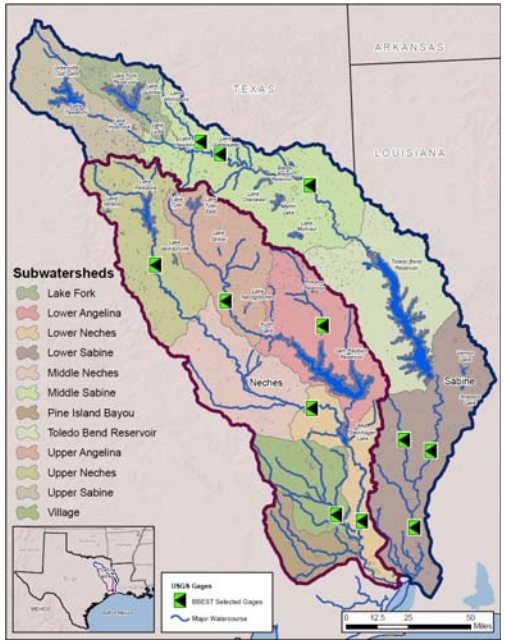

Hydrologic Analyses

SABINE-NECHES BBEST

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June 25, 2009

Topics

- Preliminary HEFR analyses
  - Method for flow classification
    - IHA
    - MBFIT
  - HEFR statistical analyses
    - Original statistical
    - Alternative frequency-based approach
- Information from Sabine and Neches WAMs
  - Seasonal classification methods
  - Available flows
- Future activities

Flow Classification

- Classify daily flow into overbank, pulse, base or subsistence
- Two methods
  - Nature Conservancy IHA method
    - Relies on rise rate, fall rate, and percentile-based threshold values
    - Primarily driven by threshold values
  - Modified Base Flow Index method (MBFIT)
    - Tracks minima in an N-day window
    - Decides whether a day is “base flow” or “pulse flow” dominated based on user input
    - Driven primarily by the length of the window (N)
    - Modified by Trungale to reclassify flows as overbank or subsistence events based on threshold values

