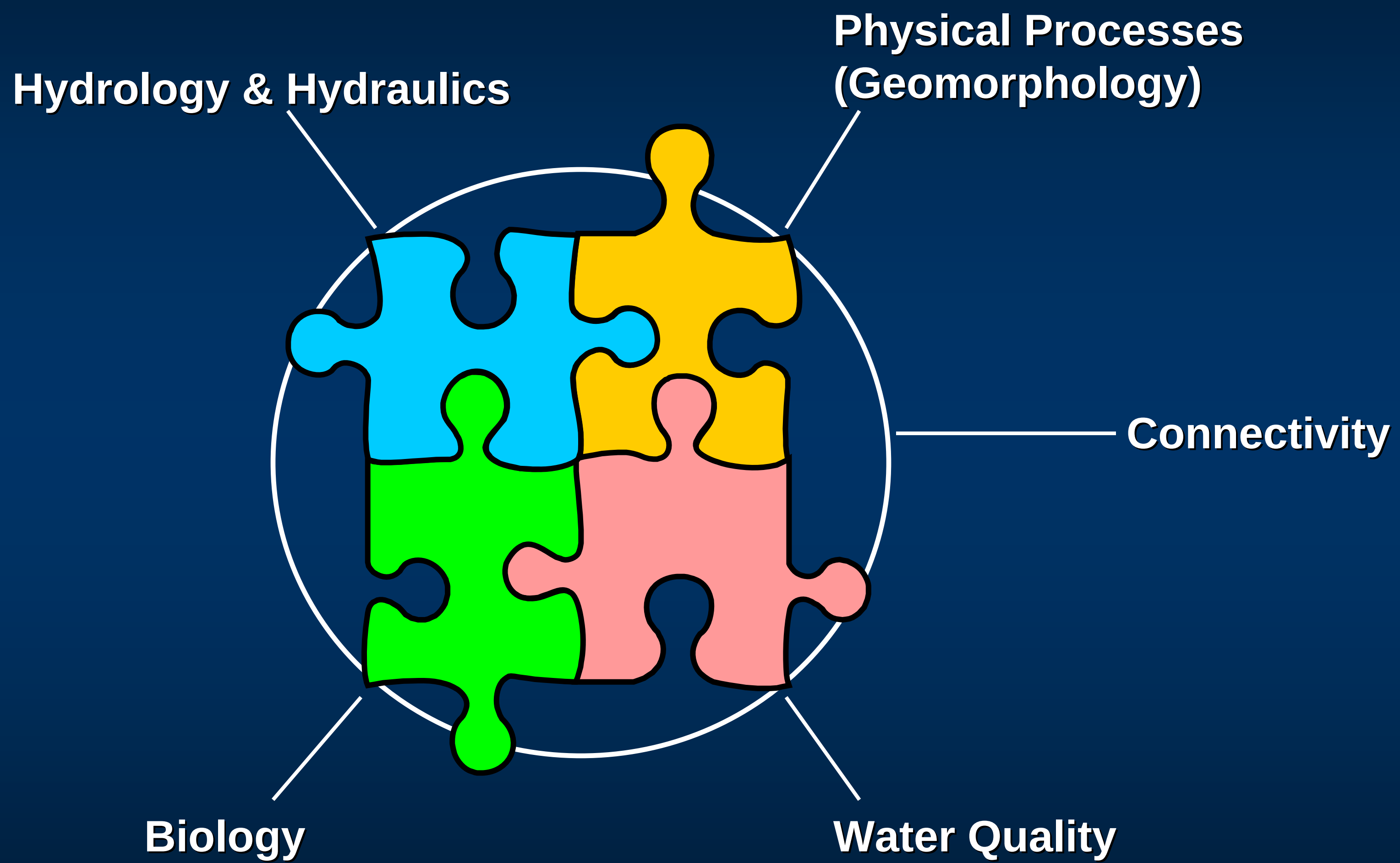
Biological Input for HEFR



Kevin Mayes, TPWD

June 10, 2010

Section 4 *from* "Essential Steps for Biological Overlays in Developing Senate Bill 3 Instream Flow Recommendations"

Report # SAC-2009-05

Pre-processing

Period of Record	Evaluate current and desired ecological condition
Number of Instream Flow Components	Are there locations where overbanking (or other) flows are not appropriate?
Hydrographic Separation Tool	MBFIT, IHA, other – which tool does the best job in identifying flow components that meet intended ecological functions?
Episodic Event Method	Percentile or Frequency – what's important? Magnitude, duration, frequency, all of them?

