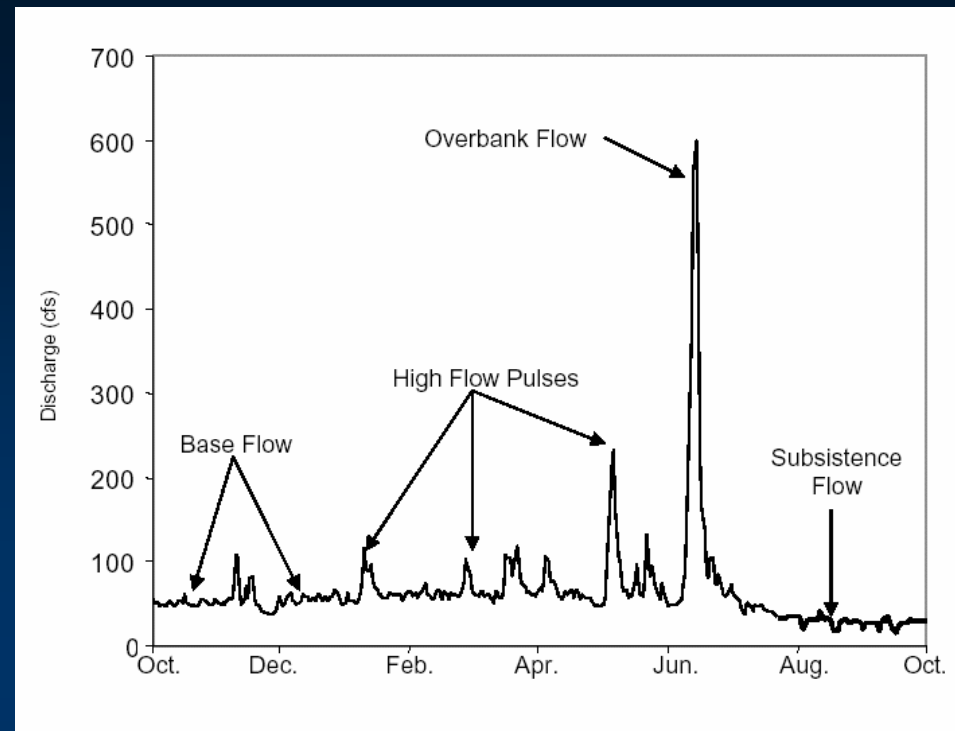


Quantifying Environmental Flow Components Using IHA



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Presentation to SB3 Science Advisory Committee
October 1, 2008

Problem Statement

Need Environmental Flow Conditions for

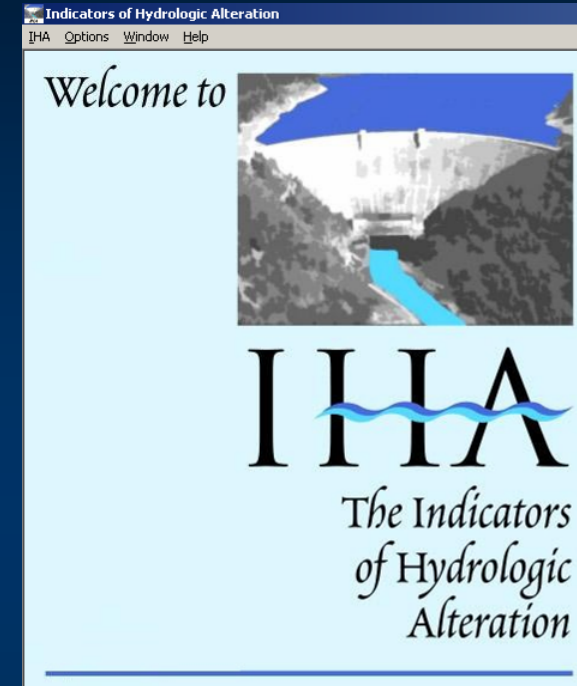
- Large river basin
- Few biological data
- No site-specific studies available
- Hydrologic data available

