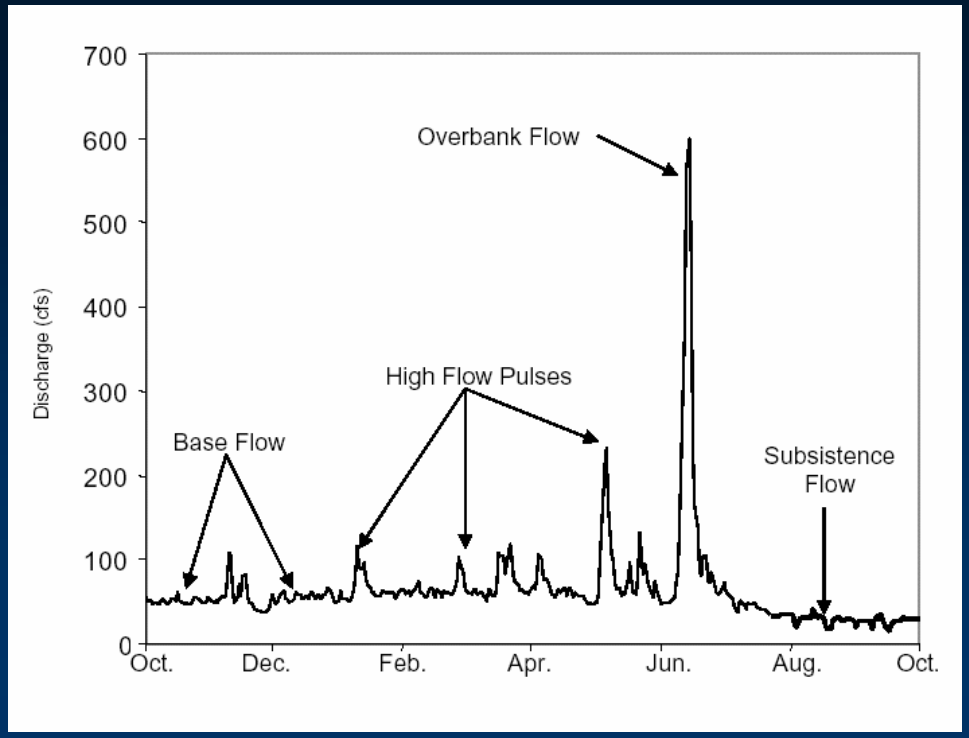
Quantifying Environmental Flow Components Using IHA



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Presentation to SB3 Science Advisory Committee

October 1, 2008

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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

