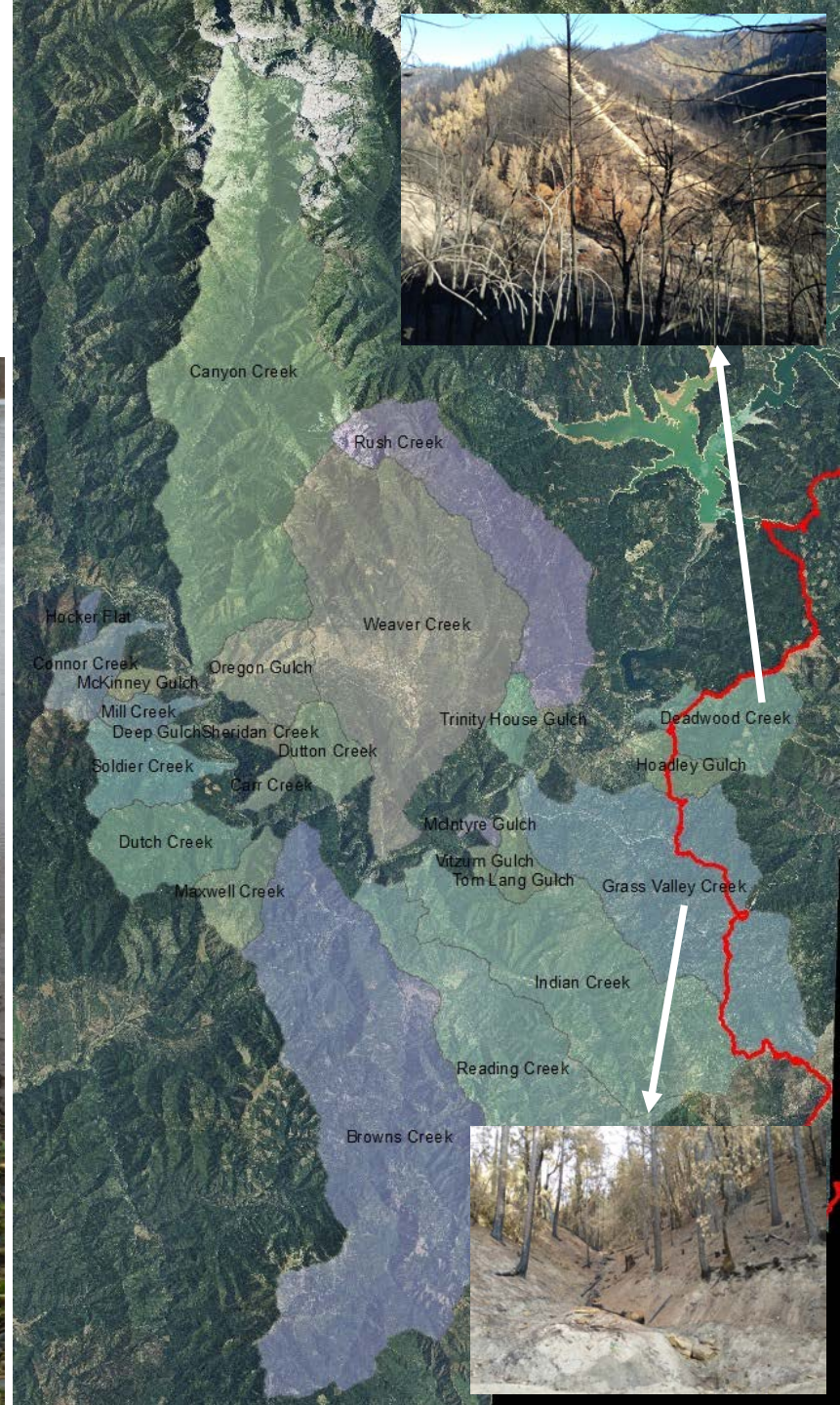
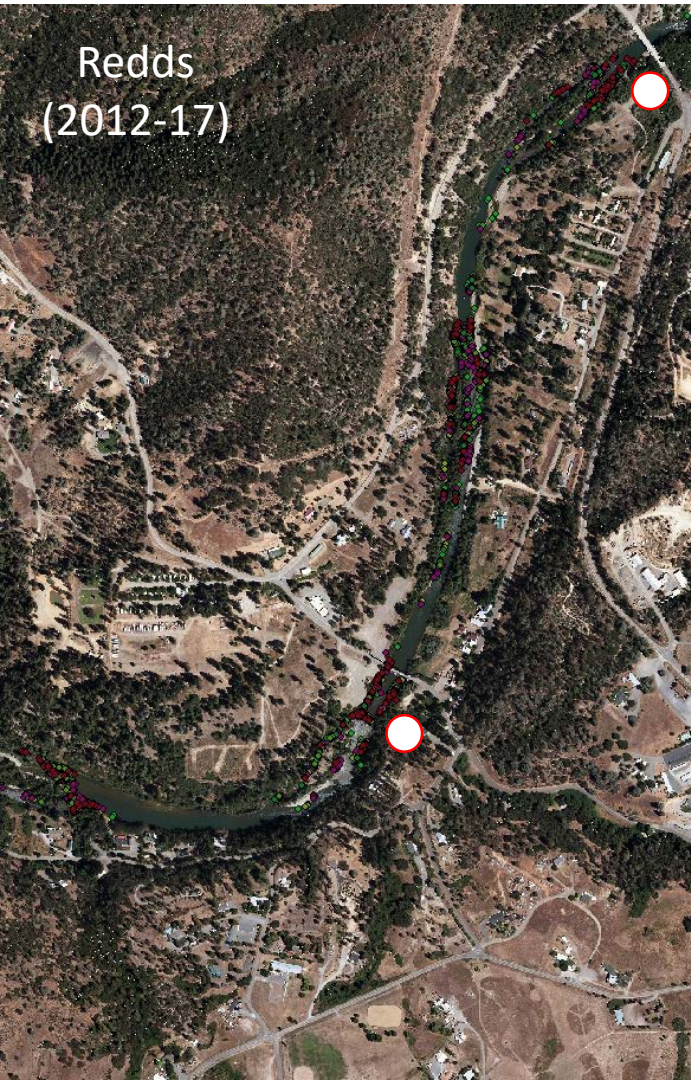


Water Year 2019 Flow Schedule Technical Recommendations

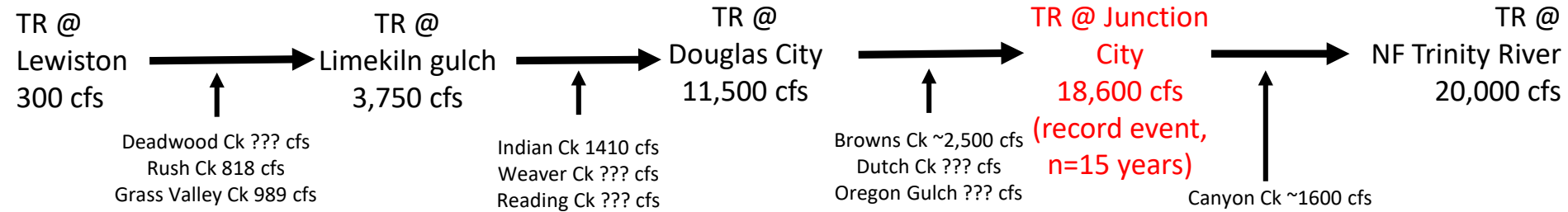


**Trinity Management Council meeting,
Weaverville, California
April 3, 2019**

Wildfire in tributaries, sediment contributions to restoration reach



February flood on Trinity River and tributaries

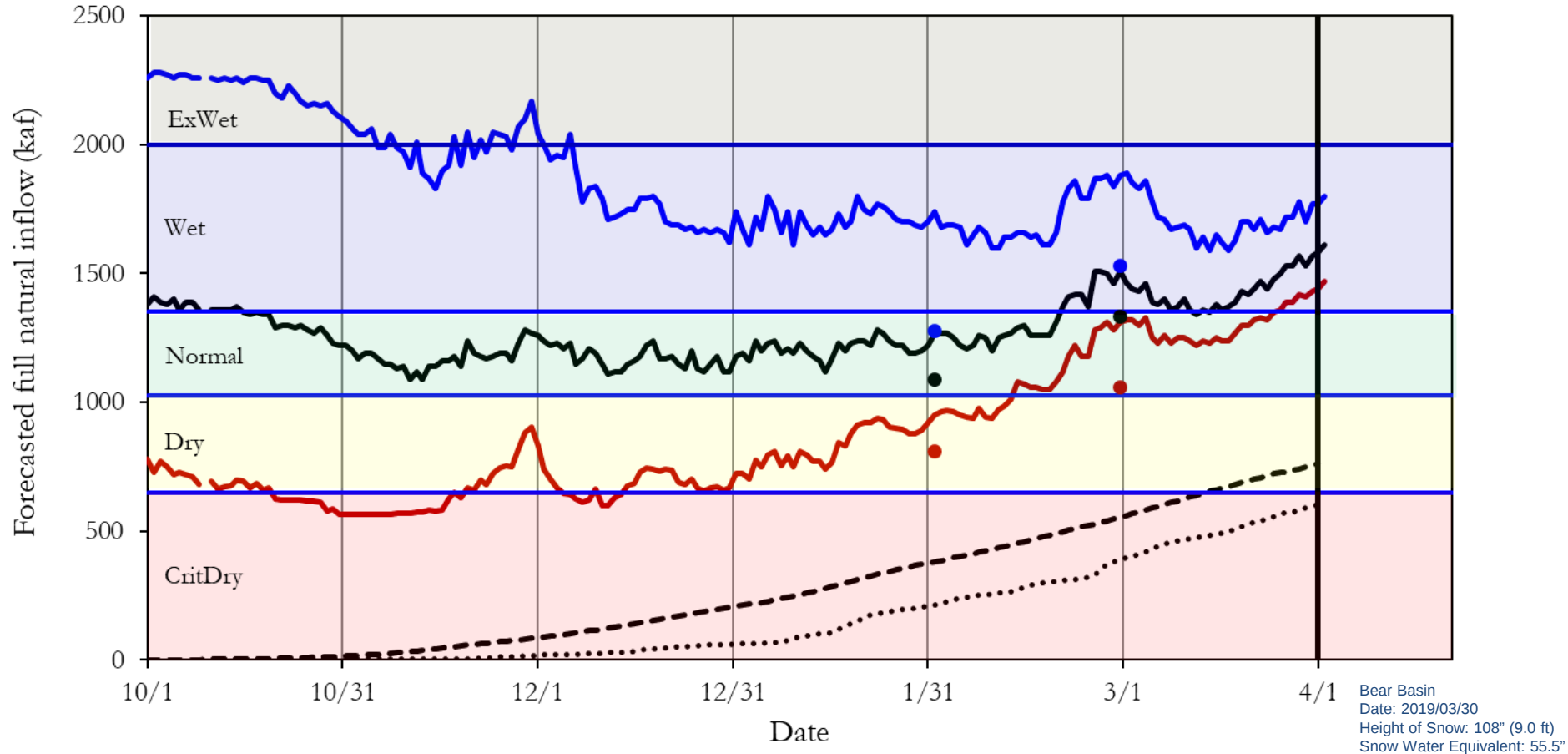


Full Natural Inflow Forecasts

CNRFC=California Nevada River Forecast Center

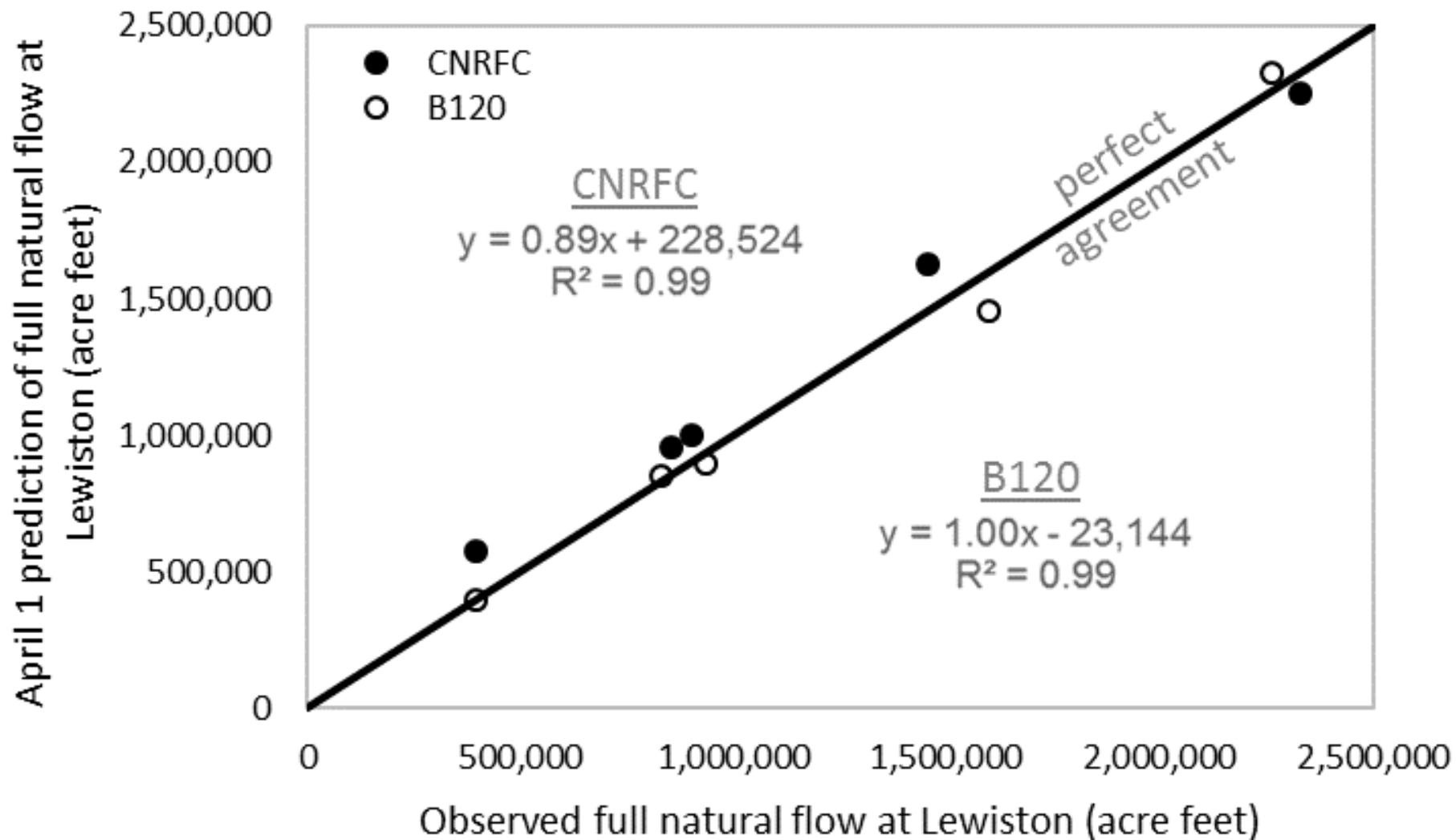
B120=Bulletin 120 published Feb-May (120 days) by CDWR

- CNRFC 10% exceedence
- CNRFC 50% exceedence
- CNRFC 90% exceedence
- B120 10% exceedence
- B120 50% exceedence
- B120 90% exceedence
- - - WY To Date Average
- WY To Date Actual



Primary differences between forecast methods is the B120 projects median precipitation and snow whereas the CNRFC incorporates forecasts of upcoming weather into their model.

