Decision Points Relevant to using Hydrology Data to Quantify Environmental Flow Recommendations

Dan Opdyke

Presentation to SB3 Science Advisory Committee

November 5, 2008

TEXAS PARKS & WILDLIFE

Important Qualifiers

- Assume hydrology data are primary data source
- Document (with same title) prepared by TPWD staff with assistance from TNC
  - Draft, not final
  - If concept is valuable to SAC, then encourage comments/additions/deletions
- Some decision points herein are specific to the HEFR methodology presented on Oct 1
  - Most are not

Important Qualifiers Continued

- Recommendations and decisions may be made by one or more of several entities.
  - Generic “analyst” in this discussion
- Examples in this presentation
  - Are not recommendations
  - Are not exhaustive

Visual Glossary

Example Matrix

- Wet
- Average
- Dry
- Subsistence

Overbank Flows	Not calculated for this project											
High Flow Pulses*	F:1 Q:5190	D:10 V:29410		F:1 Q:6410	D:9 V:42030		F:1 Q:3670	D:9 V:25810		F:1 Q:3720	D:9 V:20490	
	F:1 Q:1600	D:6 V:9630		F:2 Q:2550	D:6 V:16250		F:1 Q:1880	D:6 V:9090		F:1 Q:1630	D:6 V:9180	
	F:1 Q:600	D:5 V:4150		F:2 Q:960	D:4 V:5640		F:2 Q:580	D:4 V:3560		F:2 Q:570	D:4 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)

1 **Instream Flow Components**

3 **Hydrologic Conditions**

4 **Assignment Periods**

6 **IFC Characteristics Delineated for HFPs**

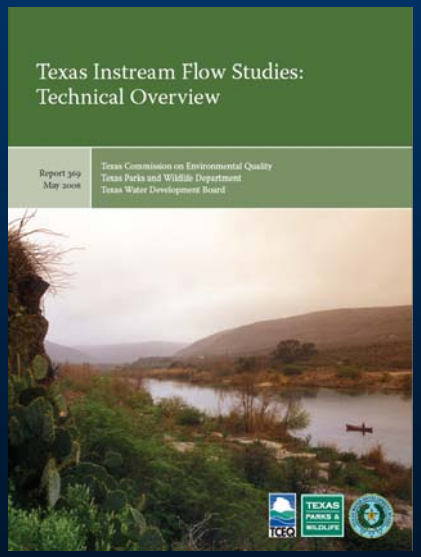
Number and Definition of Instream Flow Components