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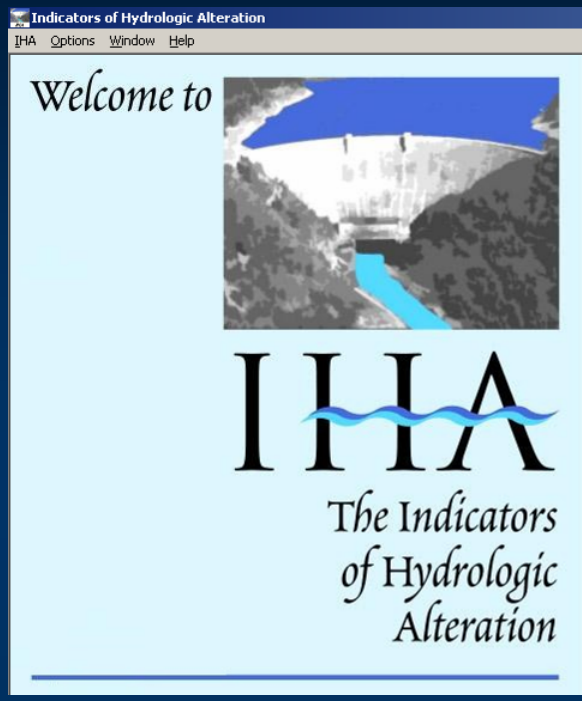
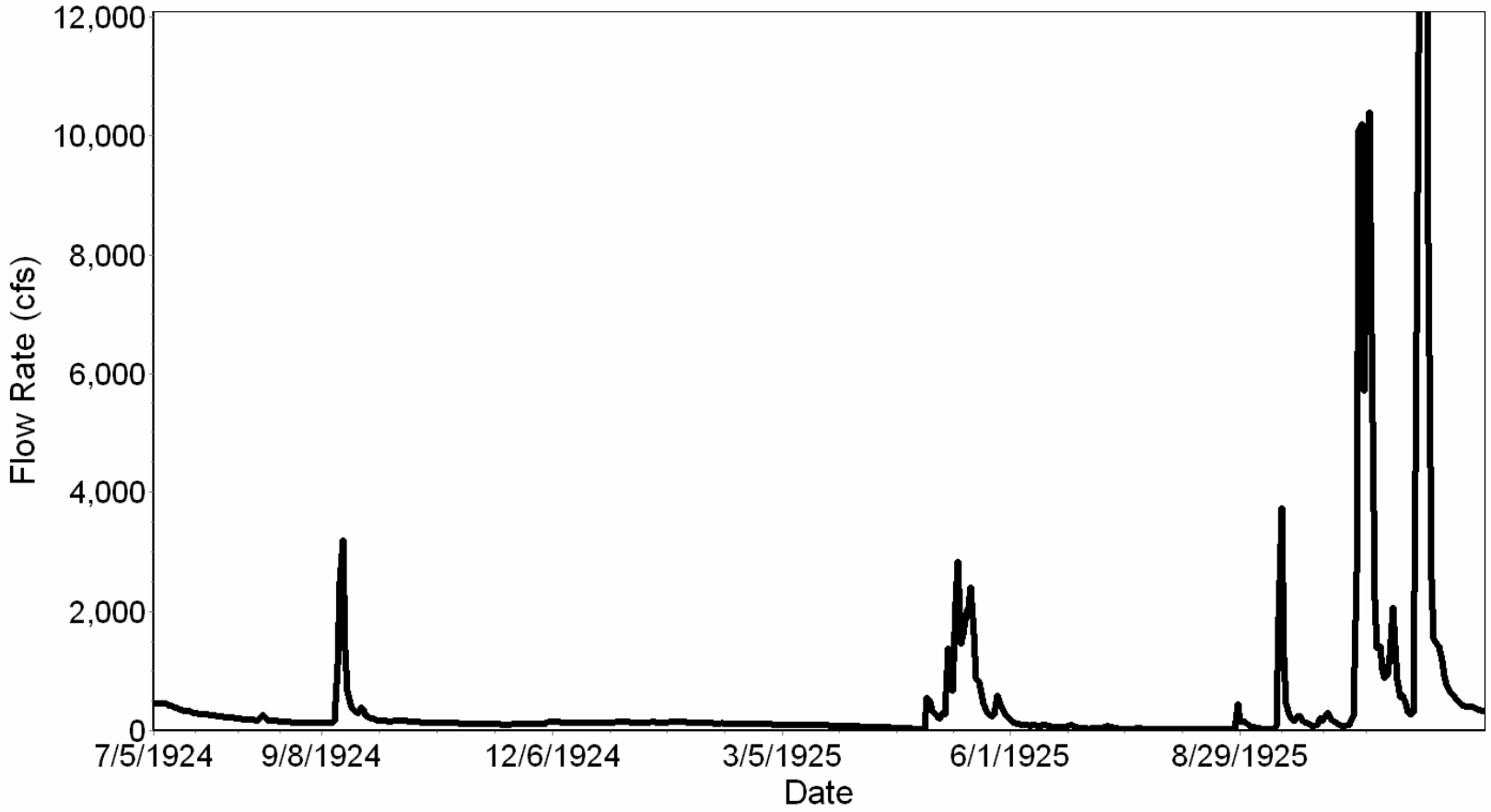
Selected Tool: IHA EFCs