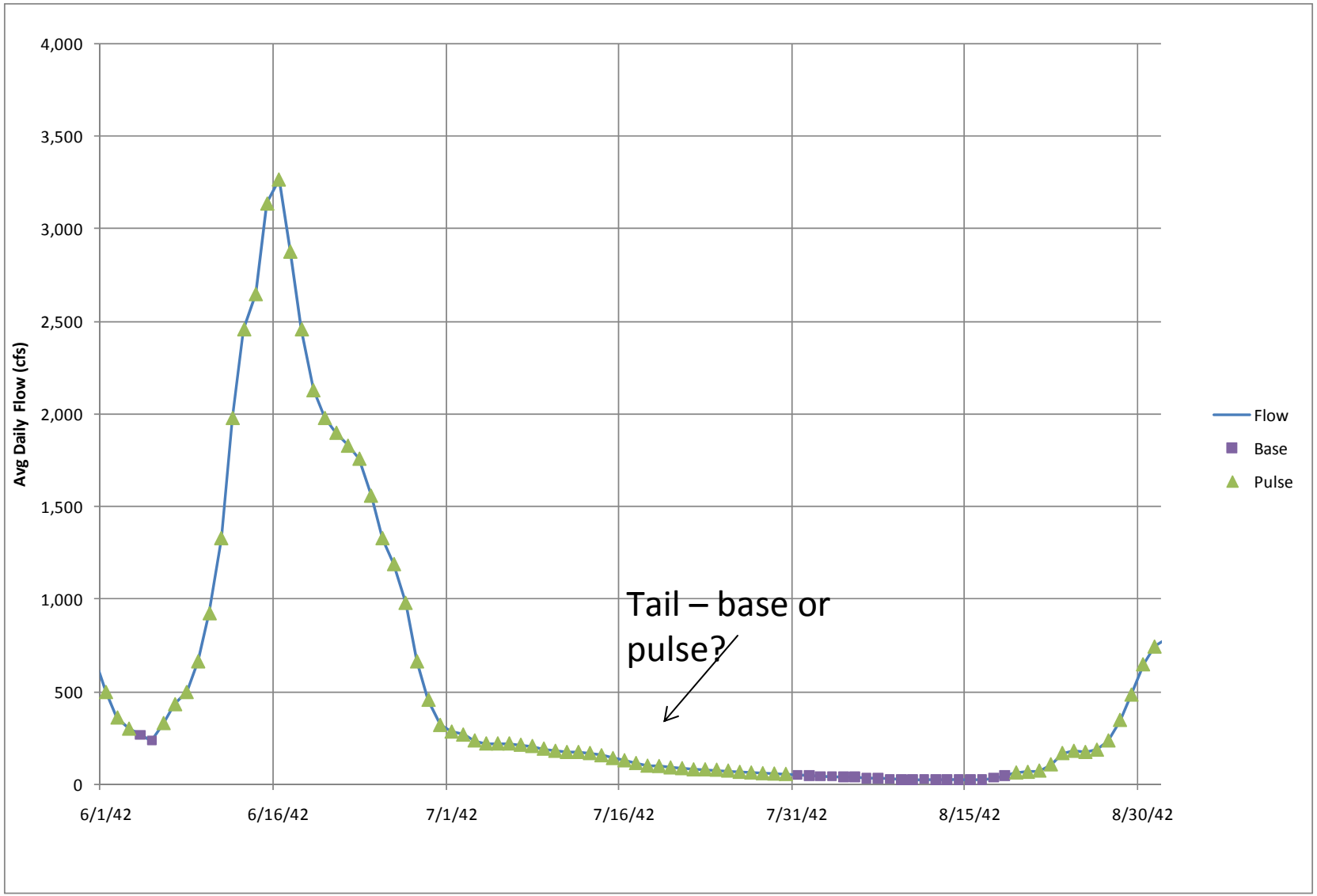
Flow Classification

- IHA Method
  - Works well if primary characteristic differentiating episodic events (pulse/overbank) from base flow events (base, subsistence) is magnitude of flow
  - Tends to classify tails of flow events as base flow events
  - Obscures higher base flow events and lower pulse flow events
- MBFIT Method
  - Preserves tails of flow events, higher base flow events and lower pulse flow events
  - Can fail when pulses are close together
  - Tends to result in more pulse days than base flow days
- Both methods produce similar results when threshold values are set closer to median (say 25th and 75th percentile)