- TIFP uses 4:
  - Subsistence
  - Baseflow
  - High flow pulses
  - Overbank

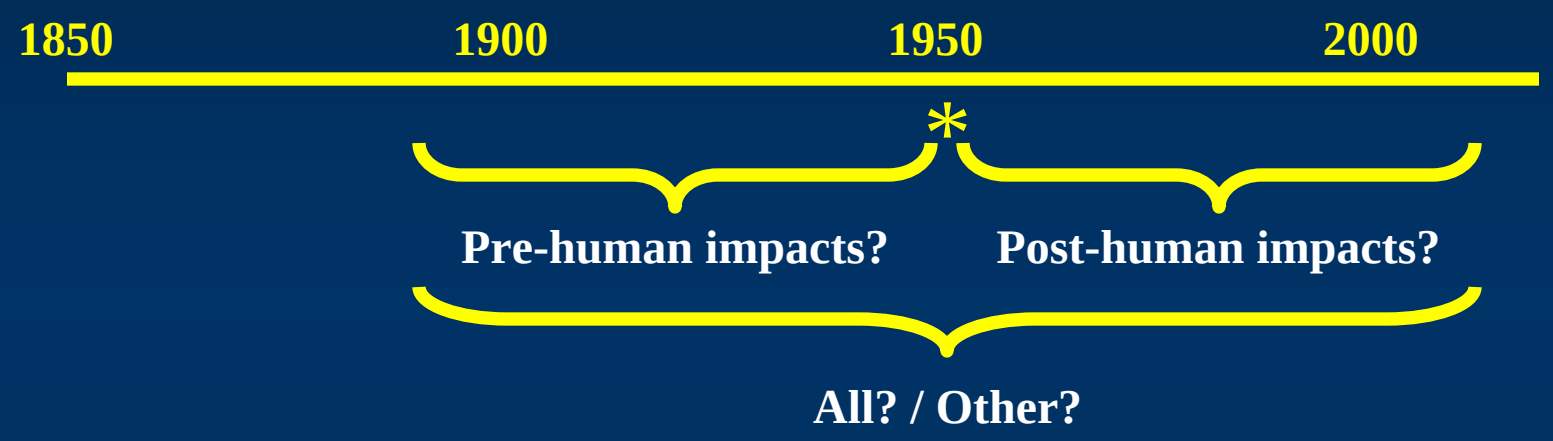
"Steady" flow components

"Episodic" flow components

- These IFCs must also be defined
- For example, TIFP HFPs:
  - "the component of an instream flow regime that represents short-duration, in-channel, high flow events following storm events."



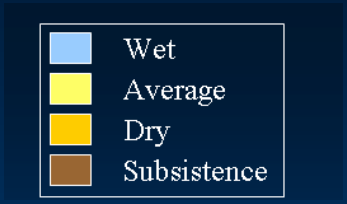
Hydrologic Period of Record



- Additional considerations
  - Minimum length of record
  - How to address data gaps
  - When/how should recommendations be updated

*** Tools are available to help guide this division**

Hydrologic Condition



- Number and definitions
  - For example: “Wet”, “Average”, “Dry”, “Subsistence”
- Set triggers such that each hydrologic condition occurs with desired frequency (Σfreq = 100%)
- Possible Triggers
  - Reservoir Storage
  - Streamflow
  - Nearby “unimpacted” streamflow
  - Meteorological predictions
  - Management/operating rules
- Additional consideration: what is the spatial extent of an assigned hydrologic condition (e.g., basin-wide, or can it vary by location – in which case the spatial extent of each trigger must be defined)

Assignment Period

DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
WINTER			SPRING			SUMMER			FALL		

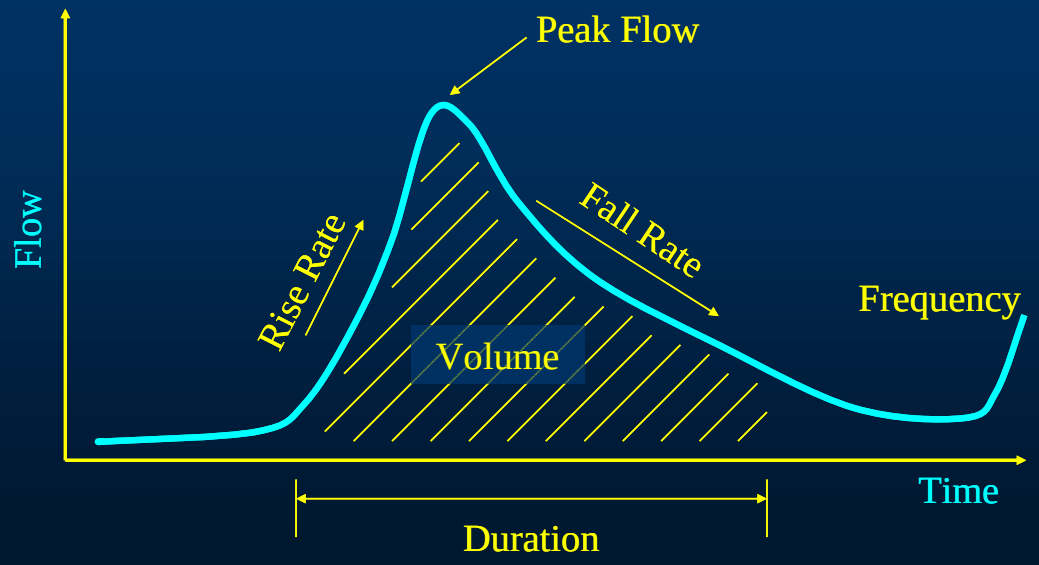
- Steady Flow Components
  - Period of time over which each flow value applies
- Episodic Flow Components
  - Period of time over which each episodic event criteria apply and over which assessment is quantified
  - Recommendation: generally >1 event per assignment period
- For example: monthly, seasonal, annual
- Assignment period can be different for each flow component

