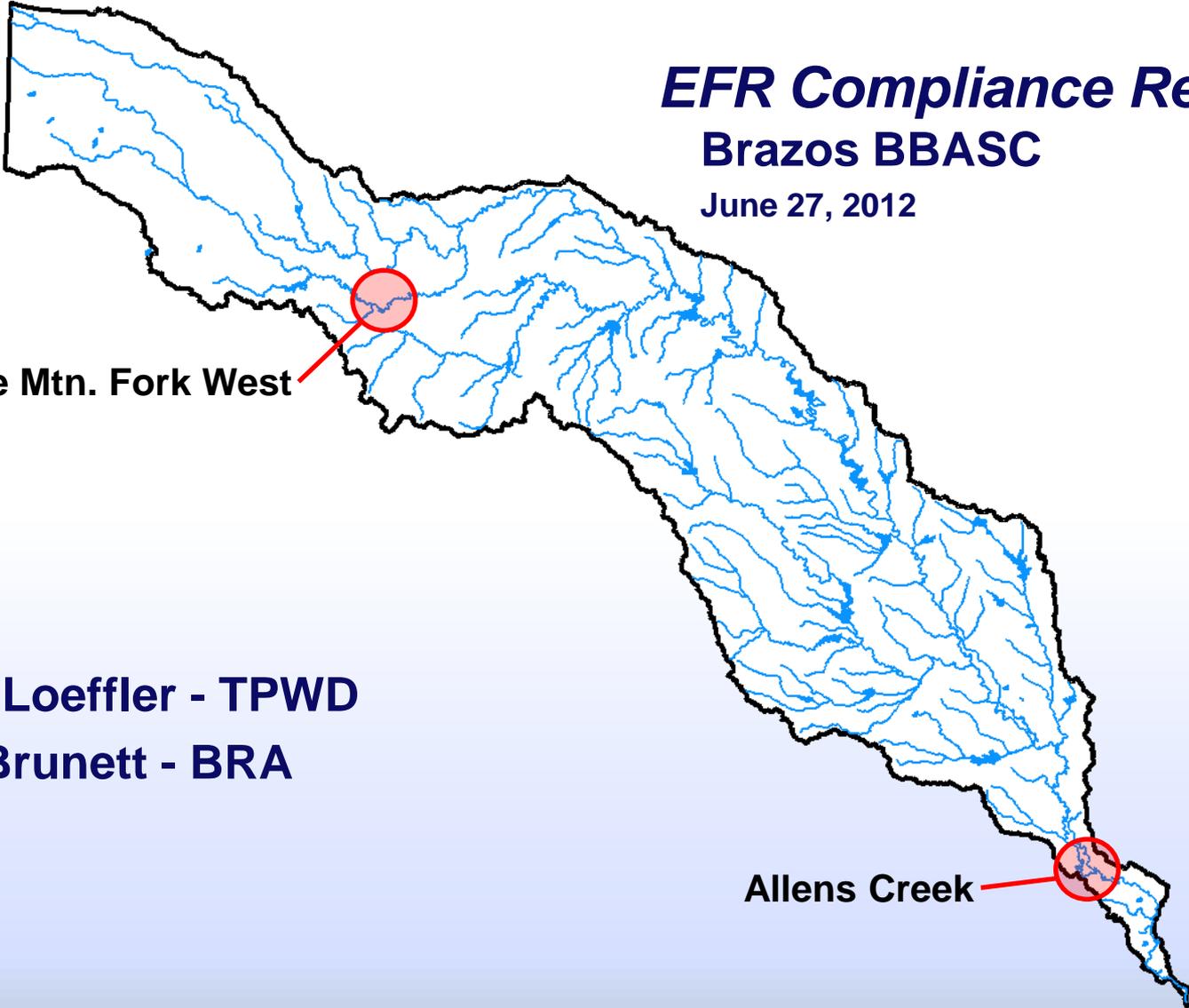


EFR Compliance Results

Brazos BBASC

June 27, 2012



Double Mtn. Fork West

Cindy Loeffler - TPWD
Brad Brunett - BRA

Allens Creek

Modified BBEST Recommendation at Richmond

Overbank Events												
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: 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)