Corollary Objectives

- Desire results with the “look and feel” of NRC/SB2/SB3 recommendations
 - That is – a “flow regime” with different “hydrologic conditions”
- Desire results that are permit ready

Selected Tool: IHA EFCs

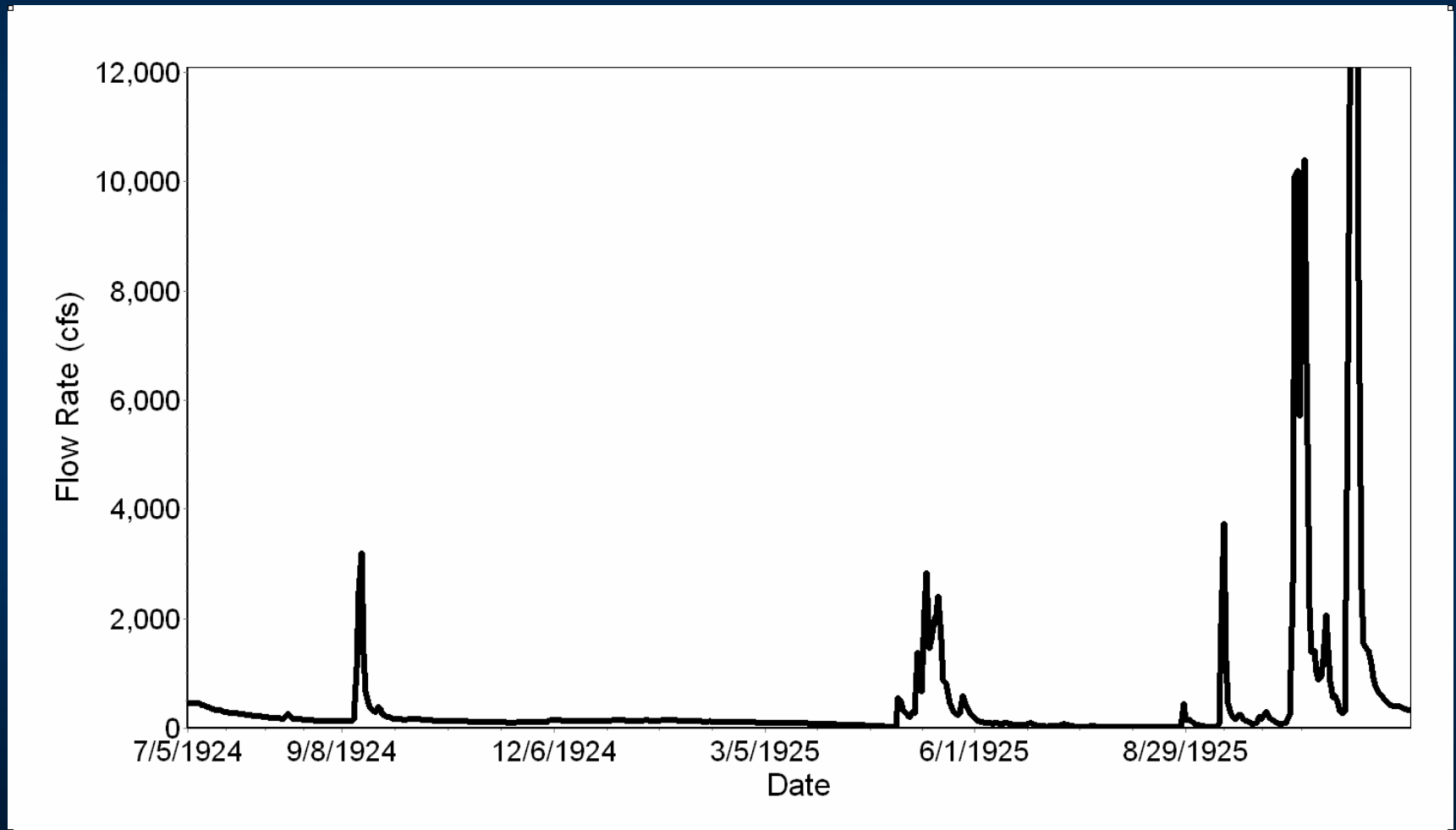
- IHA – Environmental Flow Components function
- Splits hydrograph into EFCs
- Terminology translator:



