

Trinity River Decision Support System (DSS) Update

- DSS Purpose:
 - Support decision making
 - Guide monitoring efforts
 - Assist learning about how to manage the river
- Should be useful for TAMWG and TMC
- Could help structure input from TAMWG

Trinity River DSS Exercise – WY 2012 Alternate Hydrographs

Objectives:

- Fish Production

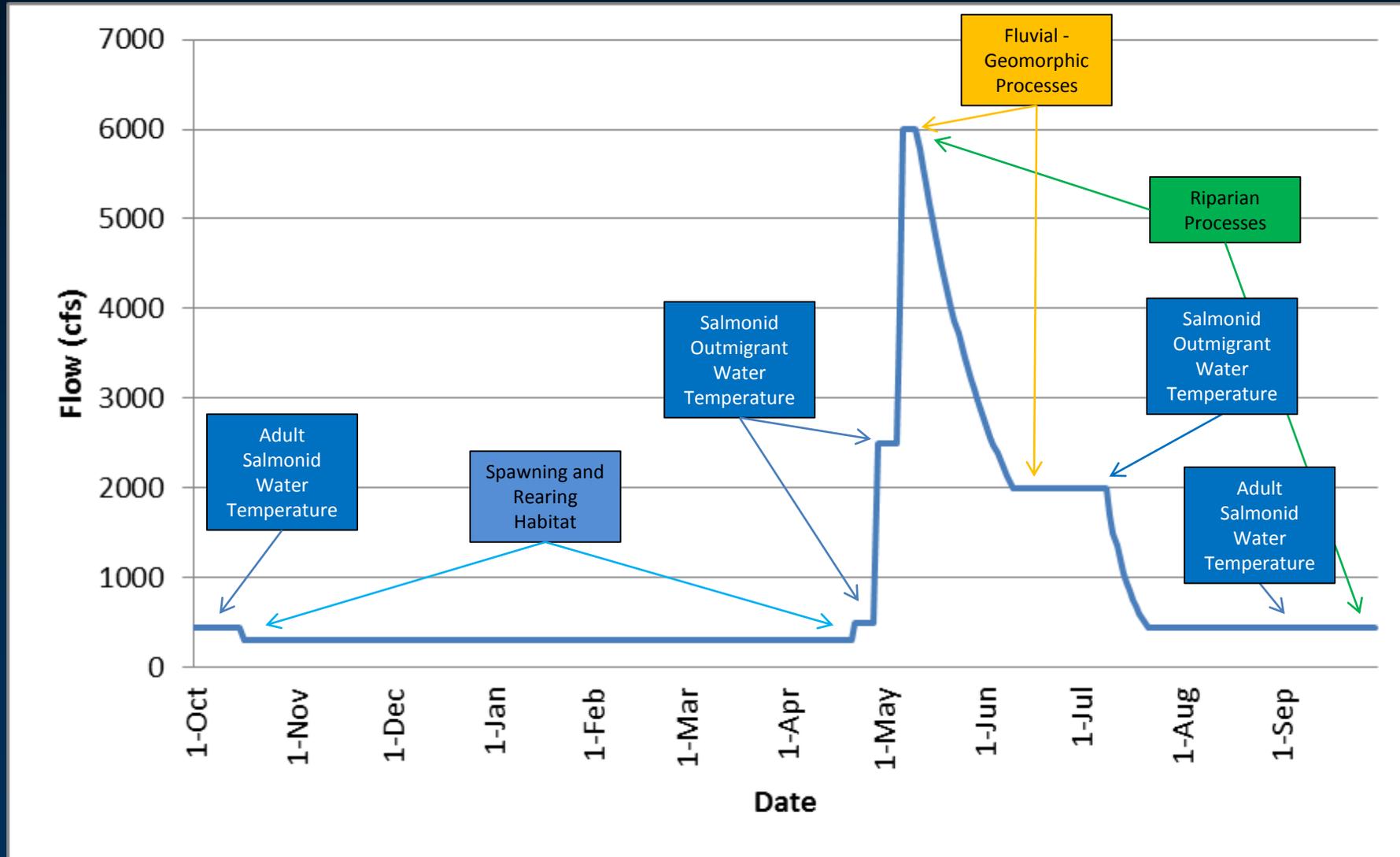
Healthy River :