Period of Record

Table 3. Characteristics of Aquatic Life Use Subcategories (from Table 4, 30 TAC 307)

	Habitat Characteristics	Species Assemblage	Sensitive species	Diversity	Species Richness	Trophic Structure
Exceptional	Outstanding natural variability	Exceptional or unusual	Abundant	Exceptionally high	Exceptionally high	Balanced
High	Highly diverse	Usual association of regionally expected species	Present	High	High	Balanced to slightly imbalanced
Intermediate	Moderately diverse	Some expected species	Very low in abundance	Moderate	Moderate	Moderately imbalanced
Limited	Uniform	Most regionally expected species absent	Absent	Low	Low	Severely imbalanced

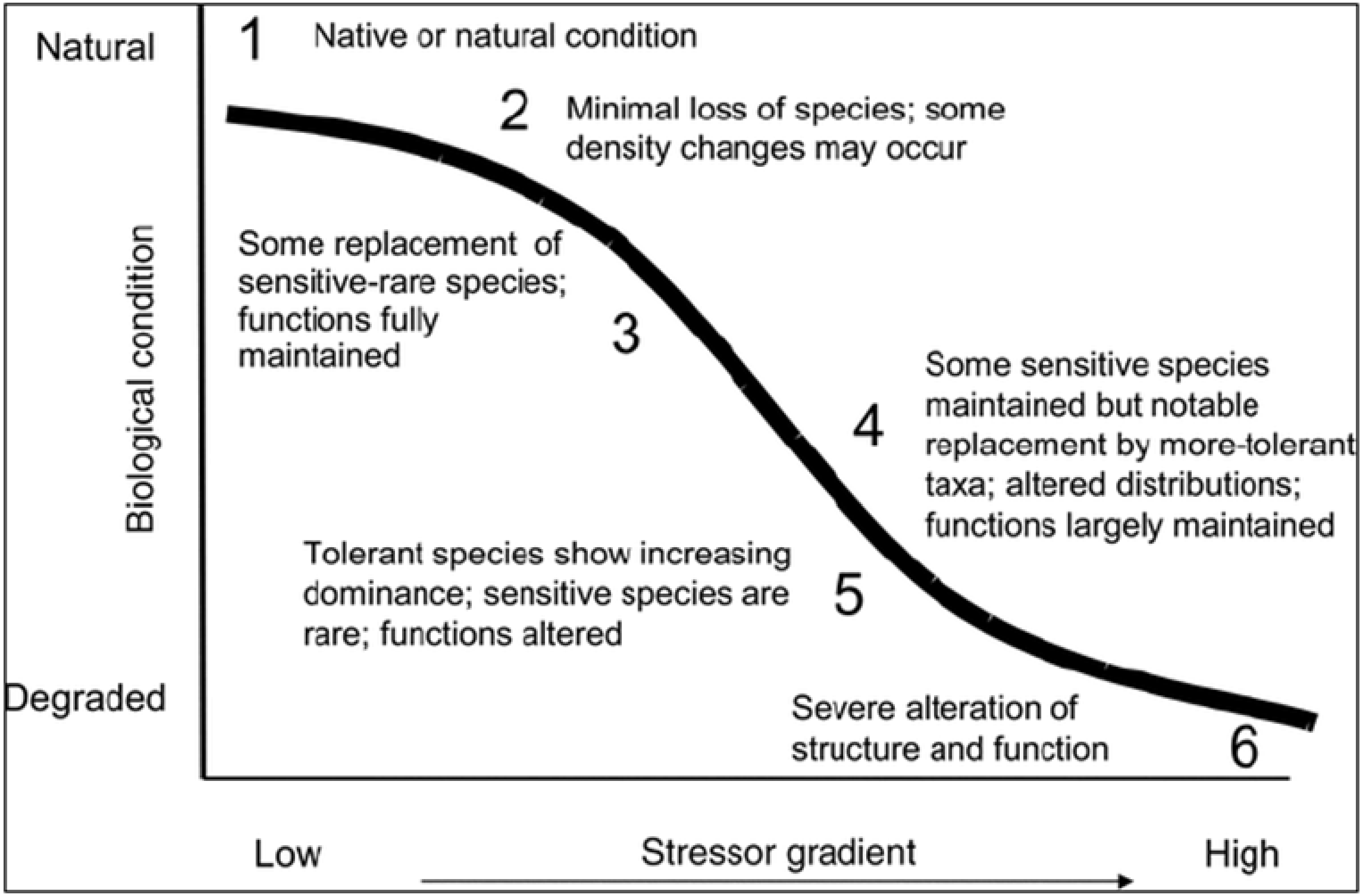
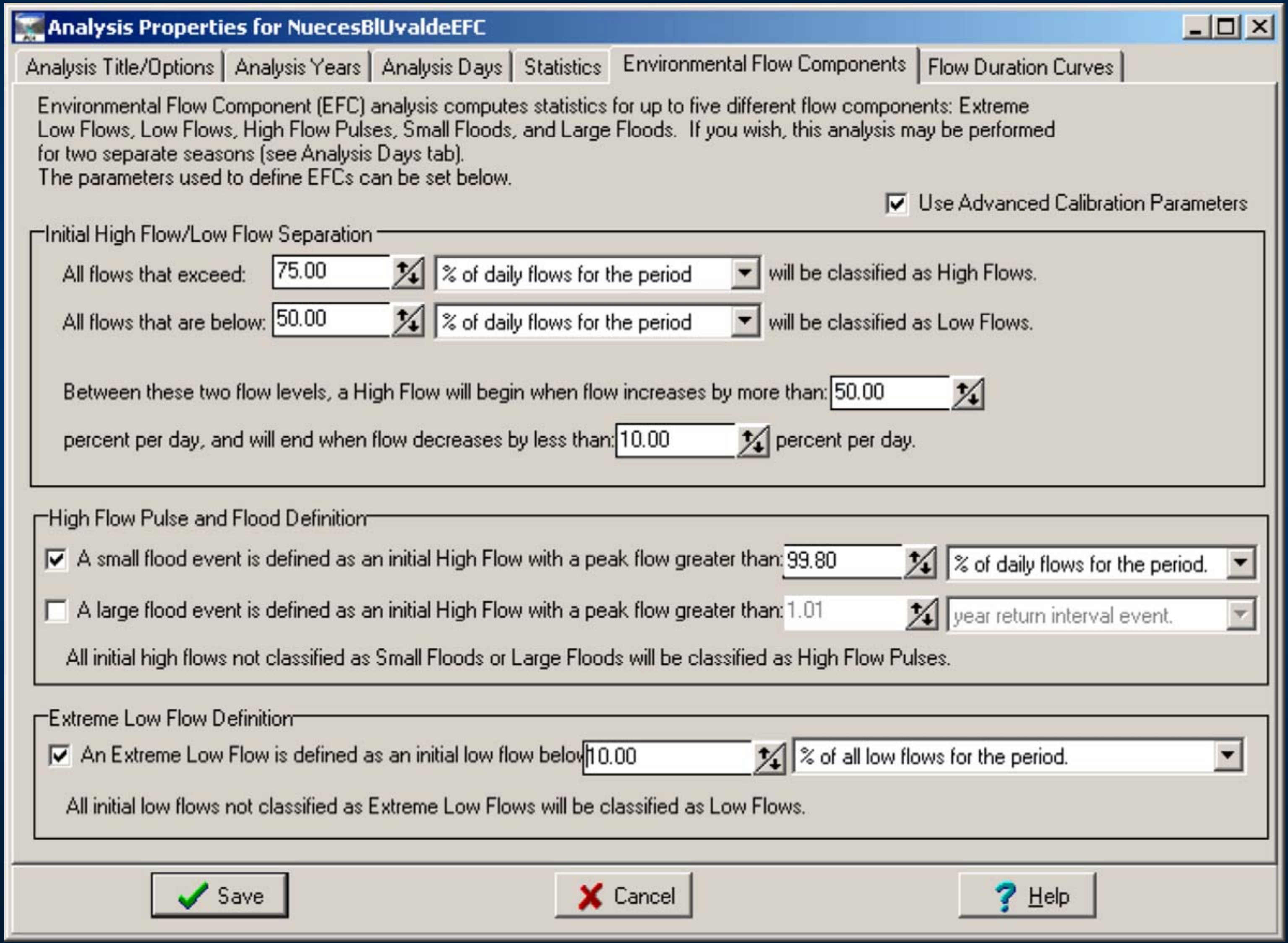


