

Updates on Modeling Efforts of Nueces BBASC Technical Consultant

Presentation to Nueces BBASC

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May 23, 2012

April 23rd Discussion

- Instream Flow
 - Planned Water Supply Project Evaluations
 - Sabinal Recharge Dam
 - Standard and Strategy Evaluation
 - Nueces River @ Laguna
 - Nueces River @ Cotulla
 - Yield vs. e-flow regime
 - Recommendation
 - Develop Modified BBEST W
 - Ecological and sediment analysis
 - Modified BBEST A
 - Modified BBEST W

April 23rd Discussion

- Nueces Bay & Delta
 - Planned Water Supply Project Evaluations
 - Lake Corpus Christi Off Channel Reservoir
 - B&E Scenario Evaluation
 - Yield
 - Average Bay Inflow
 - Path Forward
 - Evaluate scenarios to recommend attainment frequencies of meeting the BBEST targets that allow for the balance for human needs.

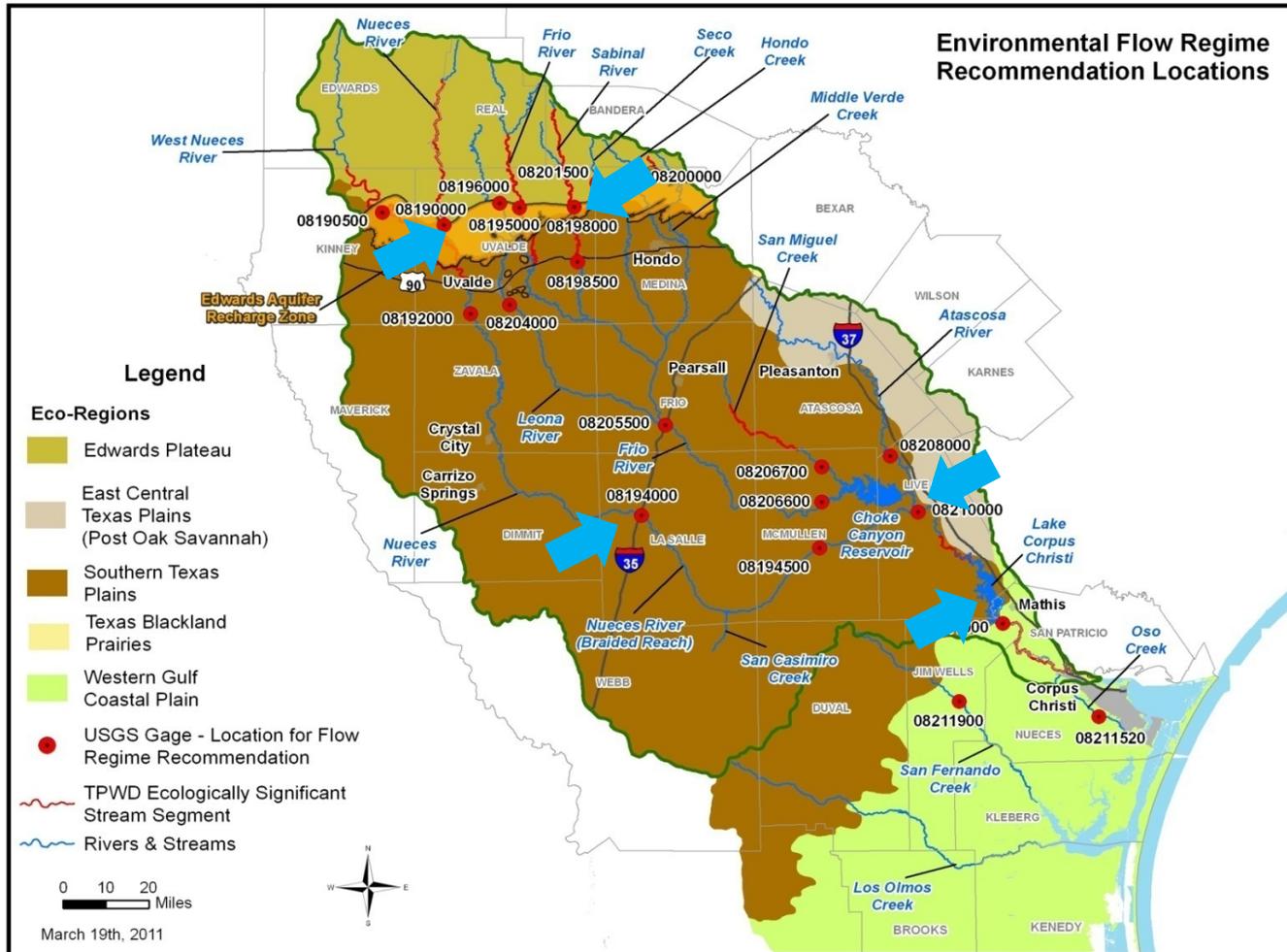
Discussion

- Instream Flow
 - HDR
 - Summary of April 23rd Analysis
 - Presentation of Modified BBEST W
 - BBEST
 - Presentation of Aquatic Habitat Analysis
 - TWDB
 - Presentation of Sediment Analysis
- BBASC vote to adopt an e-flow regime

Discussion

- Nueces Bay & Delta
 - B&E Scenario Evaluation
 - BBEST Recommendation
 - Agreed Order Safe Yield
 - No Pass-Thru's
 - OCR Order Safe Yield
 - Yield
 - Attainment Frequencies
 - Salinity
- BBASC vote to adopt an e-flow regime

Focal Sites for BBASC Instream Flow Standard Recommendations



R:\09109-140890 N BBEST\GIS\BBEST_Nueces_031911_ver1.mxd

Defined – Modified BBEST

- Overbank Exemption
- Pulse Exemption Rule
 - diversion rate $< 20\%$ of the flow pulse trigger
 - 20% rule not applicable to on-channel reservoirs
- Single Tier of Base Flows with 50% Rule
 - Diversions may not exceed 50% of the difference between the base flow and the subsistence flow.
 - Evaluated Wet and Average Base Flow Tiers

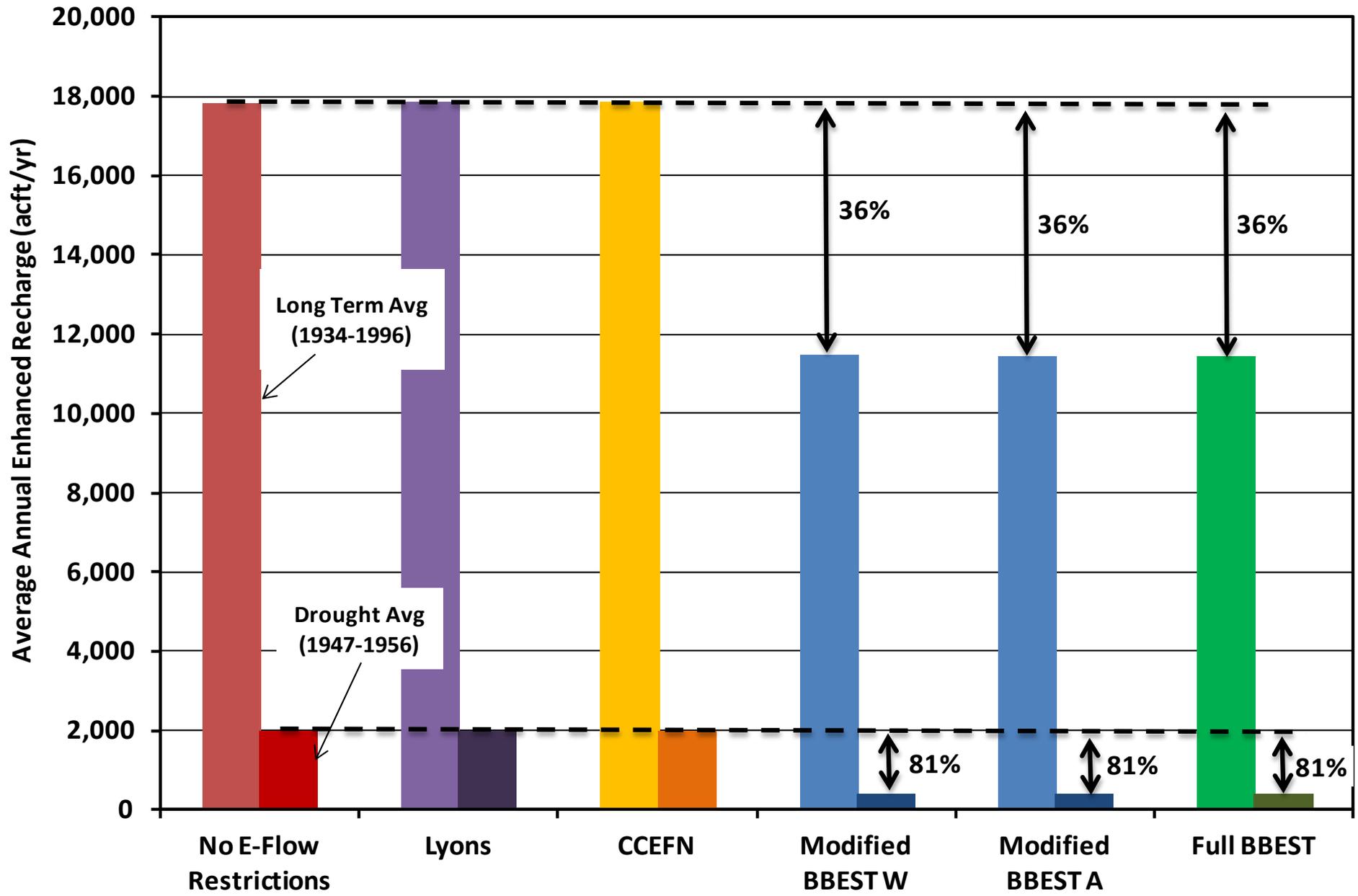
Sabinal River near Sabinal

High Flow Pulses	Qp: 5,200 cfs with Average Frequency 1 per 5 years Regressed Volume is 46,200 Duration Bound is 75																		
	Qp: 2,350 cfs with Average Frequency 1 per 2 years Regressed Volume is 20,000 Duration Bound is 54																		
	Qp: 1,020 cfs with Average Frequency 1 per year Regressed Volume is 8,290 Duration Bound is 38																		
	Qp: 330 cfs with Average Frequency 2 per year Volume Bound is 5,420 Duration Bound is 24																		
	Qp: 62 cfs with Average Frequency 1 per season Volume Bound is 1,530 Duration Bound is 17			Qp: 180 cfs with Average Frequency 1 per season Volume Bound is 2,210 Duration Bound is 15			Qp: 100 cfs with Average Frequency 1 per season Volume Bound is 1,180 Duration Bound is 12			Qp: 53 cfs with Average Frequency 1 per season Volume Bound is 840 Duration Bound is 12									
				Qp: 64 cfs with Average Frequency 2 per season Volume Bound is 750 Duration Bound is 10			Qp: 11 cfs with Average Frequency 2 per season Volume Bound is 130 Duration Bound is 5												
				Qp: 22 cfs with Average Frequency 3 per season Volume Bound is 240 Duration Bound is 6															
	Base Flows (cfs)				35				29				35						
					21				13				21						
	Subsistence Flows (cfs)				11				8				3				10		
1																			
Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov																			
Winter				Spring				Summer				Fall							