- Geomorphic work (scour and bed mobility)
- Yellow legged frog production
- Black cottonwood initiation

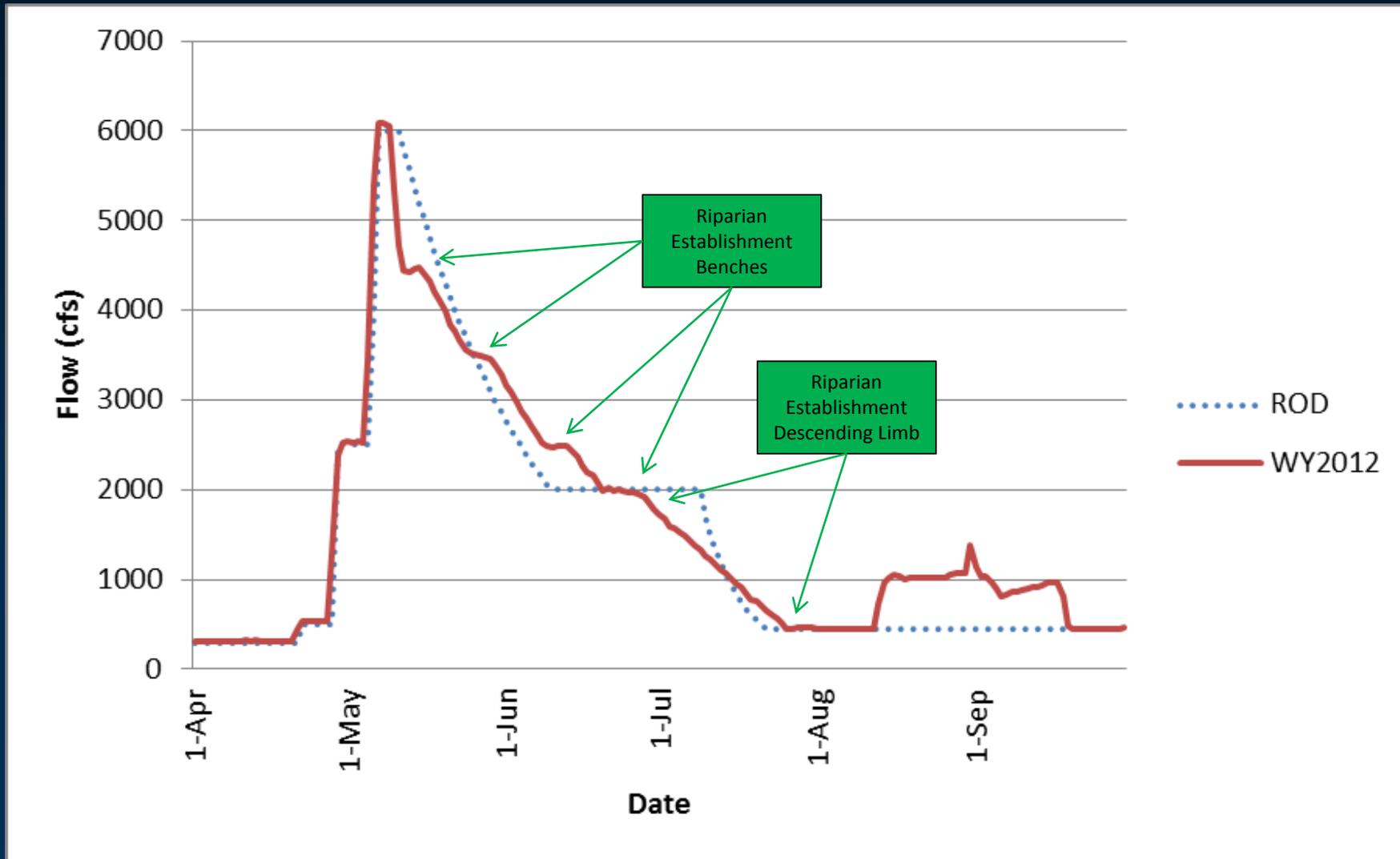
Trinity River DSS Exercise – WY 2012 Alternate Hydrographs