IHA ⇔ vs. ⇒ SB2

Environmental Flow Component	⇔	Instream Flow Component
flow components		Extreme low flow ⇔ Subsistence flow
		Low flow ⇔ Baseflow
		High flow pulse ⇔ High flow pulse
		Small flood ⇔ Overbank flow
		Large flood ⇔ n/a

Example Hydrograph



Not your Grandfather's IHA

Analysis Title/Options | Analysis Years | Analysis Days | Statistics | **Environmental Flow Components**

Environmental Flow Component (EFC) analysis computes statistics for five different flow components: extreme low flows, low flows, high flow pulses, small floods, and large floods. If you wish, this analysis may be performed for two separate seasons (see Analysis Days tab).

The parameters used to define EFCs can be set below.

High Flow Pulses

All flows that exceed percent of flows for the period will be classified as high flow pulses.

No flows that are below percent of flows for the period will be classified as high flow pulses.

Between these two flow levels, a high flow pulse will begin when flow increases by more than percent per day, and will end when flow decreases by less than percent per day.

Flood Definition

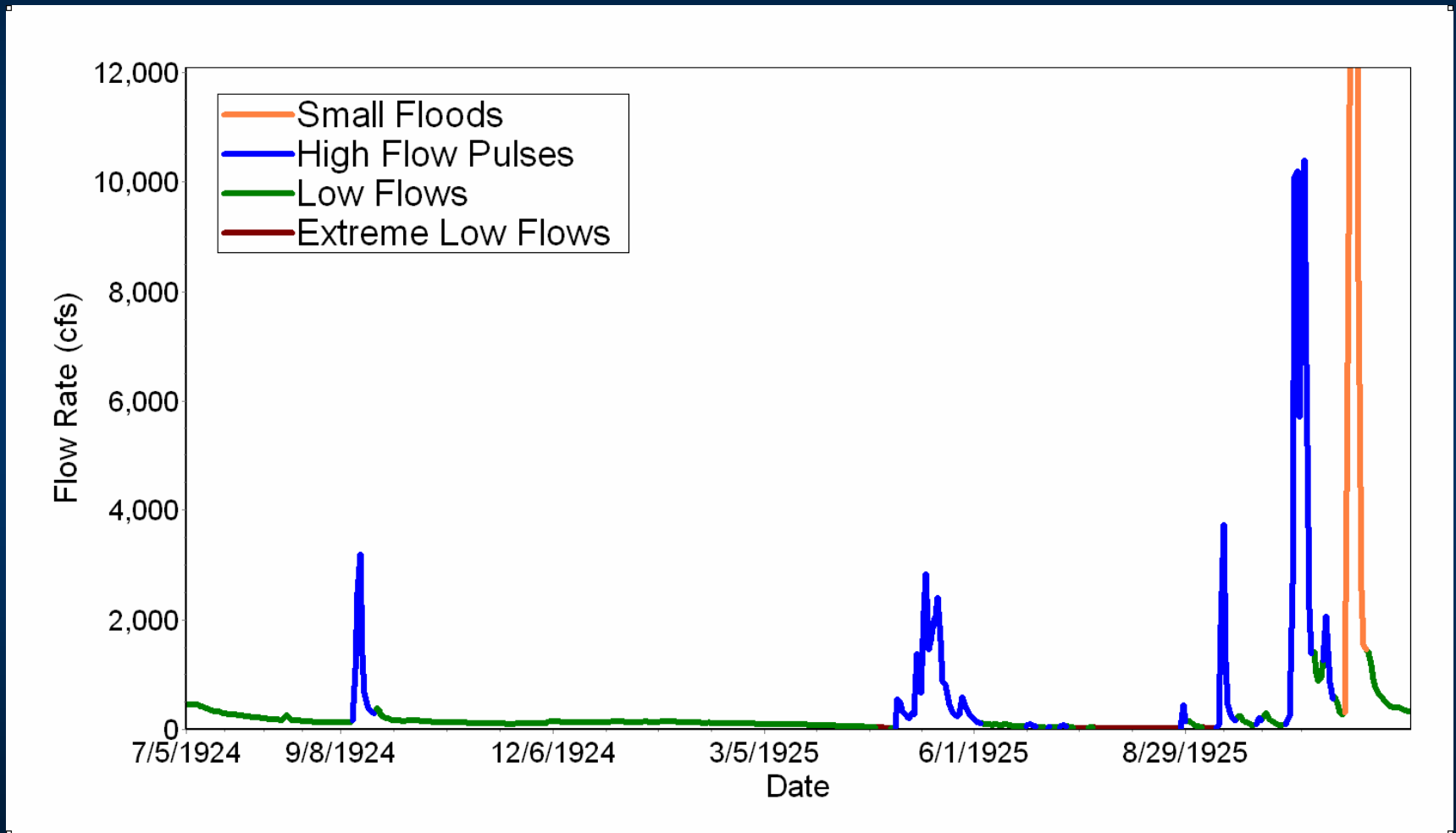
A small flood event is defined as a high flow pulse with a recurrence time of at least: years.