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

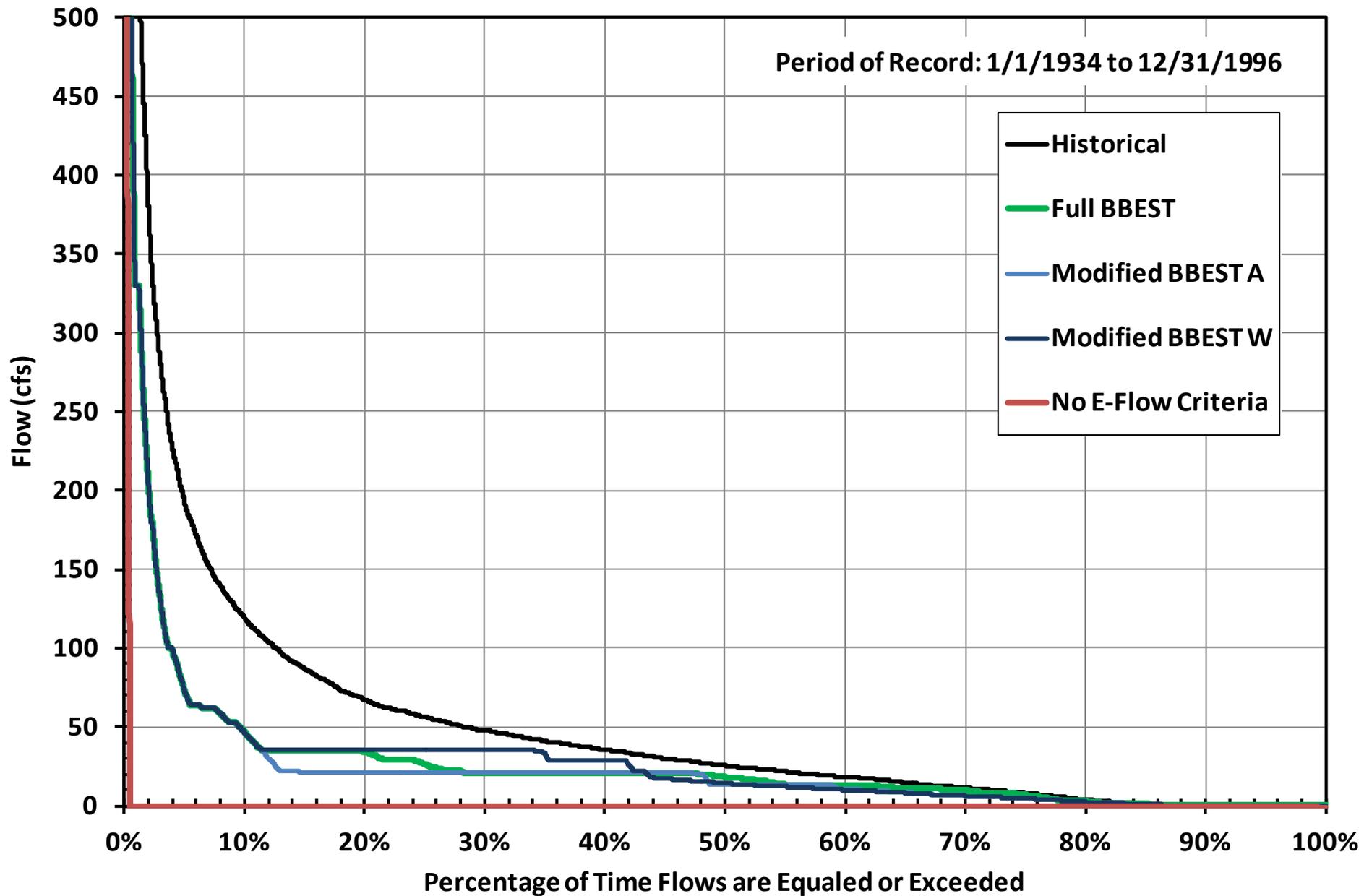
Pulse volumes are in units of acre-feet and durations are in days.
Period of Record used: 1/1/1943 to 12/31/2009.

Sabinal River at Sabinal Recharge Reservoir - Enhanced Recharge



UPDATE

Sabinal River at Sabinal Recharge Reservoir - Flow Frequency Curve



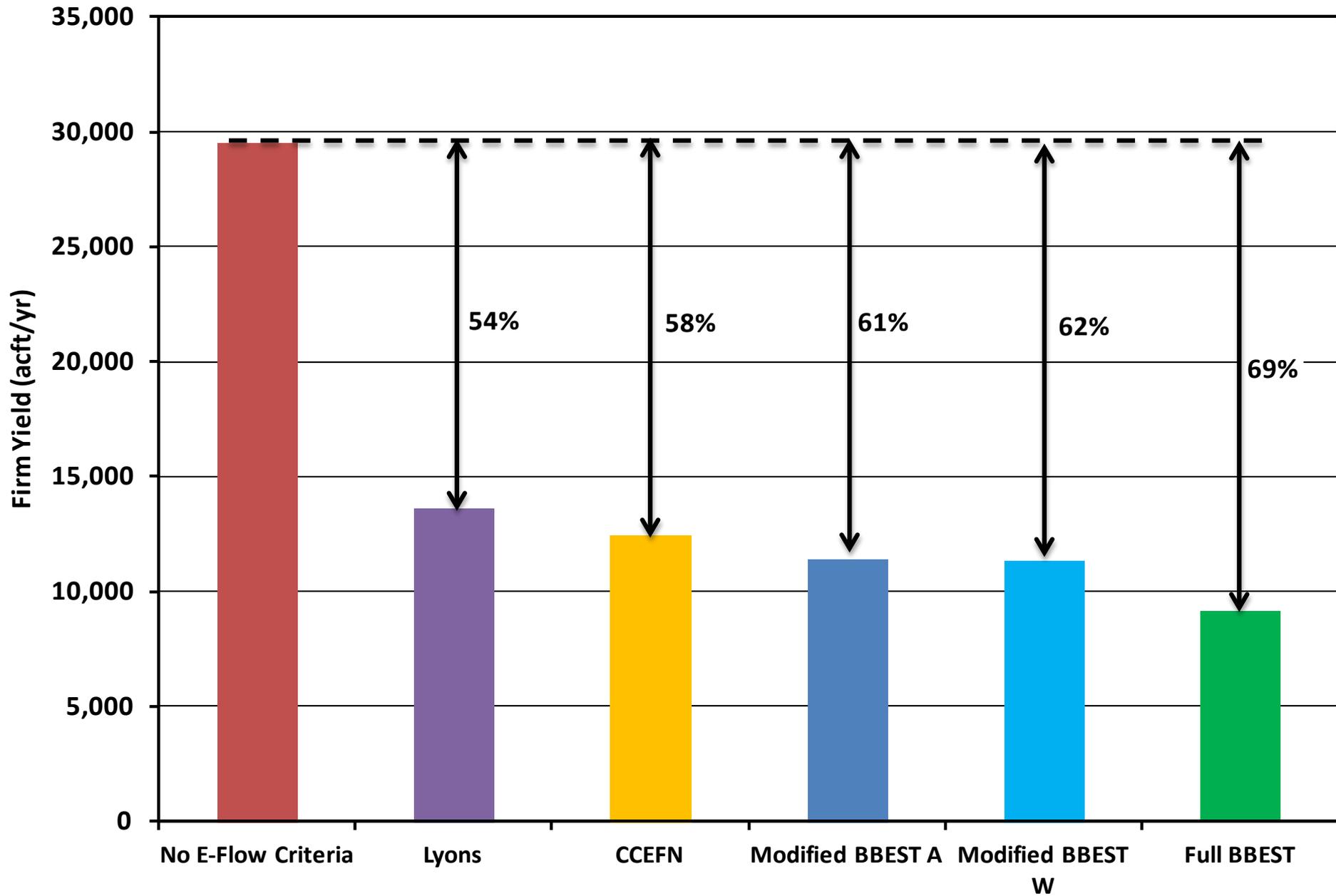
Sabinal Recharge Dam

- Preliminary Conclusions
 - The impoundment of high flow pulses by the Sabinal Dam provides the greatest opportunity for recharge enhancement.
 - Variations in base flow criteria have negligible effects on enhanced recharge.
- Downstream Impacts
 - System yield = -1,900 to -2,300 acft/yr
 - Average Annual Bay Inflow = -850 acft/yr

Standard & Strategy Evaluation

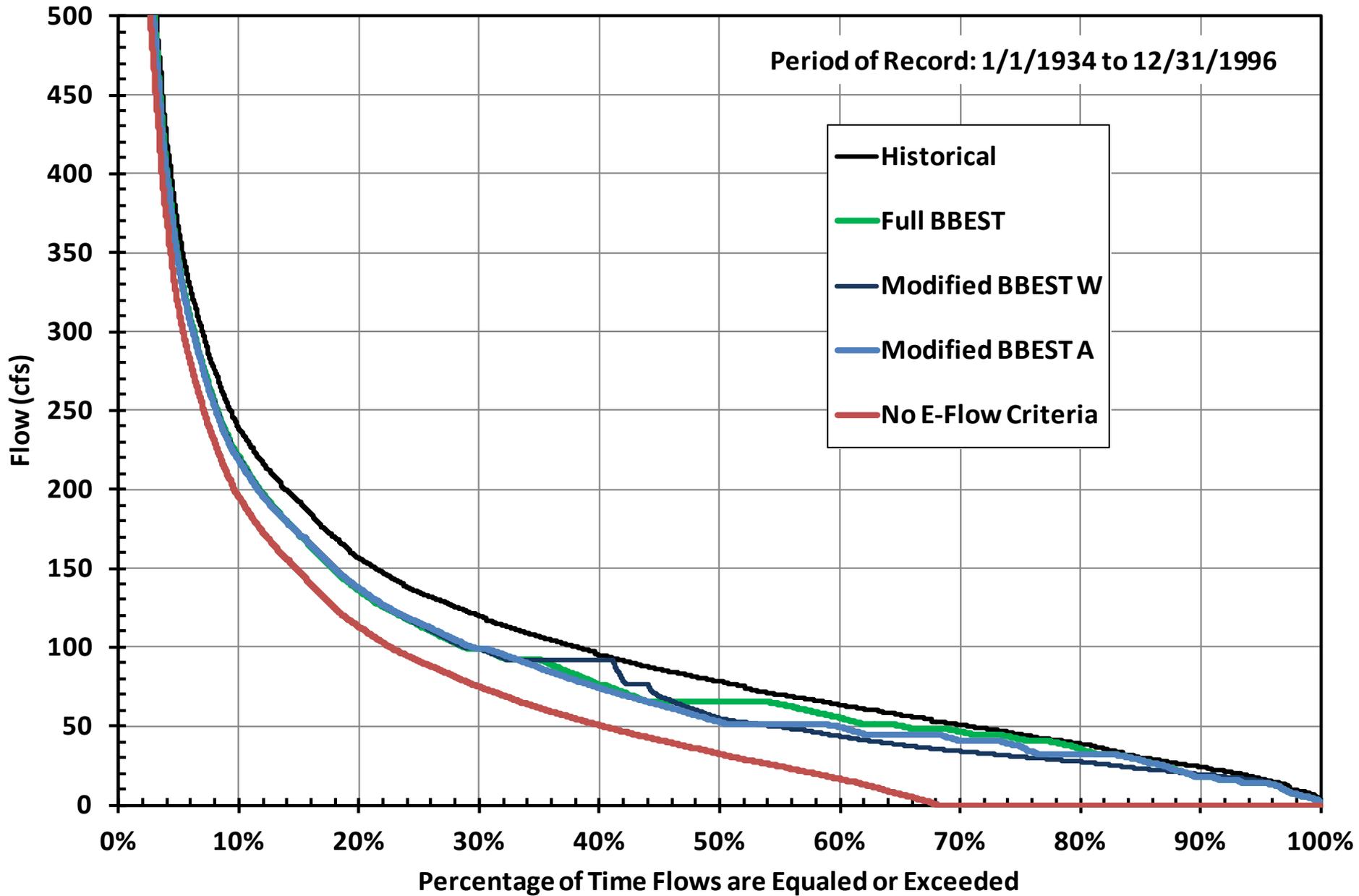
- Laguna ROTR with OCR
- Cotulla Reservoir
- Cotulla ROTR with OCR
- Evaluate:
 - No Recommendation
 - BBEST Recommendation
 - Modifications to BBEST Recommendation
- Results:
 - Yield
 - Streamflows