1. ROD Normal WY - 647 TAF instream release
2. Actual WY 2012 Release – 647 TAF + fall flow augmentation
3. Natural hydrograph mimicking Salmon River – 647 TAF
 - constrained to 647 TAF - post-hoc simulation
 - minimum flow constraints (300 and 450 cfs)

ROD Normal WY, 647 TAF



WY2012 Actual: Riparian Regeneration and Establishment

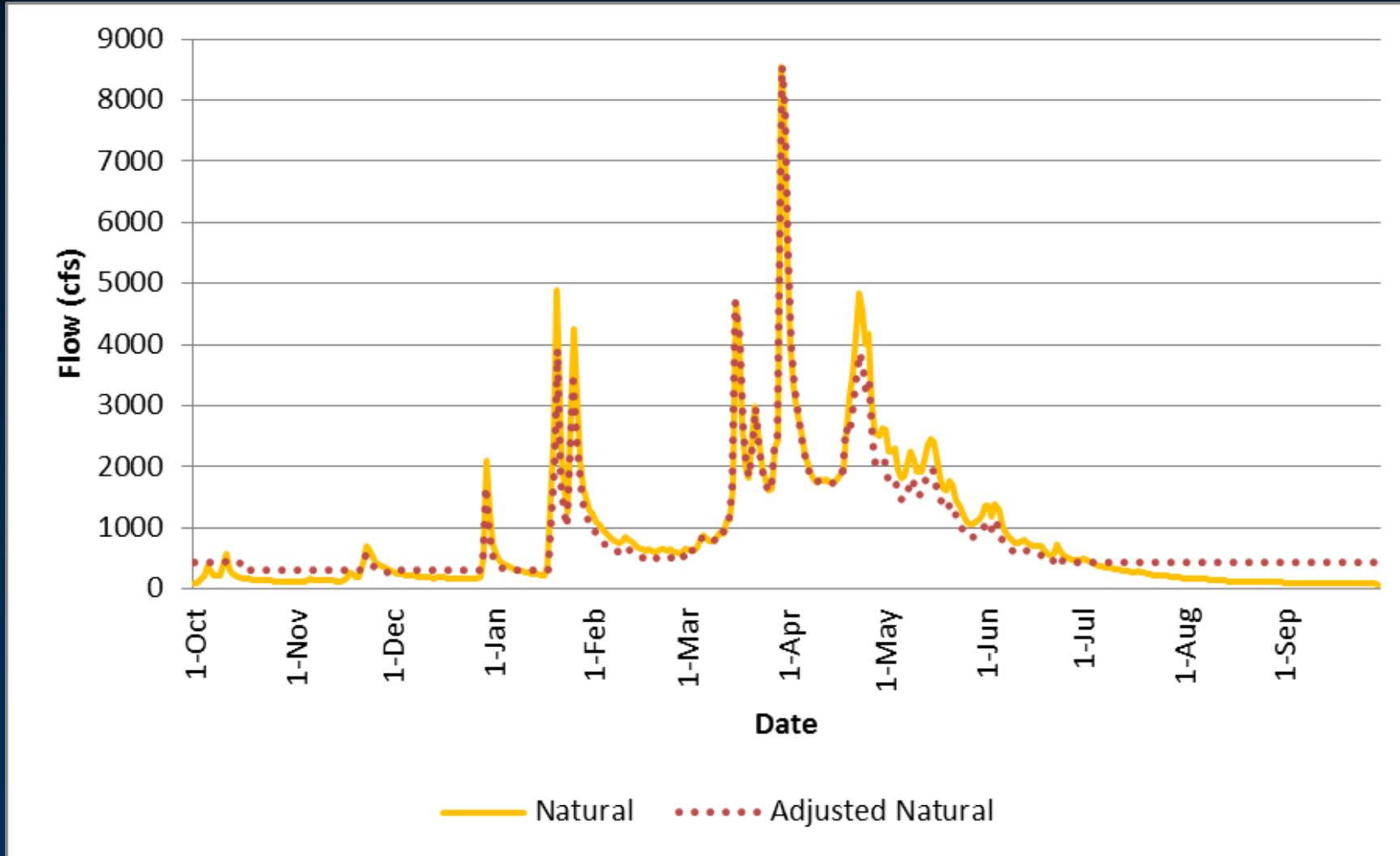


Natural Hydrograph

