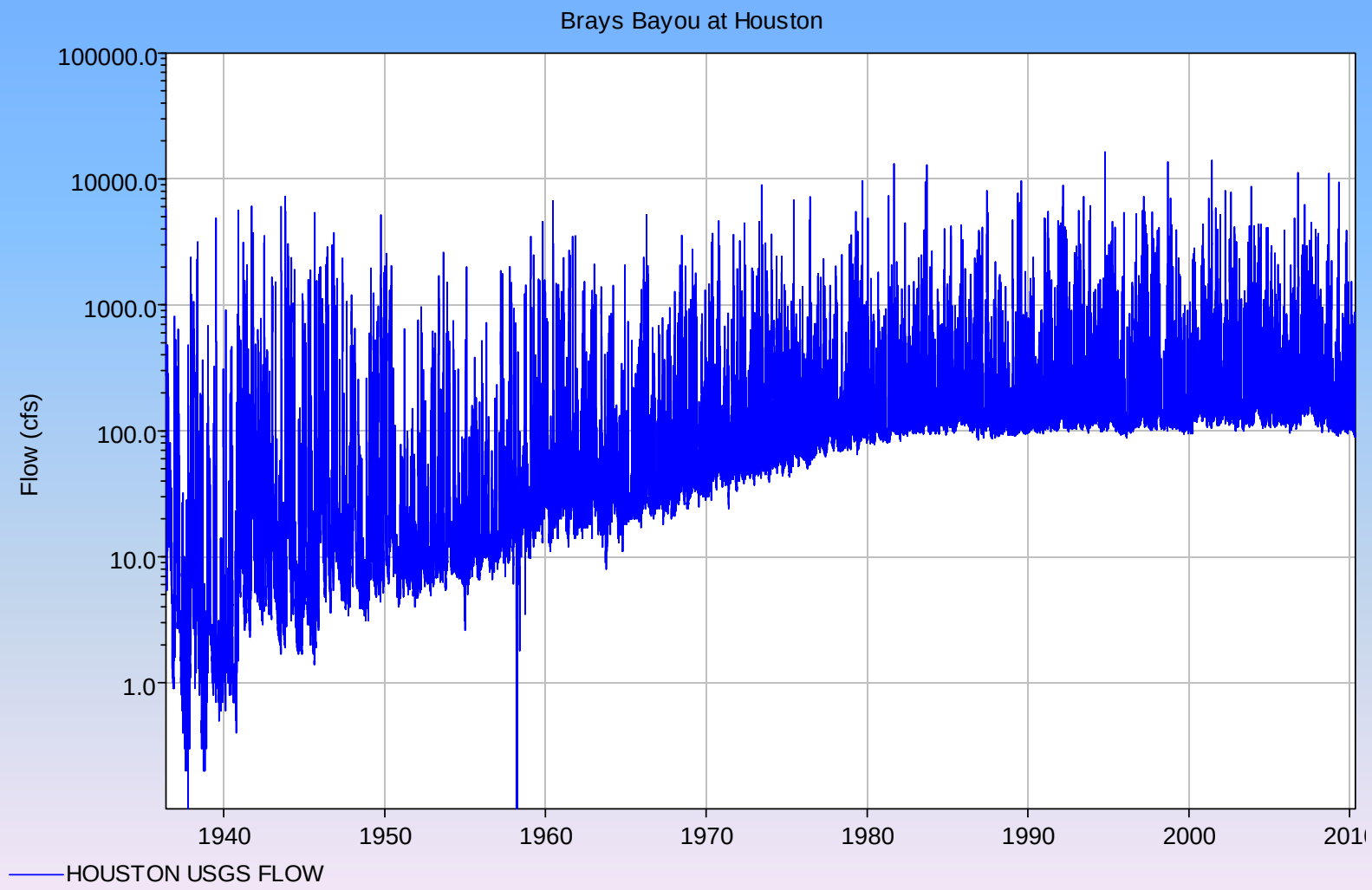


# San Jacinto Basin

Average of Exceedance or Deficit in Meeting Base Flows
for All Seasons

| Station | WAM 3 - recommended | WAM 8 - -recommended | WAM 9 - recommended |
|---|---|---|---|
| **Spring** | **-5%** | **4%** | **4%** |
| **Houston** | **18%** | **27%** | **26%** |
| **Conroe** | **-7%** | **-1%** | **-3%** |
| **Cleveland** | **-5%** | **-5%** | **-2%** |