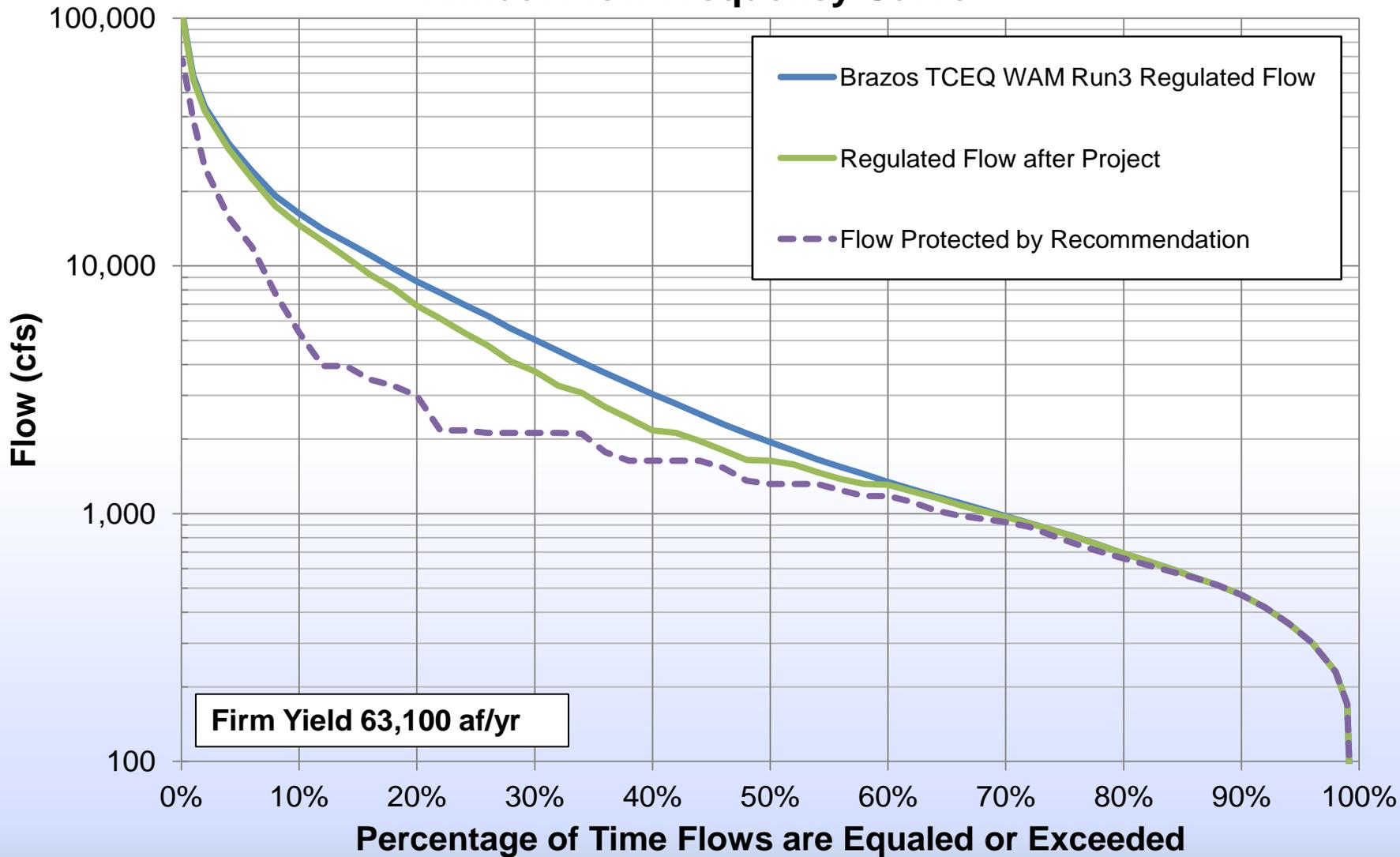
Pulse volumes are in units of acre-feet and durations are in days.

