

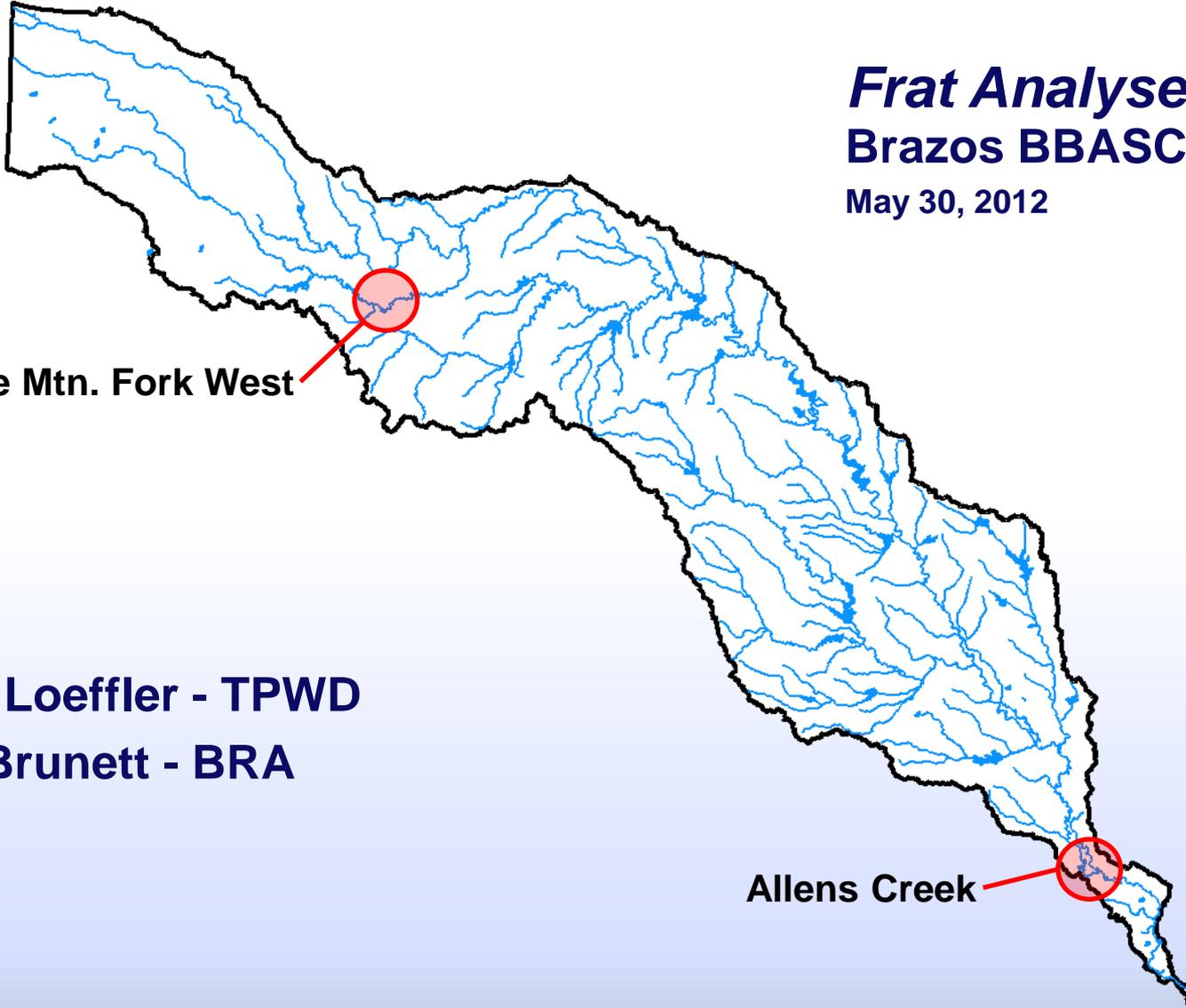
# *Frat Analyses* Brazos BBASC

May 30, 2012

Double Mtn. Fork West

Cindy Loeffler - TPWD  
Brad Brunett - BRA

Allens Creek



# ***FRAT Analysis***

- New reservoir project at junior priority**
- Streamflow TCEQ Brazos WAM Run 3 Distributed Daily**
- Period of Record: 1940 – 1997**
- Lyons Method and BBEST Environmental Flow Recommendations**

## **Double Mountain Fork West**

- Reservoir Capacity: 215,254 af**
- Reservoir Area: 6,632 acres**
- On-Channel Reservoir**

## **Allens Creek**

- Reservoir Capacity: 145,533 af**
- Reservoir Area: 7,003 acres**
- Off Channel Reservoir**
- Diversion Rate: 2,200 cfs**