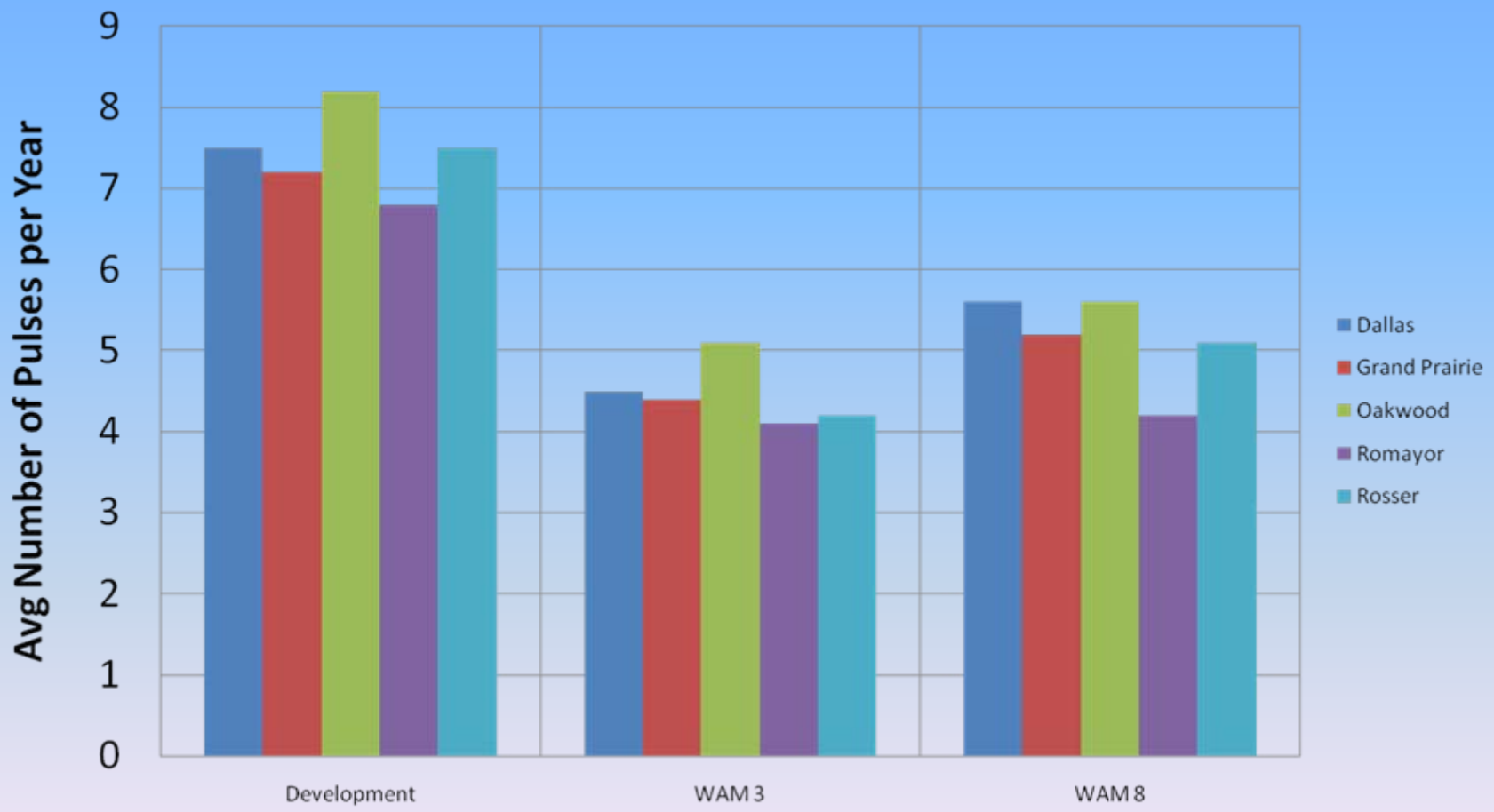
# Brays Bayou


Brays Bayou at Houston
100000.0
10000.0
1000.0
100.0
10.0
1.0
Flow (cfs)
1940
1950
1960
1970
1980
1990
2000
HOUSTON USGS FLOW

