

Evaluation of DMF West on Brazos Shiners: Fragment Lengths and Population Response

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July 30, 2012



River Fragments

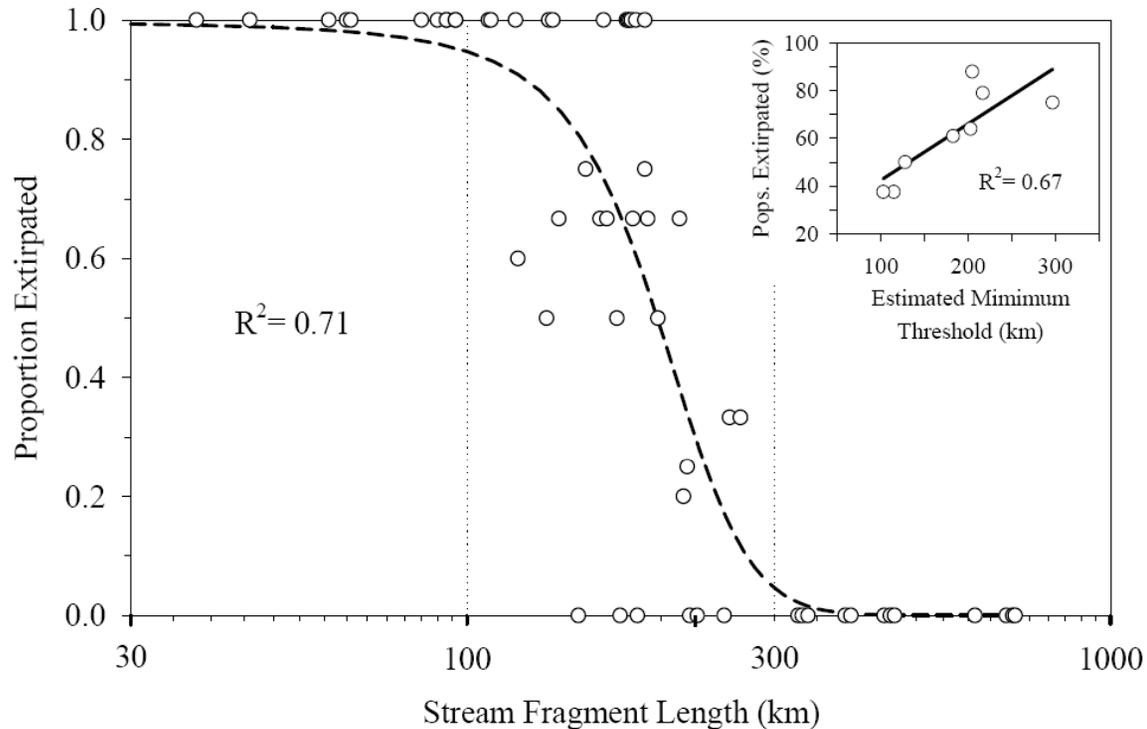


Figure 5. Proportion of species extirpated from Great Plains pelagic-spawning cyprinid communities as a function of stream fragment length (x-axis log-scaled). Logistic regression Nagelkerke R^2 value is reported. Insert illustrates percentage of extirpated populations for each species as a function of the estimated minimum threshold (km) necessary for persistence (see Table 3).

From Perkin et al. 2010. Consequences of stream fragmentation and climate Change for rare Great Plains fishes. Report to Great Plains LCC.