# BBEST Recommendation at Richmond

Overbank Events	Qp: 68,100 cfs with Average Frequency 1 per 2 years Regressed Volume is 1,487,000 Duration Bound is 41											
	Qp: 51,600 cfs with Average Frequency 1 per year Regressed Volume is 1,019,000 Duration Bound is 35											
High Flow Pulses	Qp: 24,600 cfs with Average Frequency 1 per season Regressed Volume is 383,000 Duration Bound is 23				Qp: 35,000 cfs with Average Frequency 1 per season Regressed Volume is 617,000 Duration Bound is 29				Qp: 12,900 cfs with Average Frequency 1 per season Regressed Volume is 144,000 Duration Bound is 15			
	Qp: 12,400 cfs with Average Frequency 2 per season Regressed Volume is 150,000 Duration Bound is 16				Qp: 16,300 cfs with Average Frequency 2 per season Regressed Volume is 215,000 Duration Bound is 19				Qp: 5,430 cfs with Average Frequency 2 per season Regressed Volume is 46,300 Duration Bound is 10			
	Qp: 6,410 cfs with Average Frequency 3 per season Regressed Volume is 60,600 Duration Bound is 11				Qp: 8,930 cfs with Average Frequency 3 per season Regressed Volume is 94,000 Duration Bound is 13				Qp: 2,460 cfs with Average Frequency 3 per season Regressed Volume is 16,400 Duration Bound is 6			
Base Flows (cfs)	3,310				3,980				2,190			
	1,650				2,140				1,330			
	990				1,190				930			
Subsistence Flows (cfs)	550				550				550			
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter				Spring				Summer			

Base Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)

Pulse volumes are in units of acre-feet and durations are in days.

Period of record used : 1/1/1923 to 12/31/2010.

Episodic events are terminated when the volume or duration criteria are met, or when the flow drops below 1260 cfs, or when the flow is below 8430 cfs and the flow drops from one day to the next by less than 5%.

# Lyons Method at Richmond

Overbank Events												
High Flow Pulses												
Base Flows (cfs)	555	794	860	1,317	1,640	1,995	4,600	2,740	907	562	756	492
	555	794	860	1,317	1,640	1,995	4,600	2,740	907	562	756	492
	555	794	860	1,317	1,640	1,995	4,600	2,740	907	562	756	492
Subsistence Flows (cfs)	555	794	860	1,317	1,640	1,995	4,600	2,740	907	562	756	492
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter				Spring				Summer			

Base Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)

Period of record used : 1/1/1940 to 12/31/1997.



# BBEST Recommendation at Double Mountain Fork

High Flow Pulses	Qp: 16,300 cfs with Average Frequency 1 per 5 years Regressed Volume is 77,100 Duration Bound is 31											
	Qp: 9,490 cfs with Average Frequency 1 per 2 years Regressed Volume is 44,900 Duration Bound is 27											
	Qp: 5,130 cfs with Average Frequency 1 per year Regressed Volume is 24,300 Duration Bound is 23											
	Qp: 92 cfs with Average Frequency 1 per season Regressed Volume is 610 Duration Bound is 12			Qp: 2,730 cfs with Average Frequency 1 per season Regressed Volume is 12,500 Duration Bound is 17				Qp: 2,540 cfs with Average Frequency 1 per season Regressed Volume is 11,900 Duration Bound is 19				
	Qp: 30 cfs with Average Frequency 2 per season Regressed Volume is 180 Duration Bound is 8			Qp: 1,120 cfs with Average Frequency 2 per season Regressed Volume is 5,120 Duration Bound is 14				Qp: 1,040 cfs with Average Frequency 2 per season Regressed Volume is 4,750 Duration Bound is 14				
				Qp: 570 cfs with Average Frequency 3 per season Regressed Volume is 2,600 Duration Bound is 12				Qp: 480 cfs with Average Frequency 3 per season Regressed Volume is 2,160 Duration Bound is 12				
				Qp: 280 cfs with Average Frequency 4 per season Regressed Volume is 1,270 Duration Bound is 10				Qp: 230 cfs with Average Frequency 4 per season Regressed Volume is 990 Duration Bound is 9				
Base Flows (cfs)	15				8				7			
	4				3				2			
	1				1				1			
Subsistence Flows (cfs)	1				1				1			
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter				Spring				Summer			

Base Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)

Pulse volumes are in units of acre-feet and durations are in days.

Period of record used : 1/1/1940 to 12/31/2010.

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%.