Figure 7. Conceptual Model Depicting Change in Biological Conditions in Response to an Increasing Stressor Gradient (from Davies and Jackson 2006)

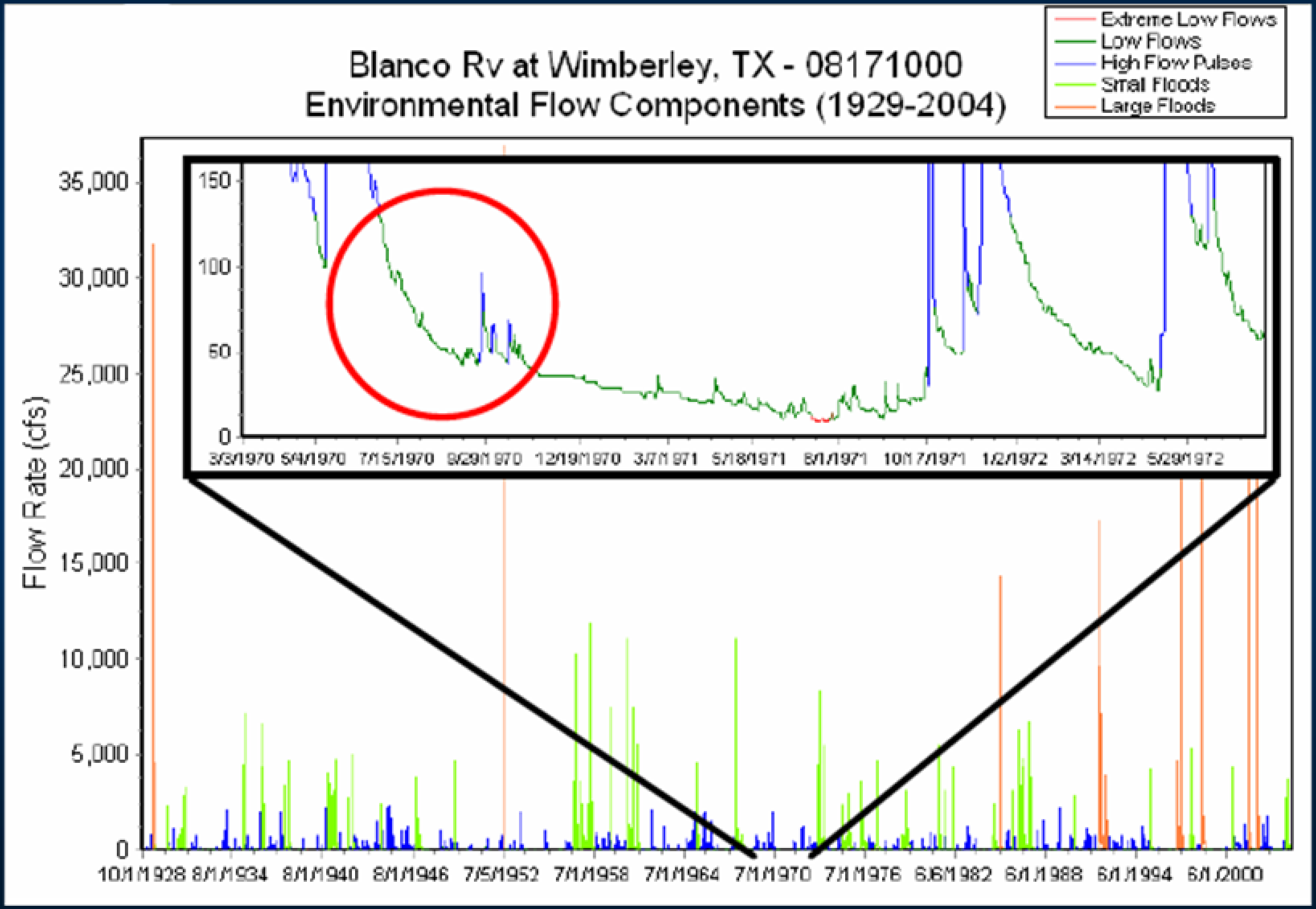
Processing (Hydrographic Separation)

HFP upper and lower thresholds	Bankfull estimates, lateral connectivity studies, habitat models
Rate of Change (IHA only)	Too fast or too slow rise and fall, shape of the pulse matters?
Small and Large Flood Recurrence Interval (IHA only)	Bankfull estimates, Flood warning and alert stages, lateral connectivity studies
Extreme Low Flow (or Subsistence) Threshold	7Q2, Q95, habitat model, fish height, mussel bed elevation