River Fragments

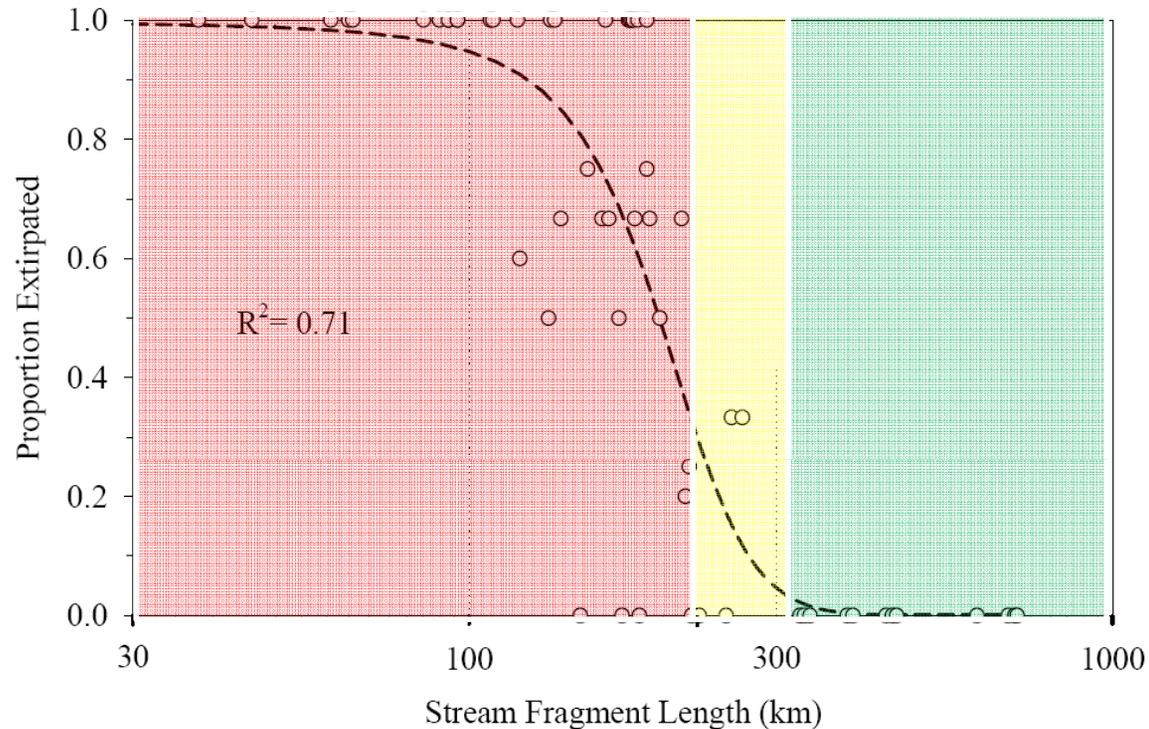
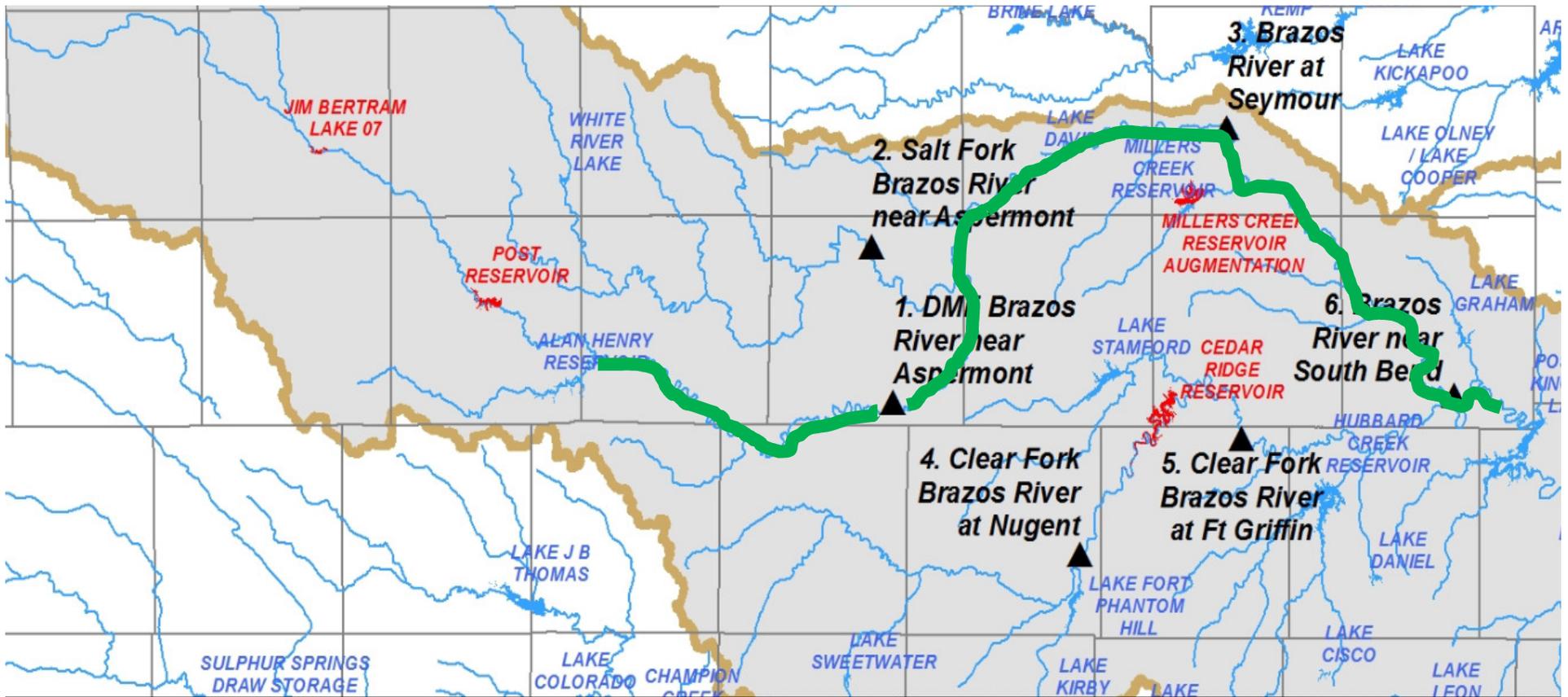