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

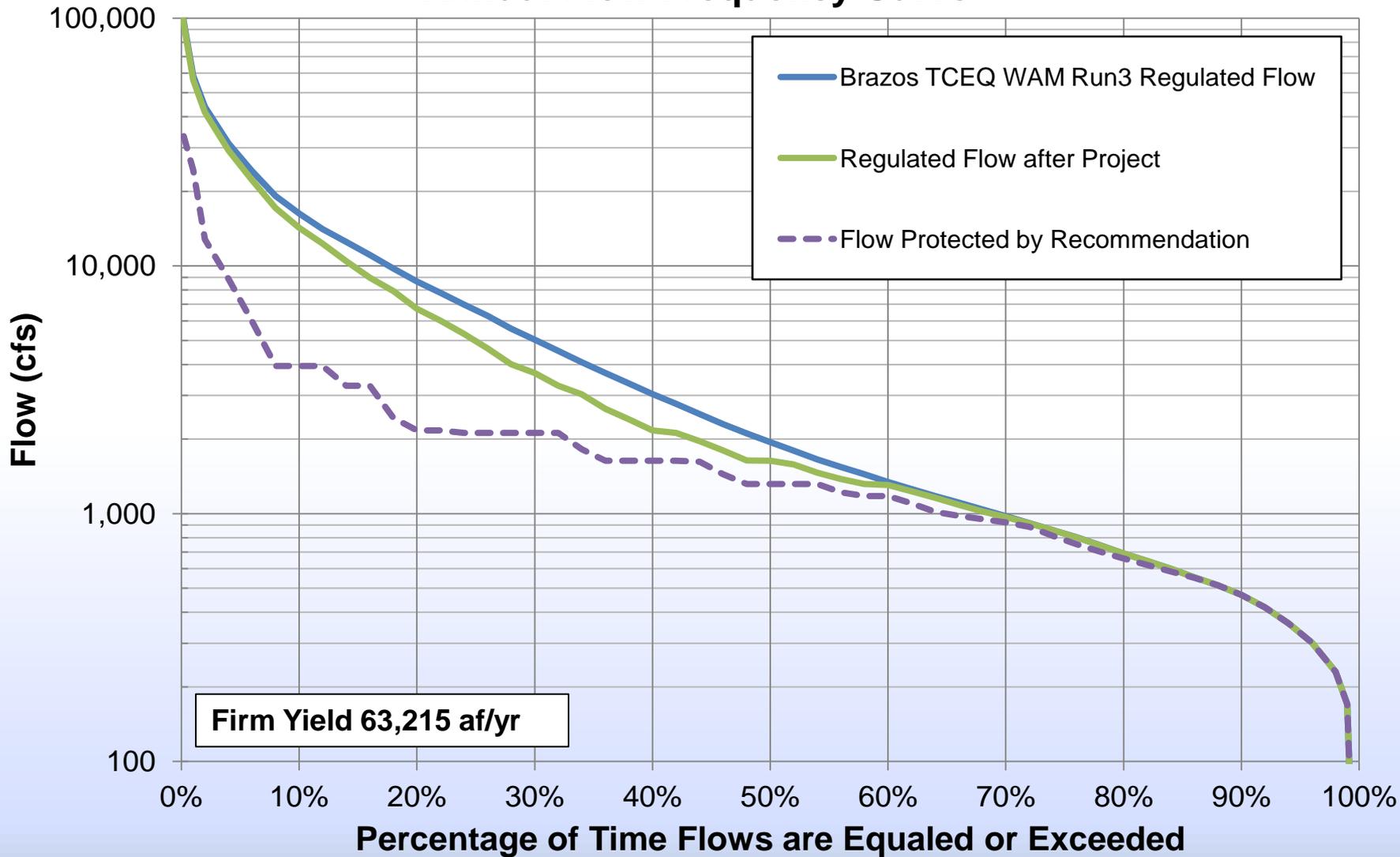
Episodic events are terminated when the volume or duration criteria are met, or when the flow drops below 1260 cfs, or when the flow is below 8430 cfs and the flow drops from one day to the next by less than 5%.