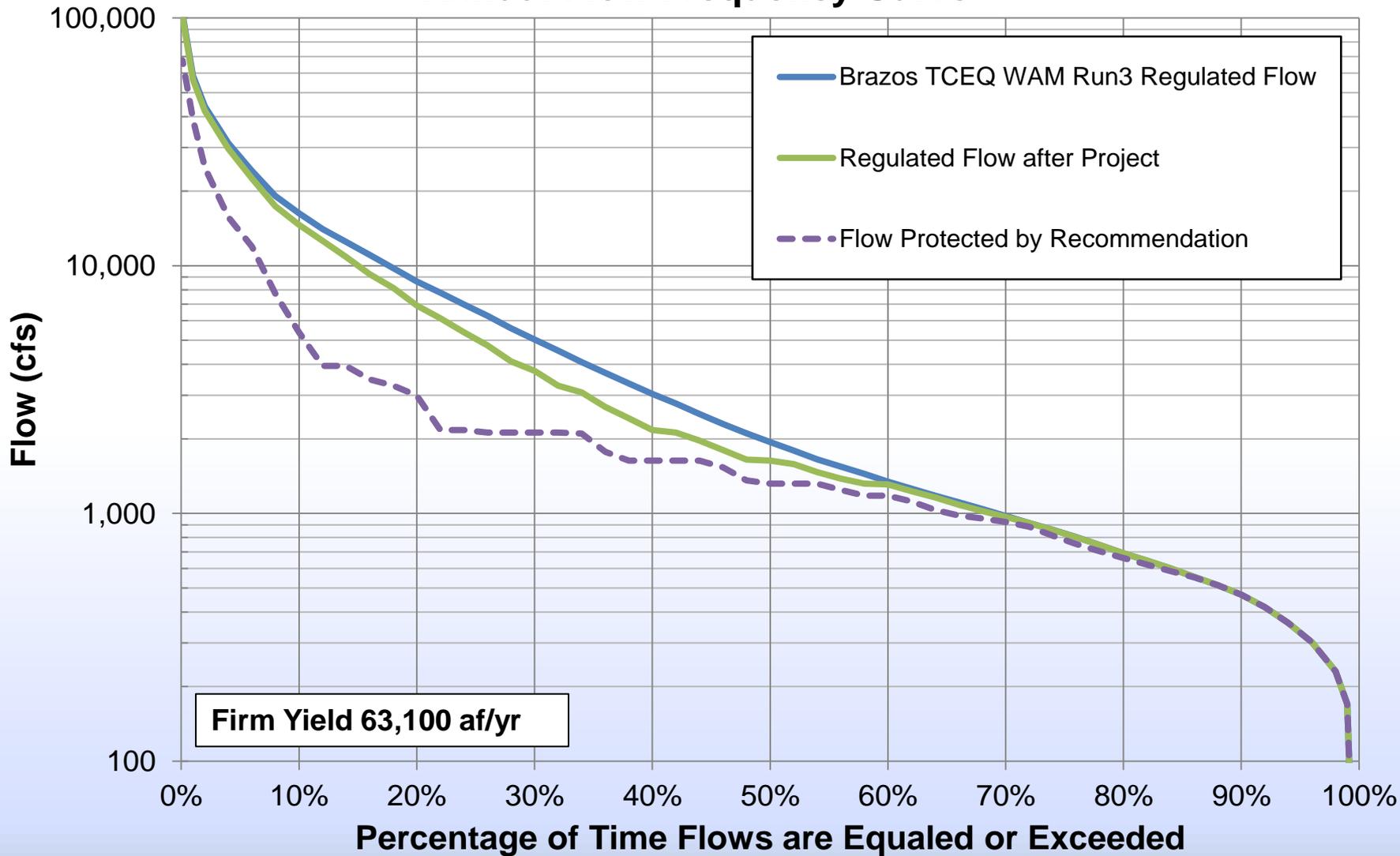
# Lyons Method at Double Mountain Fork

Overbank Events												
High Flow Pulses												
Base Flows (cfs)	4	3	2	2	2	3	13	23	6	4	8	4
	4	3	2	2	2	3	13	23	6	4	8	4
	4	3	2	2	2	3	13	23	6	4	8	4
Subsistence Flows (cfs)	4	3	2	2	2	3	13	23	6	4	8	4
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter				Spring				Summer			

Base Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)

Period of record used : 1/1/1940 to 12/31/2010.