Memory

- Carry-over from one assignment period to the next
- For example, if “winter” recommendation is 2 HFPs and “spring” recommendation is 2 HFPs, but 3 HFPs occur in the winter, is the “spring” recommendation now 1, or still 2?
- If memory is included, its features need to be explicitly defined

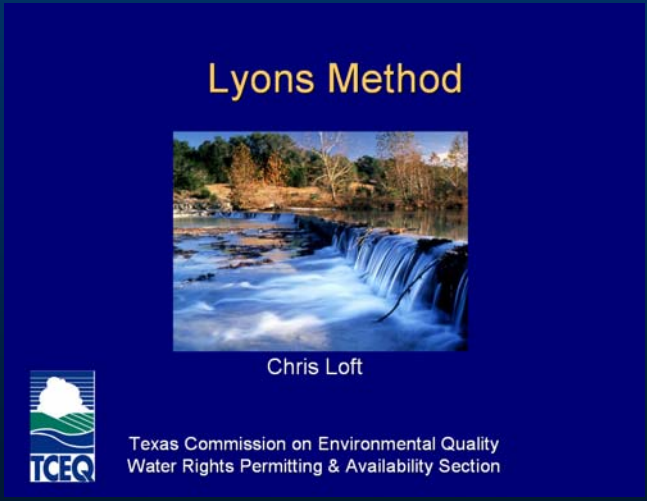
IFC Characteristics Delineated

- What flow characteristics are included in the flow recommendations?
- Steady Flow Components
  - Just flow?
- Possible Episodic Flow Components:



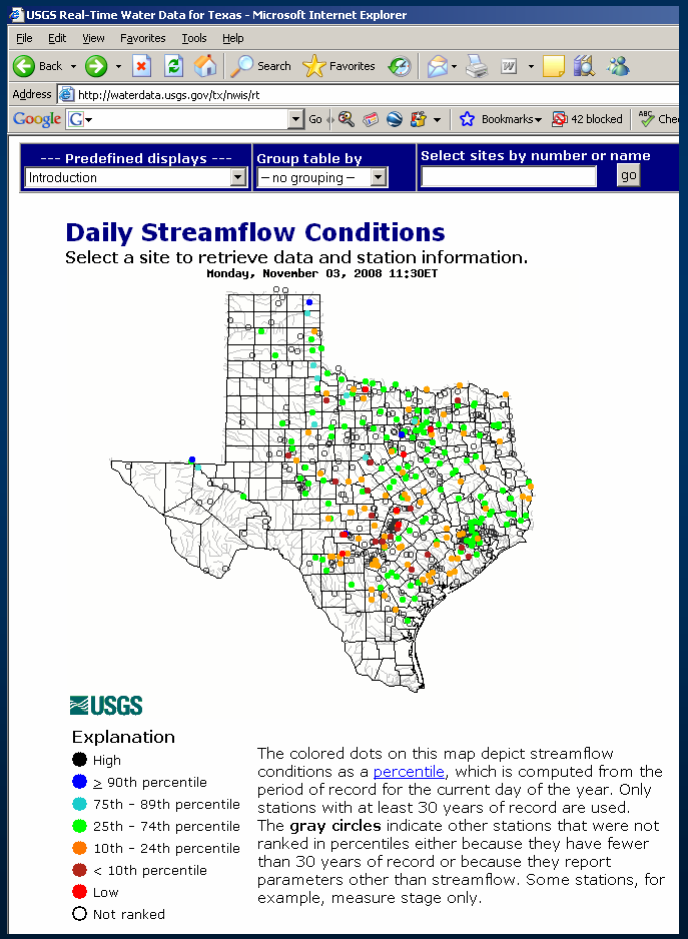
Flow Recommendations < 7Q2

- Should any flow recommendations be made that are below the flow that protects water quality standards?
- Recall "Lyons Method" Presentation by Chris Loft (Sept 3, 2008):
  - "Where the 7Q2 value is greater than the Lyons numbers, 7Q2 is used"
  - Thus 7Q2 is a floor