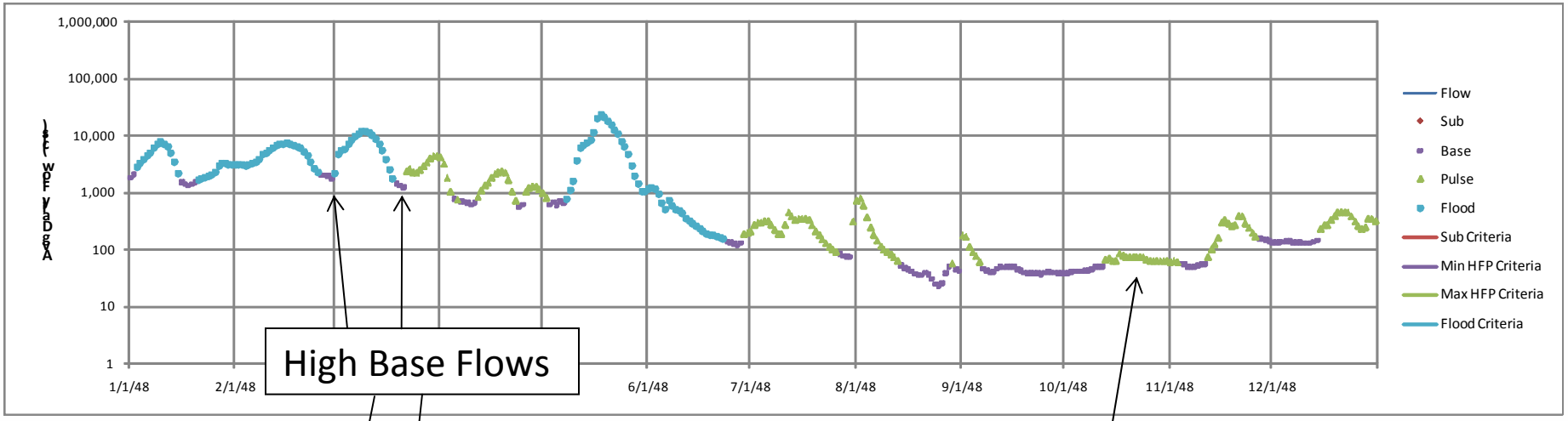
Flow Classification

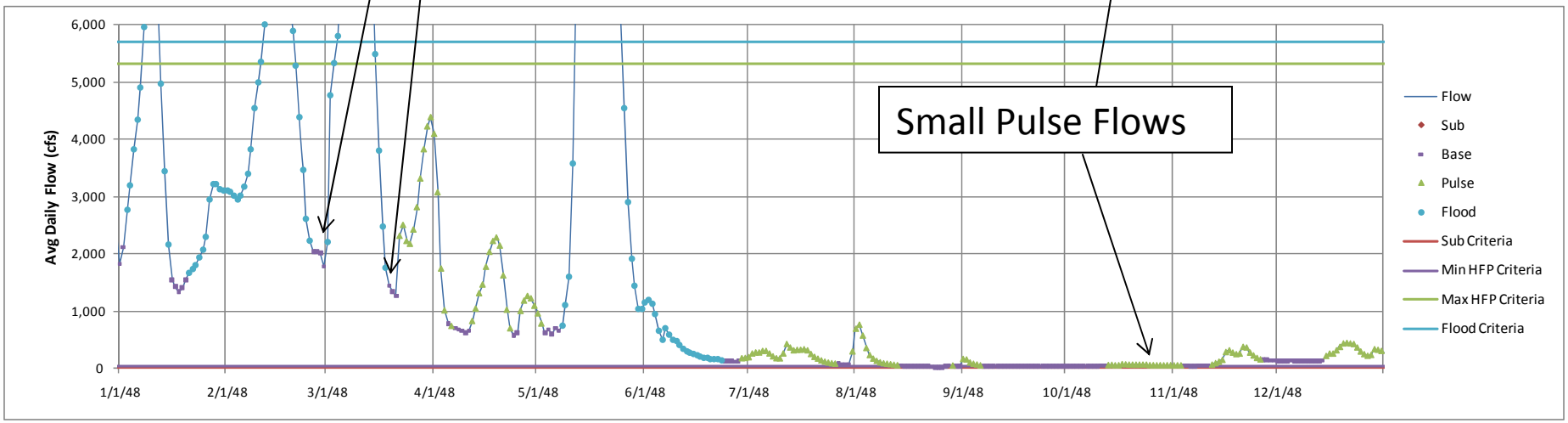
- I recommend using MBFIT for flow classification
  - Greater flexibility
  - Preserves high base and low pulse values (if those are important)
  - Produces similar results to IHA when threshold values are applied closer to median

Pulse Event Tails



High Base Flows & Small Pulses





Low Flows

- How important is the preservation of small pulse events during low-flow periods?
- What are appropriate thresholds to classify historical flows as subsistence flows?
  - 7Q2, 7Q10 or other design flows
  - Percentile based (10% of base flows)
  - Others?
- Should recent historical data be used as a basis in reaches where low flows are dominated by hydropower (Evadale, Ruliff, Bon Wier)?