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No DMF West reservoir

Alan Henry to Possum Kingdom – 552 river km (low risk)



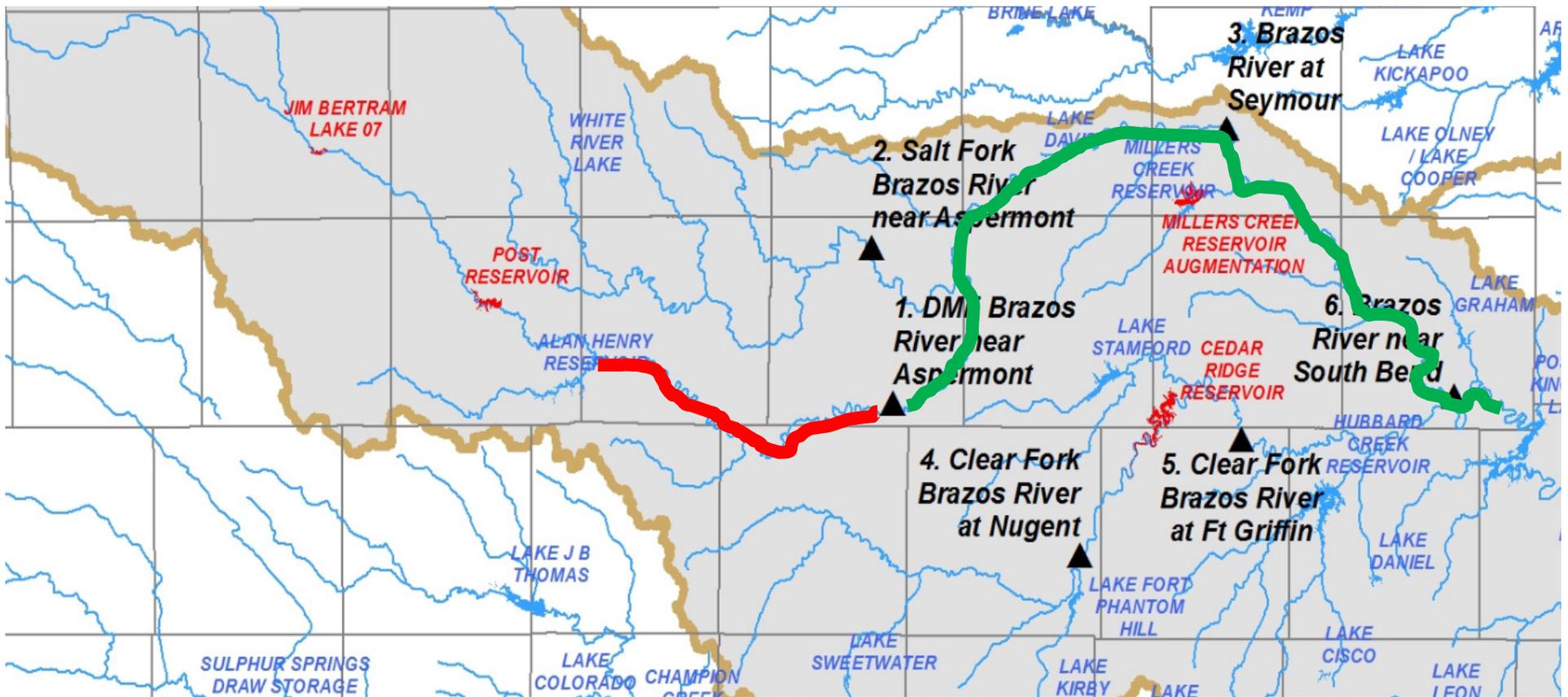
No DMF West reservoir

Alan Henry to Possum Kingdom – 552 river km (low risk)

With DMF West near Aspermont, TX

Alan Henry to DMF West – 170 river km (high risk)

DMF West to Possum Kingdom – 382 river km (low risk)



Durham and Wilde (2009) modeled smalleye shiner population in upper Brazos River

- **Used mean summer discharge (May-Sept) for Brazos River at Seymour**
- **>227 cfs increase in population**
- **<227 cfs decrease**