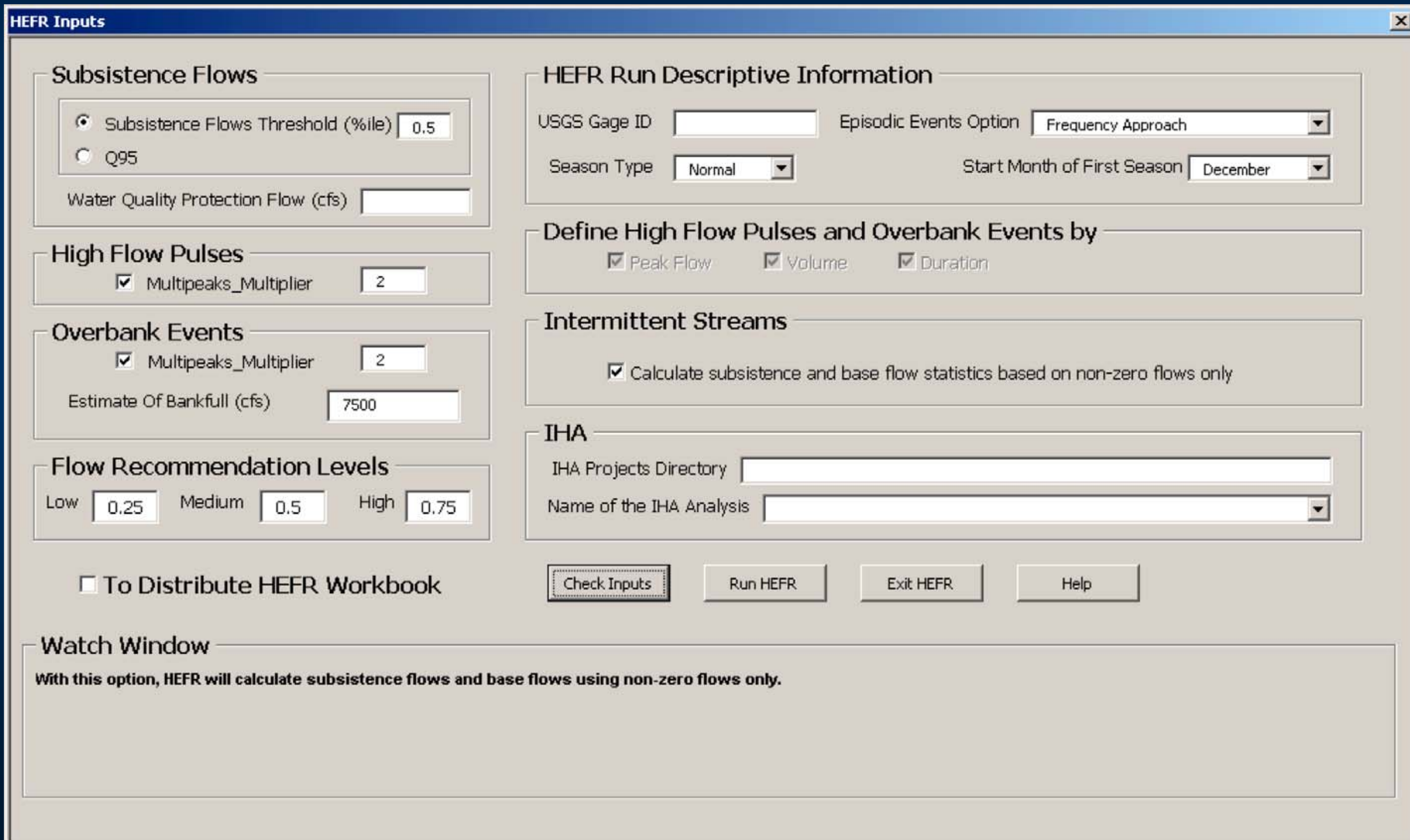
IHA input


Analysis Properties for NuecesBlUvaldeEFC
Analysis Title/Options
Analysis Years
Analysis Days
Statistics
Environmental Flow Components
Flow Duration Curves
Environmental Flow Component (EFC) analysis computes statistics for up to 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.
Use Advanced Calibration Parameters
Initial High Flow/Low Flow Separation
All flows that exceed: 75.00 % of daily flows for the period will be classified as High Flows.
All flows that are below: 50.00 % of daily flows for the period will be classified as Low Flows.
Between these two flow levels, a High Flow will begin when flow increases by more than: 50.00
percent per day, and will end when flow decreases by less than: 10.00 percent per day.
High Flow Pulse and Flood Definition
A small flood event is defined as an initial High Flow with a peak flow greater than: 99.80 % of daily flows for the period.
A large flood event is defined as an initial High Flow with a peak flow greater than: 1.01 year return interval event.
All initial high flows not classified as Small Floods or Large Floods will be classified as High Flow Pulses.
Extreme Low Flow Definition
An Extreme Low Flow is defined as an initial low flow below 10.00 % of all low flows for the period.
All initial low flows not classified as Extreme Low Flows will be classified as Low Flows.
Save
Cancel
Help

Does output make sense?