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



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



Firm Yield 63,215 af/yr

Compliance Results for Environmental Flow Recommendations Allens Creek Reservoir

Project	No Project		Infinite Project	With Allens Creek Reservoir in Place		
	Historical	WAM Run3 for Project	Infinite Infrastructure	Lyons Method	BBEST EFR	Modified BBEST EFR
Firm Yield (AF/YR)	NA	NA	NA	66,400	63,100	63,215
Non-Pulse Flows (Percent of time flow equals or exceeds BBEST EFR recommendations)						
Subsistence	87%	62%	62%	62%	62%	62%
Base Low	55%	40%	40%	37%	40%	40%
Base Medium	75%	60%	60%	47%	60%	60%
Base High	69%	59%	59%	44%	59%	59%
Pulse Flows (Total number of HFP events occurring)						
3 per season	2,546	1,983	799	1,447	1,578	1,559
2 per season	1,106	831	370	664	715	675
1 per season	317	245	118	211	227	223
1 per year	82	66	35	59	61	59
1 per 2 year	34	31	13	29	30	29



Modified BBEST EFR at Double Mountain Fork

High Flow Pulses	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			
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			

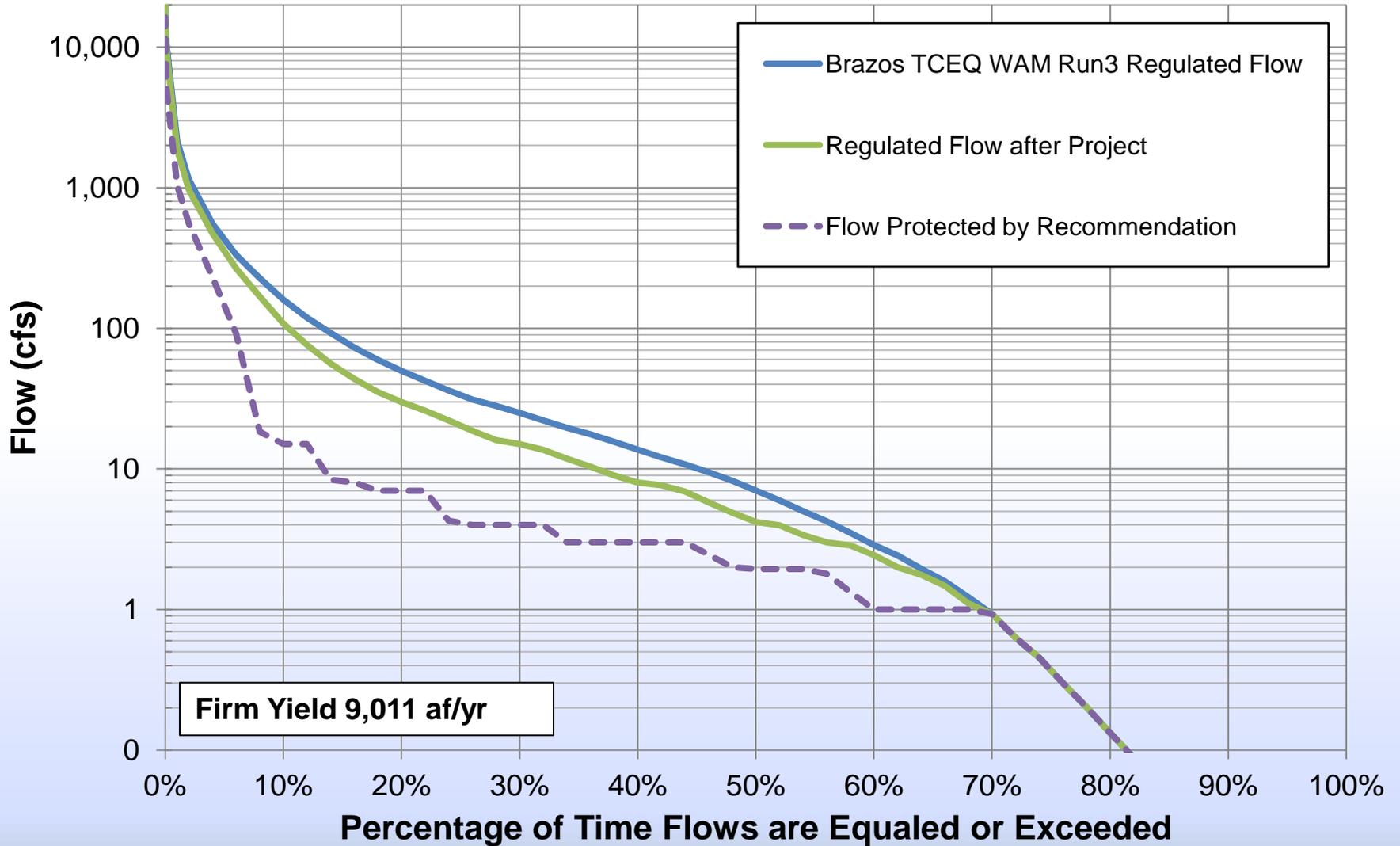
Base Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)