# San Jacinto Conclusions

- *In almost all Cases WAM 3, WAM 8 and WAM 9 have 1 to 2 Pulses less per year than occurred during the development period*
- *Not a significant difference between WAM runs 3, 8 and 9*
- *Base flows sufficient to meet BBEST recommendations in WAM 3, 8 and 9*

# Trinity River
# Average Annual Pulse Count



# Trinity Basin

Average of exceedence or deficit in meeting base flows recommendation for all seasons

| Station | WAM 3 - recommended | WAM 8 - recommended | WAM 9 - recommended |
|---|---|---|---|
| Dallas | -15% | 23% | |
| Grand Prairie | -20% | 23% | |
| Oakwood | -11% | 12% | |
| Romayor | 1% | 7% | |
| Rosser | -24% | 14% | |

# Trinity River Conclusions

- *WAM 8 averages about 2 Pulses less per year than occurred during the Regime development period.*
- *WAM 3 average about 3 Pulses less per year than occurred during the Regime development period.*
- *Base flow less than the recommended at 4 of 5 gages for WAM 3 Dallas, Grand Prairie, Rosser, Oakwood.*

# Trinity River Conclusions

- *For WAM 8 all of the gages exceeded the average base flow requirements.*

# Water Supply  Hydrology

# WAM 3 with a New Strategy

Step 1

- Agree on  WAM 3 model for The San Jacinto Basin

Step 2

- Run WAM 3 without the new strategies to develop environmental flow requirements