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

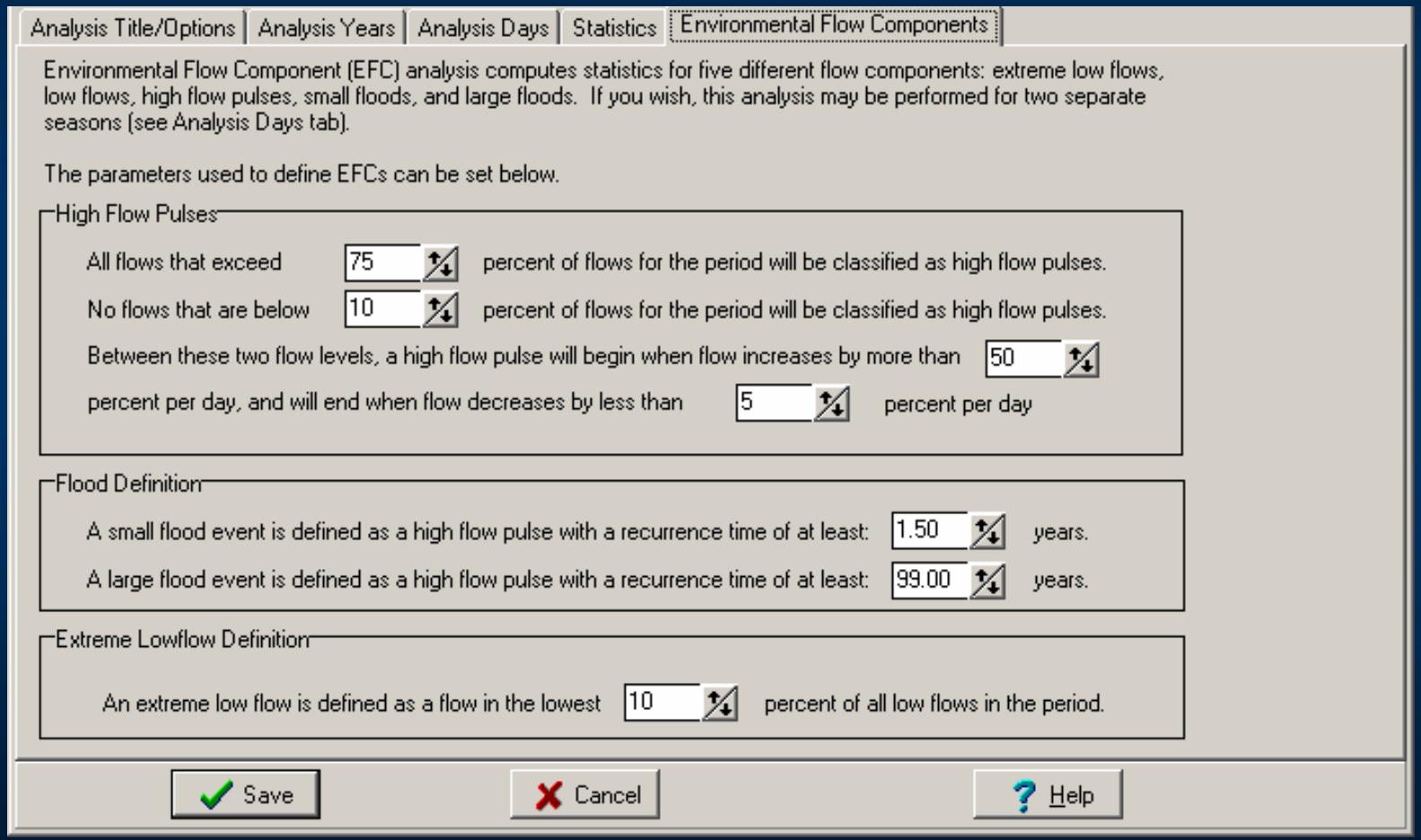


	IHA ⇦ vs. ⇨ SB2	
Environmental Flow Component	⇔	Instream Flow Component
flow components: Extreme low flow	⇔	Subsistence flow
Low flow	⇔	Baseflow
High flow pulse	⇔	High flow pulse
Small flood	⇔	Overbank flow
Large flood	⇔	n/a