Nueces River at Laguna OCR - Firm Yield

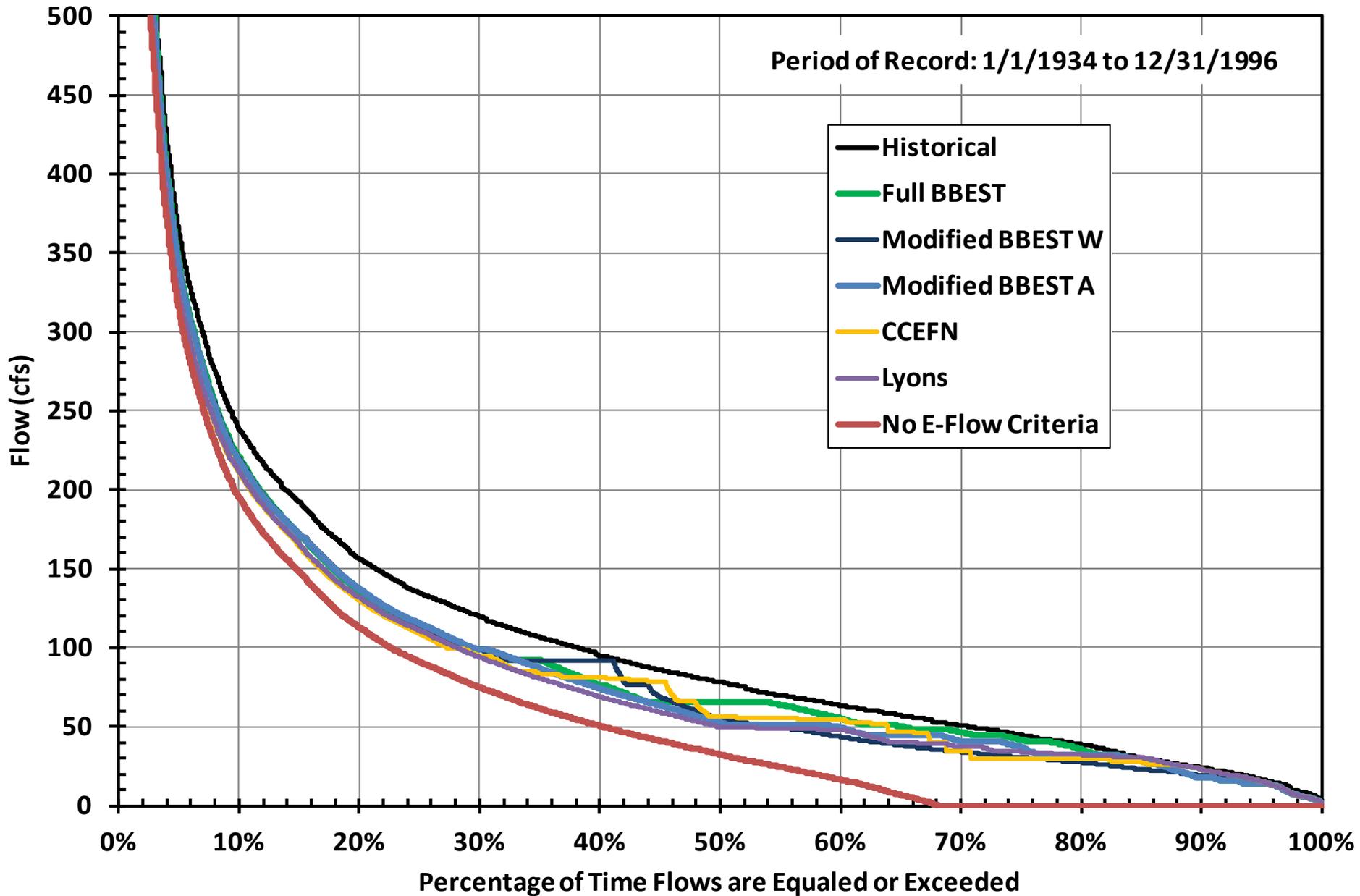


UPDATE

Nueces River at Laguna OCR - Annual Flow Frequency Curve



Nueces River at Laguna OCR - Annual Flow Frequency Curve



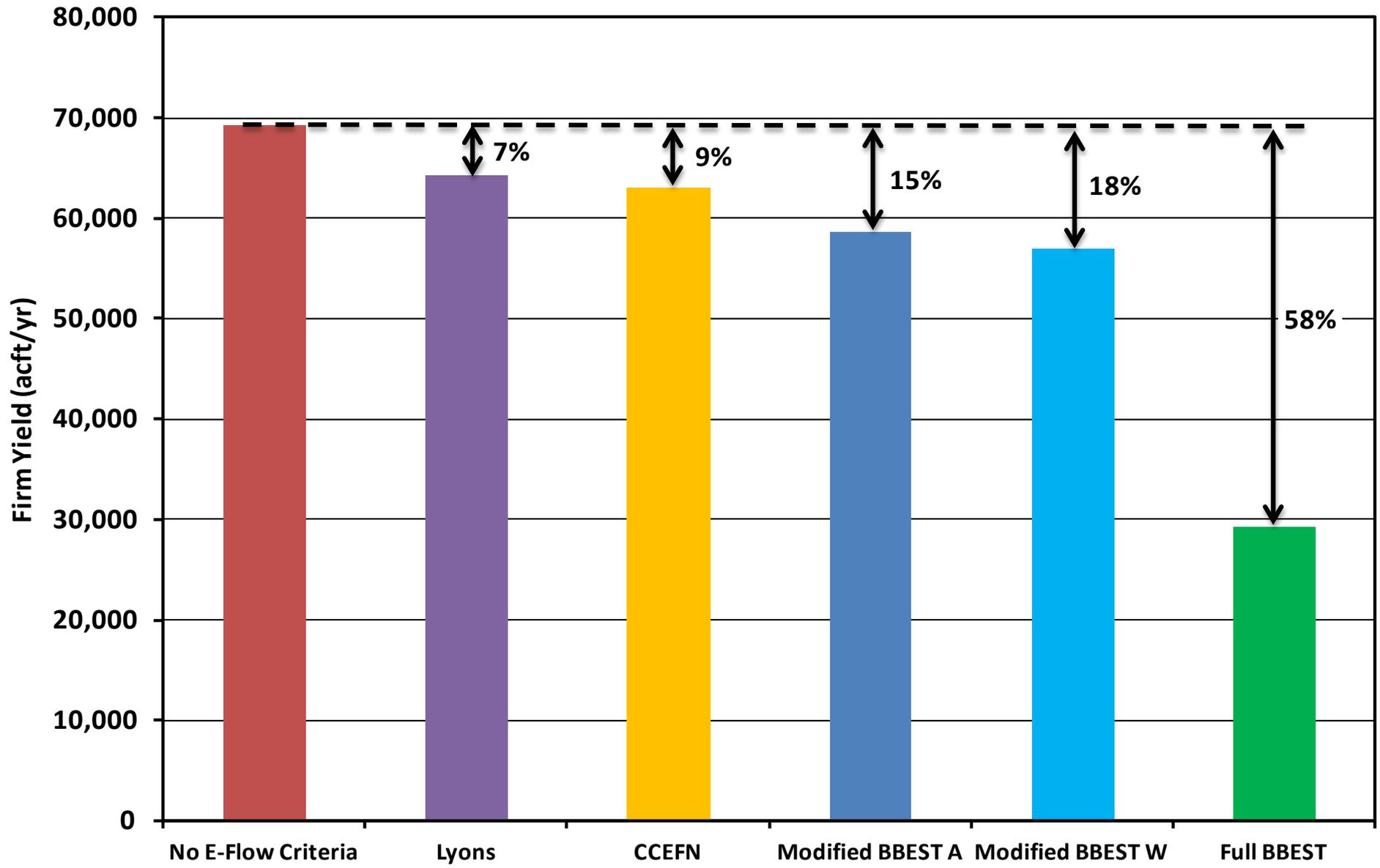
Nueces River @ Cotulla - BBEST

Overbank Events	Qp: 15,100 cfs with Average Frequency 1 per 5 years Regressed Volume is 151,000 Duration Bound is 42											
	Qp: 8,410 cfs with Average Frequency 1 per 2 years Regressed Volume is 80,700 Duration Bound is 38											
	Qp: 4,460 cfs with Average Frequency 1 per year Regressed Volume is 41,100 Duration Bound is 34											
	Qp: 1,560 cfs with Average Frequency 2 per year Volume Bound is 24,200 Duration Bound is 28											
High Flow Pulses	Qp: 96 cfs with Average Frequency 1 per season Volume Bound is 1,570 Duration Bound is 20			Qp: 1,180 cfs with Average Frequency 1 per season Volume Bound is 17,200 Duration Bound is 24			Qp: 100 cfs with Average Frequency 1 per season Volume Bound is 1,030 Duration Bound is 16			Qp: 640 cfs with Average Frequency 1 per season Volume Bound is 8,610 Duration Bound is 26		
	Qp: 8 cfs with Average Frequency 2 per season Volume Bound is 100 Duration Bound is 13			Qp: 190 cfs with Average Frequency 2 per season Volume Bound is 2,370 Duration Bound is 17						Qp: 35 cfs with Average Frequency 2 per season Volume Bound is 360 Duration Bound is 14		
				Qp: 15 cfs with Average Frequency 3 per season Volume Bound is 150 Duration Bound is 11								
Base Flows (cfs)	38			31			42					
	6			10			7			15		
Subsistence Flows (cfs)	1											
	1											
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter					Spring			Summer			Fall