Step 3

- Run WAM 3 with the new strategies without environmental flow requirements

Step 4

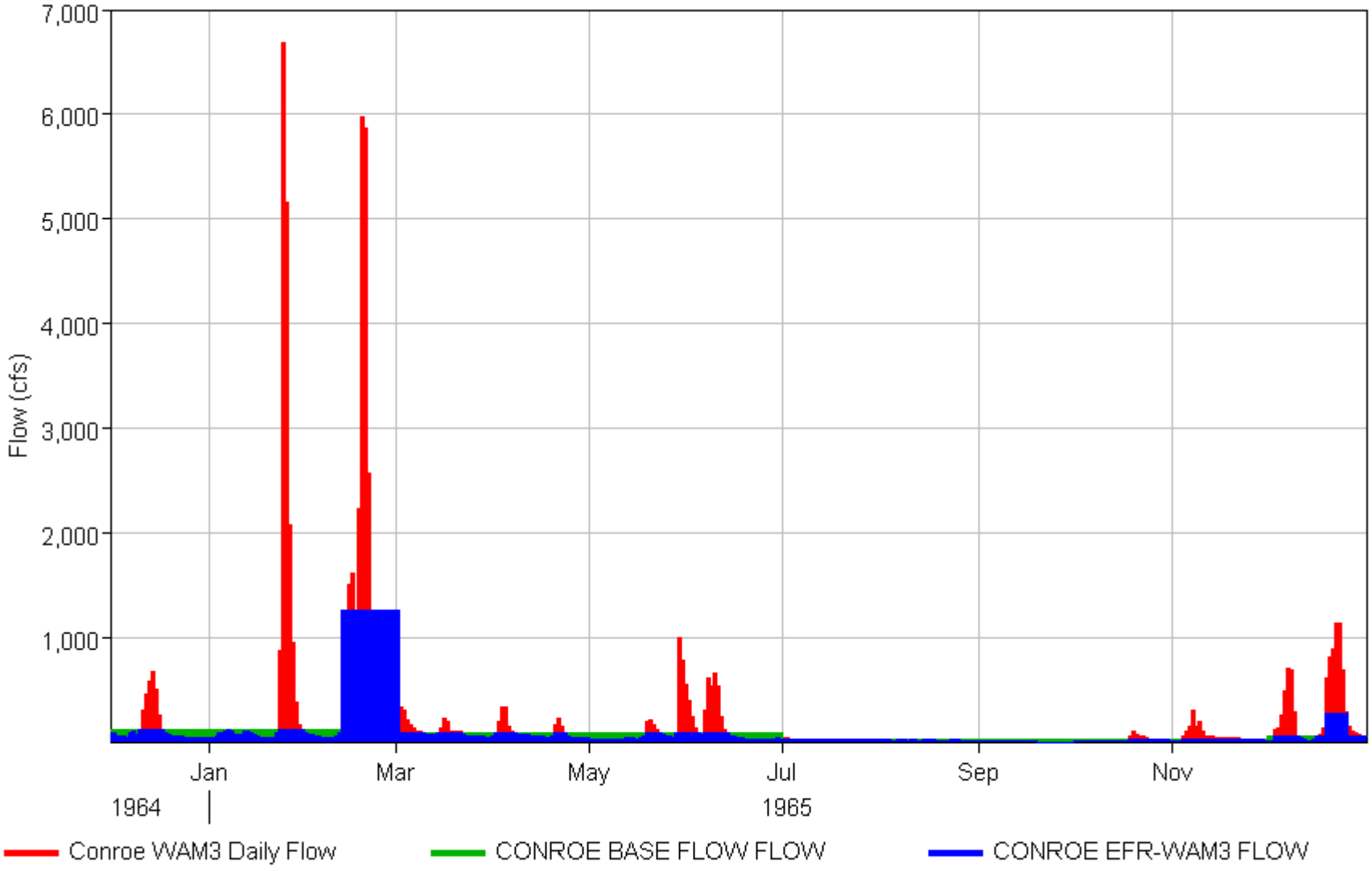
- Run WAM 3 with the new strategies with environmental flow requirements