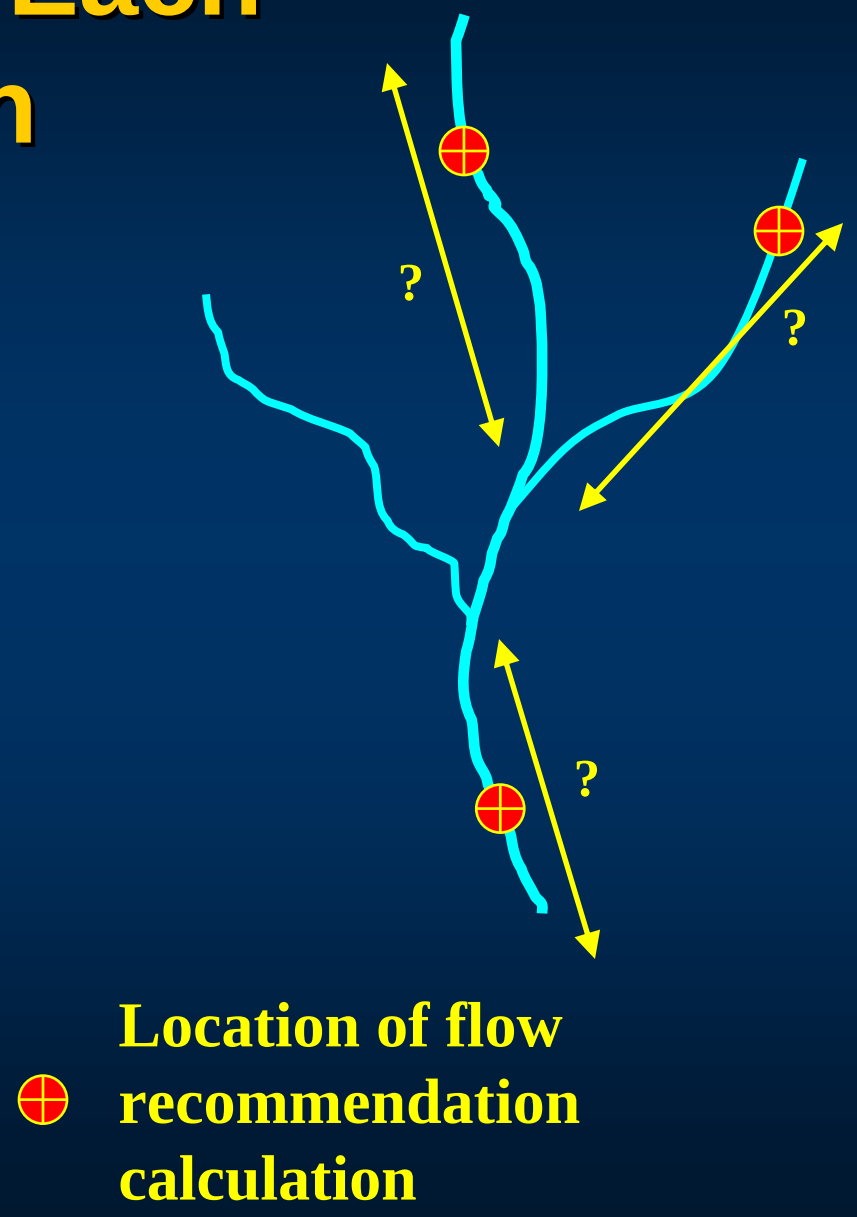
Number and Location of Control Points

- Where should analyses be performed?
- 480 active gages in TX
- 18 active gages on Sabine
- 13 on Neches



Spatial Extent of Each Recommendation

- What is the spatial extent of each calculated flow recommendation?