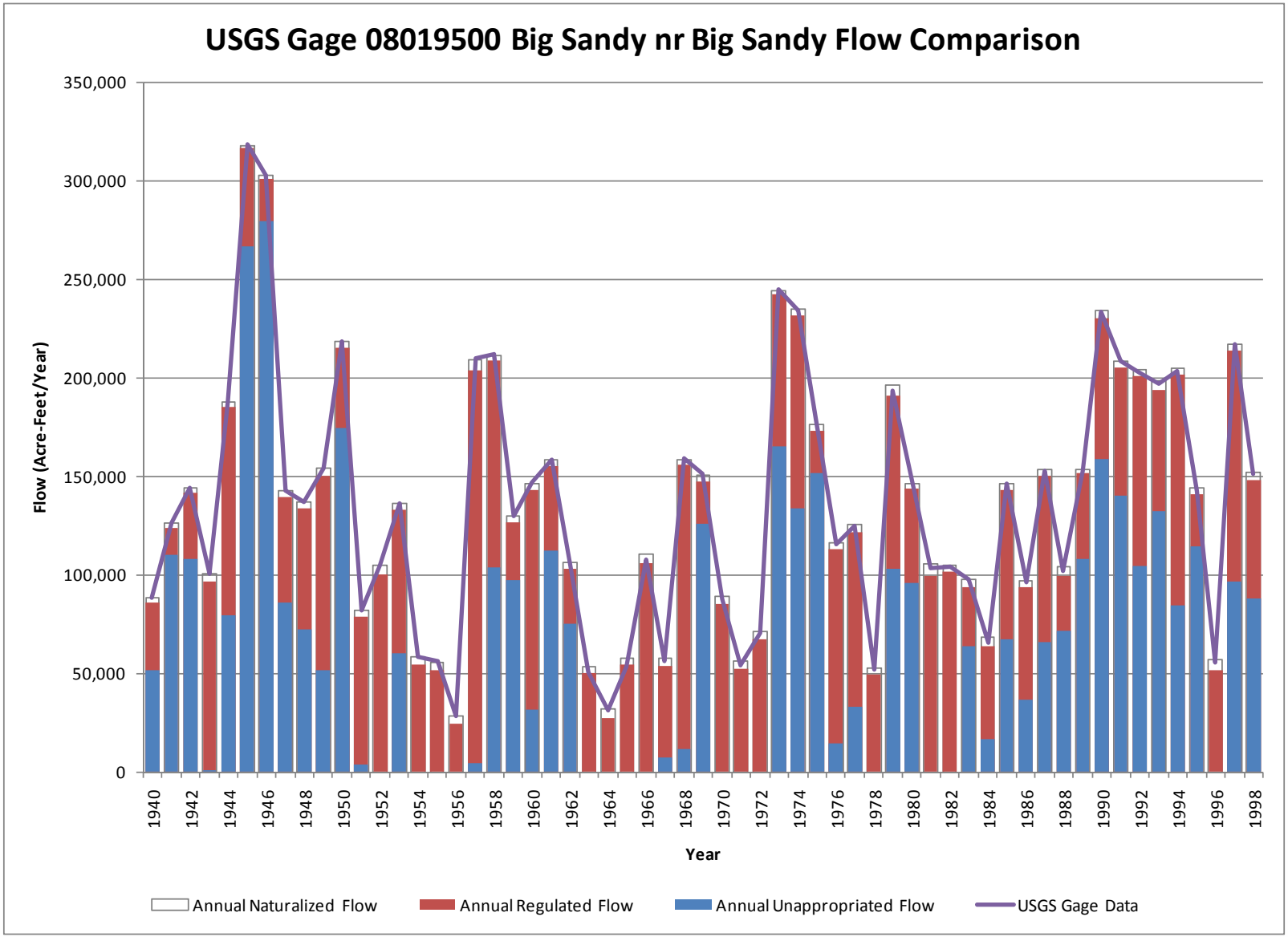
HEFR Statistical Analyses

- Preliminary analyses at each control point
  - Full period of record
  - 1940 to 1960 (pre-dam)
  - 1971 to 2008 (post dam)
- Percentile-based approach – default output
- Alternative frequency approach
  - 1 every 2 years (0.5)
  - 1 every year (1.0)
  - 1 every 3 years (1.5)
  - 2 every year (2.0)
  - 1 every season
  - 2 every season