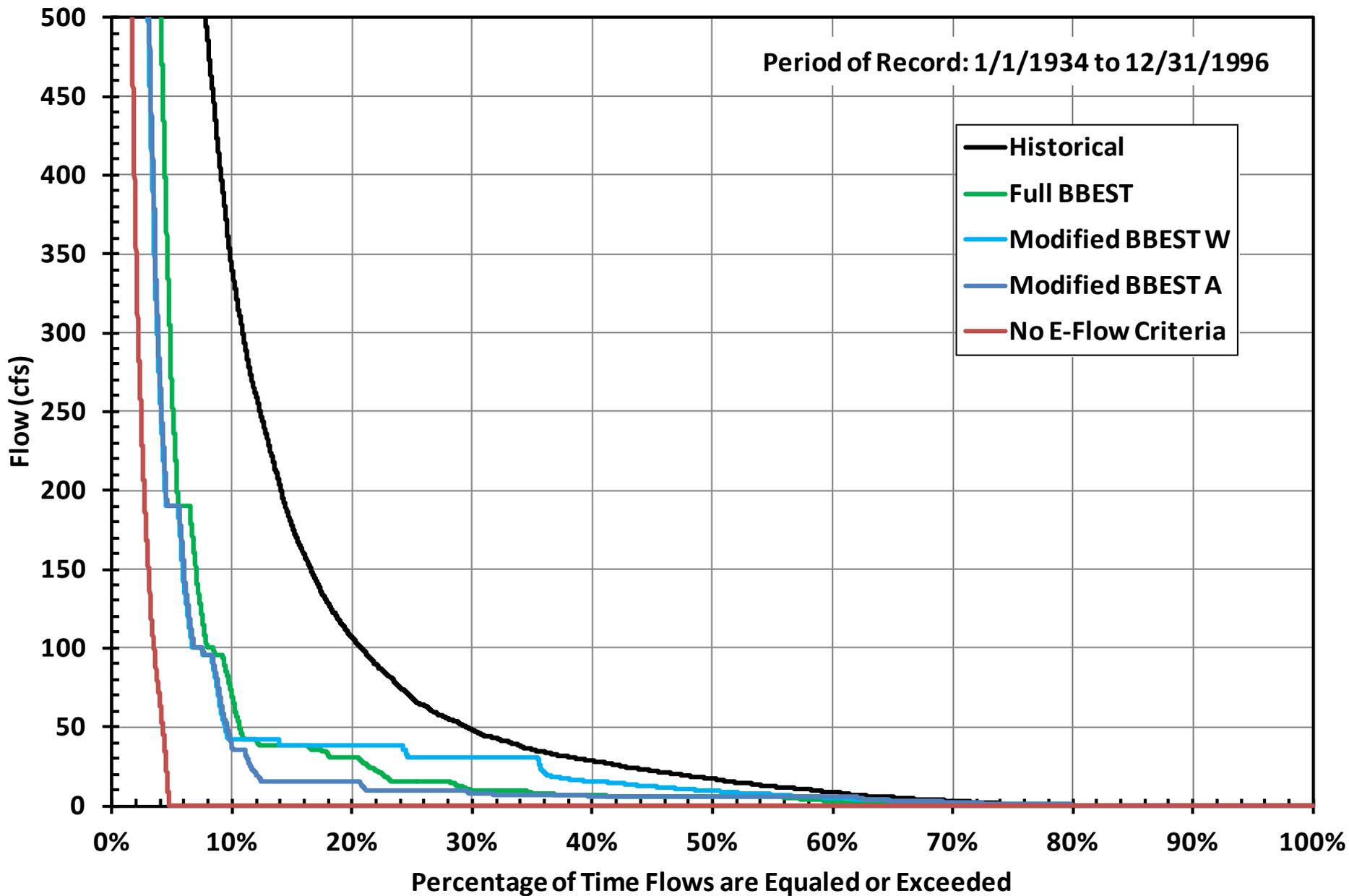
Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Pulse volumes are in units of acre-feet and durations are in days.
Period of Record used : 1/1/1927 to 12/31/2009.

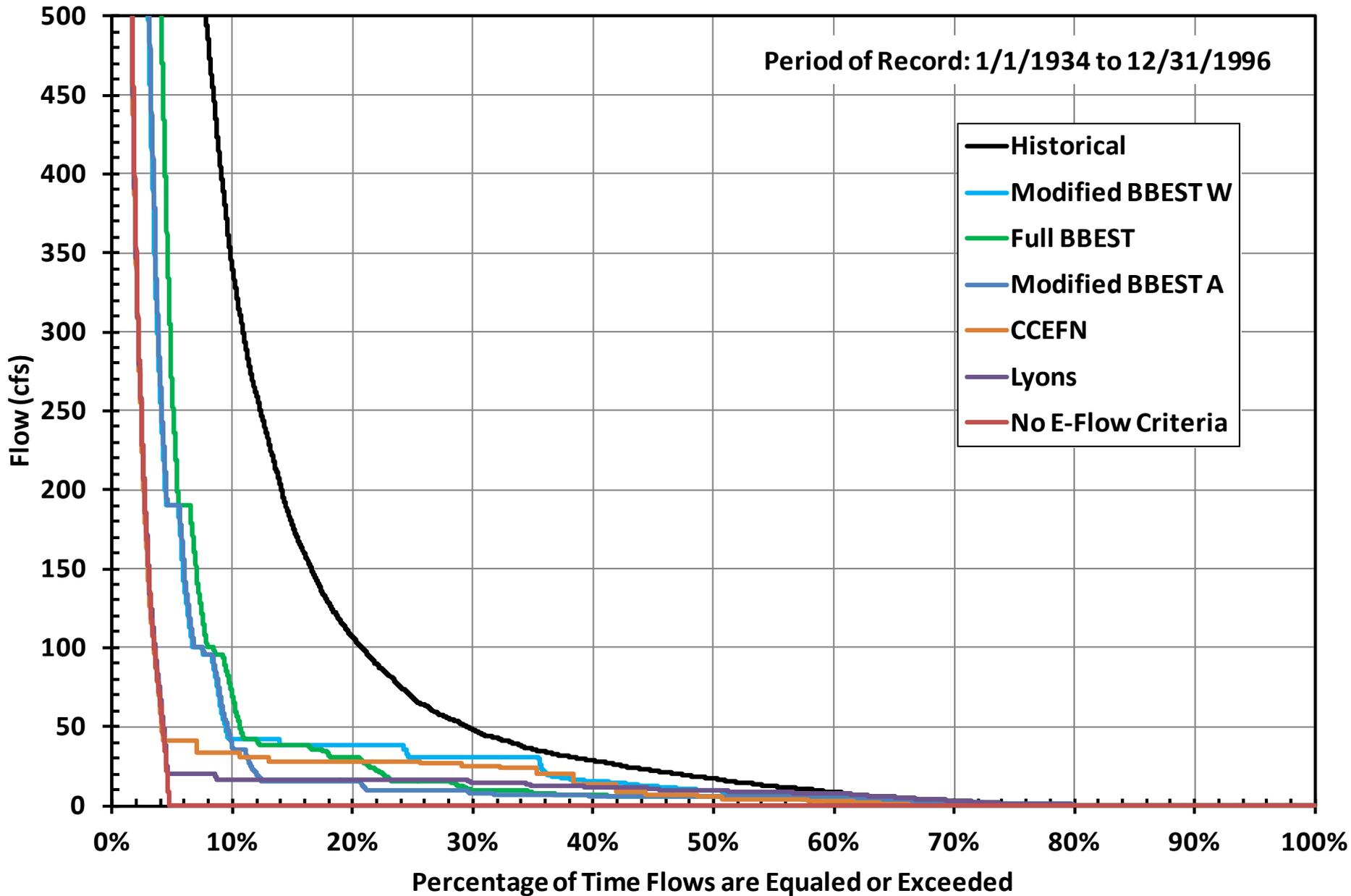
Cotulla Reservoir - Firm Yield



Cotulla Reservoir - Annual Flow Frequency Curve



Cotulla Reservoir - Annual Flow Frequency Curve



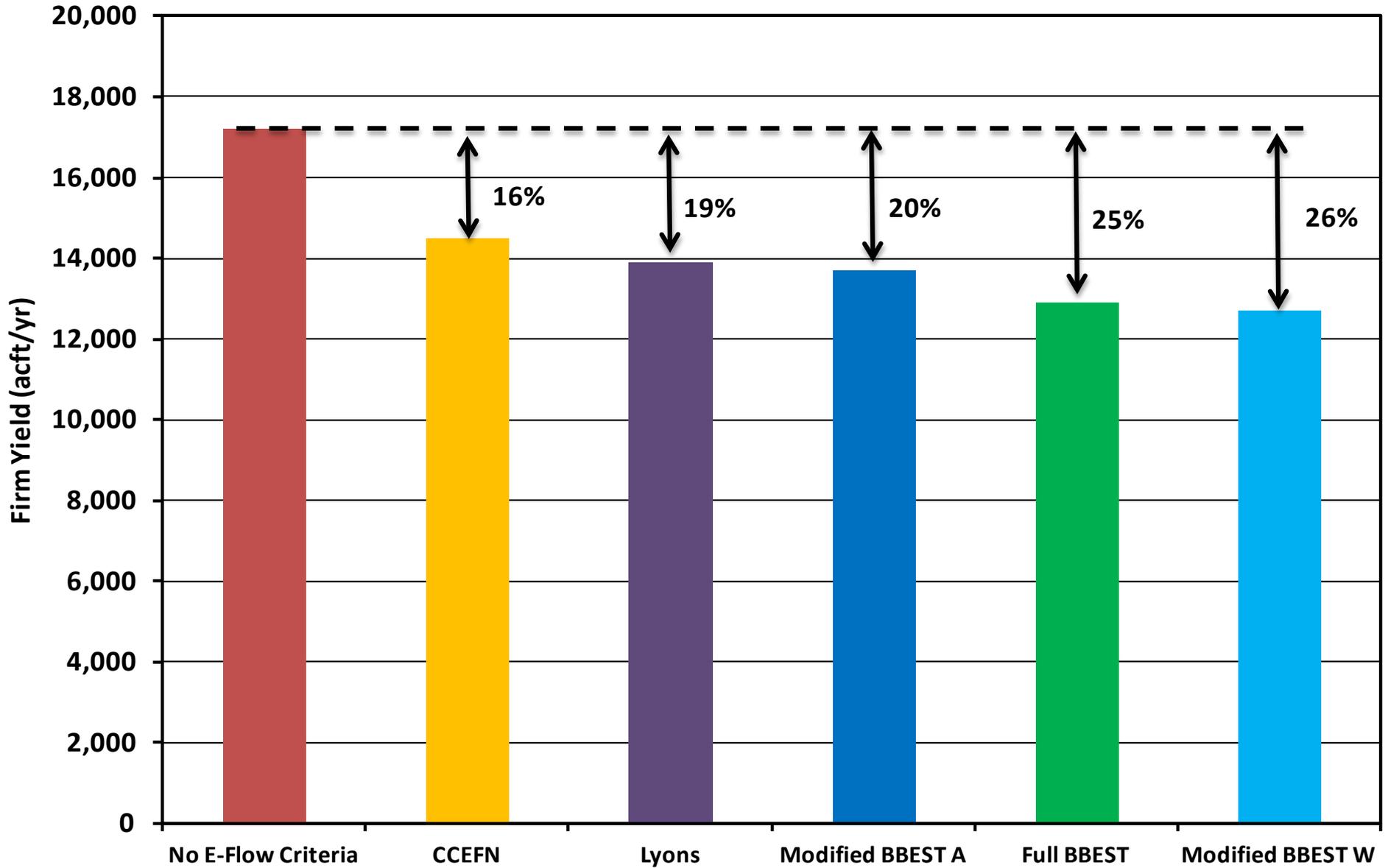
Nueces River @ Cotulla - BBEST

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	Winter					Spring			Summer			Fall