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%.

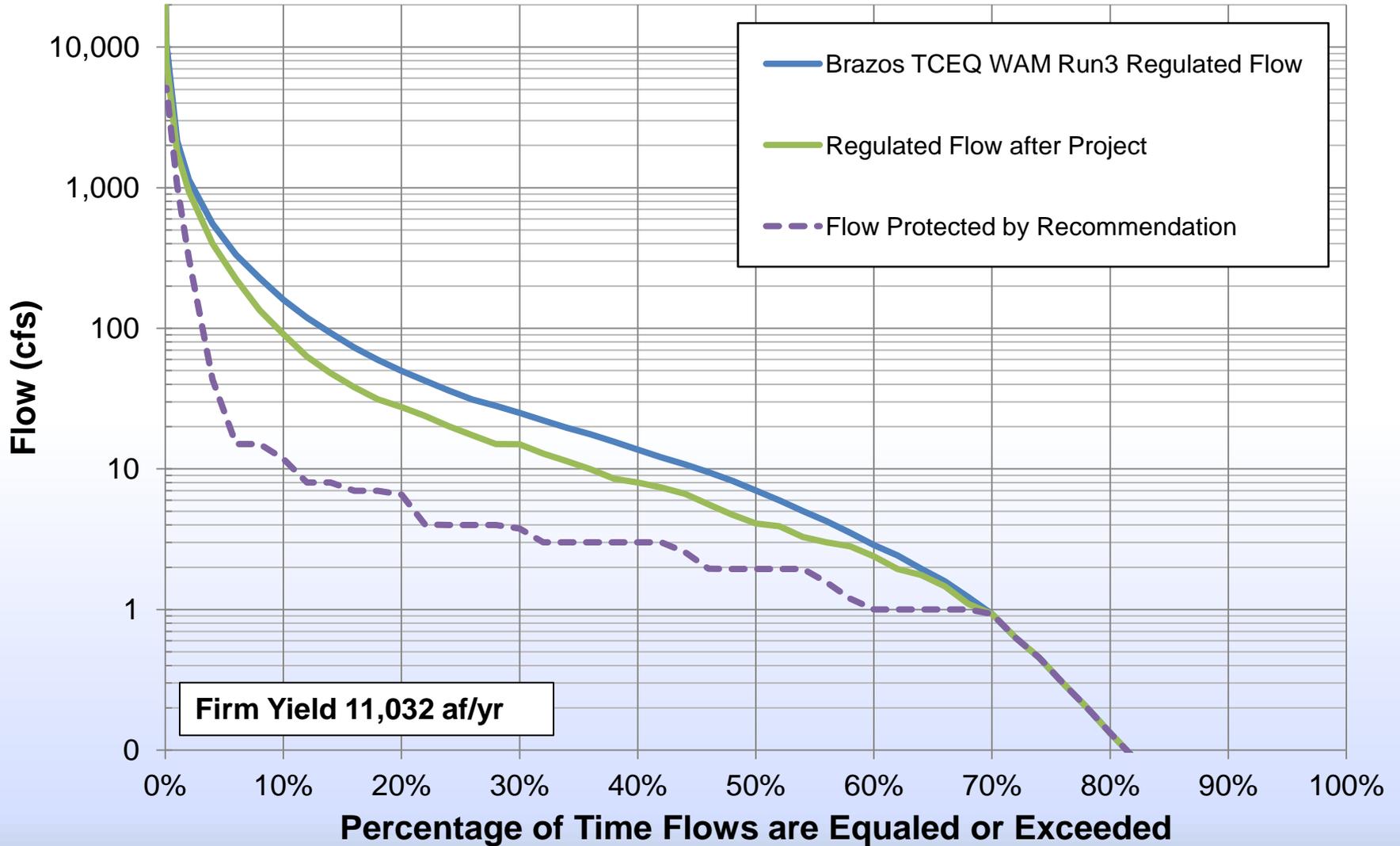
DMF West, Aspermont Gage – BBEST EFR Annual Flow Frequency Curve