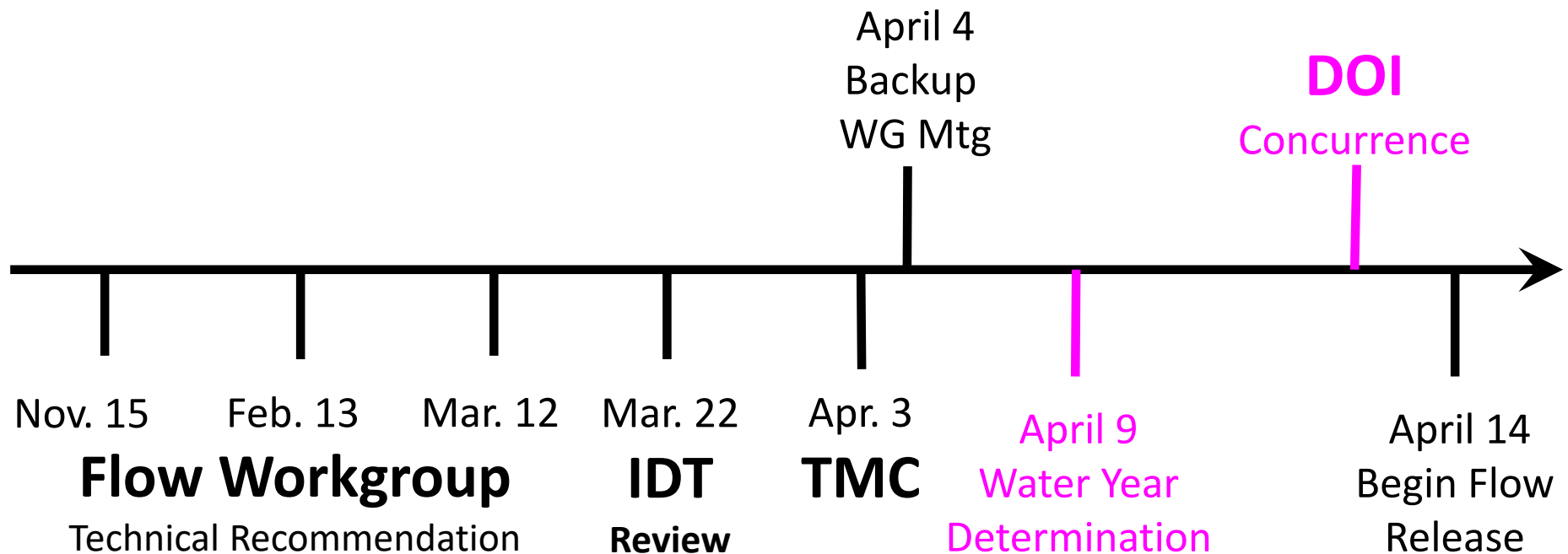
Accuracy of CNRFC and B120 predictions



					Water Year (WY) Type	Annual Basin Runoff Above Lewiston Gage (kAF)	ROD Water Allocation (kAF)	Probability of Occurrence
April 3rd CNRFC daily forecast 90% 1,460 kAF 50% 1,600 kAF 10% 1,750 kAF					Critically Dry	< 650	369	12%
					Dry	650 – 1,024	453	28%
					Normal	1,025 – 1,349	647	20%
					Wet	1,350 – 1,999	701	28%
					Extremely Wet	≥ 2,000	815	12%

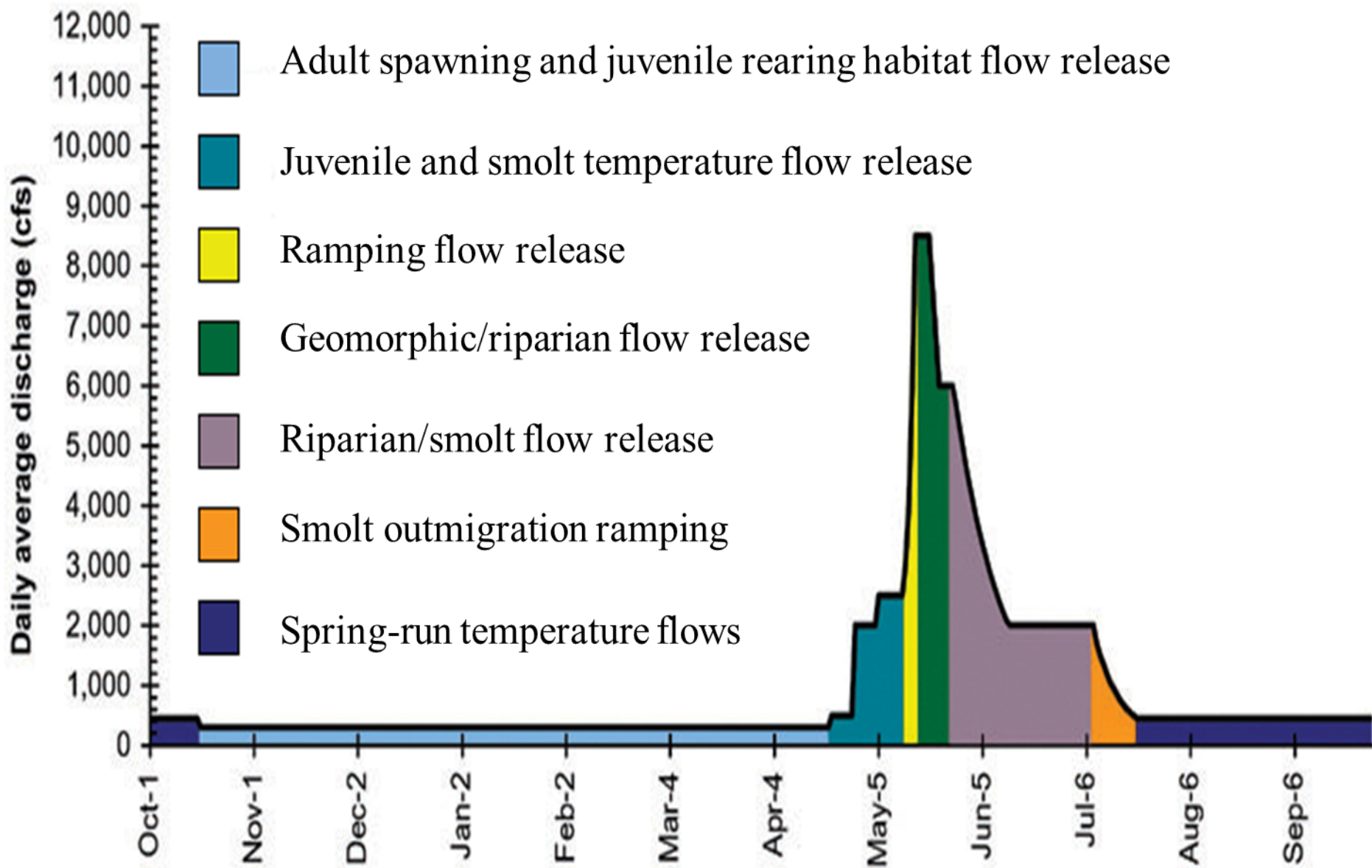
2019 Technical Evaluation

ROD and Proposed Flow Releases

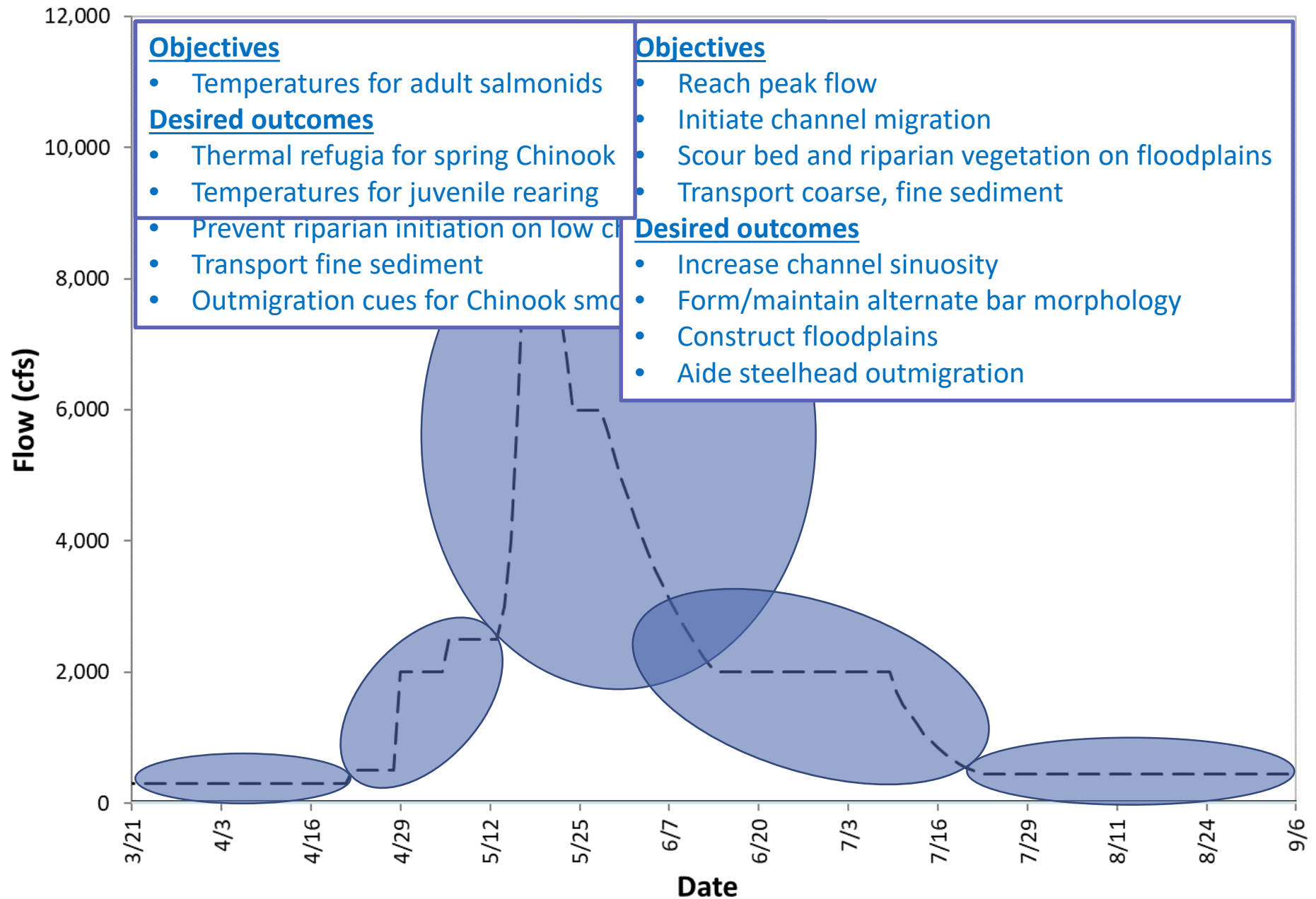


- Flow workgroup evaluated 2 proposed hydrographs each for a **Wet** WY and a **Normal** WY
- Evaluations included workgroup discussions of hydrograph objectives and modeling