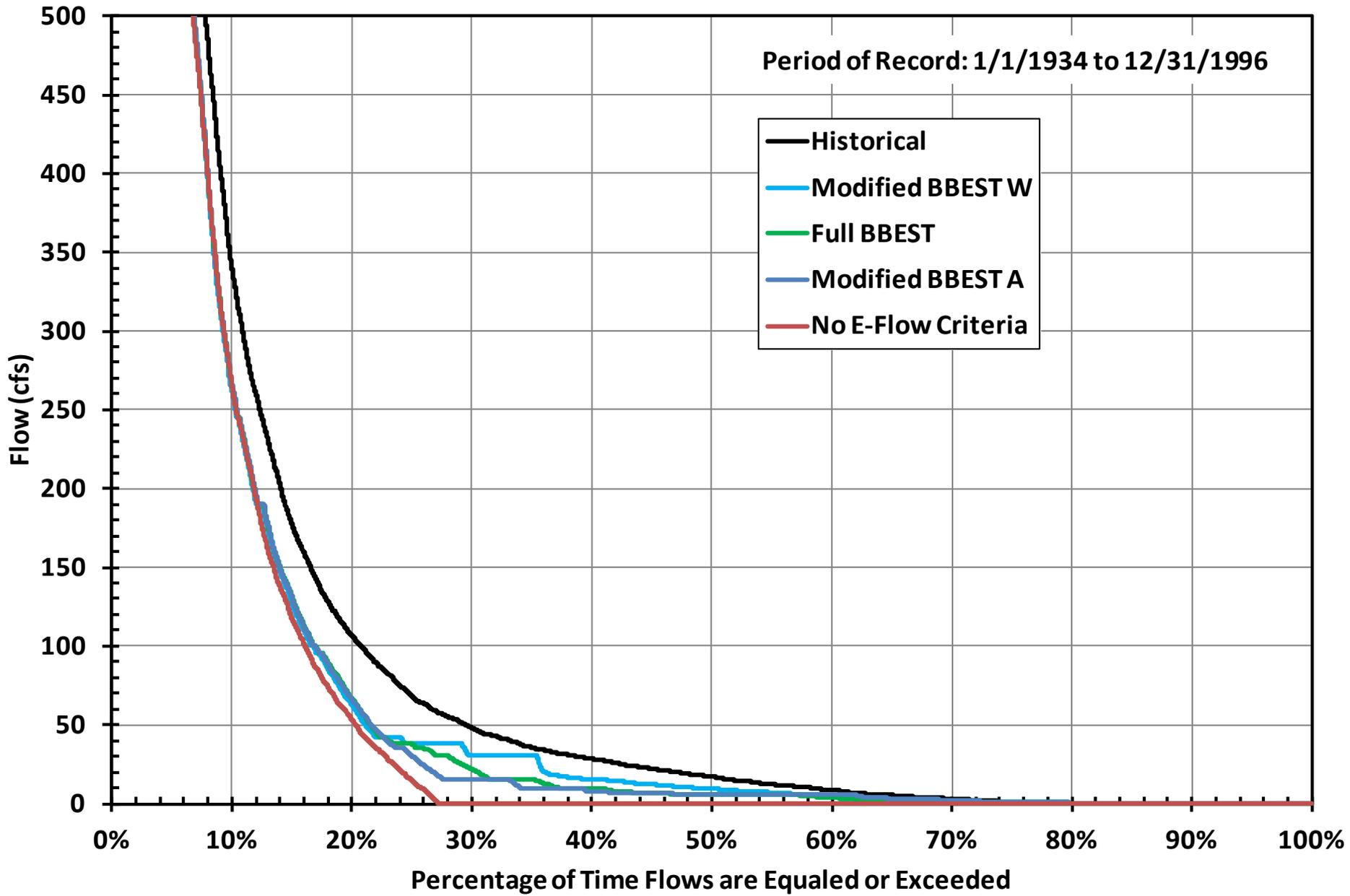
Flow Levels	High (75th %ile)
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Pulse volumes are in units of acre-feet and durations are in days.
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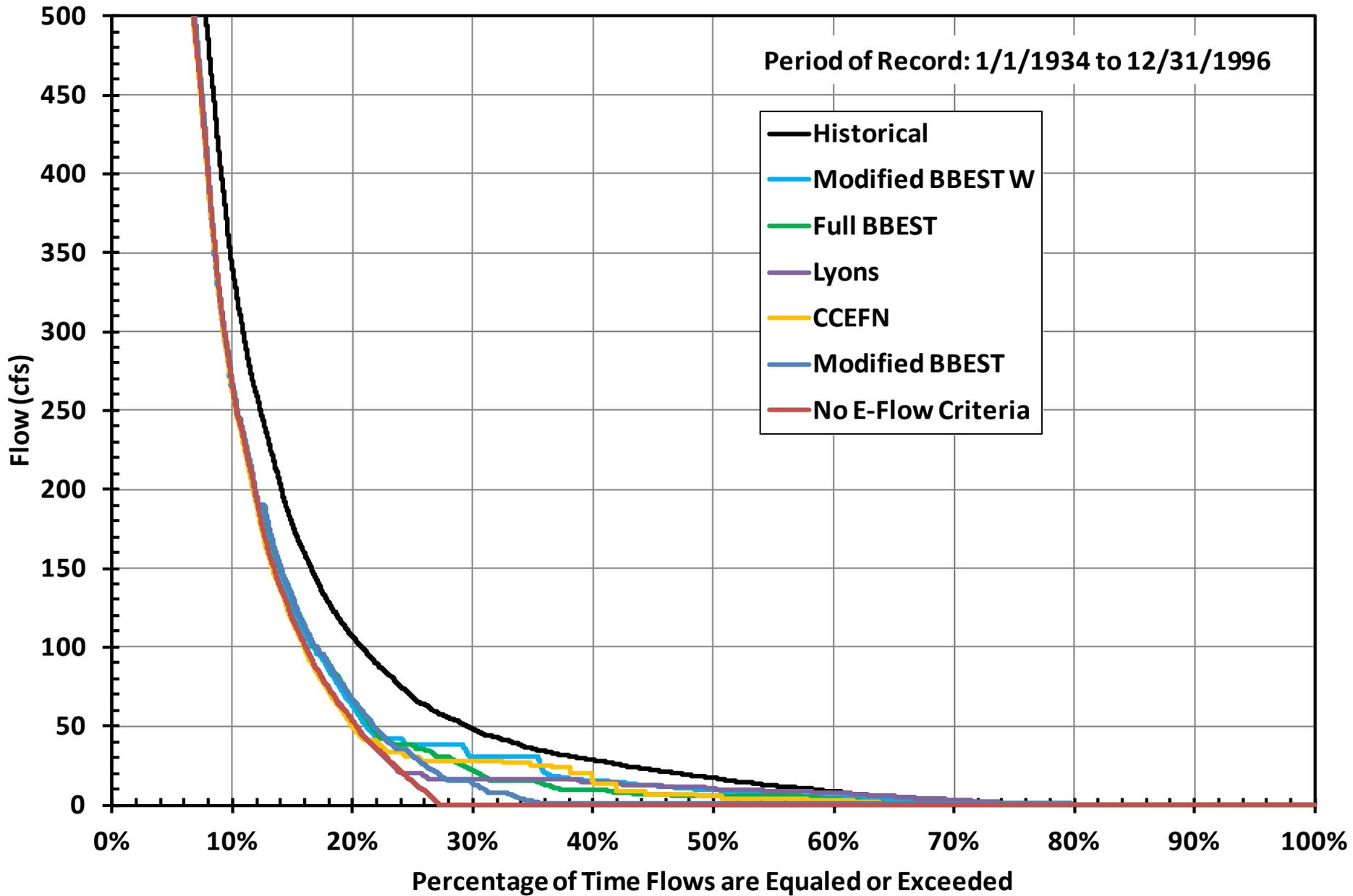
Cotulla Off-Channel Reservoir - Firm Yield



Cotulla Off-Channel Reservoir - Annual Flow Frequency Curve



Cotulla Off-Channel Reservoir - Annual Flow Frequency Curve



Path Forward

- Additional Presentations
 - BBEST - Aquatic Habitat
 - TWDB - Sediment Transport
- BBASC Adopt an Instream Environmental Flow Standard Recommendation
 - Modified BBEST
 - Overbank Exemption
 - Pulse Exemption Rule
 - Base Flow with 50% Rule
 - Wet
 - Average

Nueces Bay and Delta Inflow Regime

- BBASC Direction
 - Utilize BBEST Volume Targets
 - Modify Attainment Frequencies for Balance
- Four Focused Scenarios
 - BBEST Recommendation
 - Agreed Order – Safe Yield
 - No Pass Thru's
 - OCR Agreed Order Safe Yield
- Results
 - Yield vs. Bay Inflow vs. Salinity

Order Compared to BBEST

2001 TCEQ Agreed Order

Sys Stor. %	Jan (acft)	Feb (acft)	Mar (acft)	Apr (acft)	May (acft)	Jun (acft)	Jul (acft)	Aug (acft)	Sep (acft)	Oct (acft)	Nov (acft)	Dec (acft)	Ann. (acft)
>70	2,500	2,500	3,500	3,500	25,500	25,500	6,500	6,500	28,500	20,000	9,000	4,500	138,000
70-40	2,500	2,500	3,500	3,500	23,500	23,000	4,500	5,000	11,500	9,000	4,000	4,500	97,000
40-30	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	14,400
>30	0	0	0	0	0	0	0	0	0	0	0	0	0