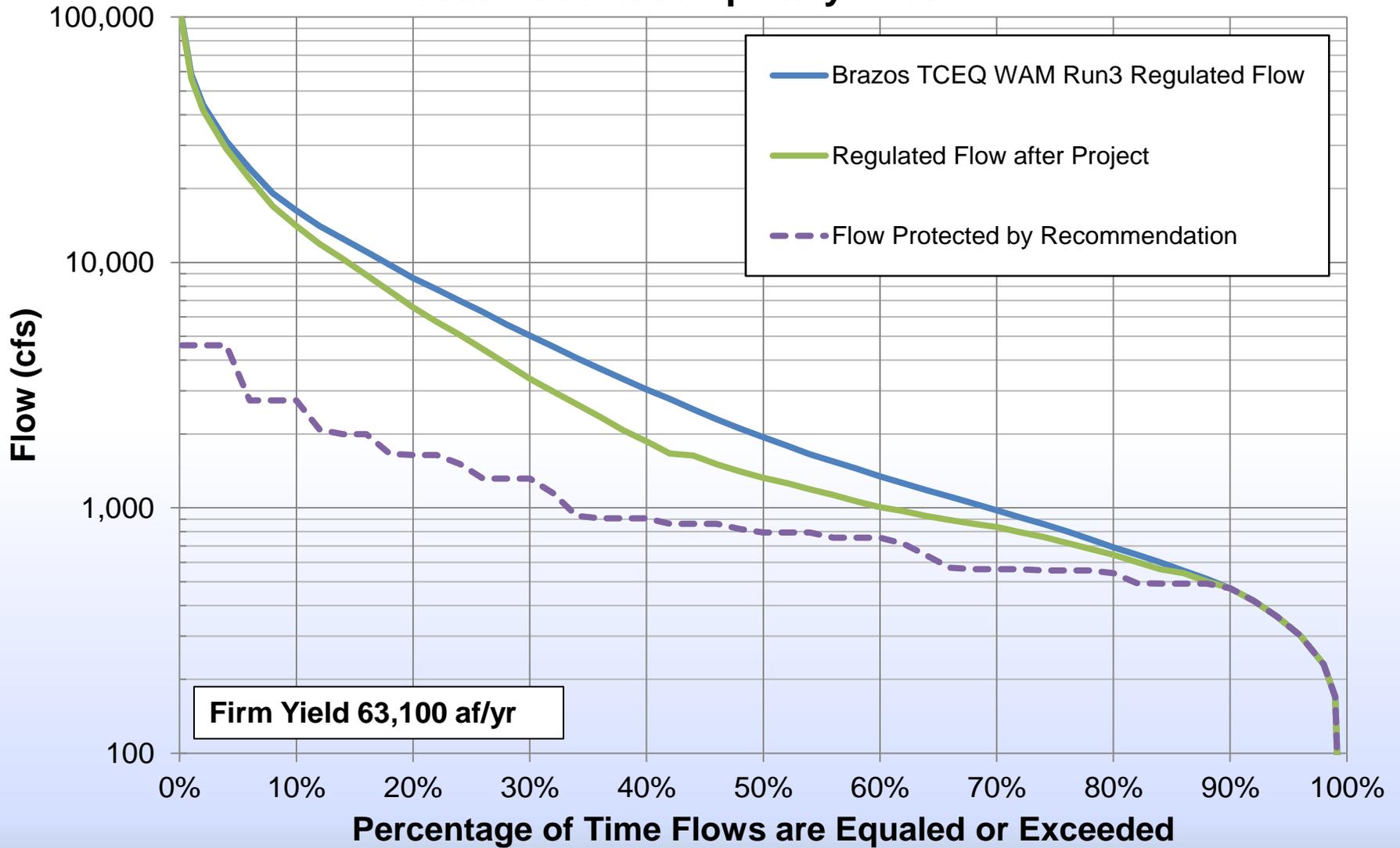
# Allens Creek, Richmond Gage – BBEST EFR Annual Flow Frequency Curve