Timing of Flow Objectives



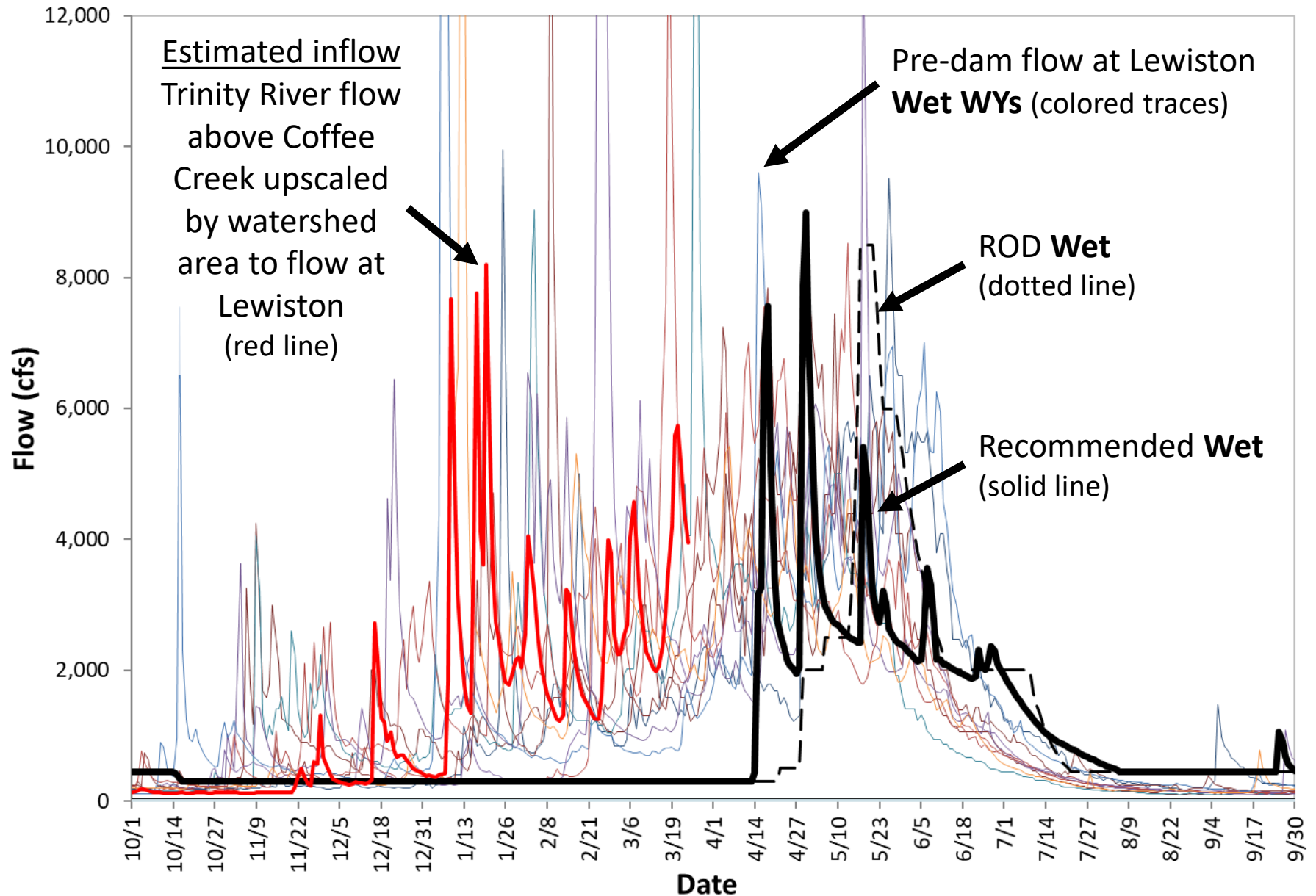
ROD objectives for Wet



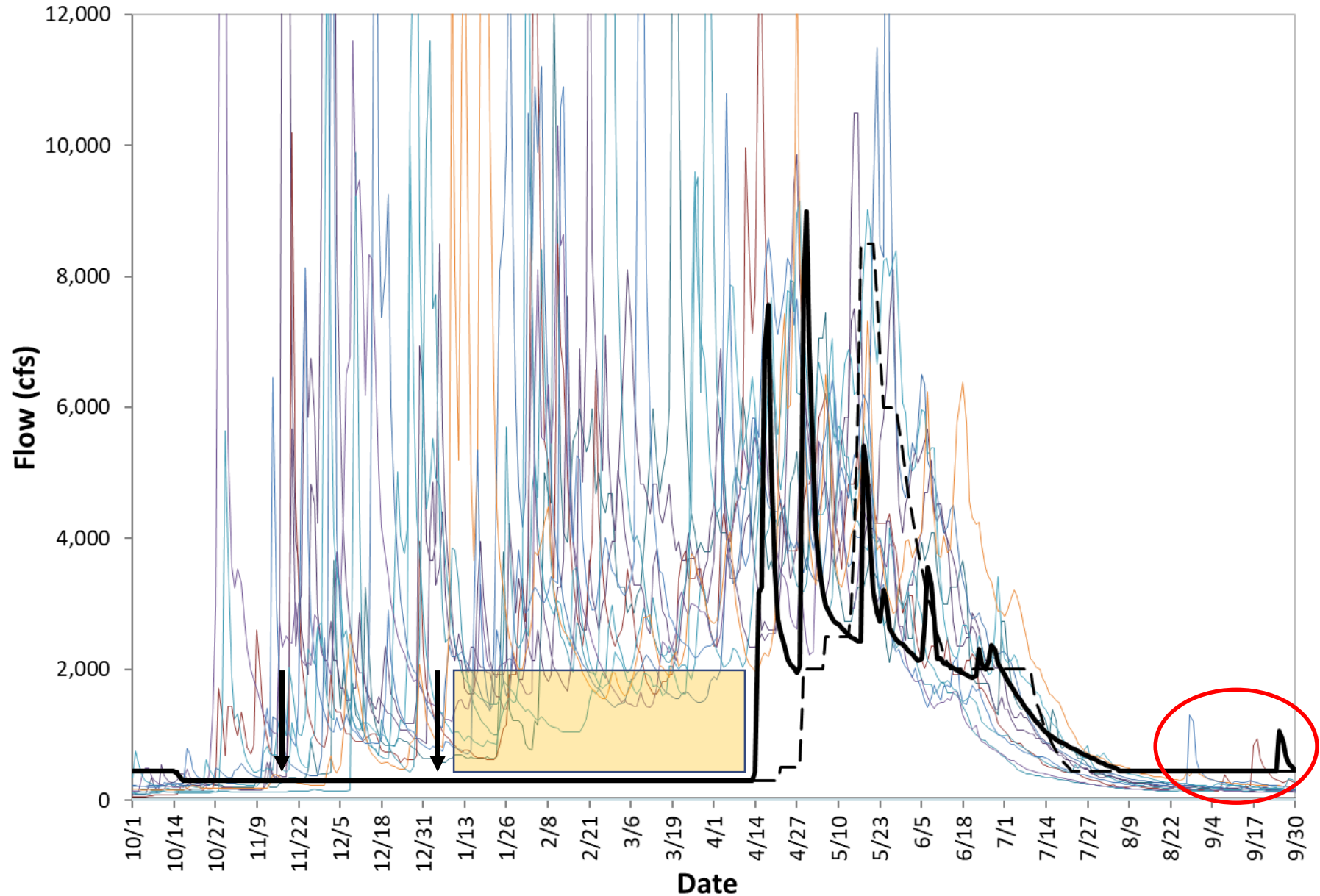
Additional objectives in derived hydrographs

- Deposit fines on floodplains with rapid rise to peak then decrease stage below surface targeted for deposition;
- Schedule diurnal changes in flow released from Lewiston dam based on diurnal flows on local, unregulated streams;
- Inundate off-channel rearing areas to provide optimal temps for fish growth: 15-18C when food not limited, 12-18C otherwise;
- Increase flow after April 15 and before the first full moon to disburse volitional release of steelhead from Trinity hatchery;
- Disperse hatchery Chinook released the week of first full moon in June;
- Provide 28d inundation to establish biofilm, pioneer macros after 35d, peak macros after 63d;
- Variable flows before hydrograph peak to delay FYLF breeding until after the peak; and
- Rapid decrease in flow from peaks to promote bank collapse.

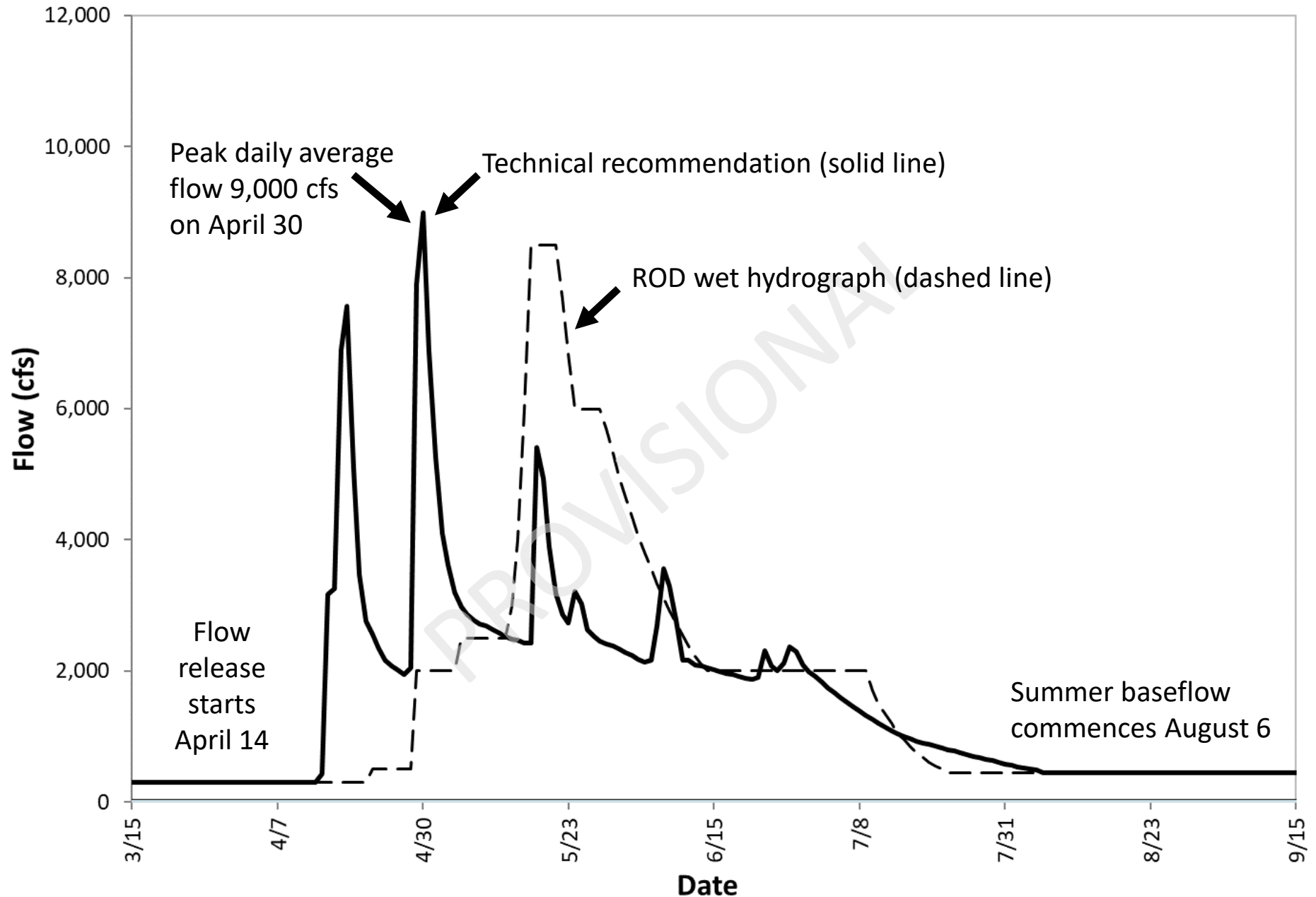
ROD, recommended **Wet** hydrograph and pre-dam flows at Lewiston



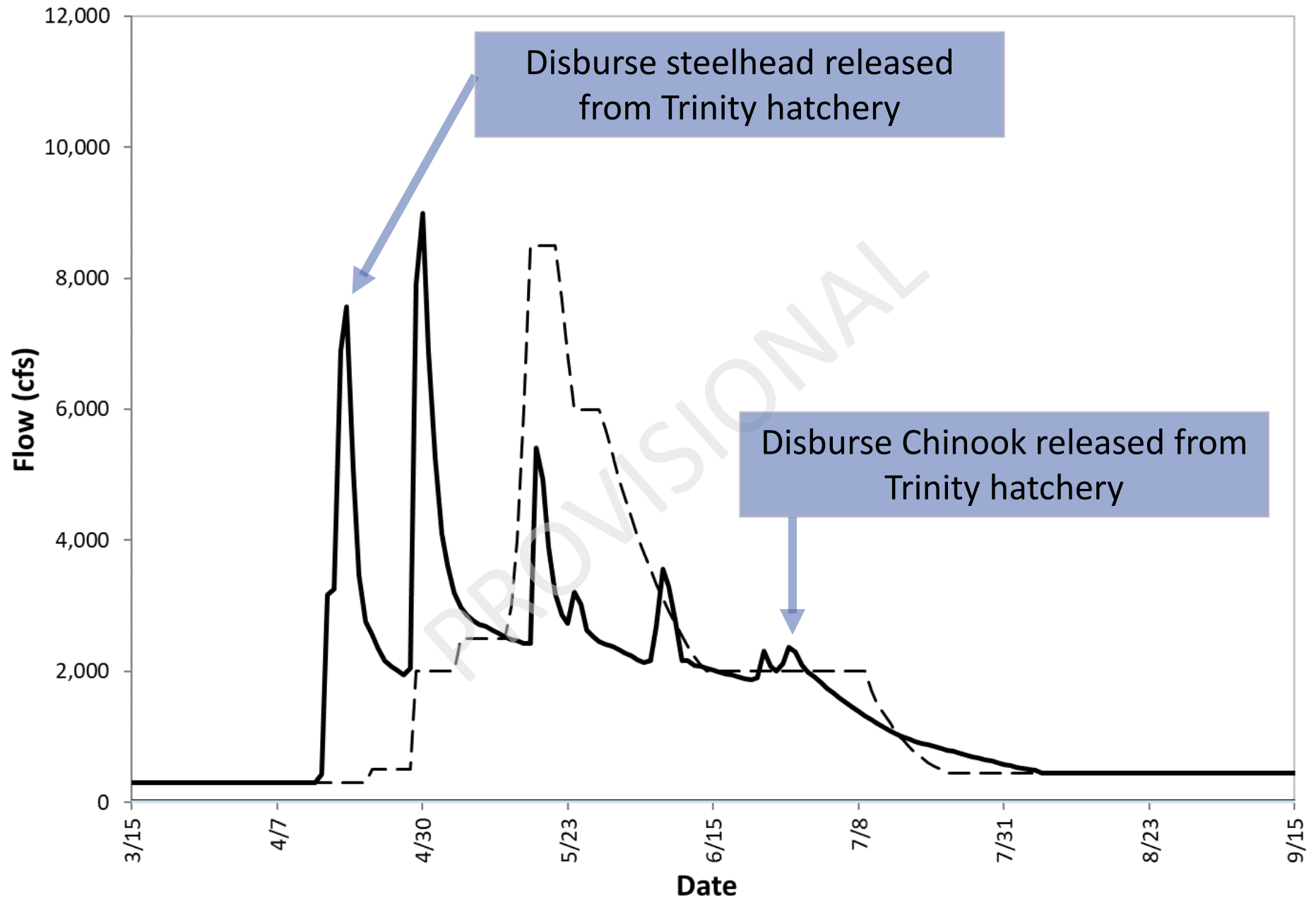
ROD, recommended **Wet** hydrograph and pre-dam flows at Lewiston