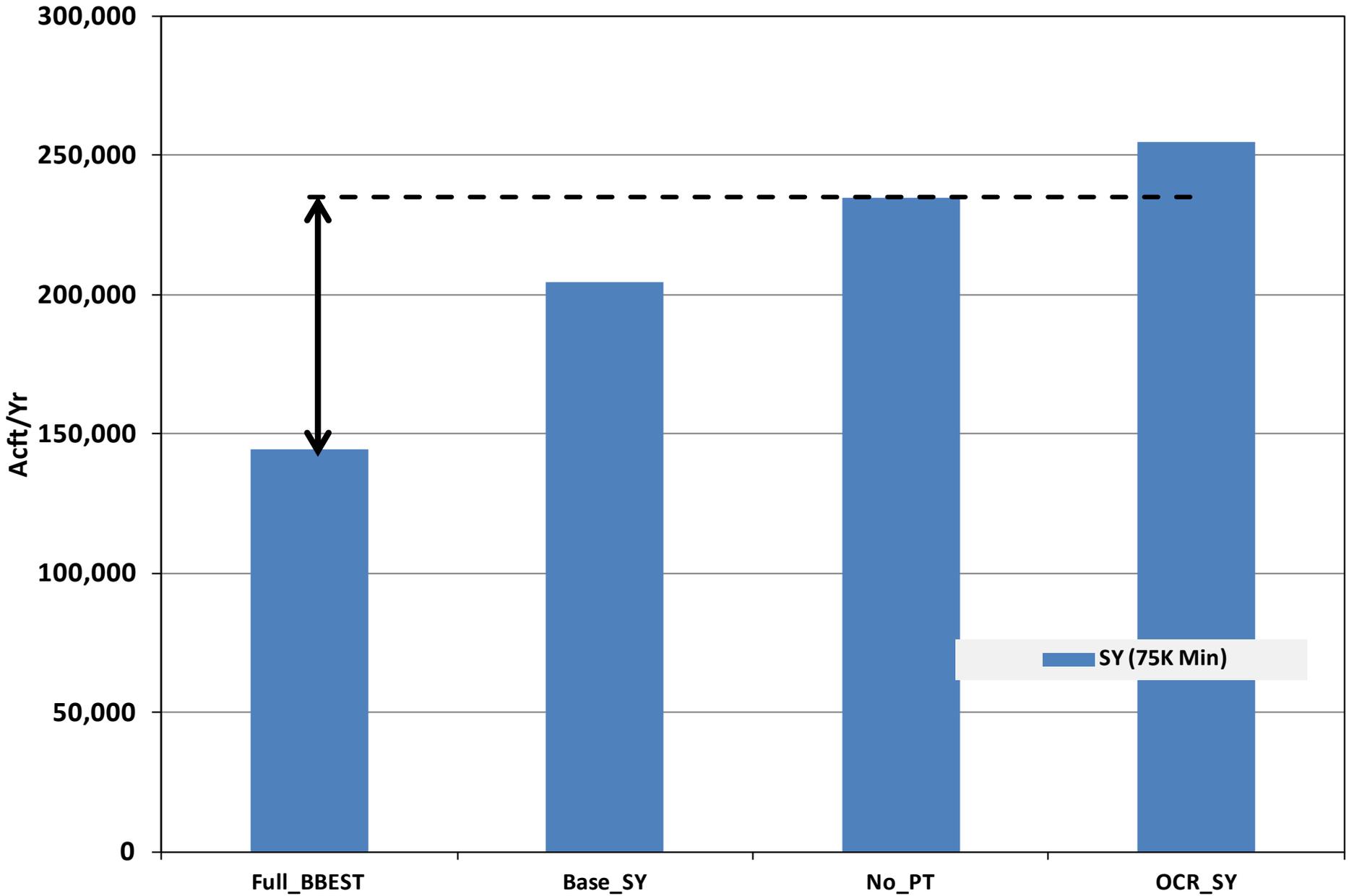
2011 BBEST Recommendation

Condition (Target Salinity)	Nueces Bay Freshwater Inflow Regime (Attainment)			Recommendations	
	One overbanking event per year of 39,000 acft; maximum discharge of 3,600 cfs			Annual Total (acft)	Attainment
High (10)	125,000 acft (20%)	250,000 acft (25%)	375,000 (20%)	750,000	25%
Base (18)	22,000 acft (60%)	88,000 acft (60%)	56,000 (75%)	166,000	80%
Subsistence (34)	5,000 acft (95%)	10,000 acft (95%)	15,000 acft (95%)	30,000	95%
	Winter = Nov - Feb	Spring = Mar - Jun	Summer/Fall = Jul - Oct		

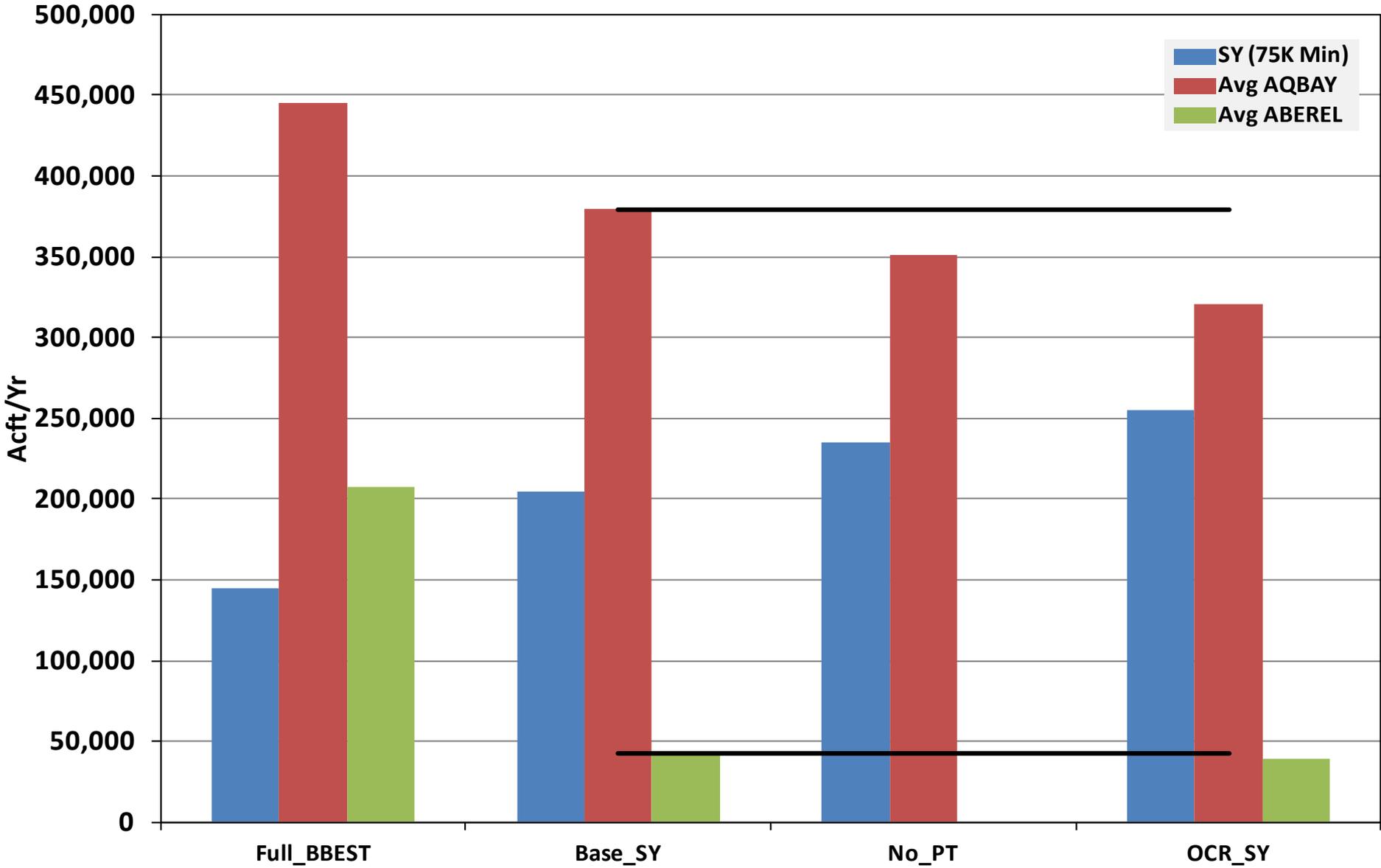
BBEST Recommendation for B&E

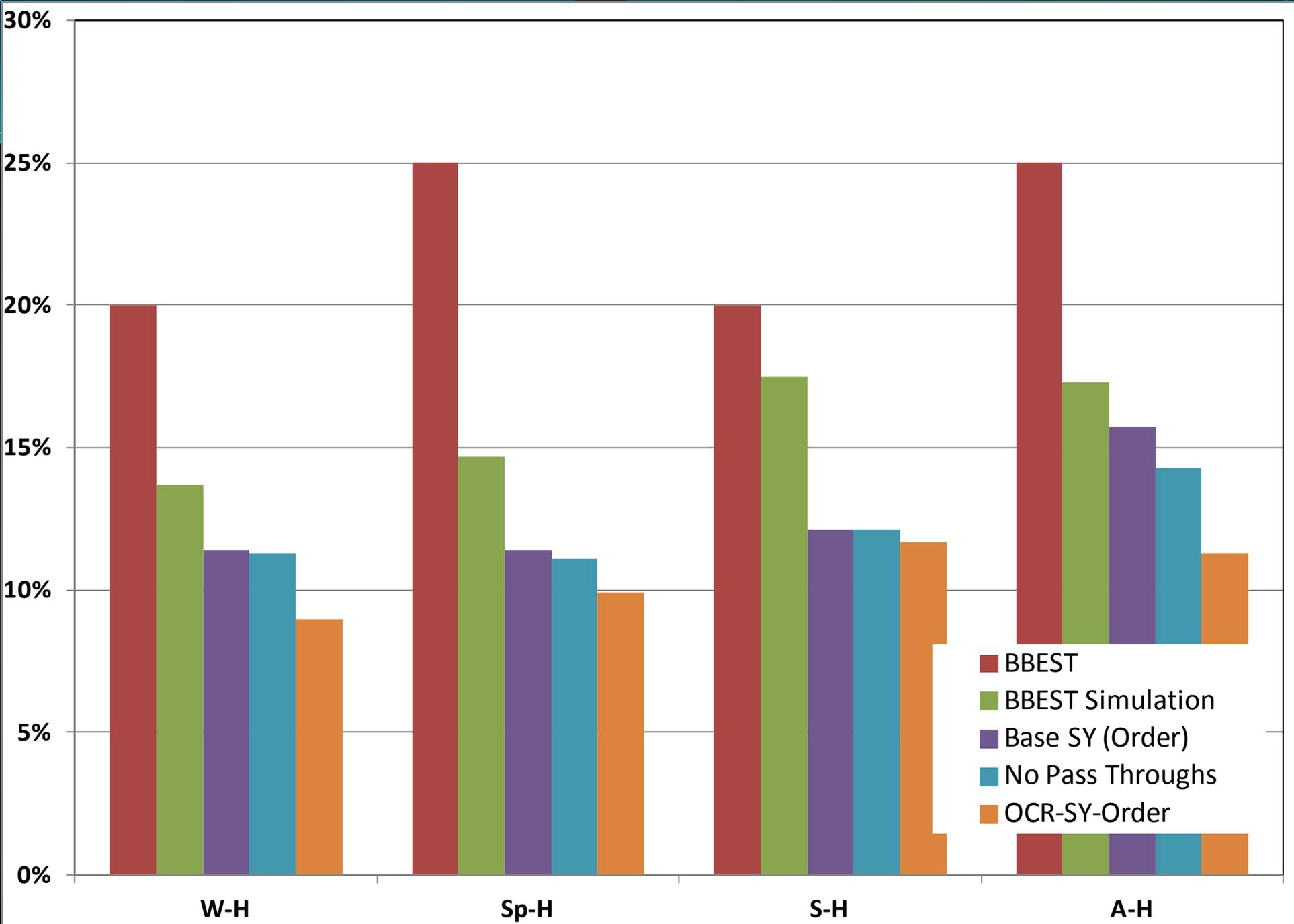
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	One overbanking event per year of 39,000 acft; maximum discharge of 3,600 cfs			Annual Total (acft)
High (10)	125,000 acft (20%)	250,000 acft (25%)	375,000 (20%)	750,000 (25%)
Base (18)	22,000 acft (60%)	88,000 acft (60%)	56,000 (75%)	166,000 (80%)
Sub. (34)	5,000 acft (95%)	10,000 acft (95%)	15,000 acft (95%)	30,000 (95%)
	Winter = Nov - Feb	Spring = Mar - Jun	Summer/Fall = Jul - Oct	