Example Hydrograph



Not your Grandfather's IHA



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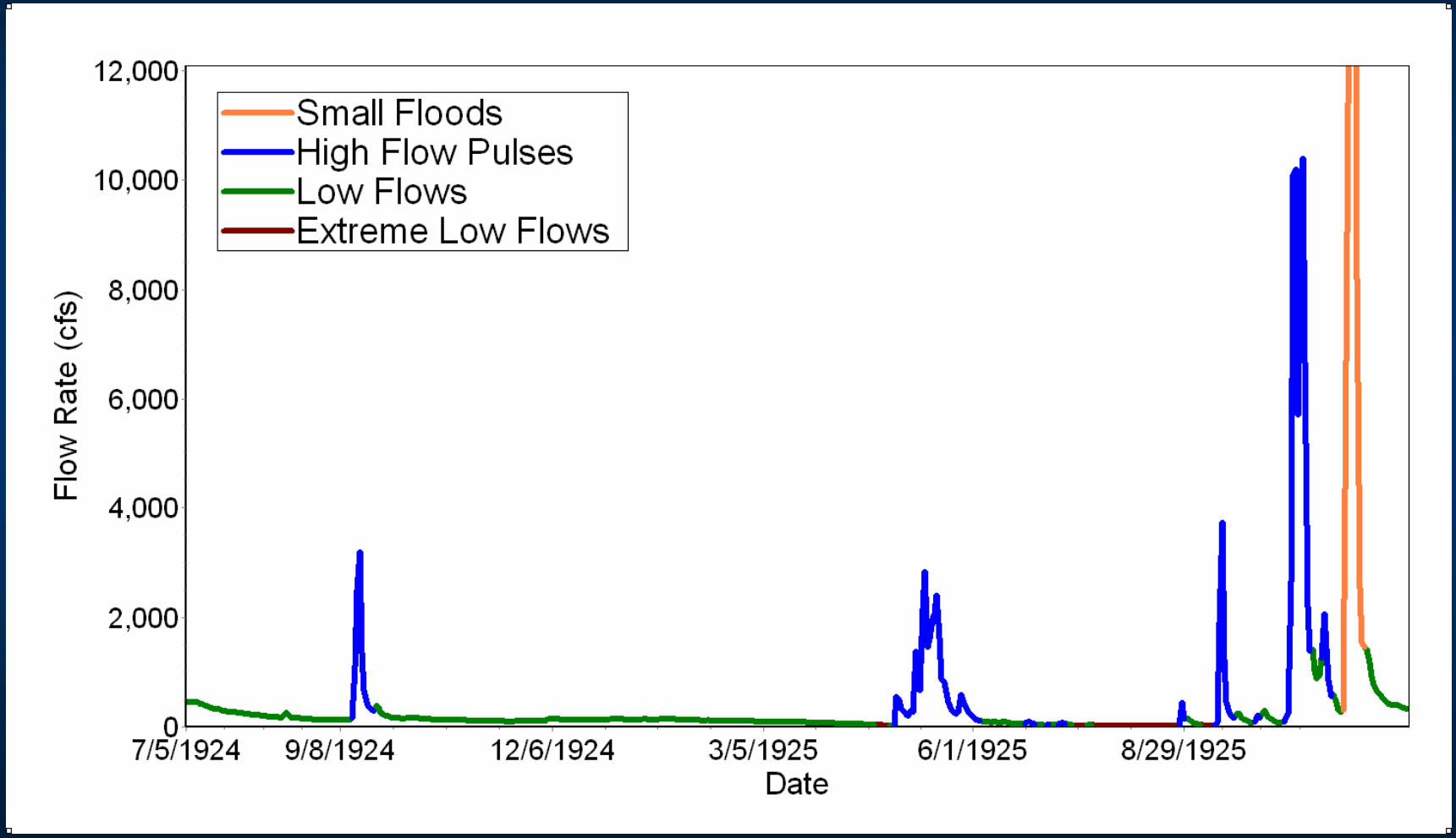
Example Hydrograph with EFCs



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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	⇨	75^{th} %-ile of outputs
Average Hydrologic Condition	⇨	50^{th} %-ile of outputs
Dry Hydrologic Condition	⇨	25^{th} %-ile of outputs
Subsistence Hydrologic Condition	⇨	MAX(50^{th} %-ile of extreme low flow, 7Q2)

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

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Example Matrix

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
	WINTER			SPRING			SUMMER			FALL		
Overbank Flows	Not calculated for this project											
High Flow Pulses*	F:1 Q:5190 V:29410 D:10			F:1 Q:6410 V:42030 D:9			F:1 Q:3670 V:25810 D:9			F:1 Q:3720 V:20490 D:9		
	F:1 Q:1600 V:9630 D:6			F:2 Q:2550 V:16250 D:6			F:1 Q:1880 V:9090 D:6			F:1 Q:1630 V:9180 D:6		
	F:1 Q:600 V:4150 D:5			F:2 Q:960 V:5640 D:4			F:2 Q:580 V:3560 D:4			F:2 Q:570 V:3510 D:4		
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											

*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

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