# Water Supply Hydrology

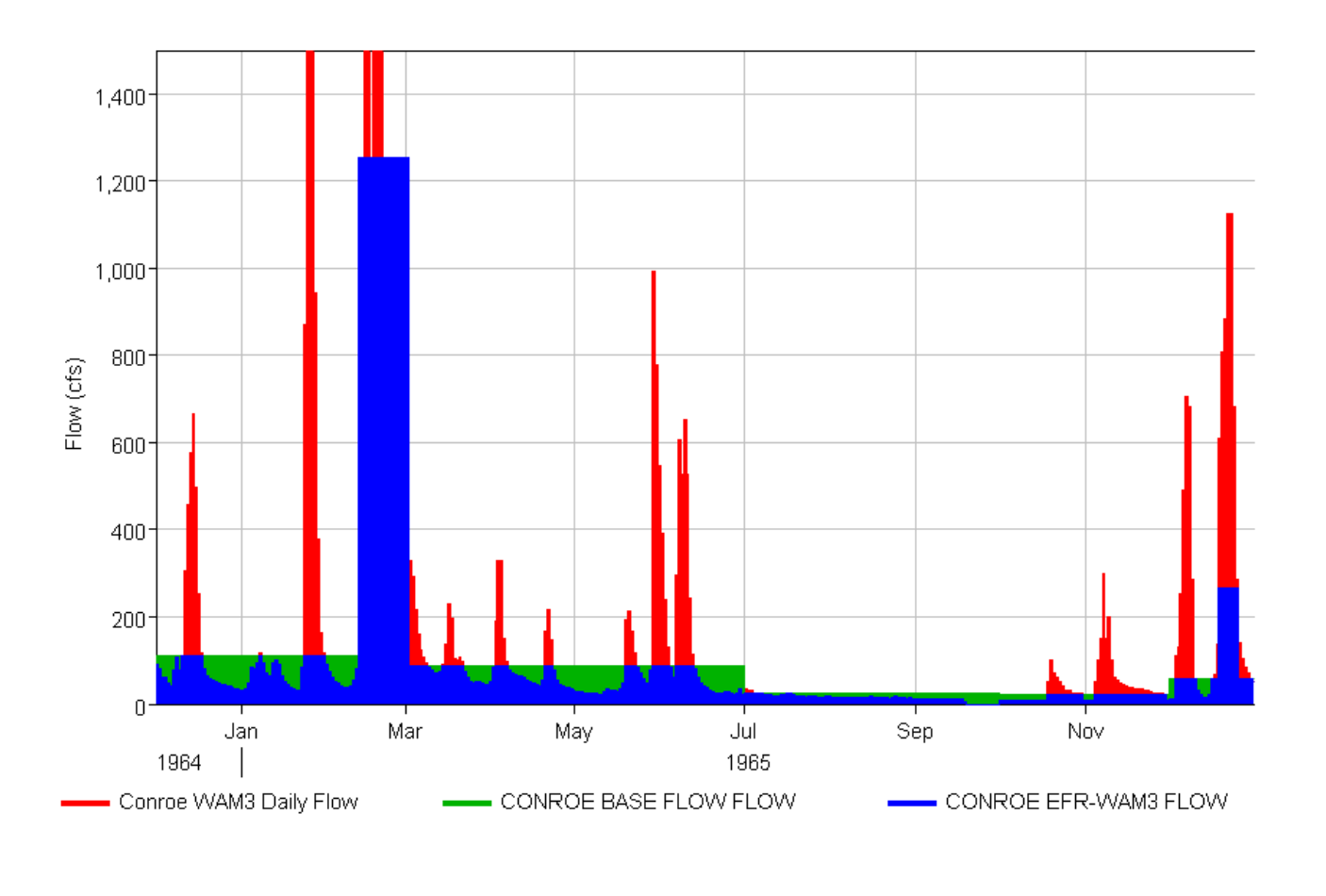
- The WAM 3 run with a new strategies requires 4 sets of Environmental Flow requirements
  - Brays Bayou Houston used at it actual location
  - Brays Bayou Houston duplicated twice and used a additional locations
  - Piney Point Environmental flow requirements are moved to point downstream diversion point