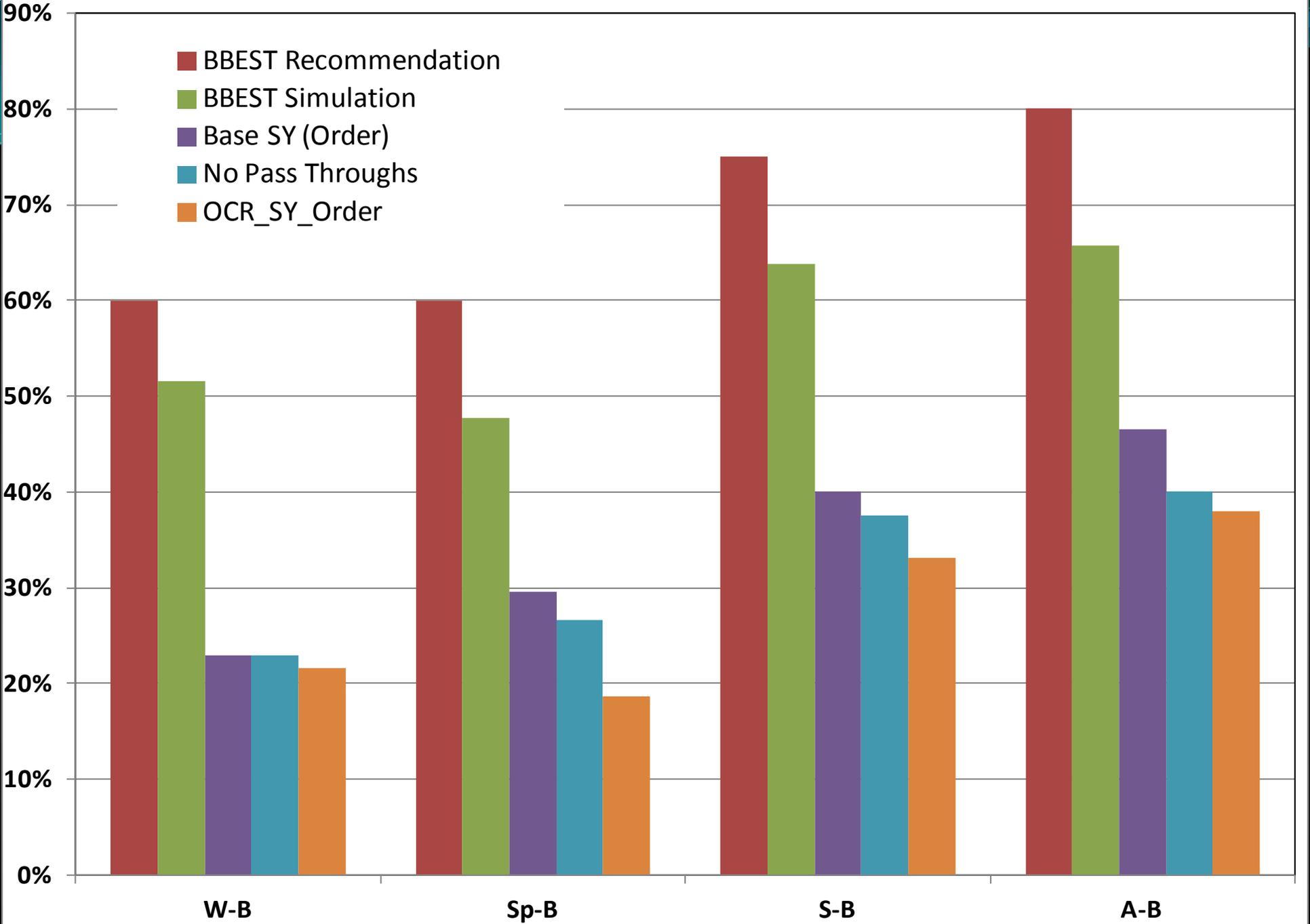
CCR/LCC/LT System Safe Yield (acft/yr)

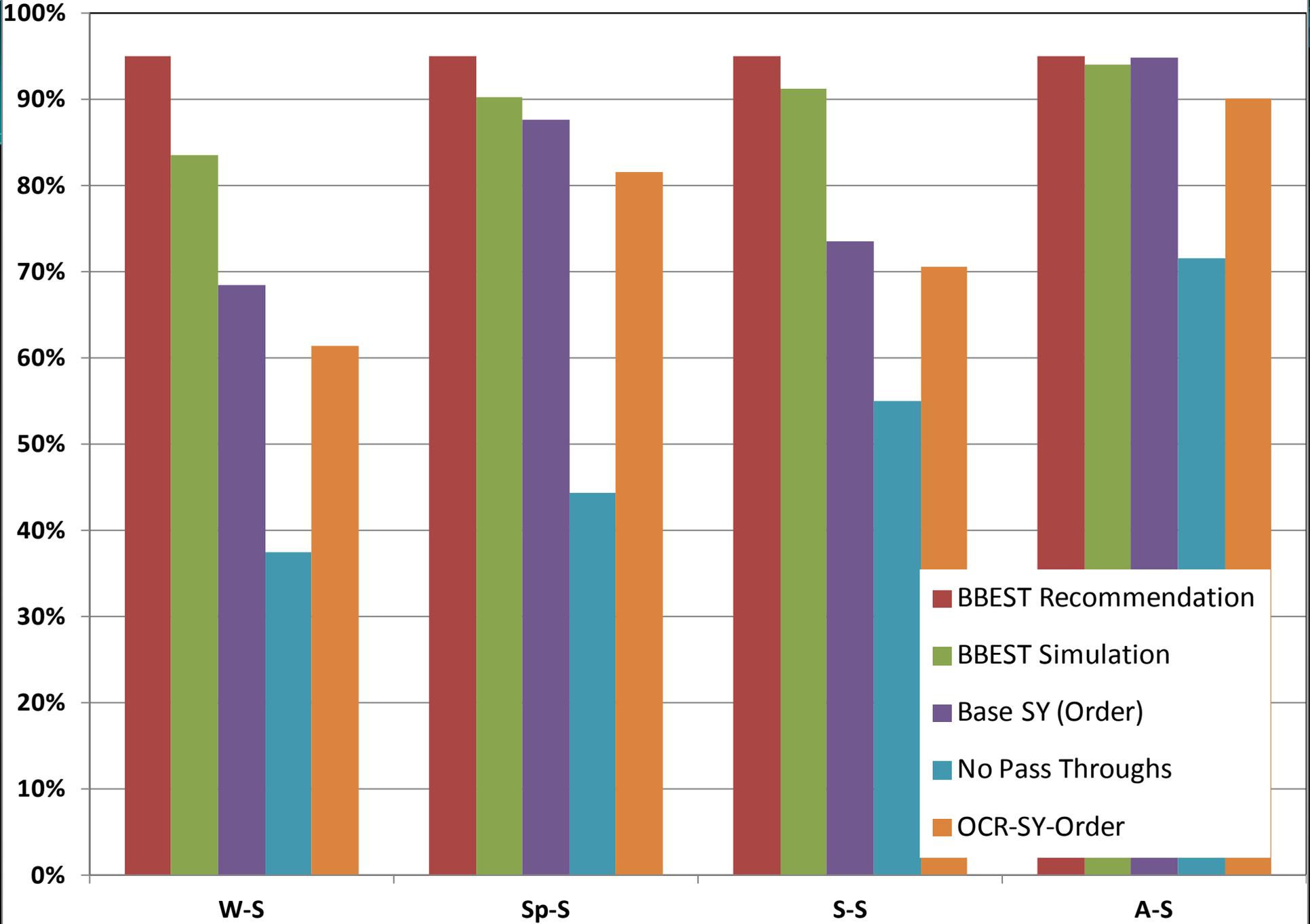


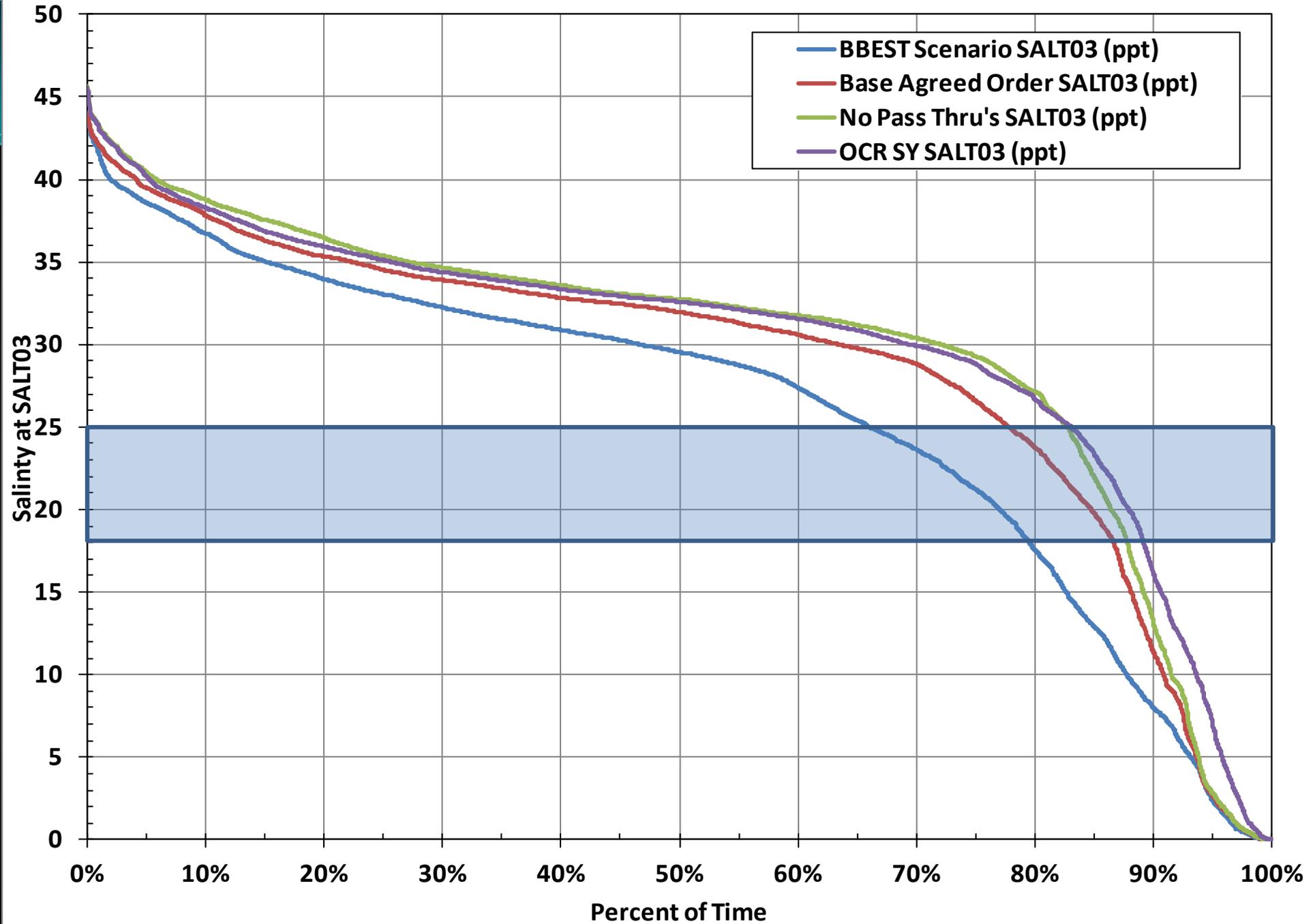
CCR/LCC/LT System Safe Yield - Average Annual Bay Inflow - Average Annual B&E Release