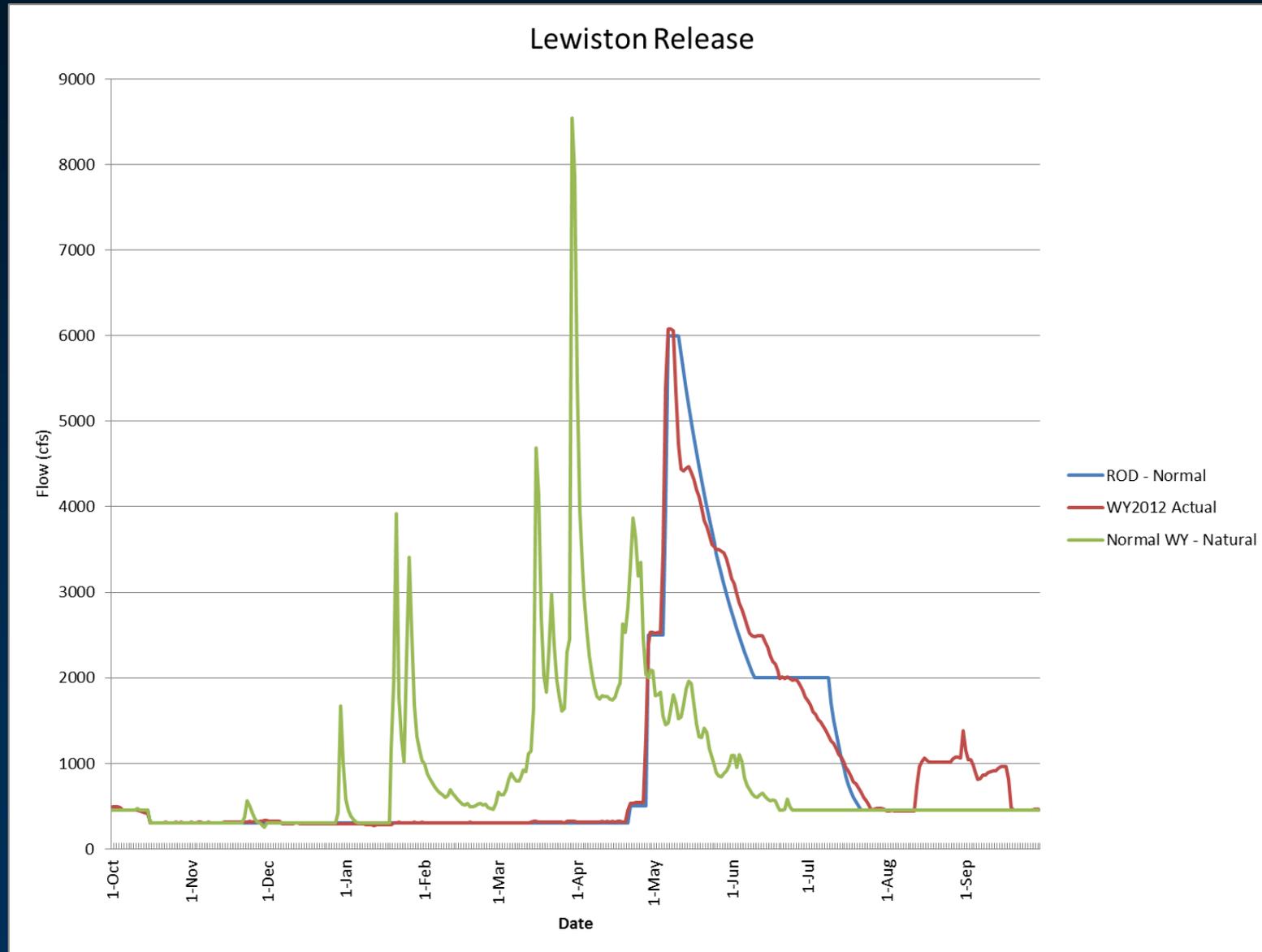
Natural hydrograph objectives:

1. Mimic natural hydrograph based on hydrologic pattern observed in the Salmon River is WY2012.
- Constraints:
 1. Total volume released = 647 TAF
 2. 300 cfs minimum flow during spawning and rearing
 3. 450 cfs summer/fall for adult temperature criteria
 4. Rest of hydrograph scaled (0.8) to gain water to meet #2 & #3 constraints.