A large flood event is defined as a high flow pulse with a recurrence time of at least: years.

Extreme Lowflow Definition

An extreme low flow is defined as a flow in the lowest percent of all low flows in the period.

Example Hydrograph with EFCs



Post-Processing

- IHA generates many statistics → not used herein
- Instead, we used Excel to generate simple nonparametric statistics of EFCs for four hydrologic conditions
 - Wet, Average, Dry, and Subsistence
- In general:

Wet Hydrologic Condition \Rightarrow 75th %-ile of outputs





Average Hydrologic Condition \Rightarrow 50th %-ile of outputs

Dry Hydrologic Condition \Rightarrow 25th %-ile of outputs

Subsistence Hydrologic Condition \Rightarrow MAX(50th %-ile of extreme low flow, 7Q2)

- Outputs may include: flow, volume, duration, frequency

Example Matrix

	Wet
	Average
	Dry
	Subsistence

Overbank Flows	Not calculated for this project											
High Flow Pulses*	F:1 D:10 Q:5190 V:29410		F:1 D:9 Q:6410 V:42030		F:1 D:9 Q:3670 V:25810		F:1 D:9 Q:3720 V:20490					
	F:1 D:6 Q:1600 V:9630		F:2 D:6 Q:2550 V:16250		F:1 D:6 Q:1880 V:9090		F:1 D:6 Q:1630 V:9180					
	F:1 D:5 Q:600 V:4150		F:2 D:4 Q:960 V:5640		F:2 D:4 Q:580 V:3560		F:2 D:4 Q:570 V:3510					
Base Flows (cfs)	379	450	574	532	950	891	767	579	291	279	374	392
	171	216	252	271	362	534	427	326	191	140	138	165
	80	98	112	94	120	294	178	132	125	89	70	92
Subsistence Flows (cfs)	68											
	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
	WINTER			SPRING			SUMMER			FALL		

*F = Frequency per season, Q = Peak flow (cfs), D = Duration (days), V = Volume (ac-ft)

Method Pros/Cons

- Advantages
 - Can be directly applied anywhere a sufficient hydrologic period of record is available
 - Could be indirectly applied at other locations using drainage area ratios and stream classifications?
 - Efficient
 - Flexibility in both EFC assignments and final statistics
 - Has the “look and feel” of SB2/SB3/flow regime concepts
- Disadvantages
 - Only uses hydrologic data
 - Flexibility means decisions and judgment are required
 - No track record of applications in Texas

TEXAS

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