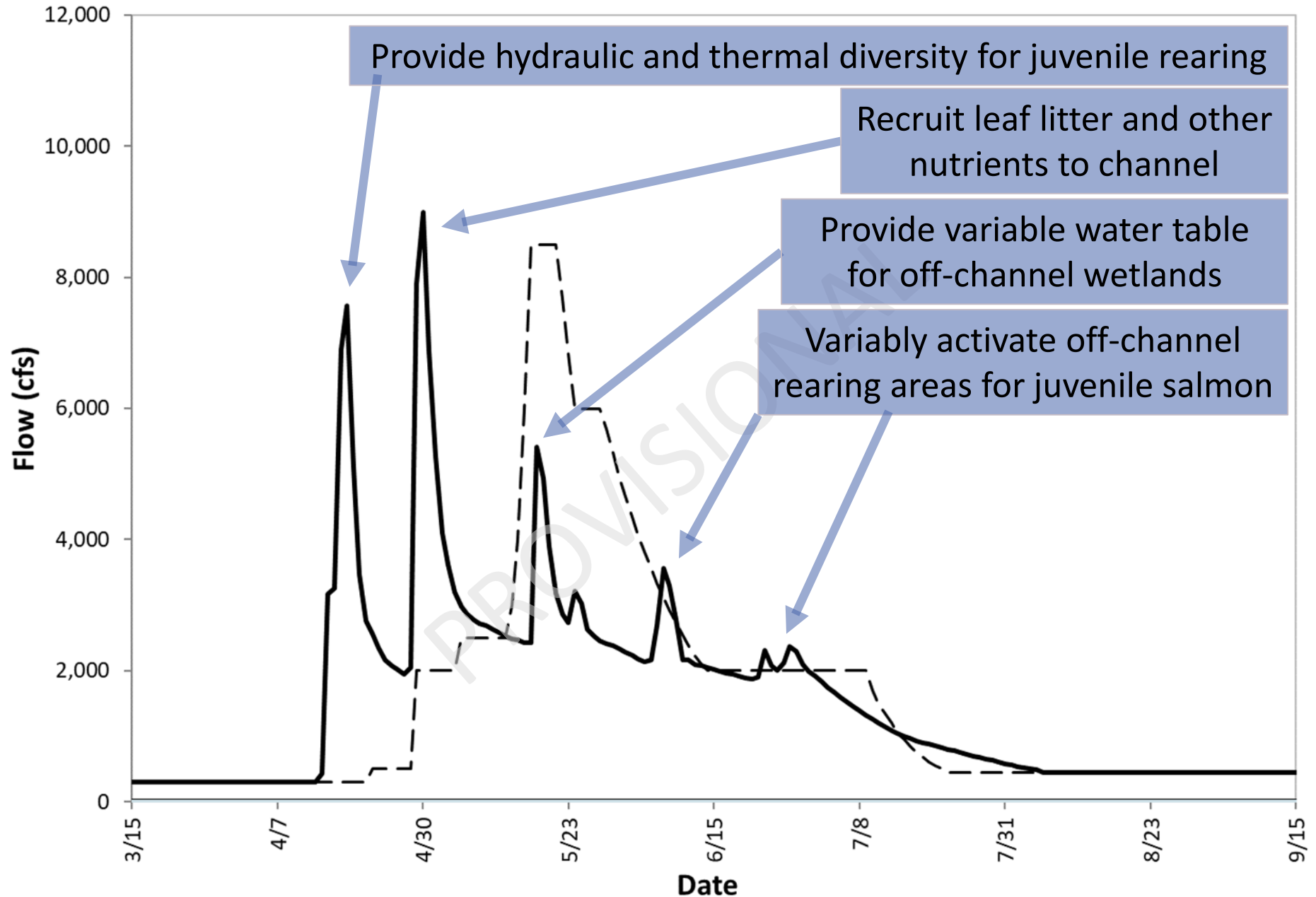
Technical Recommendation: Wet



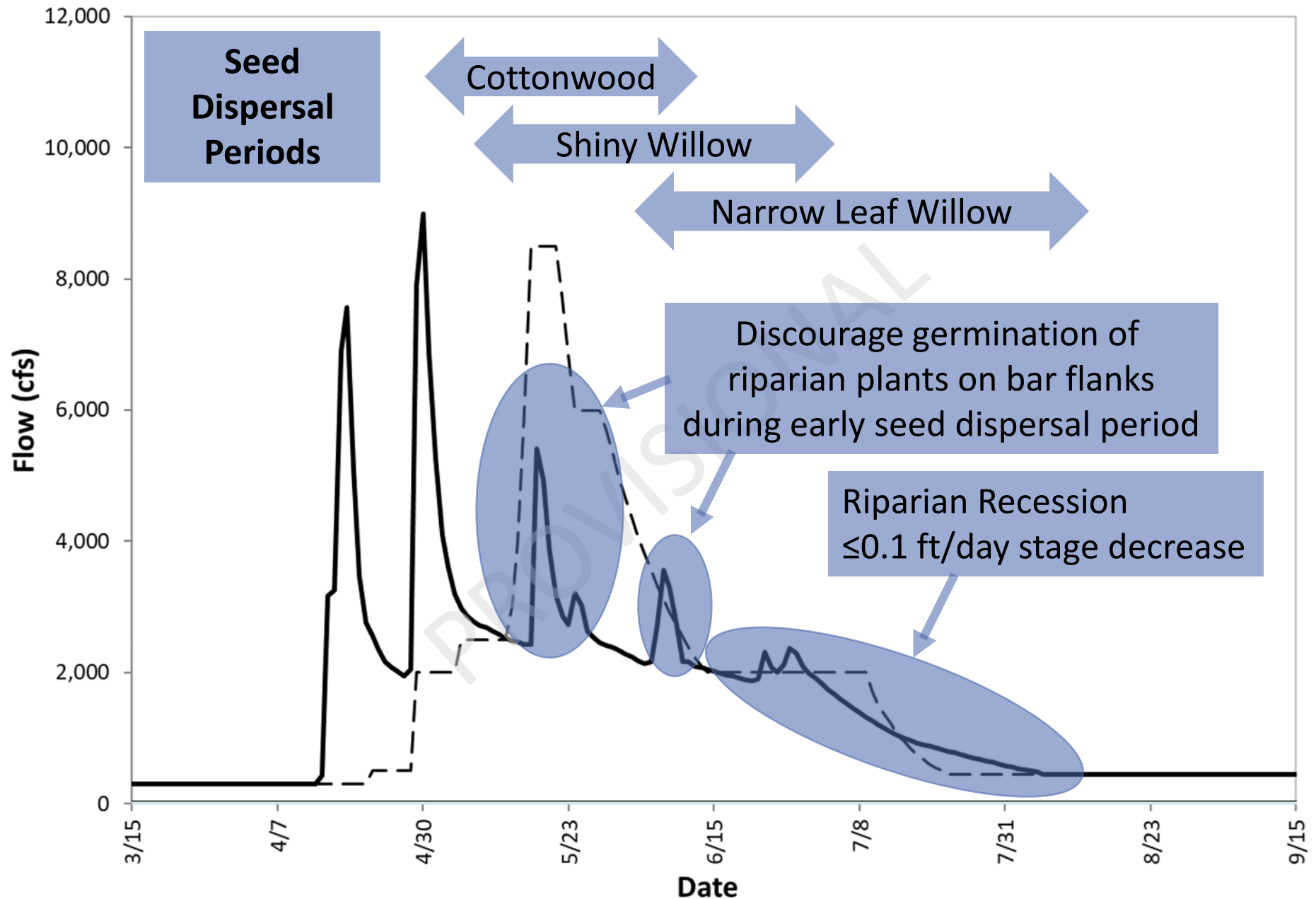
Technical Recommendation: **Wet**



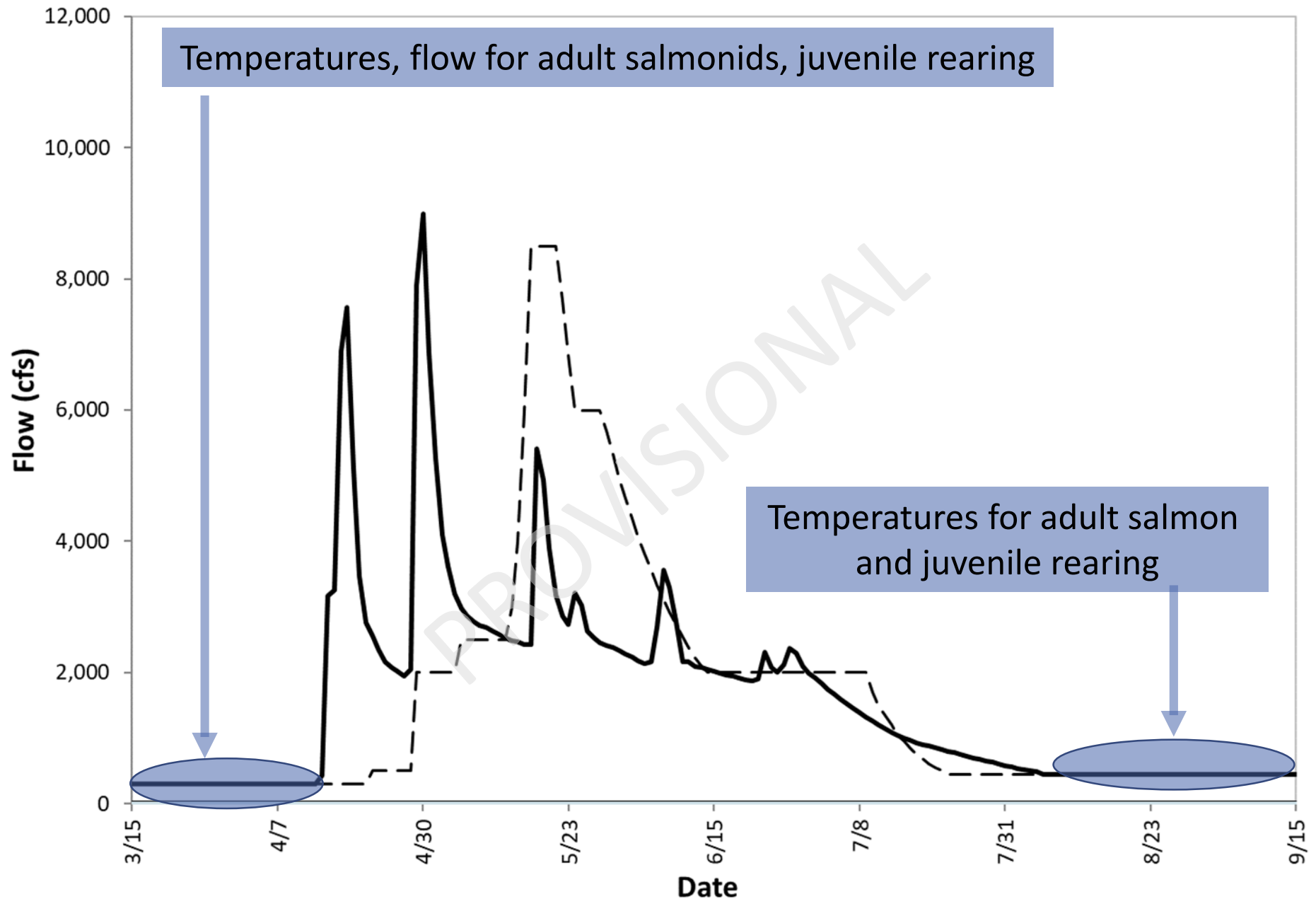
Technical Recommendation: **Wet**



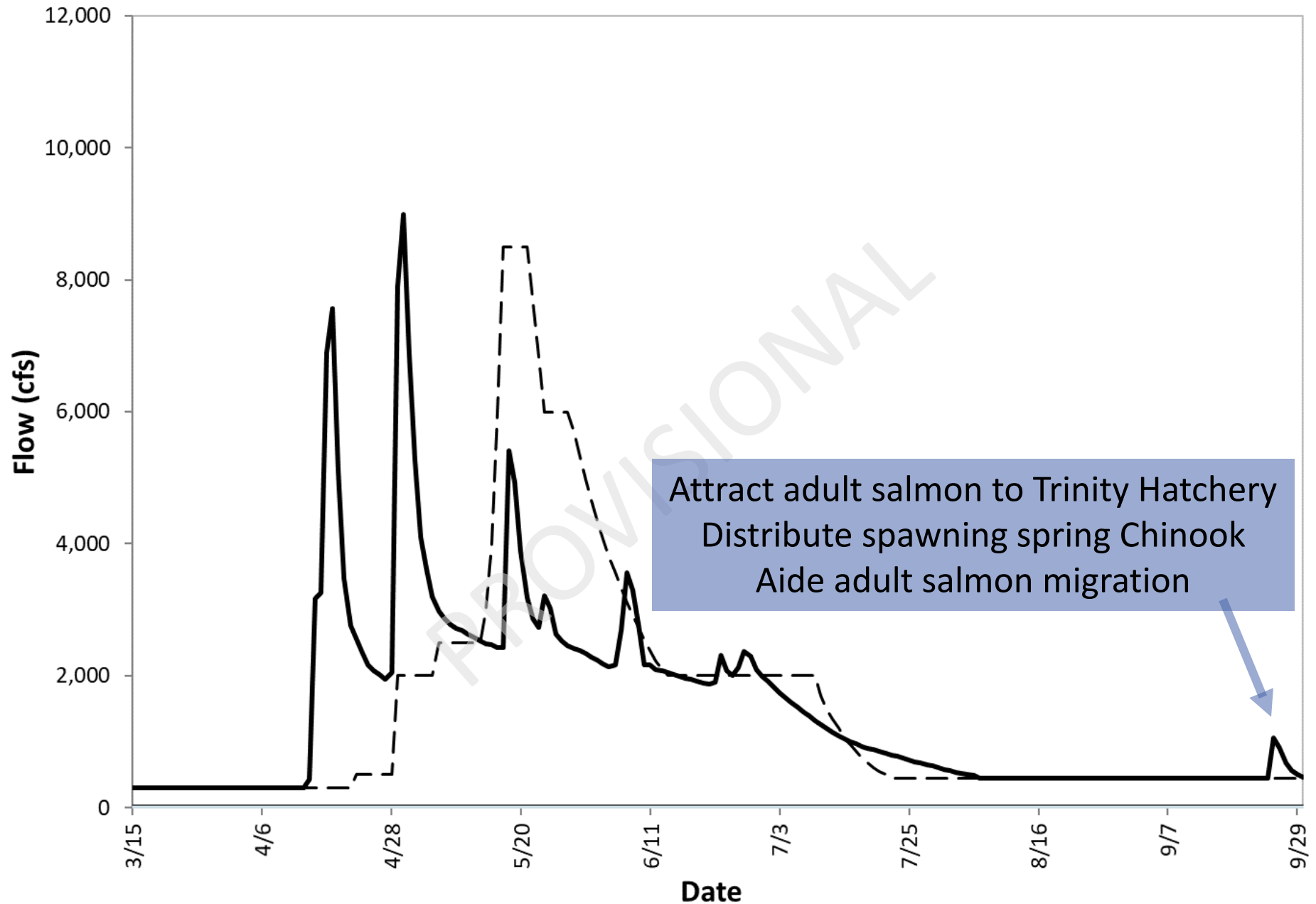
Technical Recommendation: **Wet**



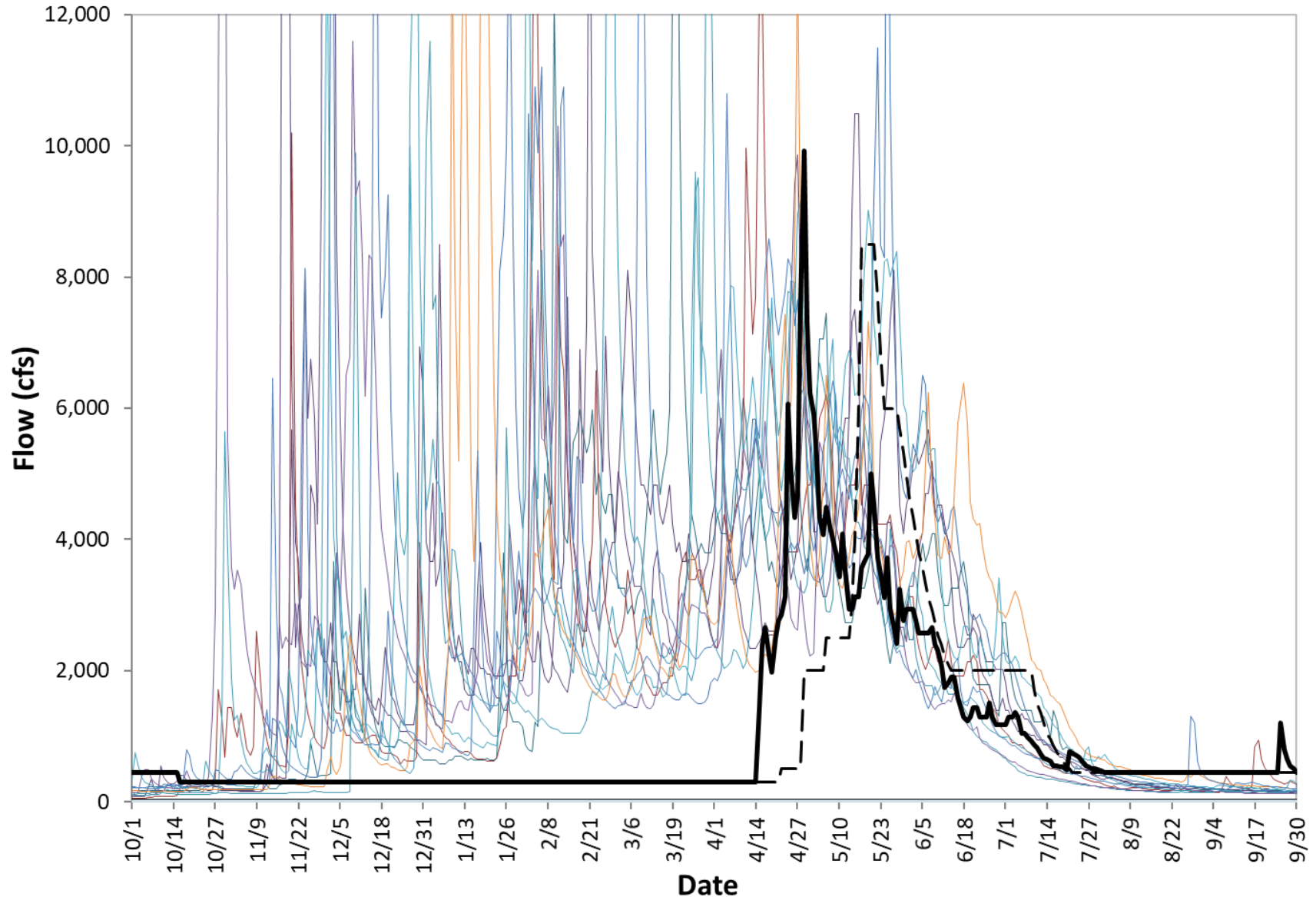
Technical Recommendation: Wet



Technical Recommendation: **Wet**



ROD, alternate **Wet** hydrograph and pre-dam flows at Lewiston



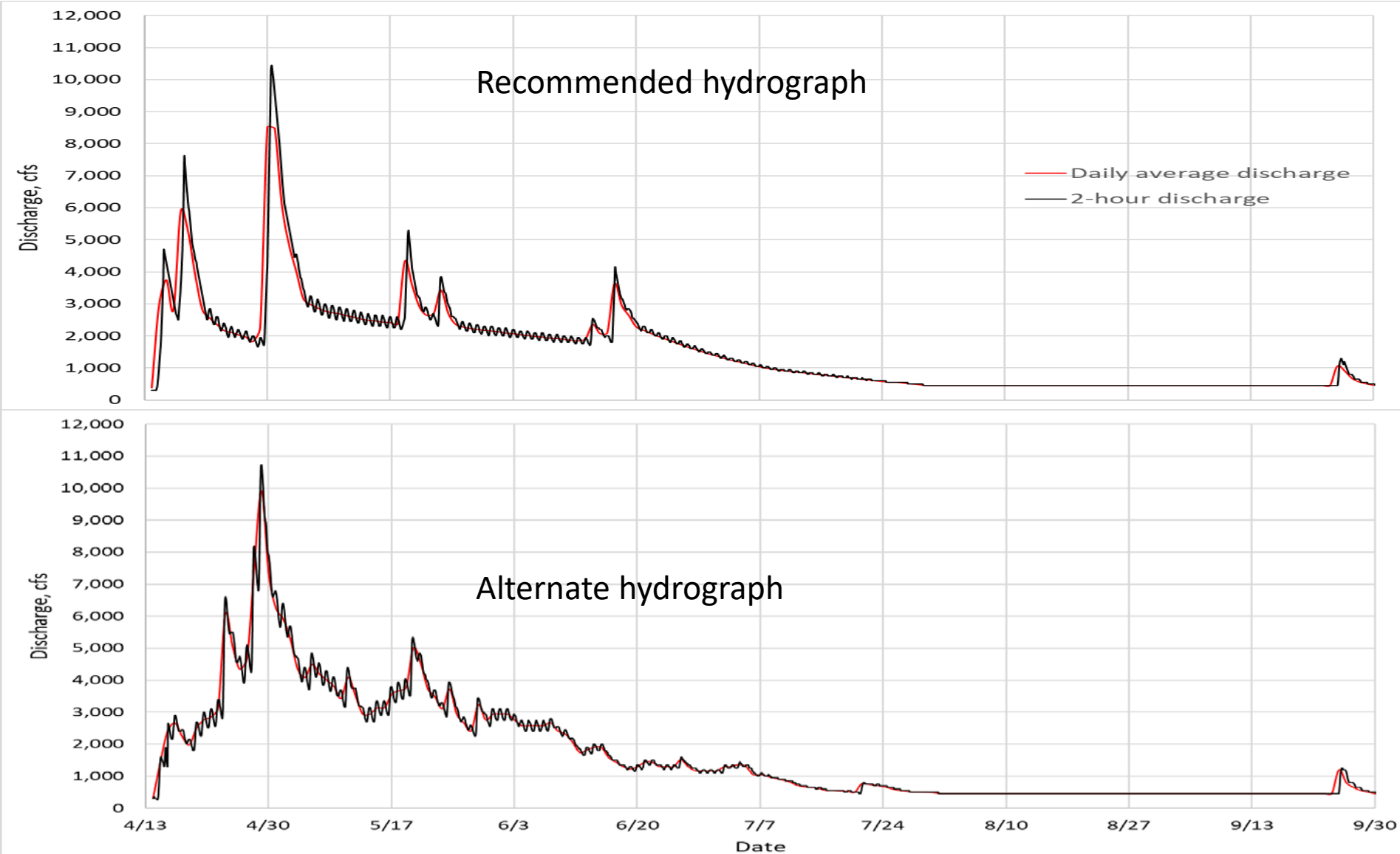
WY2018 Hydrograph modeling

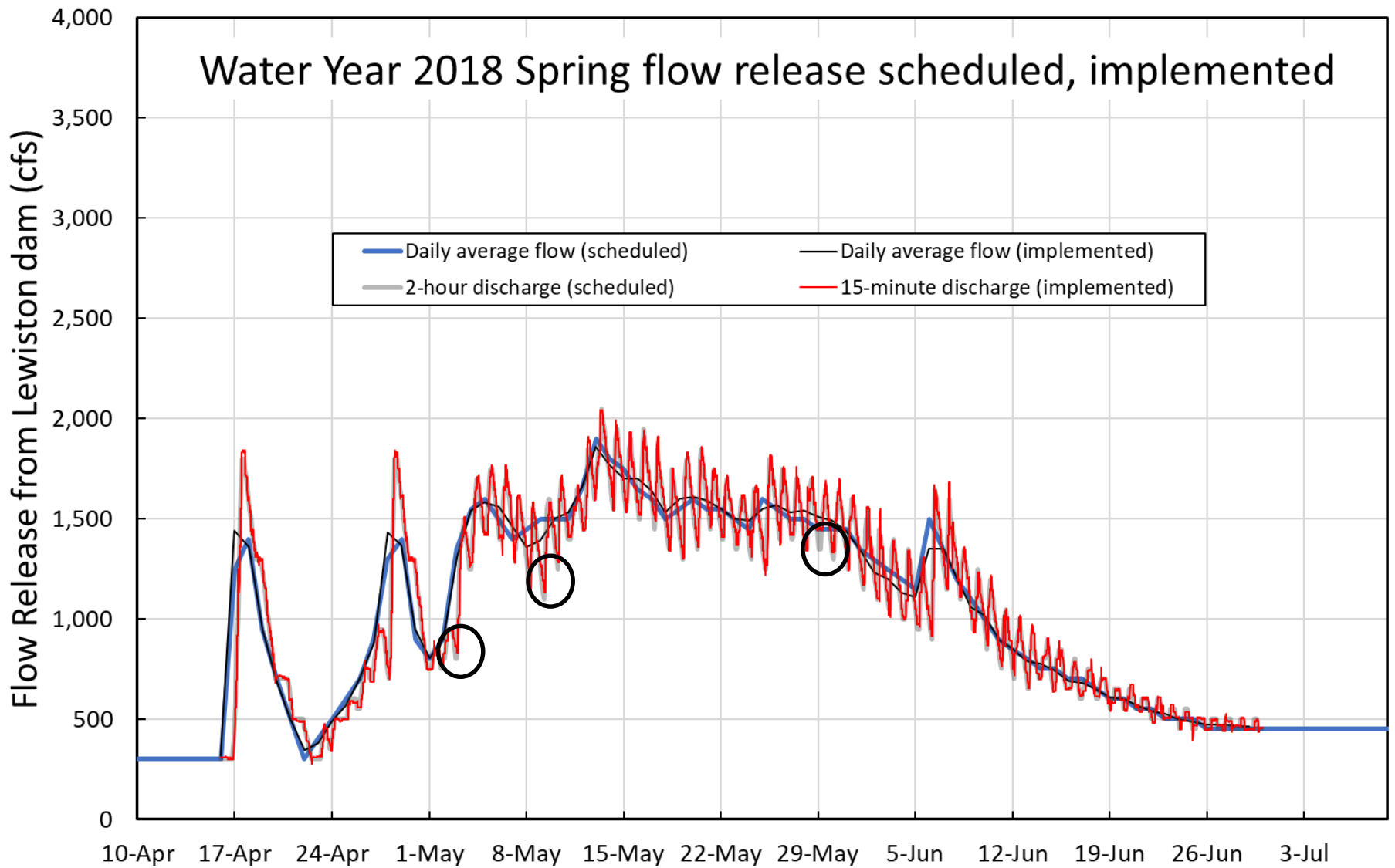
- RBM10 Model (temperature and flow; Jones et al., 2016)
- Willow Creek smolt outmigration (RT80; DRAFT MODEL)
- Bedload transport (rating curve for Douglas City; GMA, 2017)
- Bed surface mobilization and bar scour (Shields approach)
- TARGETS (riparian vegetation)
- FYFAM (Foothill yellow-legged frogs)
- SSS (Juvenile Chinook production; not used)

Modeling results for WET water year hydrographs

KEY:		BEST	MEDIUM	WORST	ROD Wet	Recommended Wet	Alternate Wet
Chinook production above NF Trinity River (SSS) and Chinook RT80 at Willow Creek					(16)	(15)	(23)
Total Natural Chinook Abundance at Pear Tree (spring and fall run)					Not modeled	Not modeled	Not modeled
Fry abundance (<55 mm)					Not modeled	Not modeled	Not modeled
Parr abundance (55 - 90 mm)					Not modeled	Not modeled	Not modeled
Smolt abundance (>90 mm)					Not modeled	Not modeled	Not modeled
Total Natural Chinook Biomass at Pear Tree (metric tons)					Not modeled	Not modeled	Not modeled
Average Natural Chinook size at Pear Tree (grams/fish)					Not modeled	Not modeled	Not modeled
Smolt Outmigration Timing (calendar date)							