HEFR Input

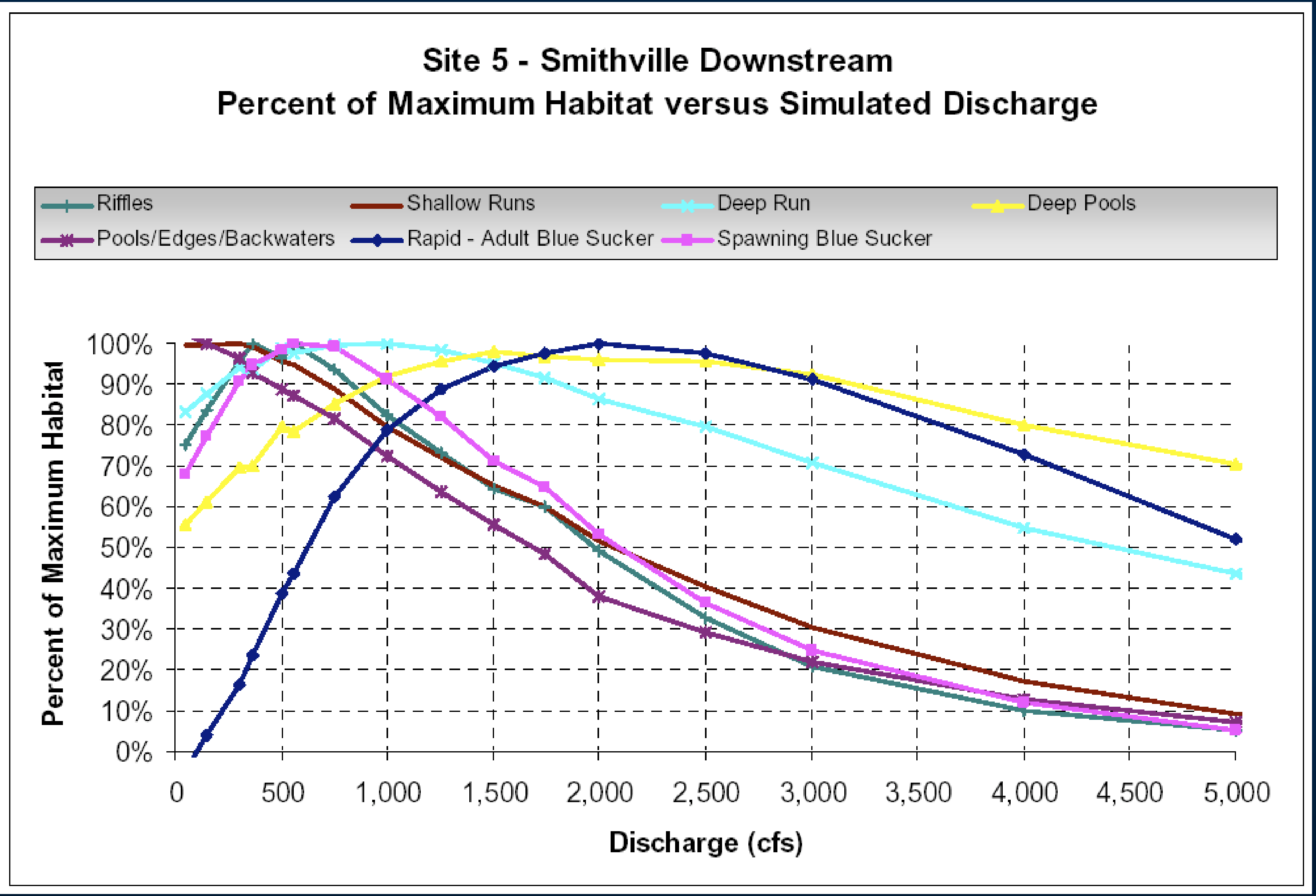


HEFR Inputs
Subsistence Flows
Subsistence Flows Threshold (%ile) 0.5
Q95
Water Quality Protection Flow (cfs)
High Flow Pulses
Multipeaks_Multiplier 2
Overbank Events
Multipeaks_Multiplier 2
Estimate Of Bankfull (cfs) 7500
Flow Recommendation Levels
Low 0.25 Medium 0.5 High 0.75
To Distribute HEFR Workbook
HEFR Run Descriptive Information
USGS Gage ID
Episodic Events Option Frequency Approach
Season Type Normal
Start Month of First Season December
Define High Flow Pulses and Overbank Events by
Peak Flow Volume Duration
Intermittent Streams
Calculate subsistence and base flow statistics based on non-zero flows only