Trinity Natural Pattern Hydrograph and Modified Natural Hydrograph



Scenario Hydrographs



Juvenile Chinook Salmon Production - Comparing Alternative Hydrographs

Credit to: Russell W. Perry, John M. Plumb,
Edward Jones, Nicholas A. Som^{*},
Nicholas J. Hetrick^{*}, and Thomas B. Hardy⁺

Weekly Abundance passing Pear Tree

Weekly abundance
(hundreds of thousands)

Median passage date

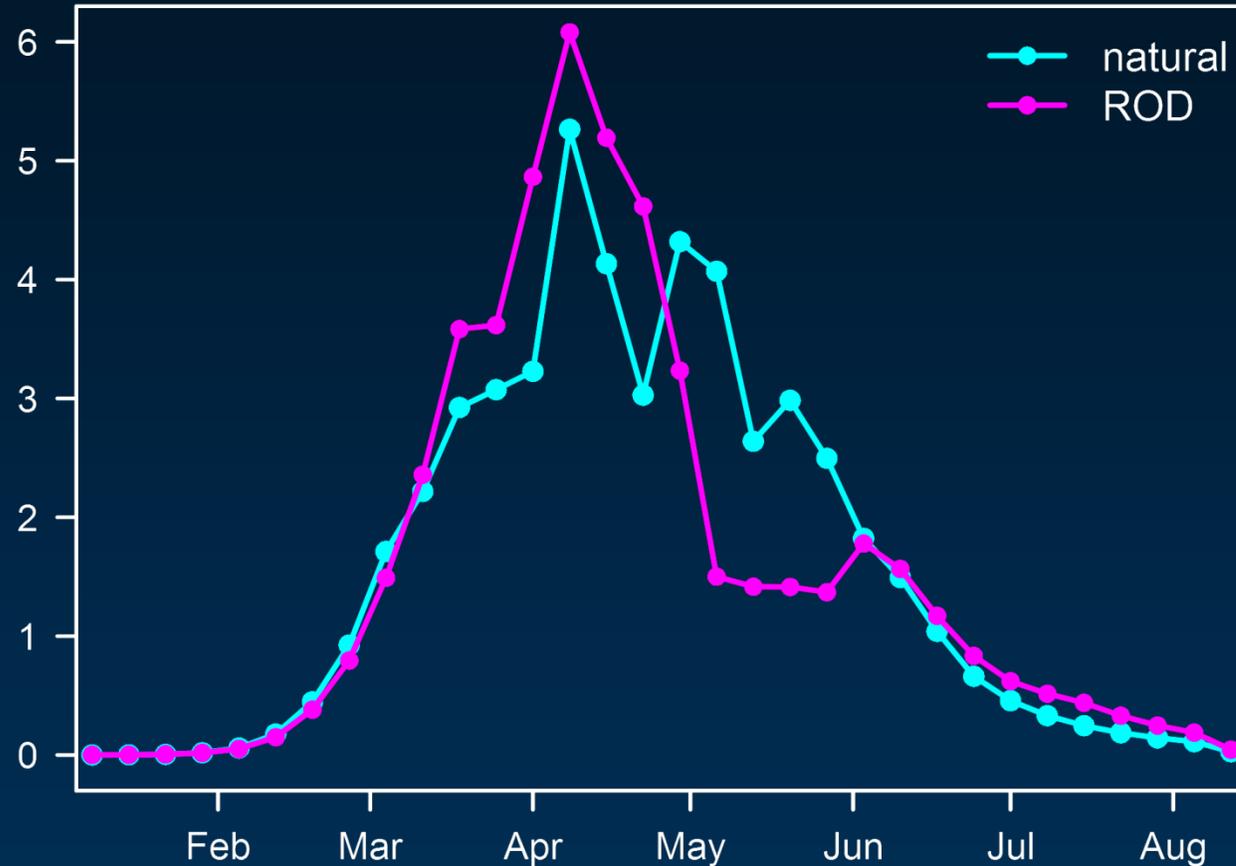
Natural – April 20

ROD – April 11

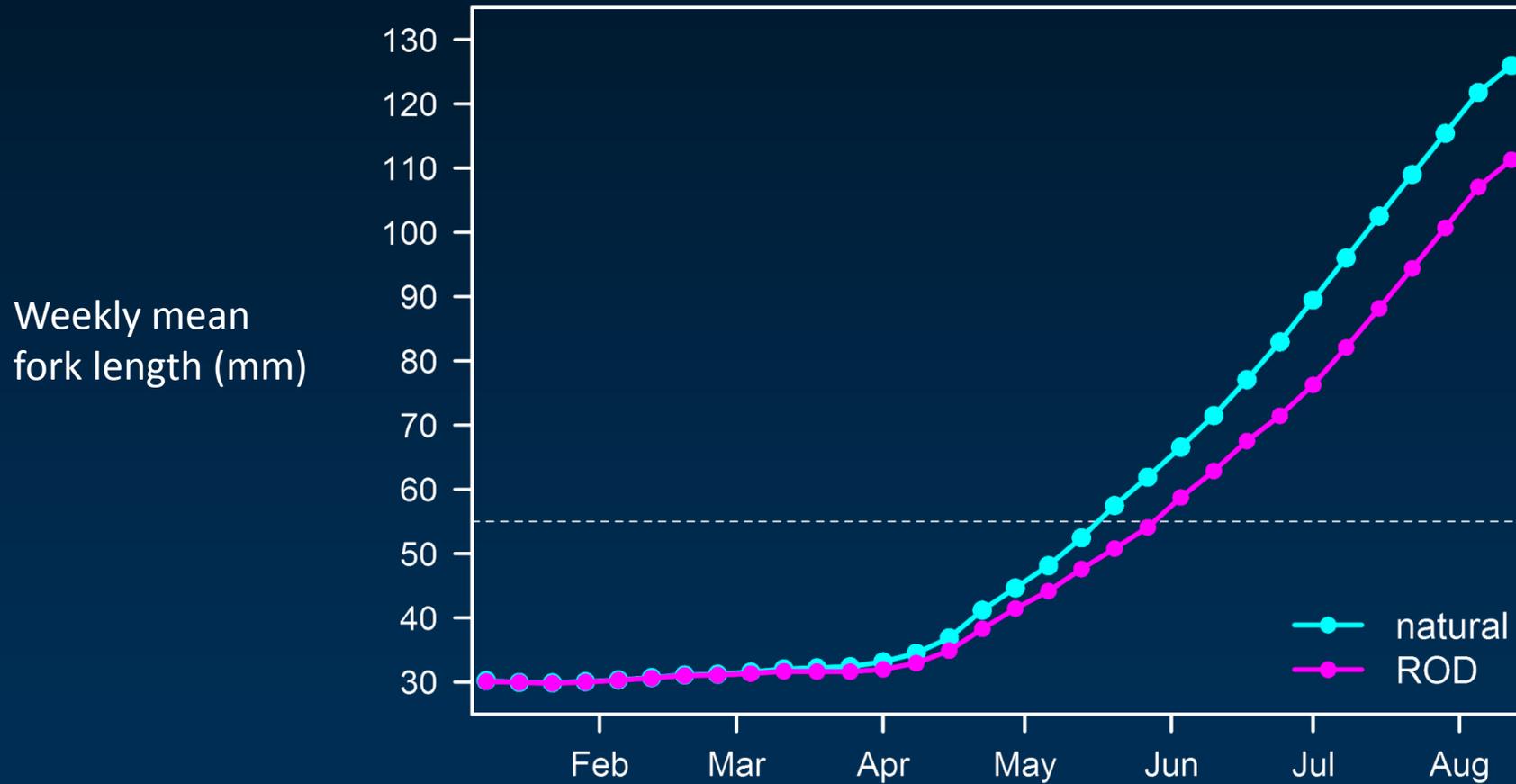
80th percentile (SS)