50% natural smolt outmigration at Pear Tree (SSS)					Not modeled	Not modeled	Not modeled
80% natural smolt outmigration at Pear Tree (SSS)					Not modeled	Not modeled	Not modeled
80% natural smolt outmigration at Willow Creek					7/18/2019	7/17/2019	7/16/2019
Temperature (RBM10)							
EIS Temperature objectives for adult salmon holding/spawning at Douglas City (exceedance degree days, C*days)							
Exceedance, average climate conditions (50% exceedance)					0	0	0
Exceedance, adverse climate conditions (10% exceedance)					0	0	0
EIS Temperature objectives for adult salmon holding/spawning above NF Trinity River (exceedance degree days, C*days)							
Exceedance, average climate conditions (50% exceedance)					0	0	0
Exceedance, adverse climate conditions (10% exceedance)					1.2	1.2	1.2
Temperature objectives for juvenile salmon at Weitchpec (exceedance degree days, C*days)							
Exceedance, average climate conditions (50% exceedance)					5	17	40
Exceedance, adverse climate conditions (10% exceedance)					85	110	128
Riparian							
Black cottonwood initiation potential (nodes)					137	150	16
Risk of encroachment by narrow leaf willow (peak discharge >6000 cfs? yes or no)					N	N	N
Biology							
Number of froglets produced in the modeled reach (Chapman Ranch ESL)					4480	10483	9038
Median date for FYLF metamorphosis					10/8/2019	10/14/2019	10/19/2019
Physical							
Total bedload transport at Douglas City (tons)					7017	3812	4152
Bed surface mobilization (% bar area)					49%	55%	53%
Deep bar scour (% bar area)					27%	31%	30%
Administrative							
Construction impacts (days ≥1000cfs between July 15 and September 15)					0	0	0