9b

New:
Spatial Extent of All Flow Recommendations

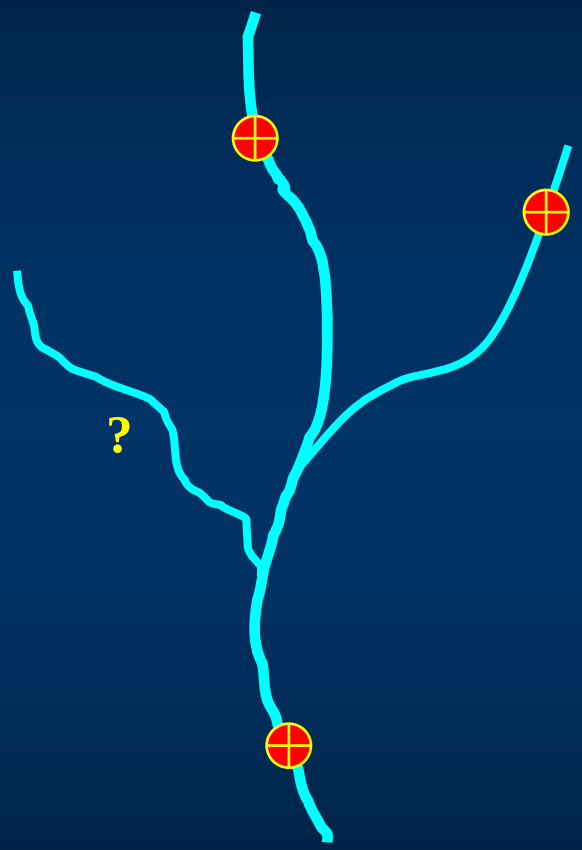
- Should every single body of “state water” be assigned a flow recommendation?
- Alternatively:
  - 2nd order streams
  - 3rd order streams
  - TCEQ classified segments
  - NHD dataset

9c

New:

How to quantify flow recommendations without a flow gage?

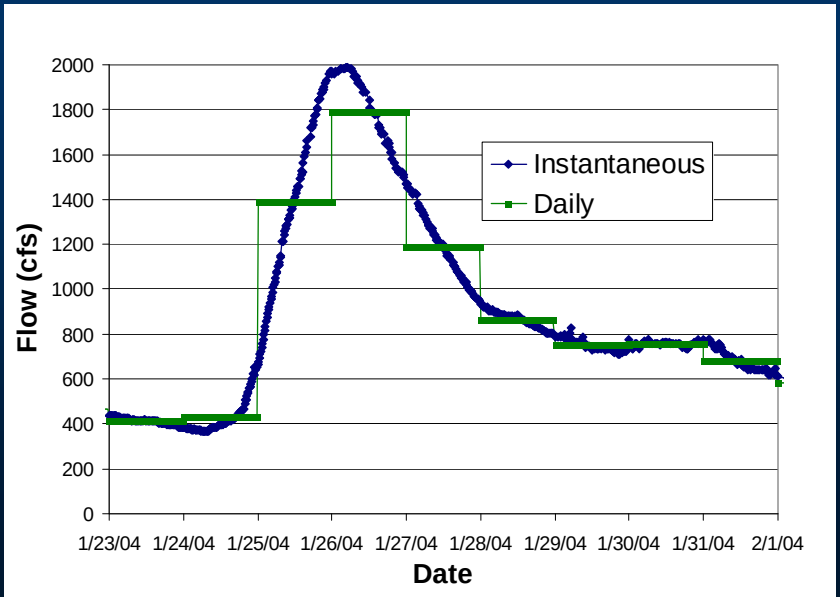
- For locations that are distinctly removed from a flow gage, how to make recommendations?
- Examples:
  - Translate flow record (e.g., using drainage area ratios) and then duplicate analysis
  - Translate flow recommendation from gage within same stream classification