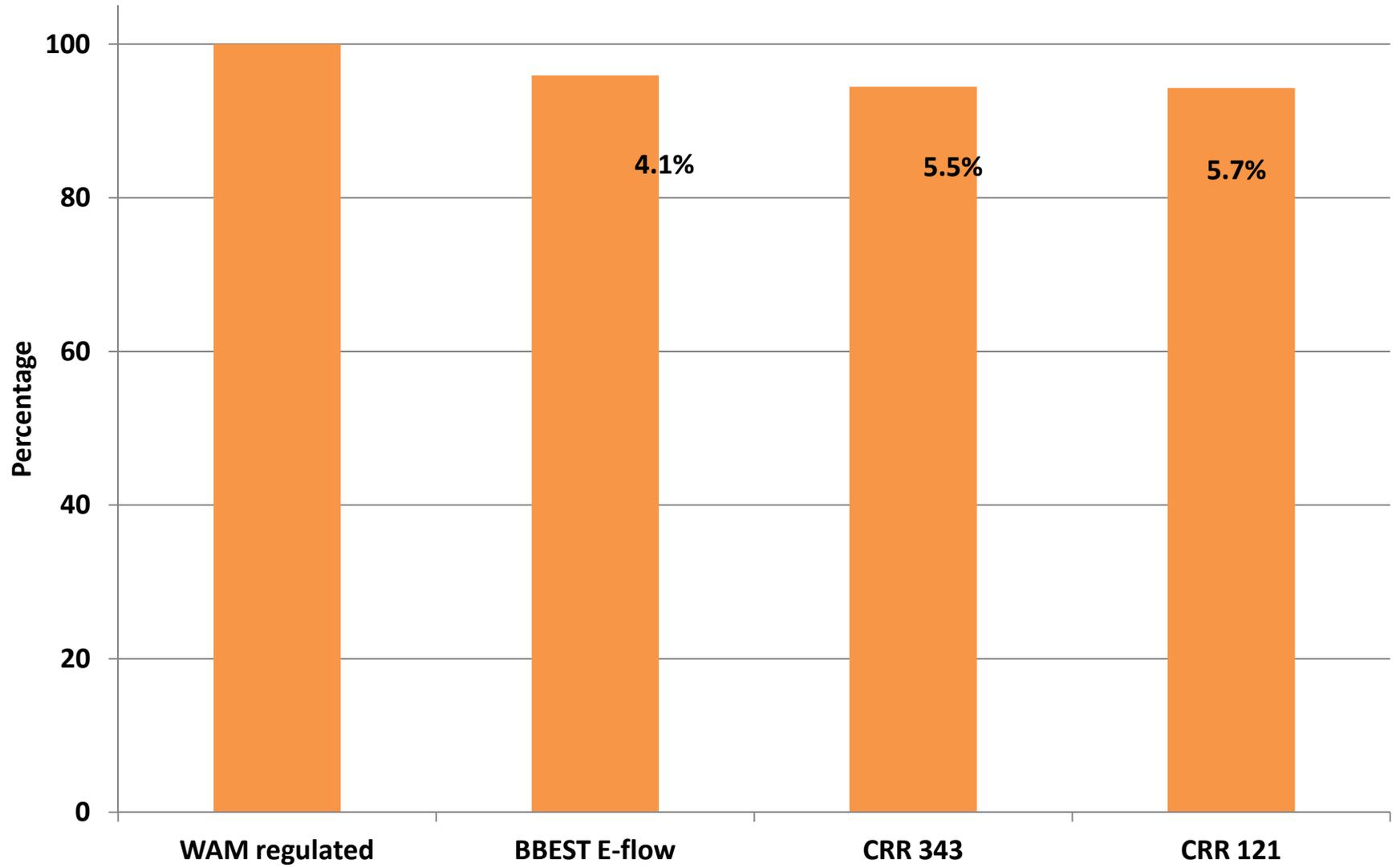


Smalleye shiner