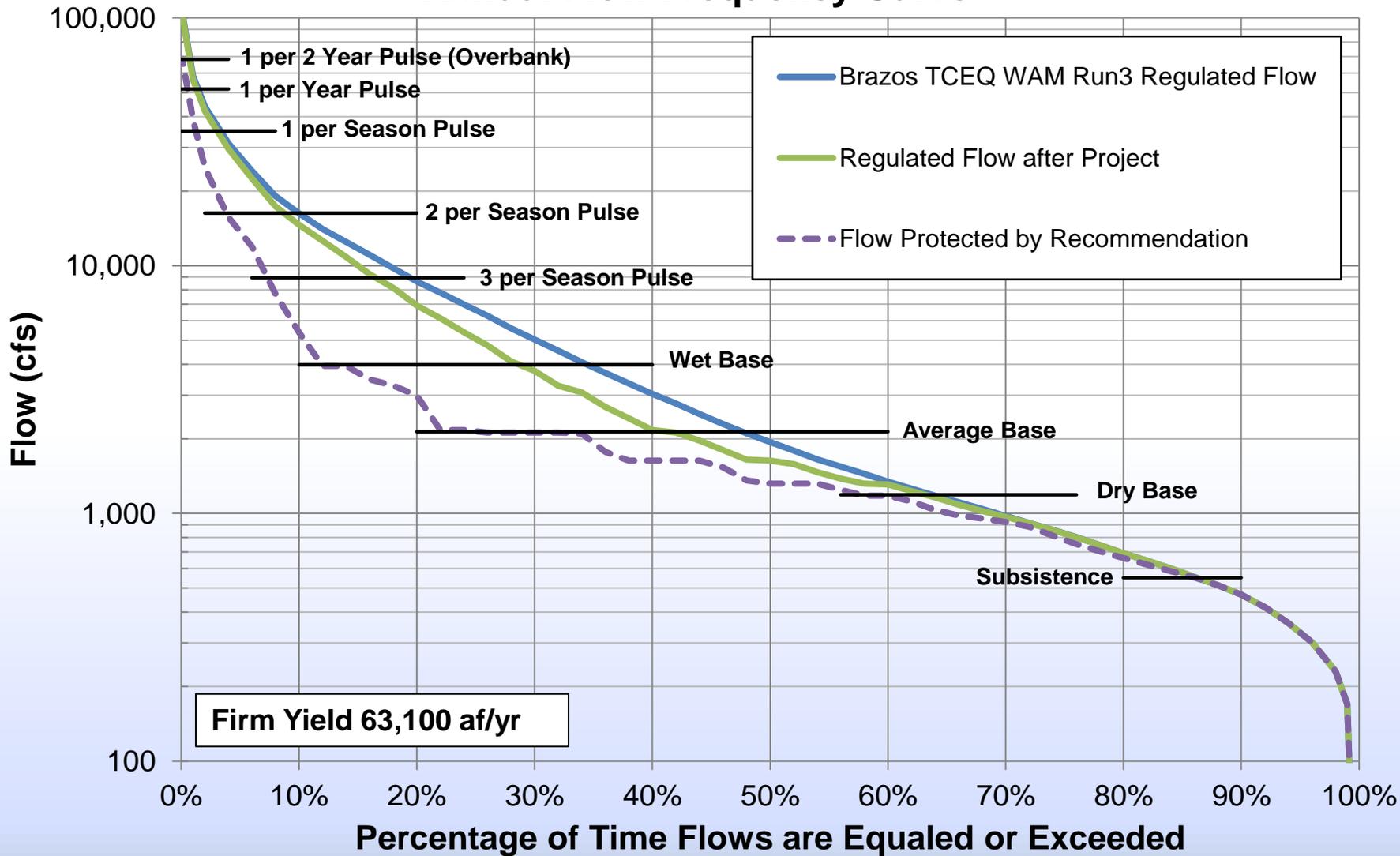
Firm Yield 63,100 af/yr



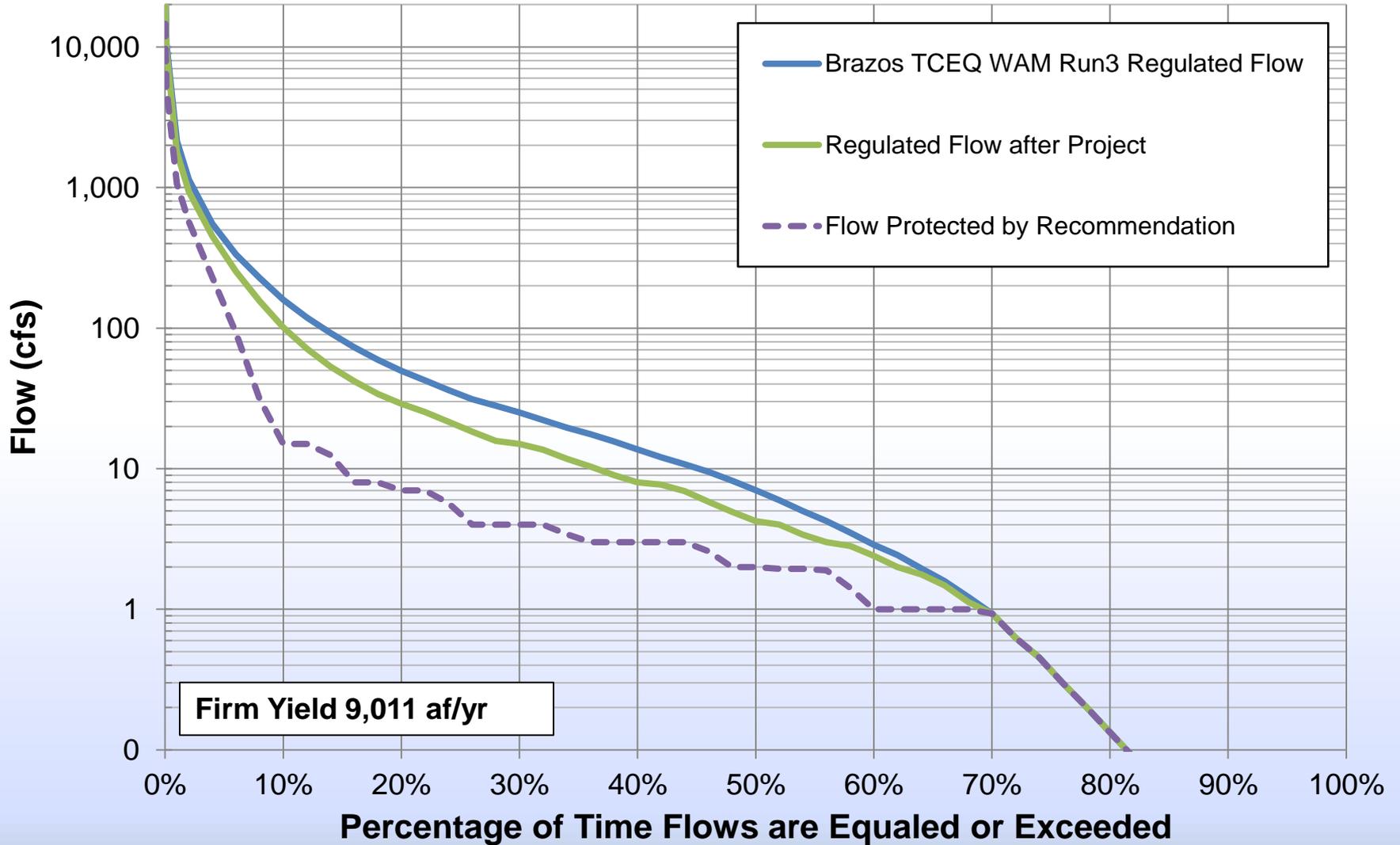
# Allens Creek, Richmond Gage – Lyons Method Annual Flow Frequency Curve