Location of flow recommendation calculation

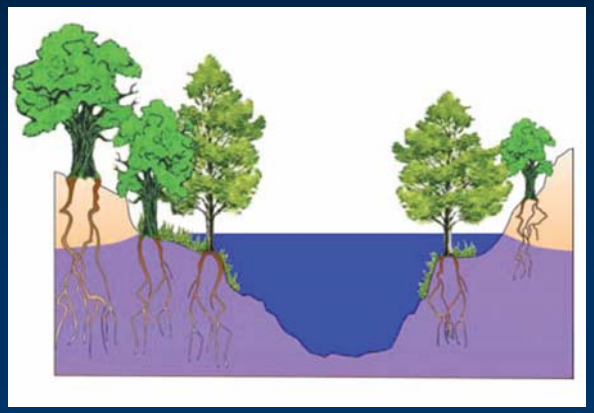
Daily Average vs. Instantaneous Flow Data

- Daily average generally sufficient for steady flow components
- Open question for episodic flow components
  - Can you use daily data and get results suitable for SB3?
- USGS Instantaneous Data Archive
  - Freely downloadable
  - Not available at all stations
  - Generally <20 years of data
  - Less QA/QC than daily data



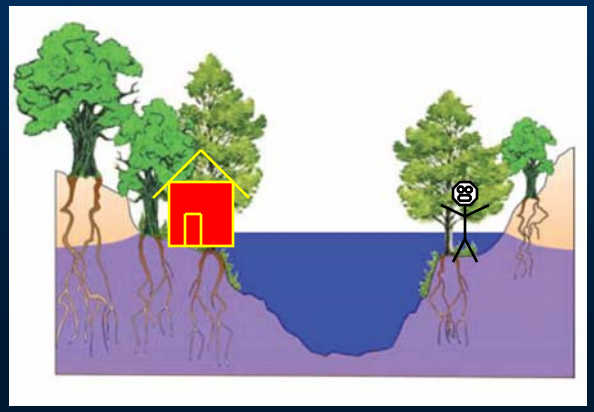
Overbank Recommendations

- Flows above bankfull are ecologically important



Source: TIFP TO

- Any flow recommendations over bankfull may be subject to legal and practical constraints