Natural – May 18

ROD – May 19



Mean fork length of fish passing Pear Tree



Summary Statistics by Scenario

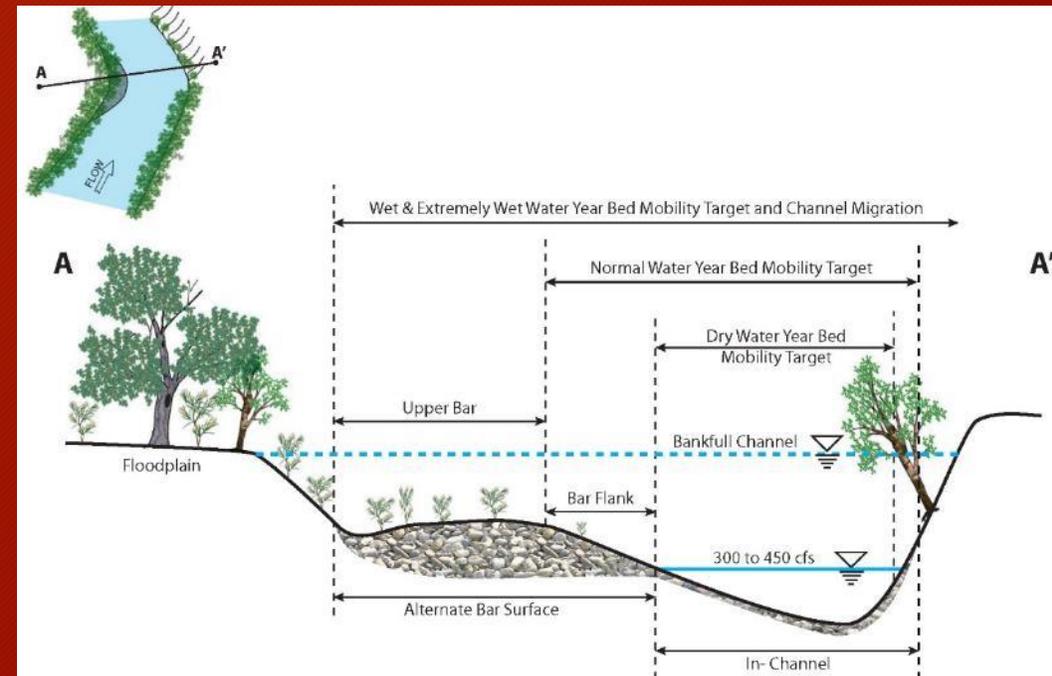
	Natural	ROD	Difference (Nat. – ROD)	Difference (%)
N - tot (millions)	5.0	5.0	0.0	0.8
N - Fry (millions)	3.8	4.2	-0.4	-8.0
N - Parr (millions)	1.2	0.8	0.4	46.6
Fry - BioMass (Metric ton)	2.5	2.2	0.3	12.3
Parr - BioMass (Metric ton)	4.9	3.3	1.6	48.1