# Allens Creek, Richmond Gage – BBEST EFR Annual Flow Frequency Curve



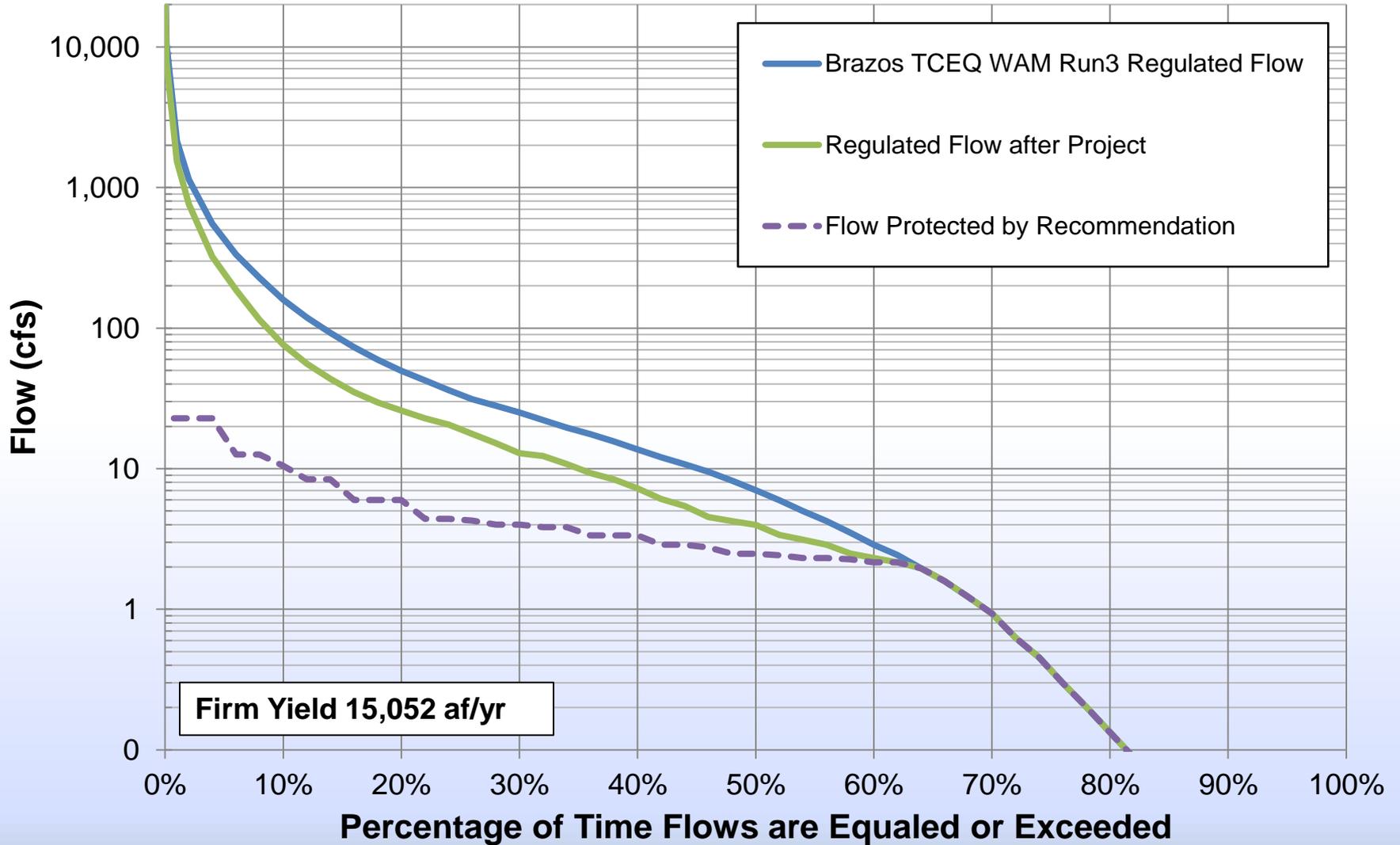
# DMF West, Aspermont Gage – BBEST EFR Annual Flow Frequency Curve