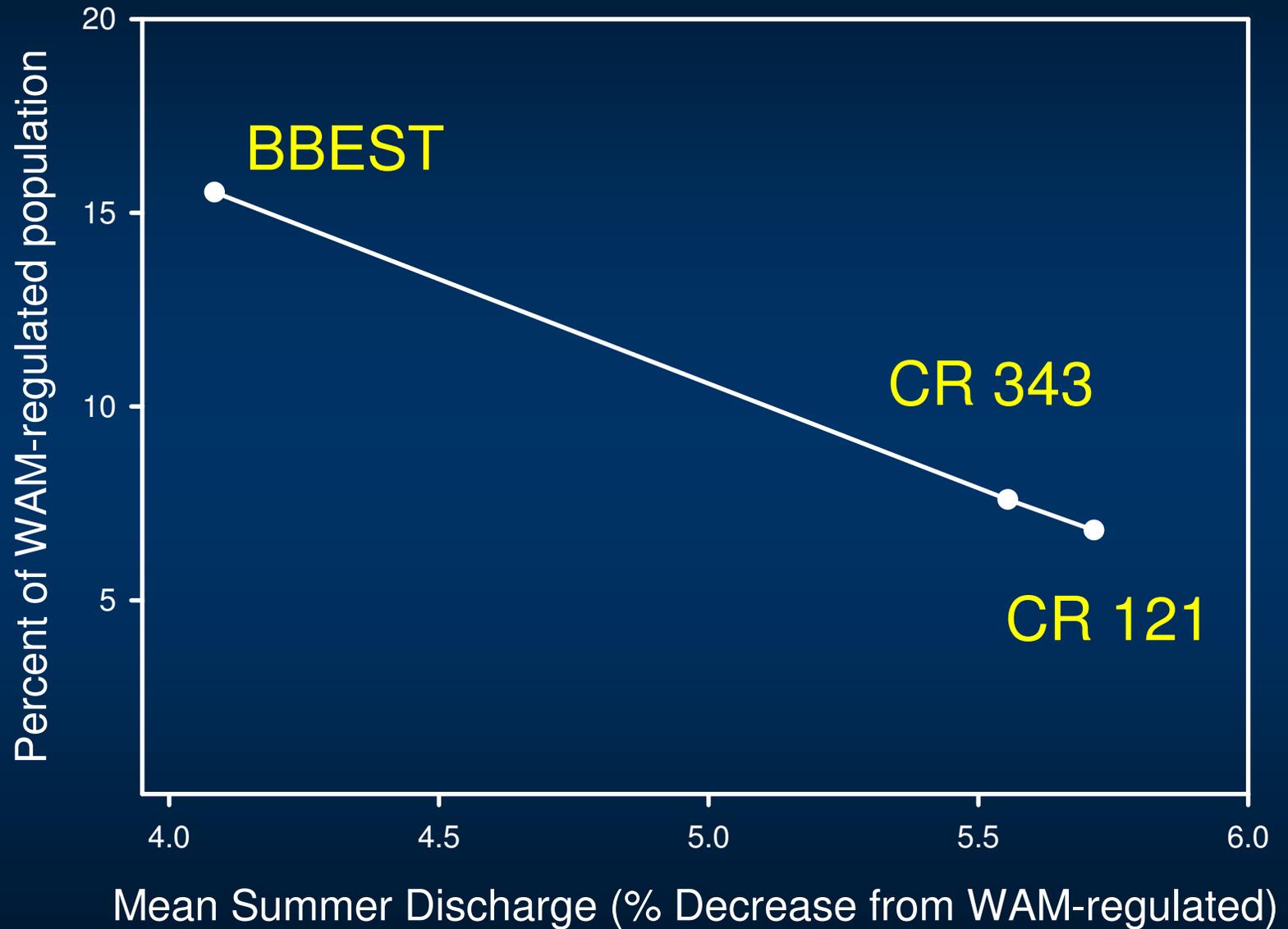
Next Steps (July 17)