Firm Yield 9,011 af/yr



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



Firm Yield 11,032 af/yr



Compliance Results for Environmental Flow Recommendations Double Mtn. Fork Reservoir

Project	No Project		Infinite Project	With Double Mtn. Fork Reservoir in Place		
Scenario	Historical	WAM Run3 for Project	Infinite Infrastructure	Lyons Method	BBEST EFR	Modified BBEST EFR
Firm Yield (AF/YR)	NA	NA	NA	15,052	9,011	11,032
Non-Pulse Flows (Percent of time flow equals or exceeds BBEST EFR recommendations)						
Subsistence	45%	48%	48%	48%	48%	48%
Base Low	45%	48%	48%	48%	48%	48%
Base Medium	60%	62%	62%	57%	62%	62%
Base High	56%	54%	54%	36%	54%	54%
Pulse Flows (Total number of HFP events occurring)						
4 per season	849	766	478	525	650	604
3 per season	543	485	313	338	419	394
2 per season	847	724	276	452	528	530
1 per season	275	228	102	137	165	164
1 per year	65	51	31	33	45	44
1 per 2 year	31	22	13	16	20	15
1 per 5 year	13	6	5	4	5	4



Questions?



Compliance Results for Environmental Flow Recommendations Infinite Infrastructure

Project	No Project		Infinite Infrastructure		
Scenario	Historical	WAM Run3 for Project	Lyons Method	BBEST EFR	Modified BBEST EFR
Firm Yield (AF/YR)	NA	NA	NA	NA	NA
Non-Pulse Flows (Percent of time flow equals or exceeds BBEST EFR recommendations)					
Subsistence	87%	62%	58%	62%	62%
Base Low	55%	40%	21%	40%	40%
Base Medium	75%	60%	13%	60%	60%
Base High	69%	59%	7%	59%	59%
Pulse Flows (Total number of HFP events occurring)					
3 per season	2,546	1,983	0	799	548
2 per season	1,106	831	0	370	143
1 per season	317	245	0	118	79
1 per year	82	66	0	35	0
1 per 2 year	34	31	0	13	0



Compliance Results for Environmental Flow Recommendations Double Mtn. Fork Reservoir

Project	No Project		Infinite Infrastructure		
Scenario	Historical	WAM Run3 for Project	Lyons Method	BBEST EFR	Modified BBEST EFR
Firm Yield (AF/YR)	NA	NA	NA	NA	NA
Non-Pulse Flows (Percent of time flow equals or exceeds BBEST EFR recommendations)					
Subsistence	45%	48%	48%	48%	48%
Base Low	45%	48%	48%	48%	48%
Base Medium	60%	62%	37%	62%	62%
Base High	56%	54%	16%	54%	54%
Pulse Flows (Total number of HFP events occurring)					
4 per season	849	766	0	478	276
3 per season	543	485	0	313	210
2 per season	847	724	0	276	269
1 per season	275	228	0	102	97
1 per year	65	51	0	31	27
1 per 2 year	31	22	0	13	0
1 per 5 year	13	6	0	5	0