Firm Yield 9,011 af/yr



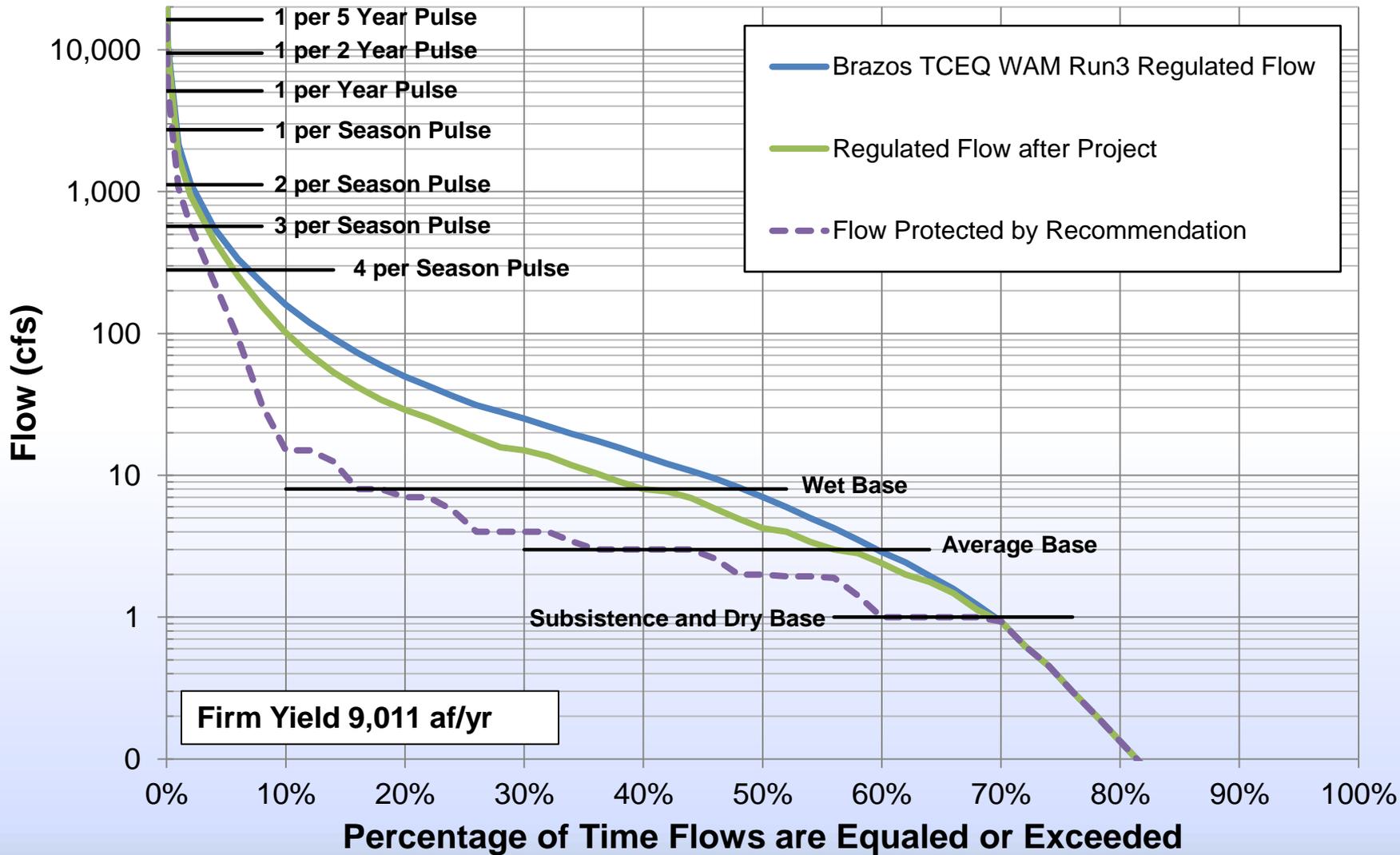
# DMF West, Aspermont Gage – Lyons Method Annual Flow Frequency Curve