Diurnal fluctuations in recommended and alternate Wet hydrographs

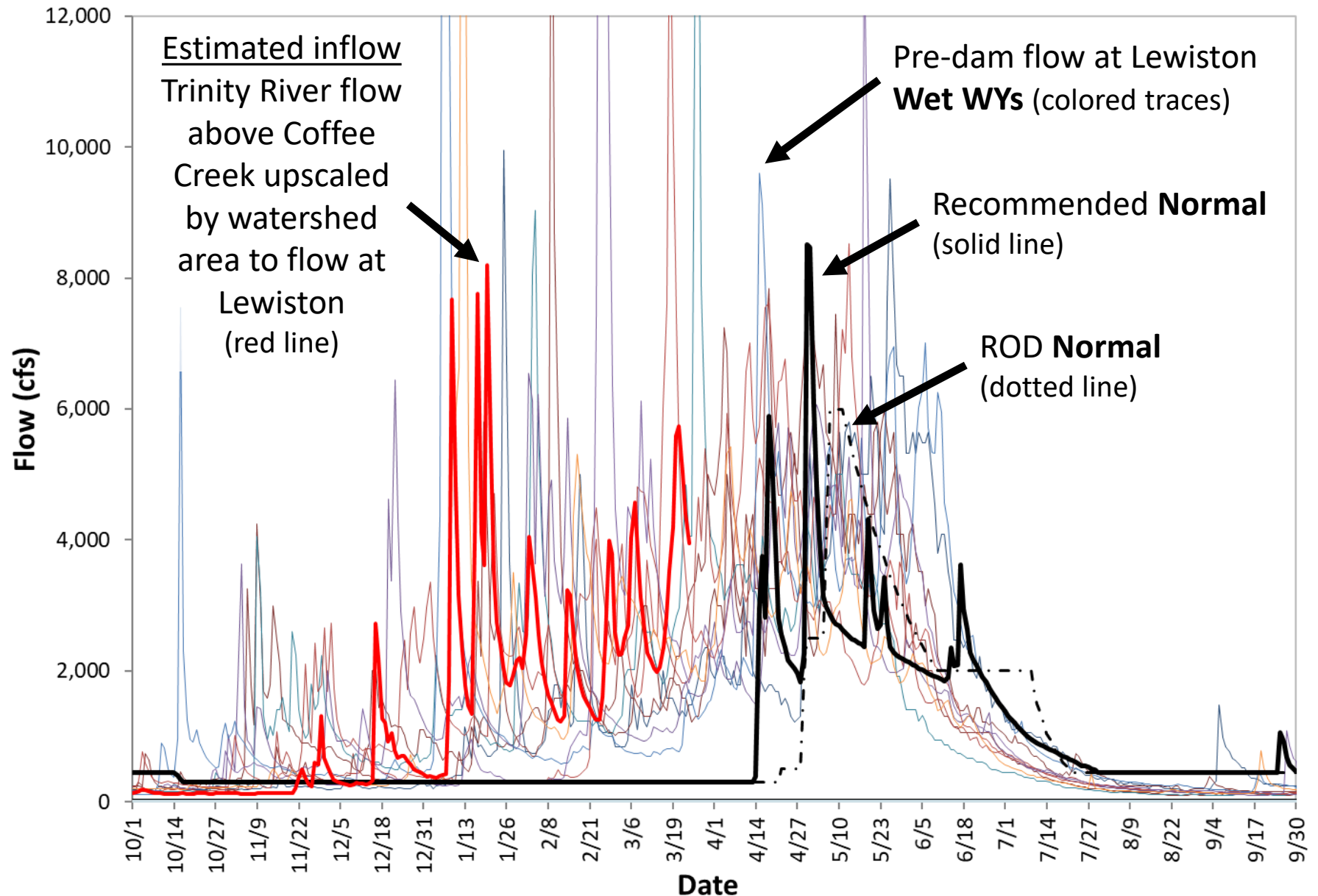




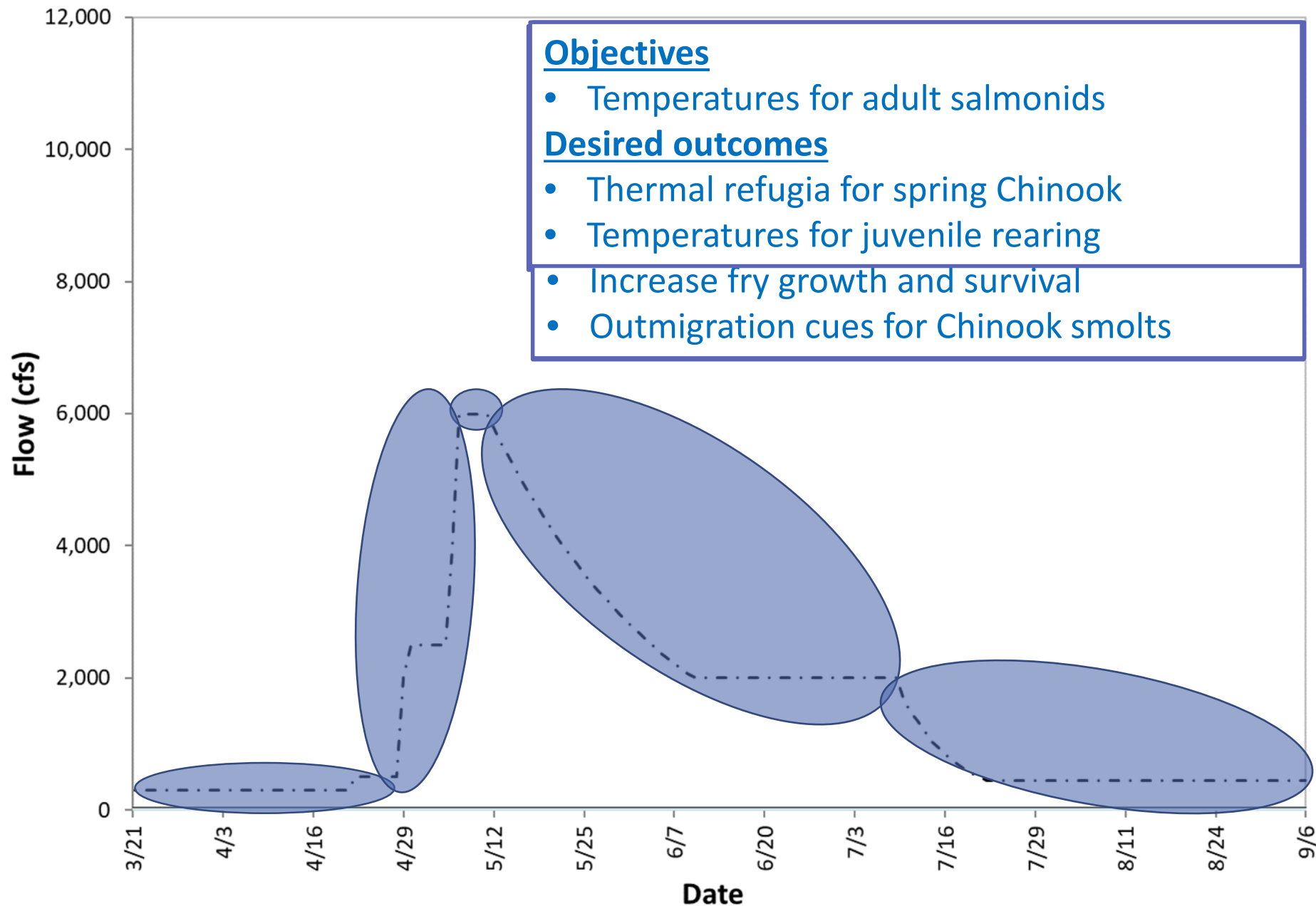
Monitoring during spring flow release

Funding Status	Type of Monitoring
Funded	Sediment transport
Funded	Mainstem temperature, discharge
Funded	Riparian recruitment of cottonwood and tree willows
Funded	Juvenile outmigrants
Funded	Chinook spawning abundance and distribution
Funded	Large wood at rehabilitation sites
Funded	Gravel augmentation
Funded	Physical habitat at rehabilitation sites
Unfunded	Tributary delta deposition and erosion
Unfunded	Off-channel thermal diversity
Unfunded	Juvenile off-channel rearing
Unfunded	Channel meandering and bank collapse
Unfunded	Invertebrate drift and colonization
Unfunded	Systemic large wood
Unfunded	Systemic physical habitat

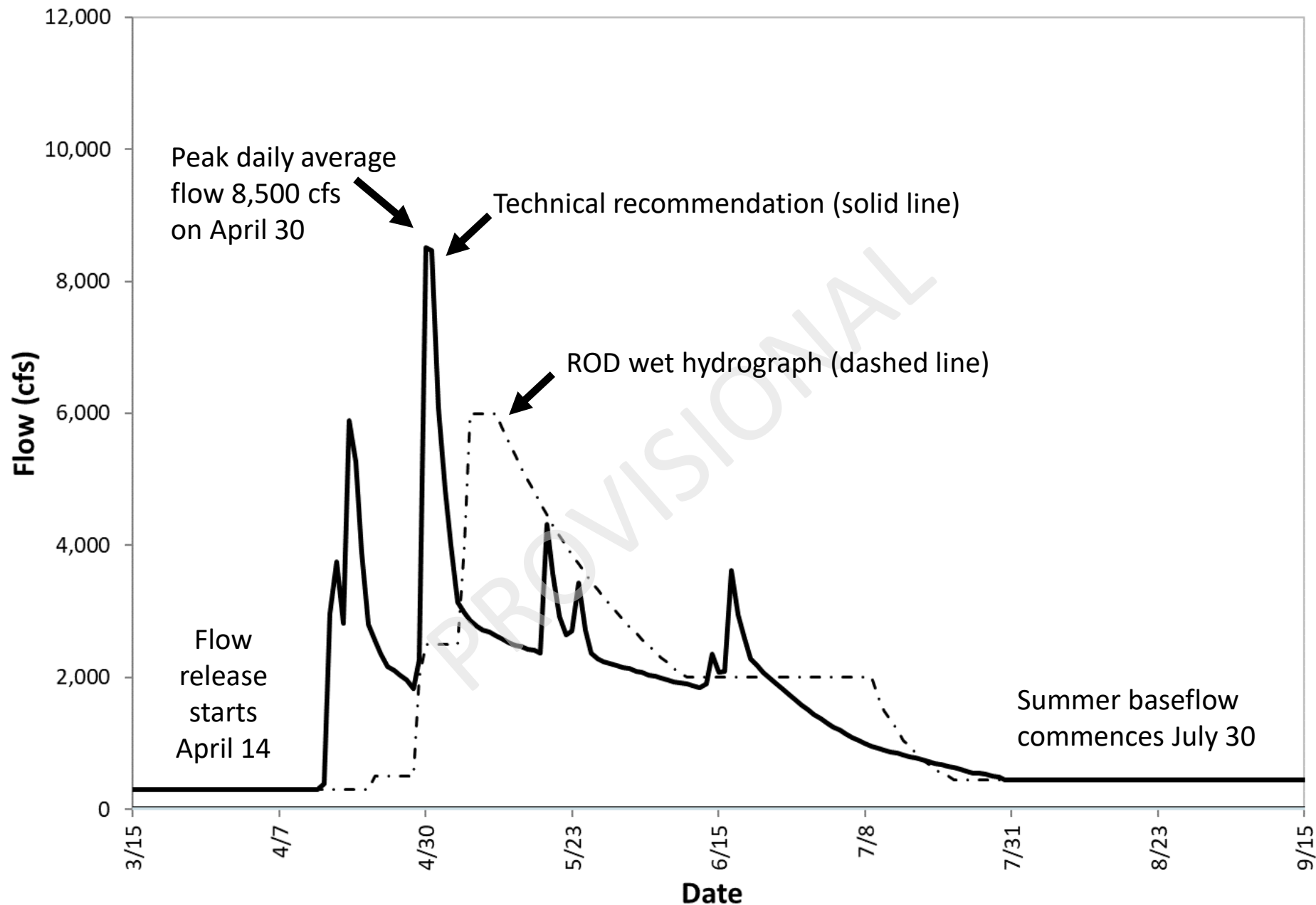
ROD, recommended **Normal** hydrograph and pre-dam flows at Lewiston