- Quantify effects of DMF West releases (FRAT output) on Brazos River at Seymour
 - Used Brazos G WAM, 2060 from BBEST
 - Ran for BBEST e-flow, CR 343, CR 121
- Work with Texas Tech to rerun population dynamics model at Brazos River at Seymour
 - Calculated mean summer discharge for input to Dr. Wilde's model
- Look at each scenario to determine percent reduction in population

Change in Mean Summer Discharge



Smalleye Shiner Population Response



Conclusions on DMF West

- Upstream extirpation very probable
- Downstream effects = high risk
 - Population declines with small changes in mean summer discharge
 - migration blocked
 - Salinity increases due to Salt Fork?
- Downstream Fragment Length = low risk

Double Mountain Fork Brazos River near Aspermont Stream Gage - DRAFT EFS based on CRR template

High Flow Pulses	Wet	Not Recommended	Qp: 570 cfs with Average Frequency 1 per season Regressed Volume is 2600 Duration Bound is 12				Qp: 480 cfs with Average Frequency 1 per season Regressed Volume is 2160 Duration Bound is 12						
	Avg	Not Recommended	Qp: 280 cfs with Average Frequency 2 per season Regressed Volume is 1270 Duration Bound is 10				Qp: 230 cfs with Average Frequency 2 per season Regressed Volume is 990 Duration Bound is 9						
	Dry	Not Recommended	Qp: 280 cfs with Average Frequency 1 per season Regressed Volume is 1270 Duration Bound is 10				Qp: 230 cfs with Average Frequency 1 per season Regressed Volume is 990 Duration Bound is 9						
Base Flows (cfs)	Wet	15	8				7						
	Avg	4	3				2						
	Dry	1	1				1						
Subsistence Flows (cfs)		1.0				1.0				1.0			
		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
		Winter				Spring				Summer			
Flow Levels		High (75th %ile)								Notes: 1. Period of Record used : 1/1/1940 to 12/31/2010. 2. Volumes are in acre-feet and durations are in days. 3. Episodic events are terminated when the volume or duration criteria are met, or when the flow drops below 8 cfs, or when the flow is below 45 cfs and the flow drops from one day to the next by less than 5%. 4. 50% rule applied as defined by BBASC 5. Wet, Average, Dry defined by hydrologic season.			
		Medium (50th %ile)											
		Low (25th %ile)											

1-2-1

Double Mountain Fork Brazos River near Aspermont Stream Gage - DRAFT EFS based on CRR template

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3-4-3