# Water Supply  Hydrology

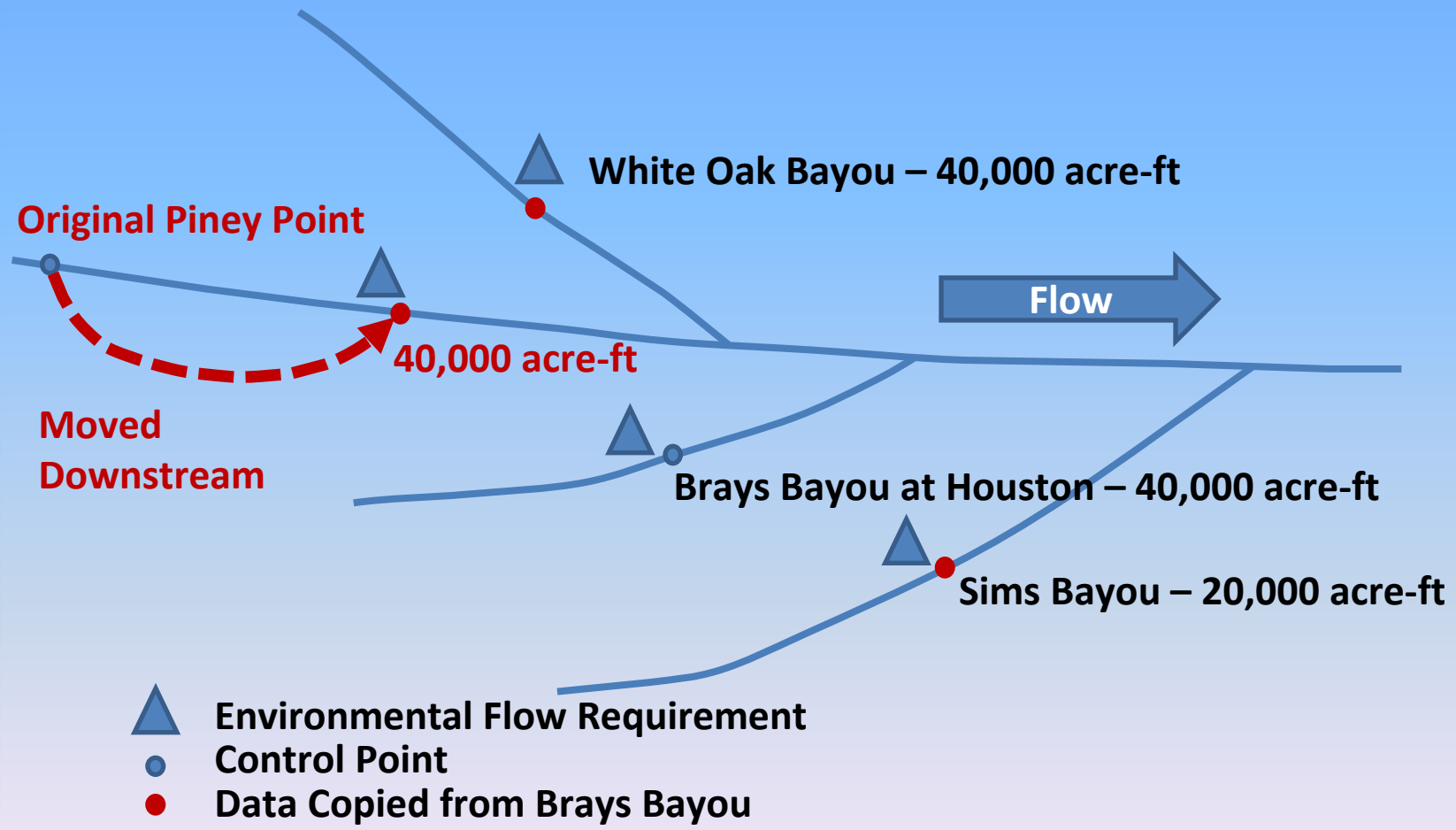
- Piney Point had gaged records for 27 years so for remaining 30 years gage date from  nearby gage was used to create the 57 year record.


7,000
6,000
5,000
4,000
3,000
2,000
1,000
Flow (cfs)
Jan
Mar
May
Jul
Sep
Nov
1964
1965
Conroe WAM3 Daily Flow
CONROE BASE FLOW FLOW
CONROE EFR-WAM3 FLOW

# WAM 3 Run with a New Strategies



# WAM 3 Example Implementation



# WAM 3 with a New Strategy

| Water Diversions | Mean Shortage (ac-ft) | |
|---|---|---|
| | W/ FLOW REQ | W/O FLOW REQ |
| NEWWRWO | 16153 | 11938 |
| NEWWRBR | 12109 | 9469 |
| NEWWRSB | 6985 | 4006 |
| NEWWRBU | 18367 | 11217 |
| **Total** | 53614 | 36631 |
| Water Diversions | Volume Reliability (%) | |
| | W/ FLOW REQ | W/O FLOW REQ |
| NEWWRWO | 59.62 | 70.15 |
| NEWWRBR | 69.73 | 76.33 |
| NEWWRSB | 65.08 | 79.97 |
| NEWWRBU | 69.39 | 81.31 |
| **Total** | 66.49 | 77.11 |
| Water Diversions | Period Reliability (%) | |
| | W/ FLOW REQ | W/O FLOW REQ |
| NEWWRWO | 39.47 | 48.39 |
| NEWWRBR | 50.58 | 56.73 |
| NEWWRSB | 48.68 | 60.82 |
| NEWWRBU | 51.32 | 63.01 |

# WAM 3 with a New Strategy

- 80% of Environmental Flow requirements unverifiable
  - Brays Bayou gage many be representative of the other gages in the area.
- Project had significant shortfalls with out an Environmental Flow Requirements
- Environmental Flows Requirements increased shortfalls

# That’s all Folks