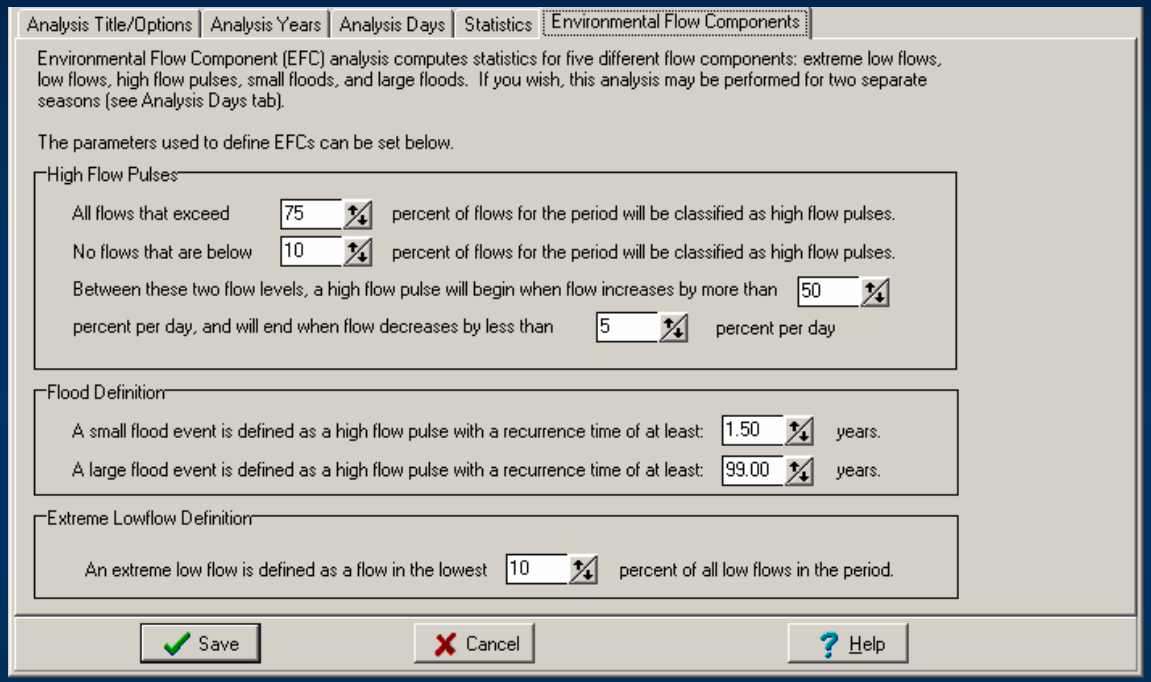
Ability to Implement Recommendations

- Some potential flow regime characteristics will be more challenging to implement than others
- For example, a statistic shared by IHA and TX-HAT is the annual “Number of flow reversals”
  - How do you implement that?

HEFR-specific 1

EFC Parameter Set

- Used to parse the hydrograph into flow components
- 7 parameters

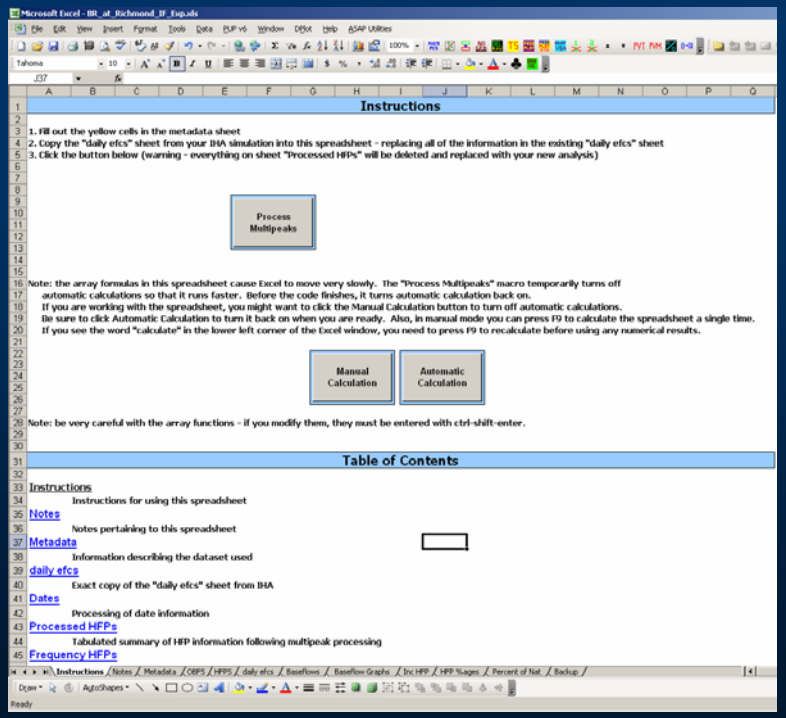


- Possible options:
  - Use defaults
  - Generate “Texas” defaults
  - Generate “Texas” defaults, but allow site-specific
  - Generate basin-specific defaults
  - Generate basin-specific defaults, but allow site-specific
  - Generate guidelines and always use site-specific

HEFR-specific 2

Post-IHA Manipulation of IFCs

- IHA EFC tool not infinitely flexible
- Additional processing may be desired
- Excel tool:



HEFR-specific 3

IFC Statistics

- Statistics may be calculated in IHA
  - Limited in scope
  - Must agree with calculation methodologies
- Outside software may be used
  - For example: Excel, SAS

TEXAS

PARKS &

WILDLIFE