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

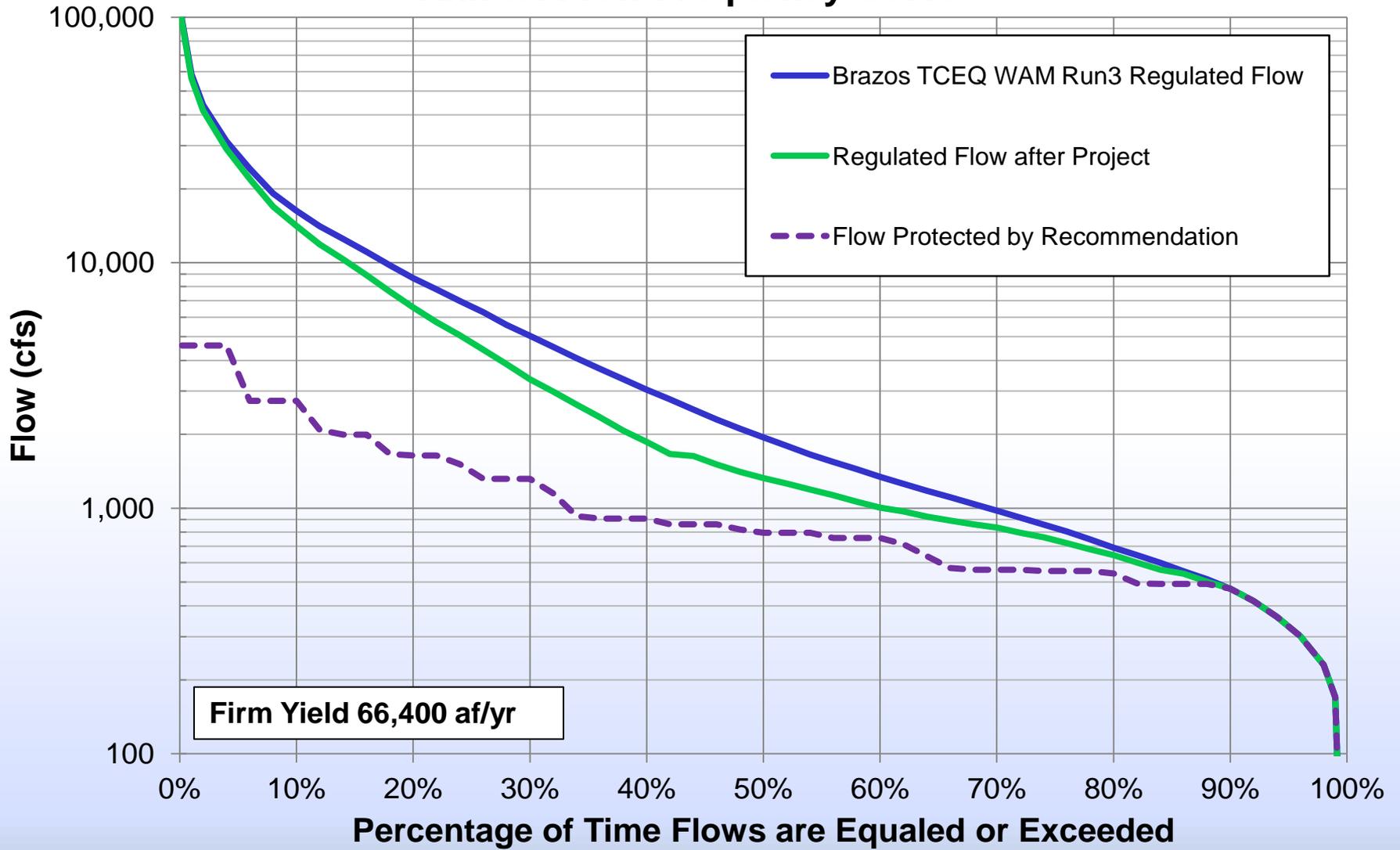
Overbank Events												
High Flow Pulses												
Base Flows (cfs)	555	794	860	1,317	1,640	1,995	4,600	2,740	907	562	756	492
	555	794	860	1,317	1,640	1,995	4,600	2,740	907	562	756	492
	555	794	860	1,317	1,640	1,995	4,600	2,740	907	562	756	492
Subsistence Flows (cfs)	555	794	860	1,317	1,640	1,995	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.



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



Firm Yield 66,400 af/yr

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.

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