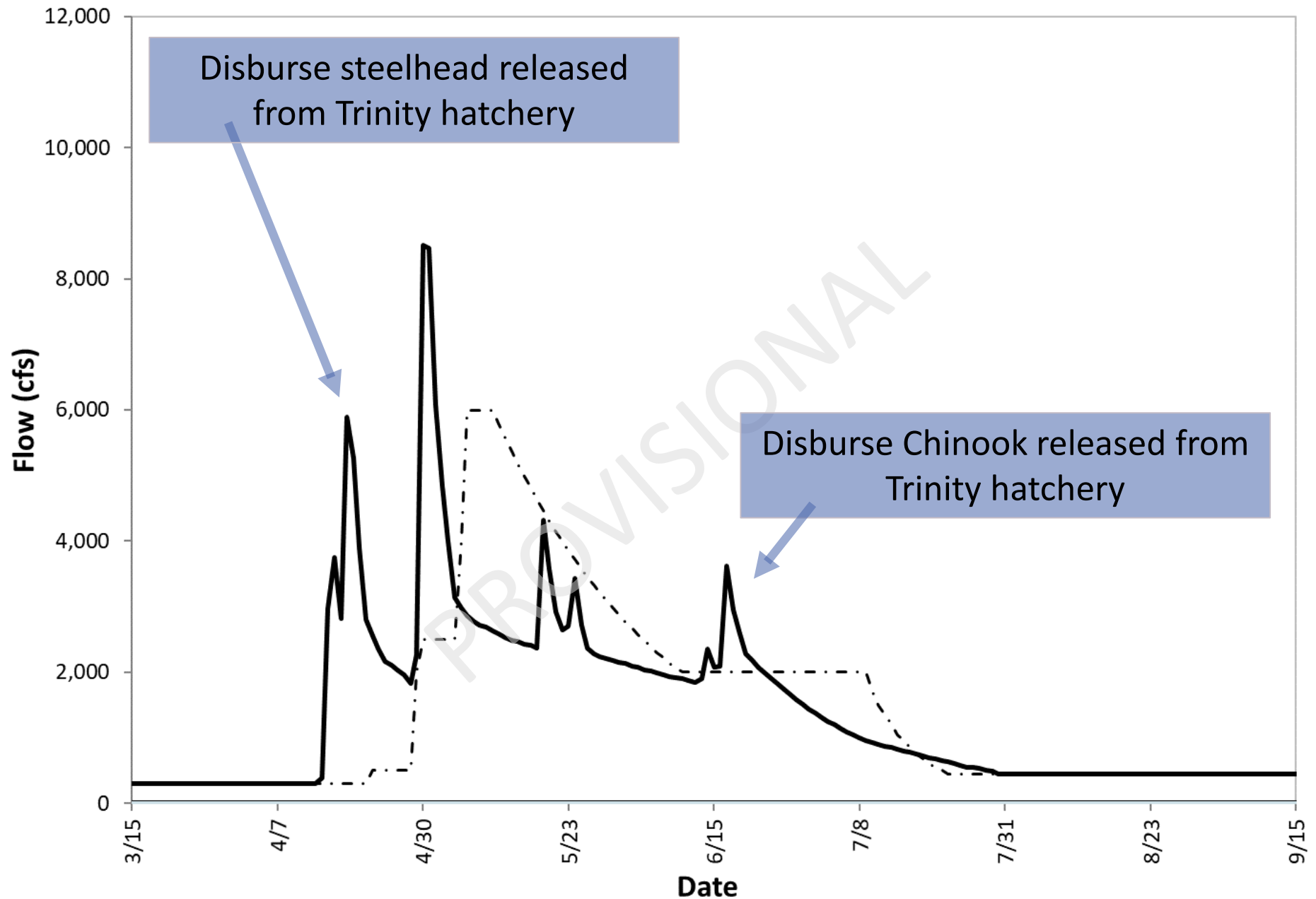
ROD objectives for Normal



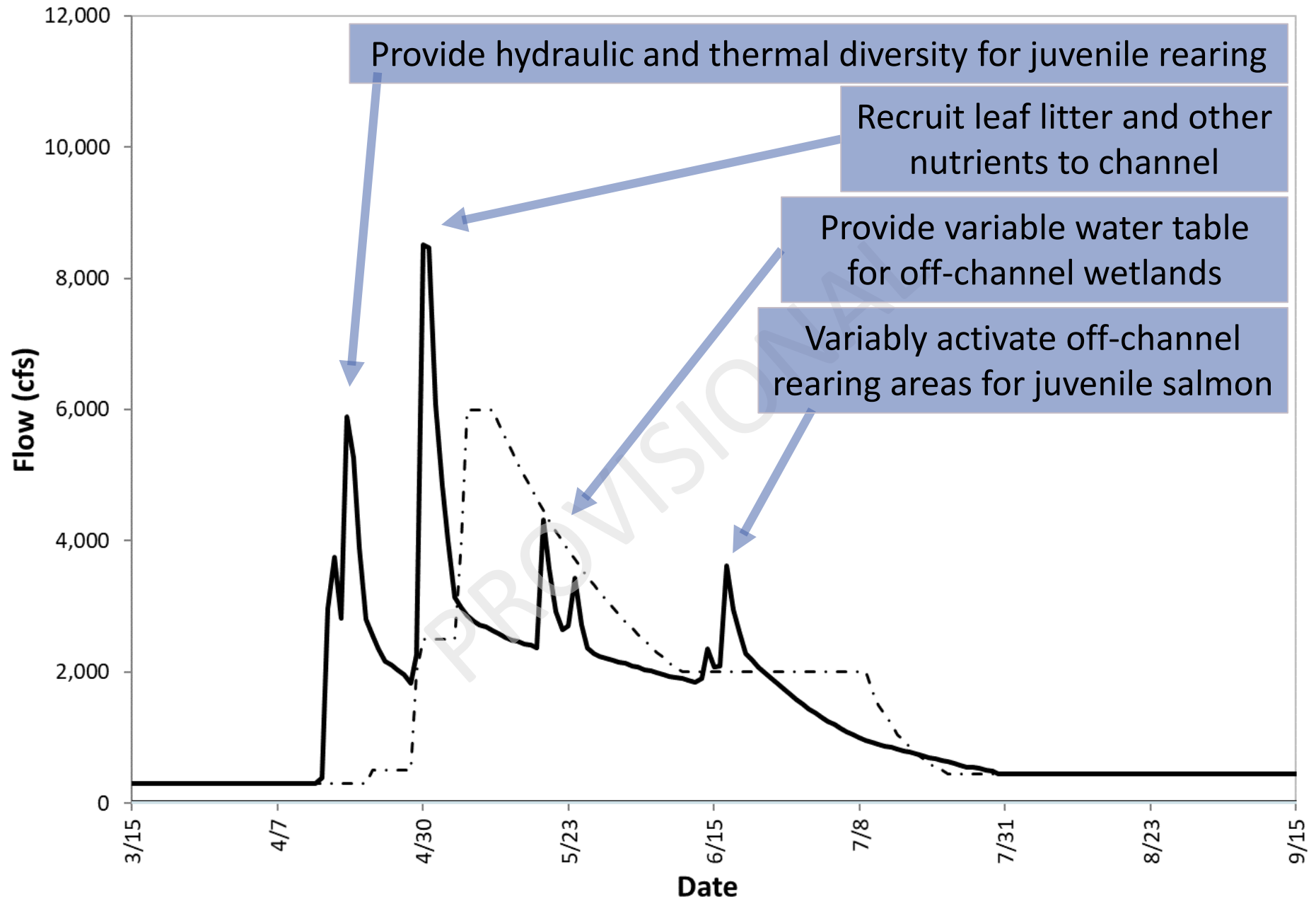
Technical Recommendation: Normal



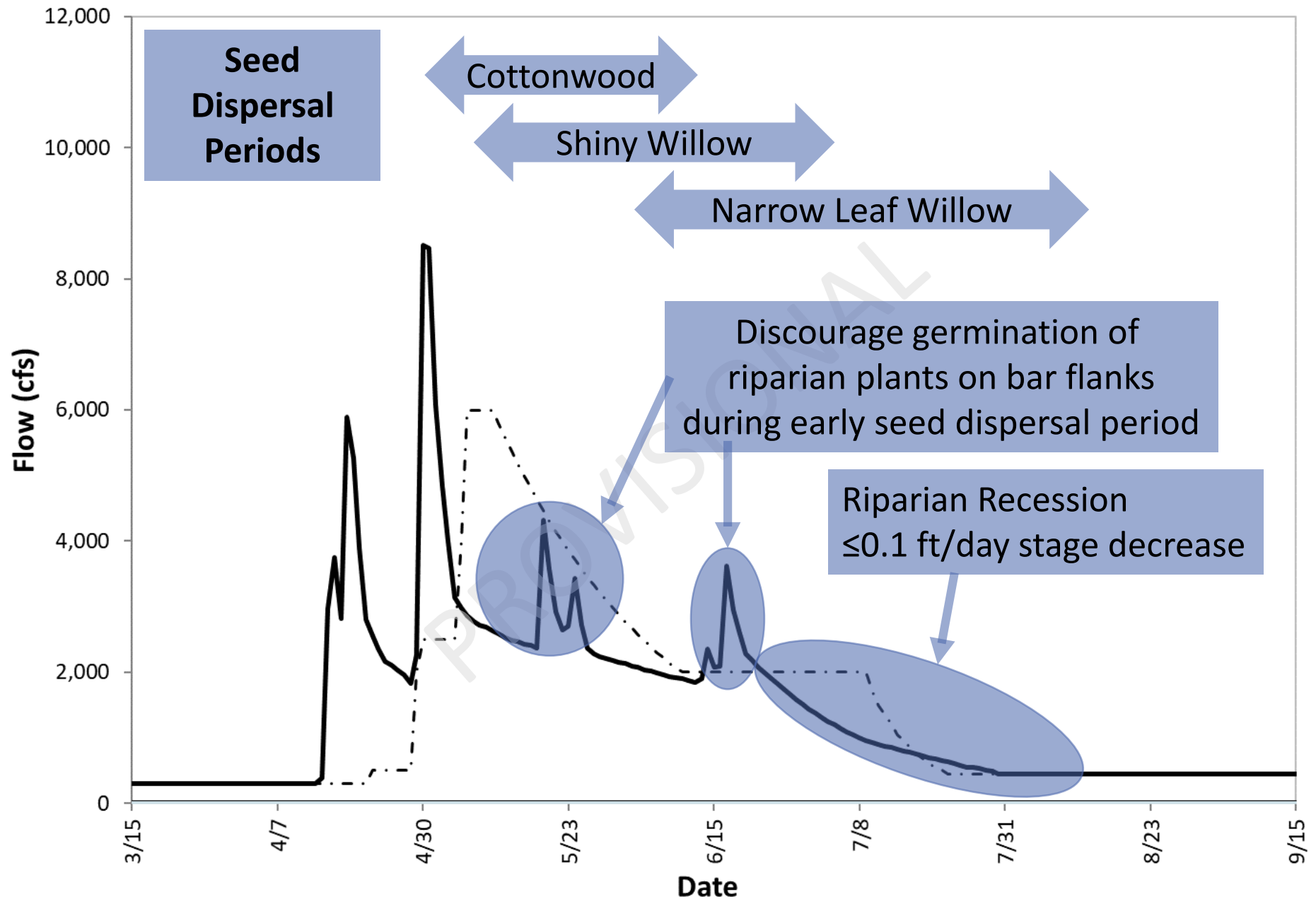
Technical Recommendation: Normal



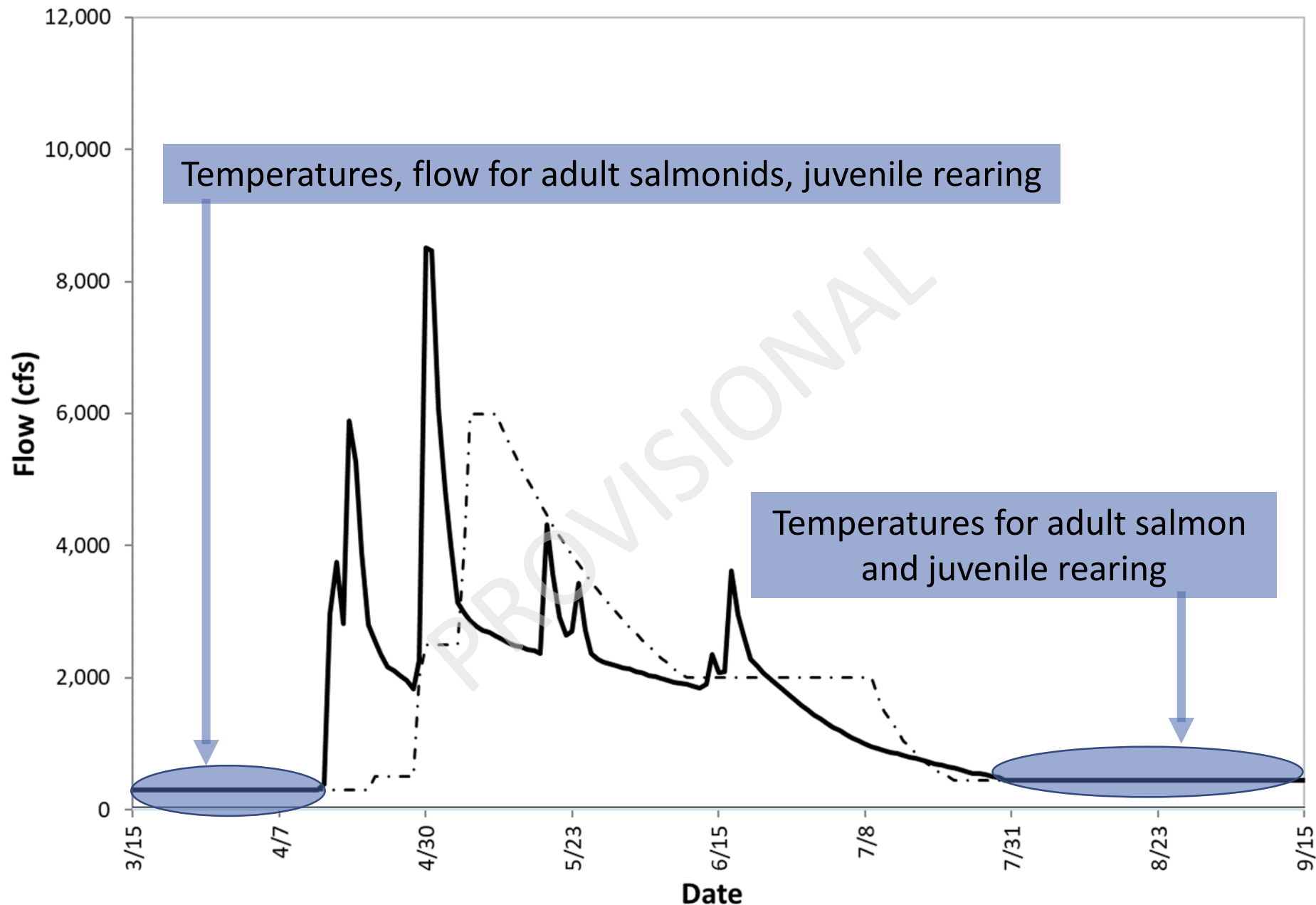
Technical Recommendation: Normal



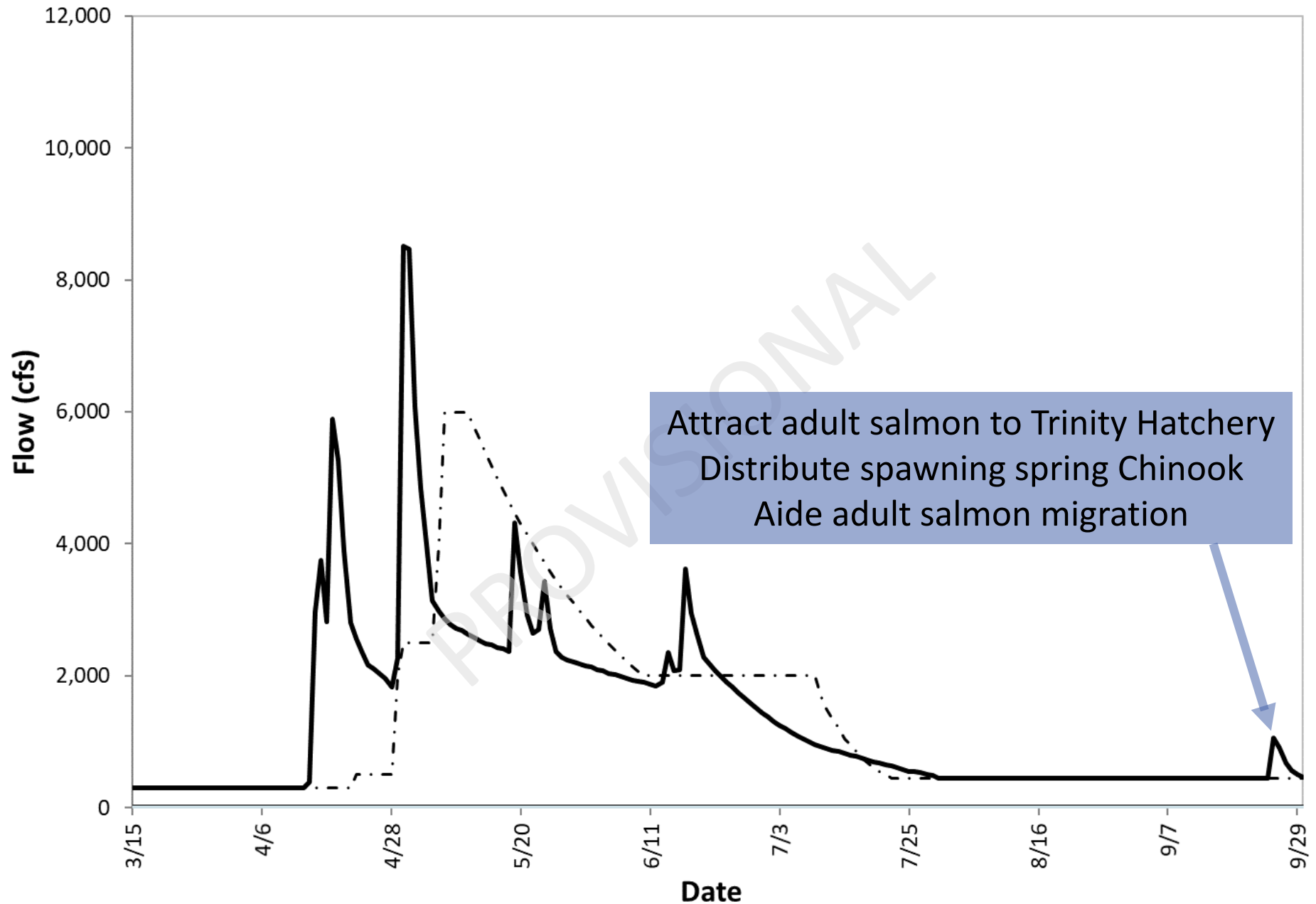
Technical Recommendation: Normal



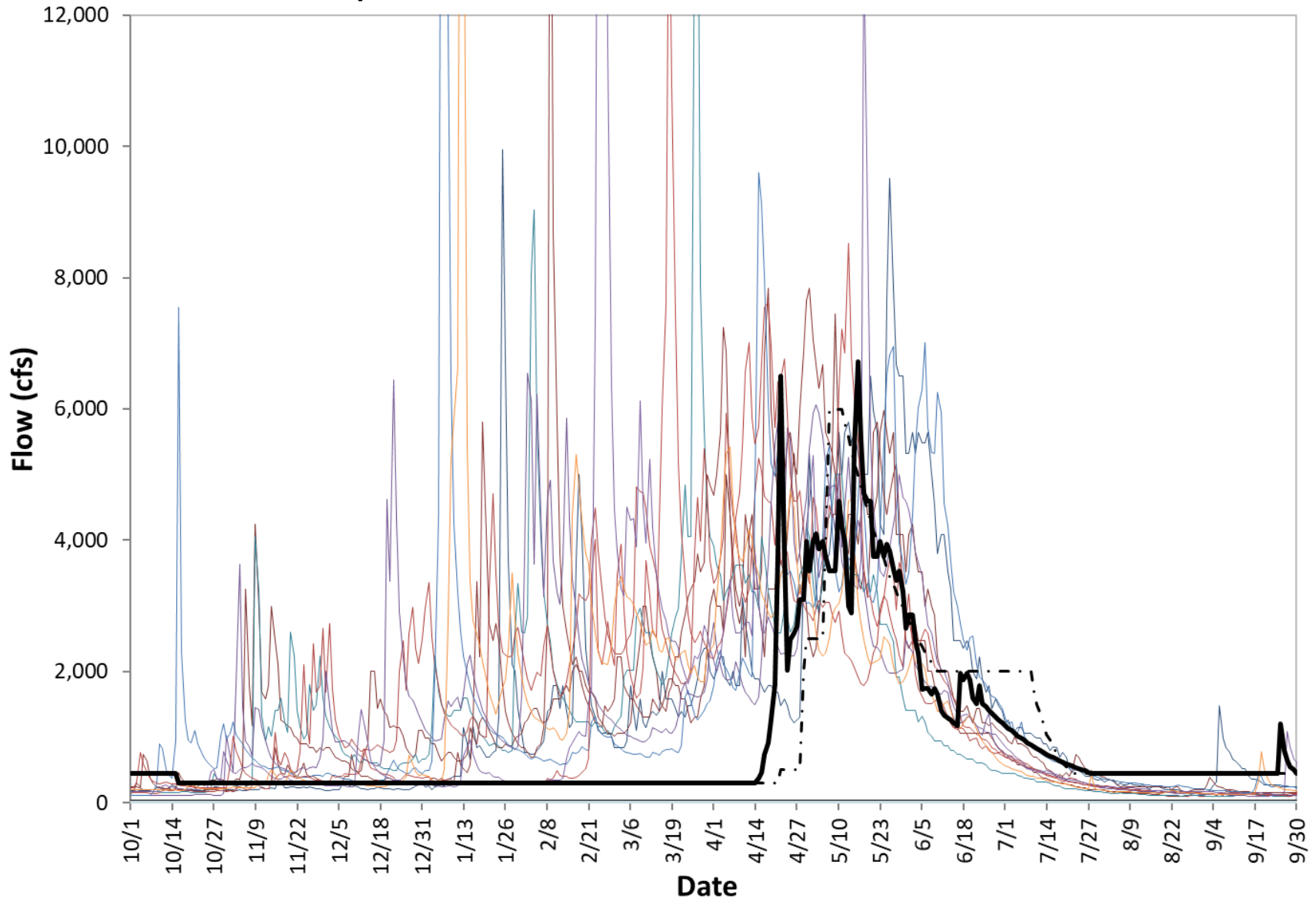
Technical Recommendation: Normal



Technical Recommendation: Normal



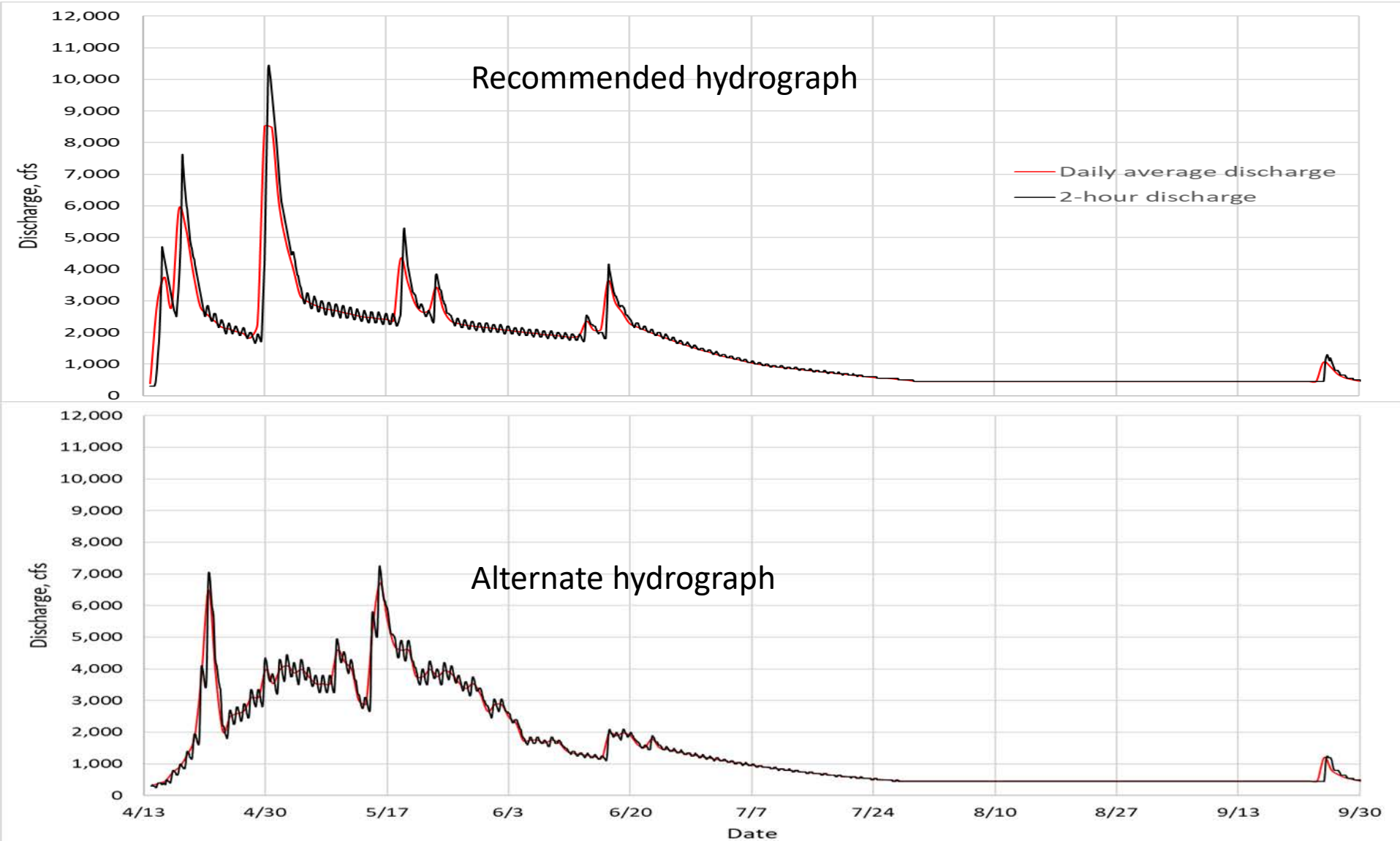
ROD, alternate **Normal** hydrograph and pre-dam flows at Lewiston



Modeling results for **NORMAL** water year hydrographs

KEY:		BEST	MEDIUM	WORST	ROD Normal (17)	Recommended Normal (15)	Alternate Normal (19)
<u>Chinook production above NF Trinity River (SSS) and Chinook RT80 at Willow Creek</u>							
Total Natural Chinook Abundance at Pear Tree (spring and fall run)					Not modeled	Not modeled	Not modeled
Fry abundance (<55 mm)					Not modeled	Not modeled	Not modeled
Parr abundance (55 - 90 mm)					Not modeled	Not modeled	Not modeled
Smolt abundance (>90 mm)					Not modeled	Not modeled	Not modeled
Total Natural Chinook Biomass at Pear Tree (metric tons)					Not modeled	Not modeled	Not modeled
Average Natural Chinook size at Pear Tree (grams/fish)					Not modeled	Not modeled	Not modeled
Smolt Outmigration Timing (calendar date)							
50% natural smolt outmigration at Pear Tree (SSS)					Not modeled	Not modeled	Not modeled
80% natural smolt outmigration at Pear Tree (SSS)					Not modeled	Not modeled	Not modeled
80% natural smolt outmigration at Willow Creek					7/13/2019	7/7/2019	7/11/2019