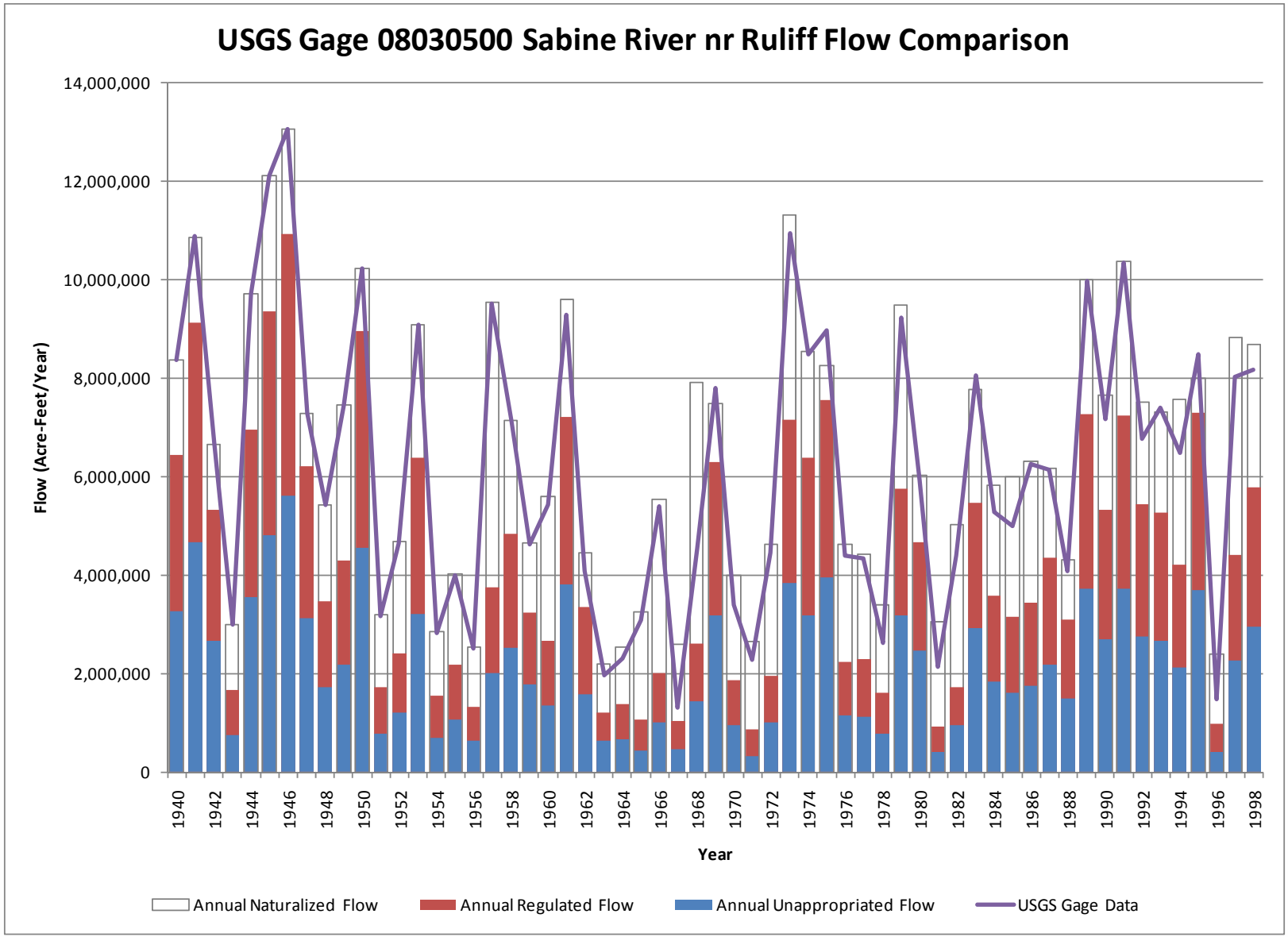
WAM Modeling

- Neches & Sabine WAMs
- Full authorization (Run 3) and Current Conditions (Run 8)
- Changes to Neches WAM subordination (Region I)
- Looking at
  - Naturalized flows – flows adjusted to remove diversions, return flows & effects of major reservoirs
  - Regulated flows – flows in river after all water rights have diverted
  - Unappropriated flows – flows in river not allocated to water rights or existing instream flows
- Regulated flows and available flows can be used to meet environmental flows

Run 3 Annual Flows



Run 3 Annual Flows



Seasonal Classification

- Determining flow conditions in WAM runs
  - Reservoir storage
  - Historical or naturalized flows
  - Historical Palmer drought index
  - Basin-wide or gage specific?

Future Activities

- Refine HEFR runs
- Compare HEFR results to WAM output
  - Daily “step-out” based on historical
  - Assumed distribution