IHA
IHA Projects Directory
Name of the IHA Analysis
Check Inputs
Run HEFR
Exit HEFR
Help
Watch Window
With this option, HEFR will calculate subsistence flows and base flows using non-zero flows only.

Processing (HEFR setup)

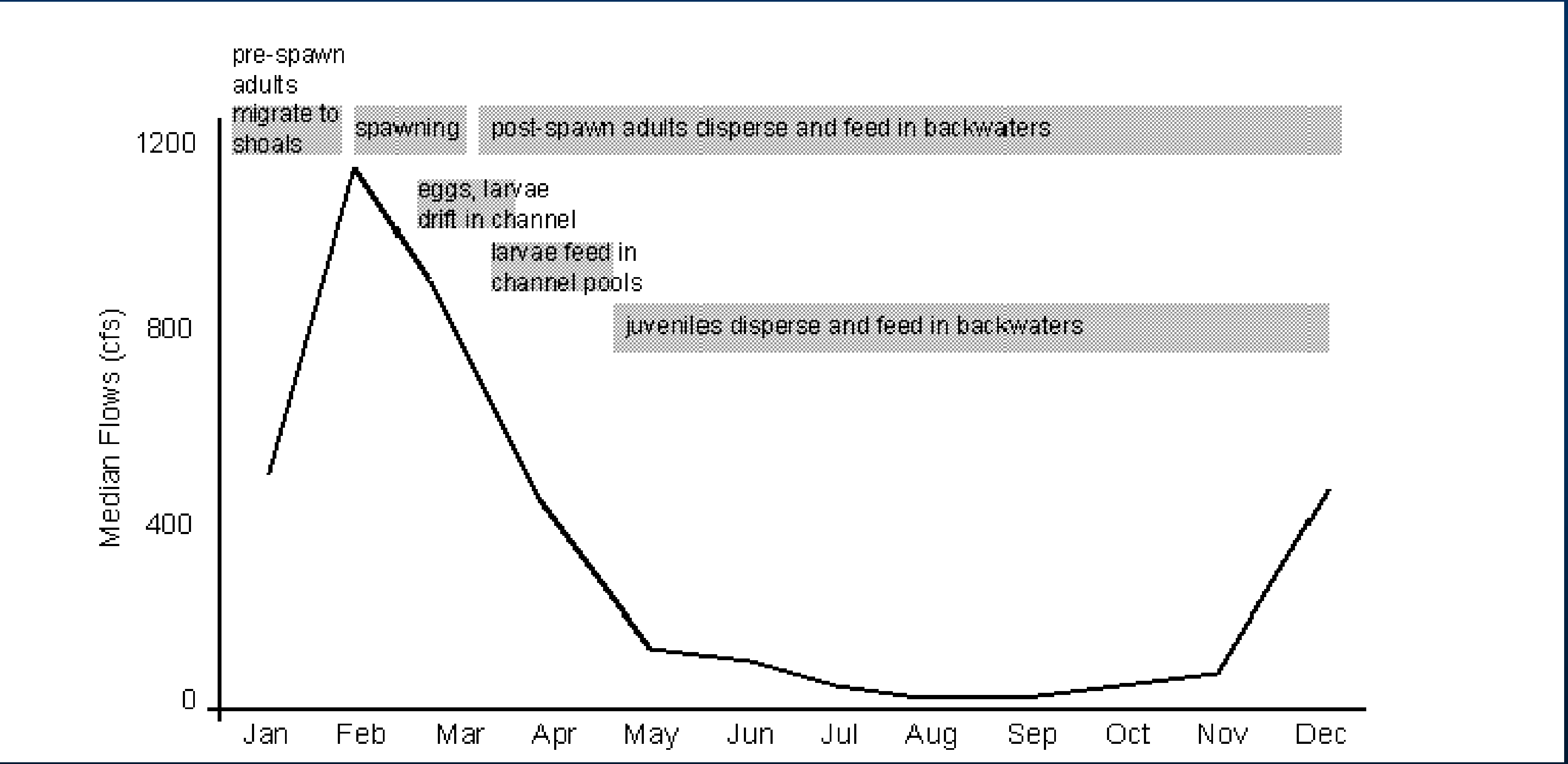
Subsistence Flow Threshold Percentile or “method”	Median of classified IHA low flows? 7Q2, Q95 to replace values less than these? Other information such as critical habitat flows?
Hydrologic Conditions	All three needed? What info is available to help set?
Seasonality	4 seasons of 3 months? When does it start? Migration and spawning seasons, other life history traits, riparian connectivity