<u>Temperature (RBM10)</u>							
EIS Temperature objectives for adult salmon holding/spawning at Douglas City (exceedance degree days, C*days)							
Exceedance, average climate conditions (50% exceedance)					0	0	0
Exceedance, adverse climate conditions (10% exceedance)					0	0	0
EIS Temperature objectives for adult salmon holding/spawning above NF Trinity River (exceedance degree days, C*days)							
Exceedance, average climate conditions (50% exceedance)					0	0	0
Exceedance, adverse climate conditions (10% exceedance)					1.2	1.2	1.2
Temperature objectives for juvenile salmon at Weitchpec (exceedance degree days, C*days)							
Exceedance, average climate conditions (50% exceedance)					7	32	37
Exceedance, adverse climate conditions (10% exceedance)					100	128	133
<u>Riparian</u>							
Black cottonwood initiation potential (nodes)					451	118	33
Risk of encroachment by narrow leaf willow (peak discharge >6000 cfs? yes or no)					N	N	N
<u>Biology</u>							
Number of froglets produced in the modeled reach (Chapman Ranch ESL)					2145	7395	4606
Median date for FYLF metamorphosis					9/12/2019	10/8/2019	10/2/2019
<u>Physical</u>							
Total bedload transport at Douglas City (tons)					2129	2990	1620
Bed surface mobilization (% bar area)					38%	55%	41%
Deep bar scour (% bar area)					21%	31%	23%
<u>Administrative</u>							
Construction impacts (days ≥1000cfs between July 15 and September 15)					0	0	0

Diurnal fluctuations in recommended and alternate Normal hydrographs



Gravel Augmentation Recommendation



Conor Shea

Questions?