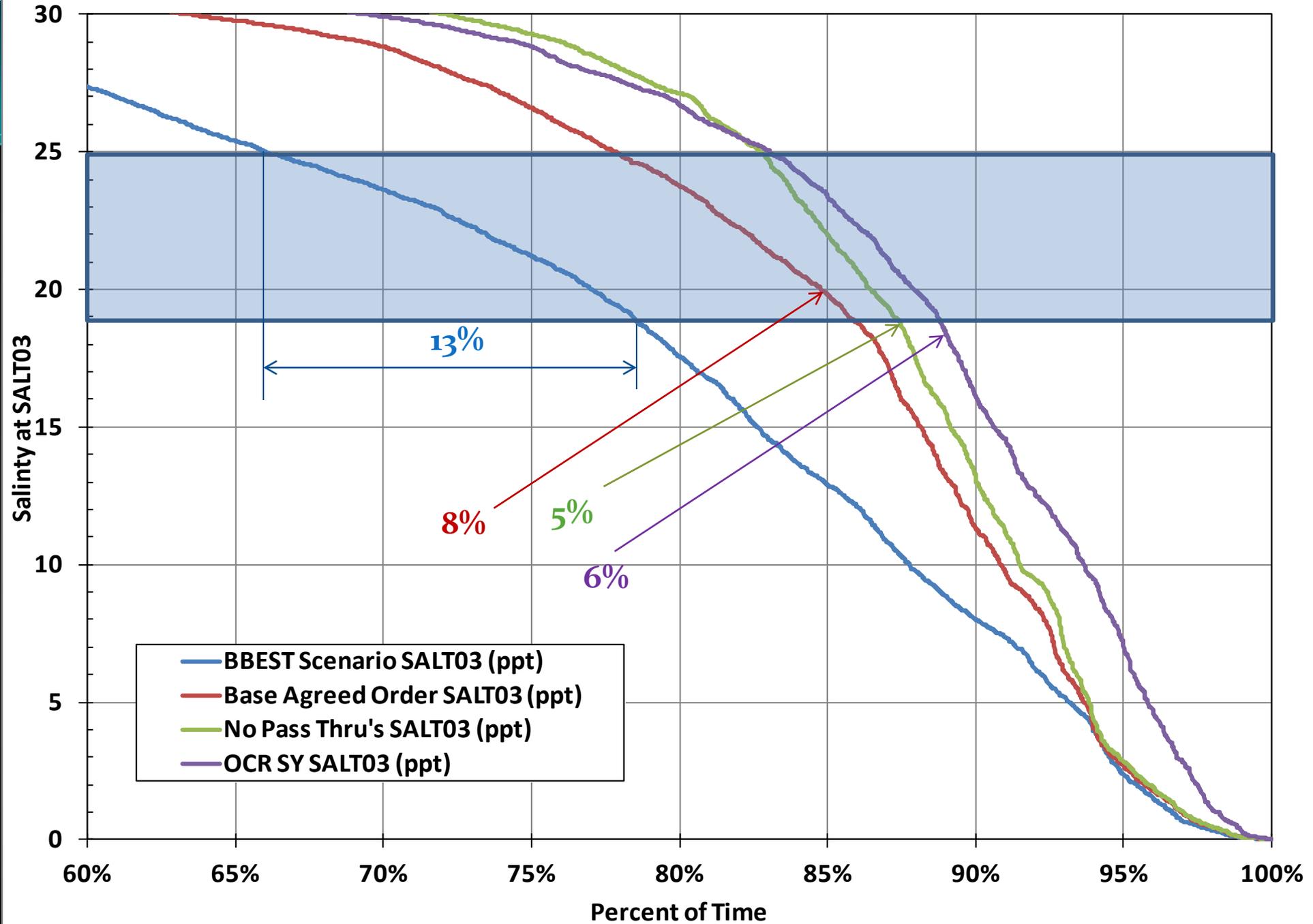












B&E – Attainment Freq – Opt 1

Condition (Target Salinity)	Nueces Bay Freshwater Inflow Regime (Attainment)			Recommendations
				Annual Total (acft)
High (10)	125,000 acft (9%)	250,000 acft (10%)	375,000 (12%)	750,000 (11%)
Base (18)	22,000 acft (22%)	88,000 acft (19%)	56,000 (33%)	166,000 (38%)
Sub. (34)	5,000 acft (61%)	10,000 acft (82%)	15,000 acft (71%)	30,000 (90%)
	Winter = Nov - Feb	Spring = Mar - Jun	Summer/Fall = Jul - Oct	

B&E – Attainment Freq – Opt 2

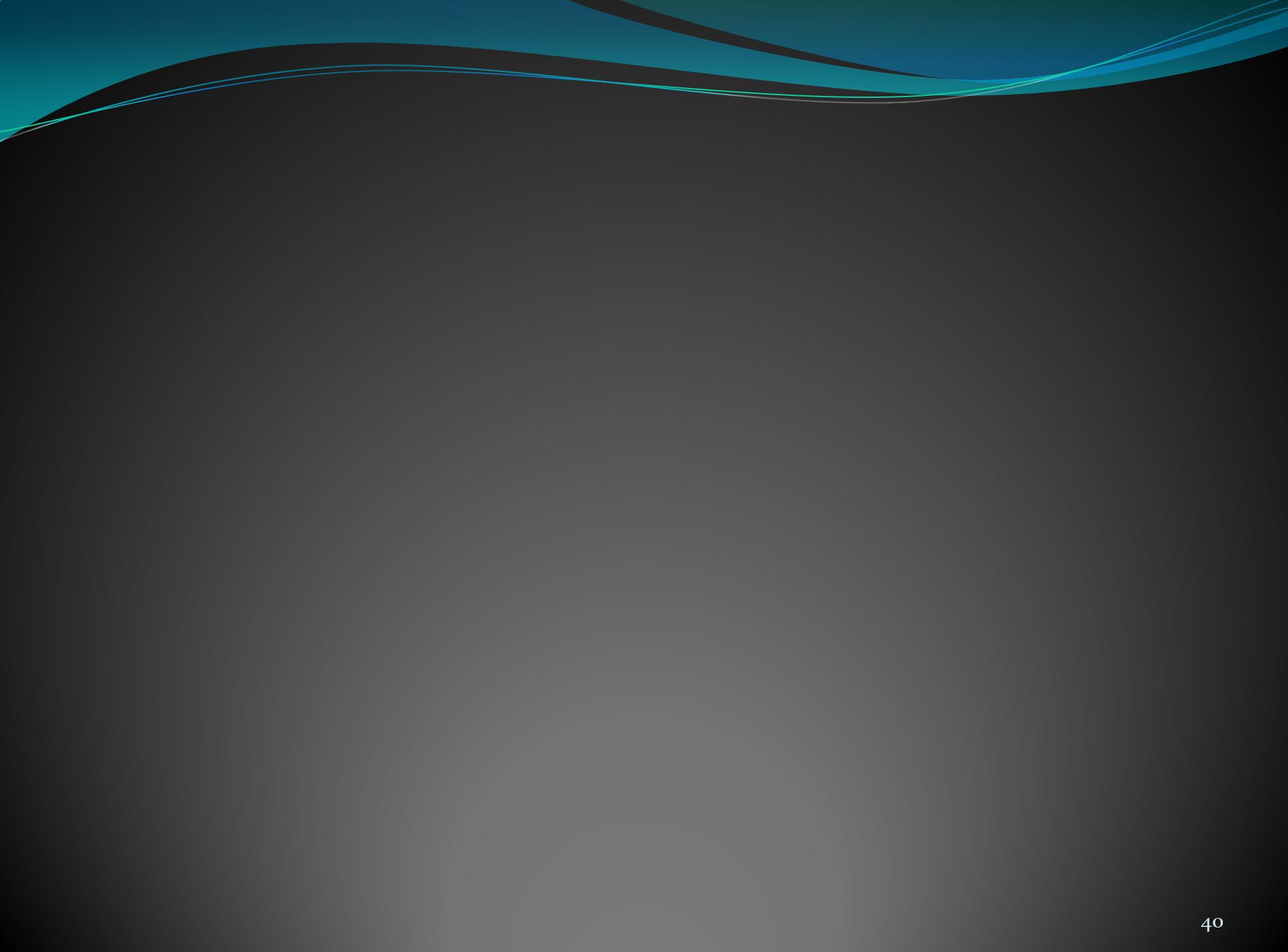
Condition (Target Salinity)	Nueces Bay Freshwater Inflow Regime (Attainment)			Recommendations
				Annual Total (acft)
High (10)	125,000 acft (11%)	250,000 acft (11%)	375,000 (12%)	750,000 (16%)
Base (18)	22,000 acft (23%)	88,000 acft (30%)	56,000 (40%)	166,000 (47%)
Sub. (34)	5,000 acft (69%)	10,000 acft (88%)	15,000 acft (74%)	30,000 (95%)
	Winter = Nov - Feb	Spring = Mar - Jun	Summer/Fall = Jul - Oct	

For BBASC Consideration

- BBASC Adopt an Estuary & Delta Environmental Flow Standard Recommendation
 - BBEST Seasonal Volume Targets
 - Attainment Frequencies
 - Option 1 - Agreed Order plus OCR
 - Option 2 - Agreed Order

Path Forward / Questions?

- Report Compilation



Scenario Results

- Yield vs. Avg. Annual Bay Inflow

Run #	Run Description	SY (75K Min)	Avg AQBAY
1	Base_SY	204,449	379,284
2	No_PT	235,001	350,800
3	Seasonal_order	169,691	410,454
4	Spring_target	170,889	415,491
5	Summer_Tar	180,960	405,900
6	Winter_Tar	213,264	372,547
7	3K_All_months	230,089	358,019
8	Reduced may June	220,110	364,423

Monthly Bay Inflow - Frequency