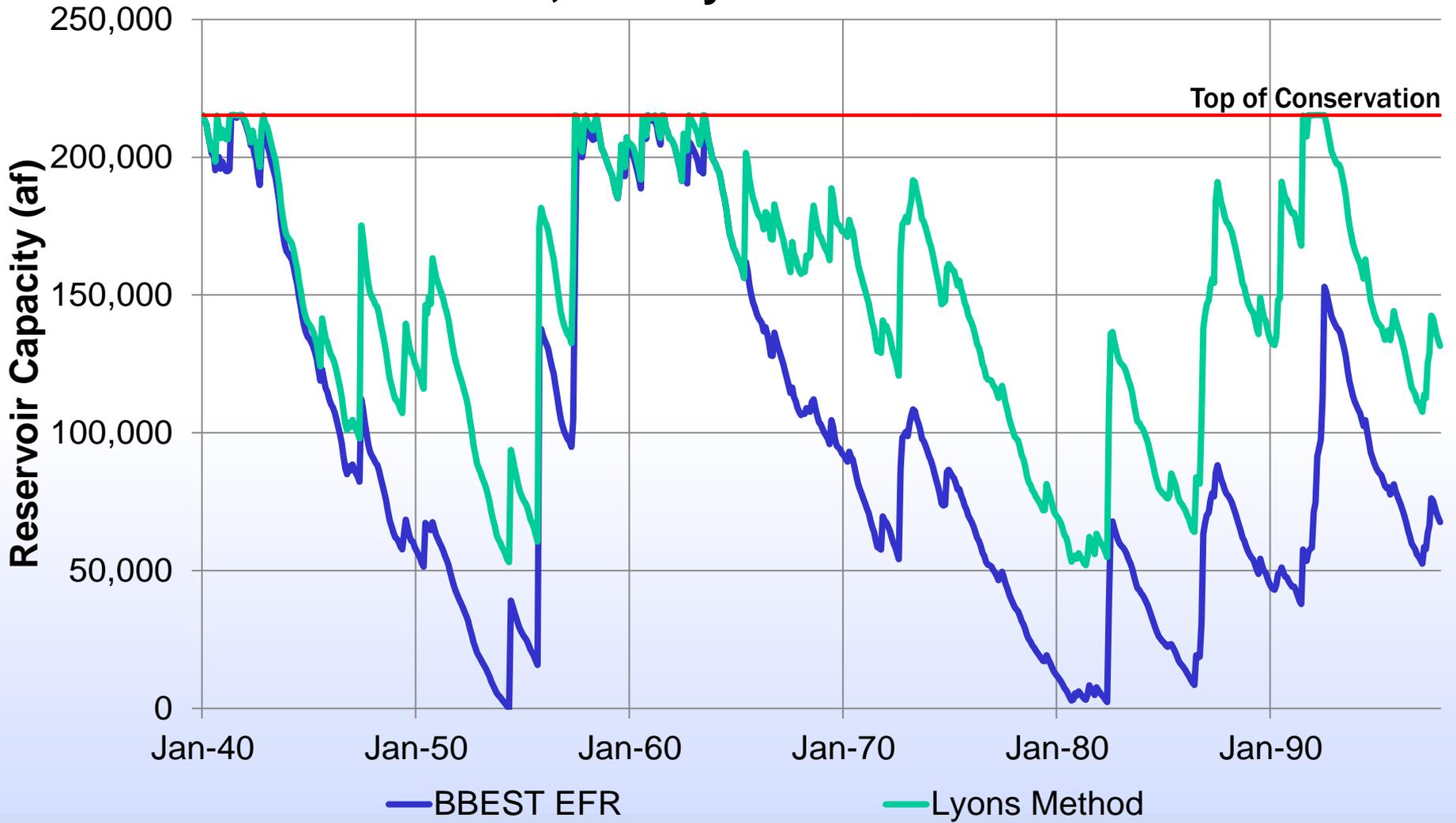
**Firm Yield 15,052 af/yr**



# DMF West, Aspermont Gage – BBEST EFR Annual Flow Frequency Curve



# Double Mountain Fork West Reservoir 9,011 af/yr Demand



Top of Conservation

— BBEST EFR

— Lyons Method



# ***Firm Yield Summary***

<b>Environment Flows</b>	<b>Allens Creek</b>	<b>DMF West</b>
Lyons	66,400 af/yr	15,052 af/yr
BBEST	63,100 af/yr	9,011 af/yr
Reduction	3,300 af/yr (5.0%)	6,041 af/yr (40.1%)



# Questions?