Hydrologic Conditions



Seasonality

- Paddlefish Life History



Default Settings

	Dec / Jan / Feb (Winter)	Mar / Apr / May (Spring)	Jun / Jul / Aug (Summer)	Sep / Oct / Nov (Fall)
Overbank Flows	Return Period (R) : 2.4 (years)		Duration (D) : 19 (days)	
	Volume (V) : 57323 (ac-ft)		Peak Flow (Q) : 4450 (cfs)	
High Flow Pulses	F: 1	F: 1	F: 1	F: 1
	D: 6	D: 6	D: 6	D: 6
	Q: 913	Q: 1000	Q: 986	Q: 1030
	V: 6957	V: 6433	V: 6987	V: 6060
	F: 2	F: 2	F: 2	F: 2
	D: 4	D: 4	D: 4	D: 4
	Q: 582	Q: 643	Q: 617	Q: 617
	V: 4217	V: 3763	V: 3283	V: 3599
	F: 3	F: 3	F: 3	F: 3
	D: 3	D: 3	D: 3	D: 3
	Q: 410	Q: 474	Q: 372	Q: 414
	V: 2063	V: 2335	V: 1684	V: 1881
Base Flows (cfs)	313	307	253	274
	230	222	189	192
	189	189	189	189
Subsistence Flows (cfs)	189	189	189	189

Hydrologic Conditions	
	Wet (75th %ile)
	Average (50th %ile)
	Dry (25th %ile)
	Subsistence

High Flow Pulse Characteristics	
	F = Frequency (per season)
	D = Duration (days)
	Q = Peak Flows (cfs)
	V = Volume (ac-ft)

Refined with Biological Input

	Winter (Jan, Feb, Mar)	Spring (Apr, May, Jun)	Summer (Jul, Aug, Sep)	Fall (Oct, Nov, Dec)
Overbank Flows	Qp: 6,830 cfs with Frequency 5 per 17 years Volume is 67,424 to 99,563 (83,494) Duration is 13 to 43 (23)			
High Flow Pulses	Qp: 535 cfs with Frequency 8 per year Volume is #N/A to 18,718 (2,715) Duration is 2 to 7 (4)			
	Qp: 385 cfs with Frequency 10 per year Volume is #N/A to 16,785 (782) Duration is 2 to 5 (3)			
Base Flows (cfs)	223	221	200	213
	178	178	170	178
	144	148	145	152
Subsistence Flows (cfs)	102	92	89	89

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Winter			Spring			Summer			Fall		

Hydrologic Conditions	
	Wet (75th %ile)
	Average (50th %ile)
	Dry (25th %ile)
	Subsistence

High Flow Pulse Characteristics	
	F = Frequency (per season)
	D = Duration (days)
	Q = Peak Flows (cfs)
	V = Volume (ac-ft)

Recommendations

- Get engaged and stay engaged
- Participate in the pre-processing decisions and understand the implications
- Understand the parameters in processing hydrologic data
- Look at the IHA output and graphics
- Does the output make sense?
- Document the rationale of the decisions – see example in Section 4