Bed Scour and Mobility

PURPOSE

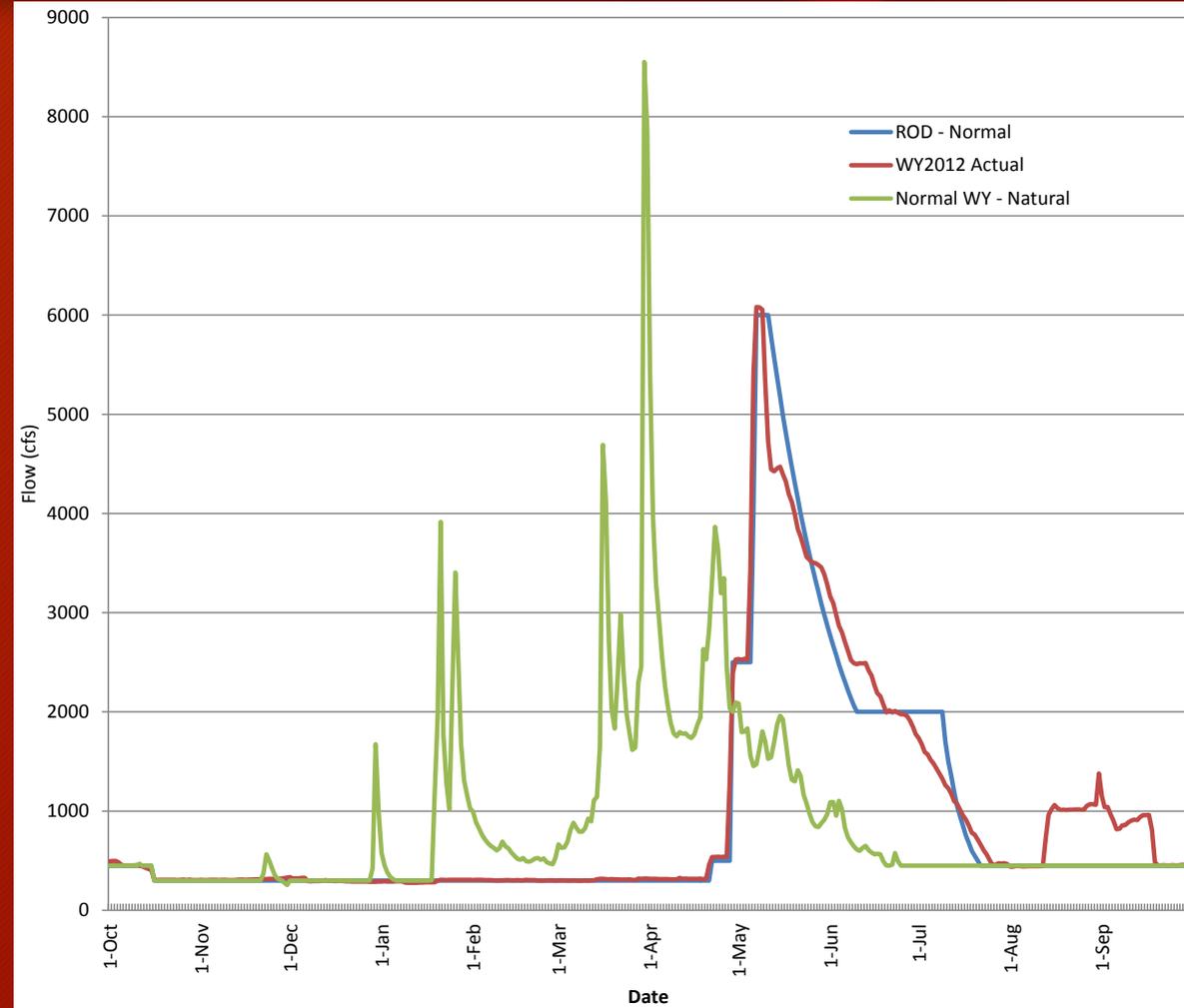
- Prevent detrimental encroachment of active bars
- Maintain complex channel morphology
- Scour fine sediments

CREDIT: Robert Franklin, Hoopa Valley Tribe



Bed Scour and Mobility Model-Hydrology

- $Q_{peak}=6,000$ cfs for ROD and WY2012 Actual
- $Q_{peak}=8,500$ cfs for Natural
- Assume no tributary accretion, but is easily added



Bed Scour and Mobility Model Output: 6,000 cfs and 8,500 cfs on mid-channel bar

- Predicted D84 Bed Mobility
- Predicted >1D84 Bed Scour
- Predicted >2D84 Bed Scour



Bed Scour and Mobility Model Output: Comparison of Results for all Active Bars in 3-mile reach

Total Active Bar Area (sq ft)	Peak Flow	Predicted Active Bar area <u>mobilized</u> by peak flow, D84 Shields parameter > 0.02 (sq ft)	Percent of total Active Bar area mobilized by peak flow	Predicted Active Bar area with <u>shallow scour</u> (>1D84) by peak flow, D84 Shields parameter > 0.025 (sq ft)	Percent of total Active Bar area scoured by peak flow	Predicted Active Bar area with <u>deeper scour</u> (>2D84) by peak flow, D84 Shields parameter > 0.030 (sq ft)	Percent of total Active Bar area scoured by peak flow
33,480	6,000 cfs	16,229	48.5%	5,828	17.4%	3,297	9.8%
33,480	8,500 cfs	20,169	60.2%	9,090	27.2%	5,617	16.8%

- Model predicts bed mobility objective are partially met during Normal year release (6,000 cfs) and shallow bed scour objective not met for Wet year (8,500 cfs) release
- Portion of bar area mobilized increases by 24% between 6,000 and 8,500 cfs
- Portion of bar area with shallow scour increases by 56% between 6,000 and 8,500 cfs
- Portion of bar area with deeper scour increases by 70% between 6,000 and 8,500 cfs
- Critical Shields parameter values used needs further review/calibration/discussion



BLACK COTTONWOOD REGENERATION FOR THREE DSS HYDROGRAPHS

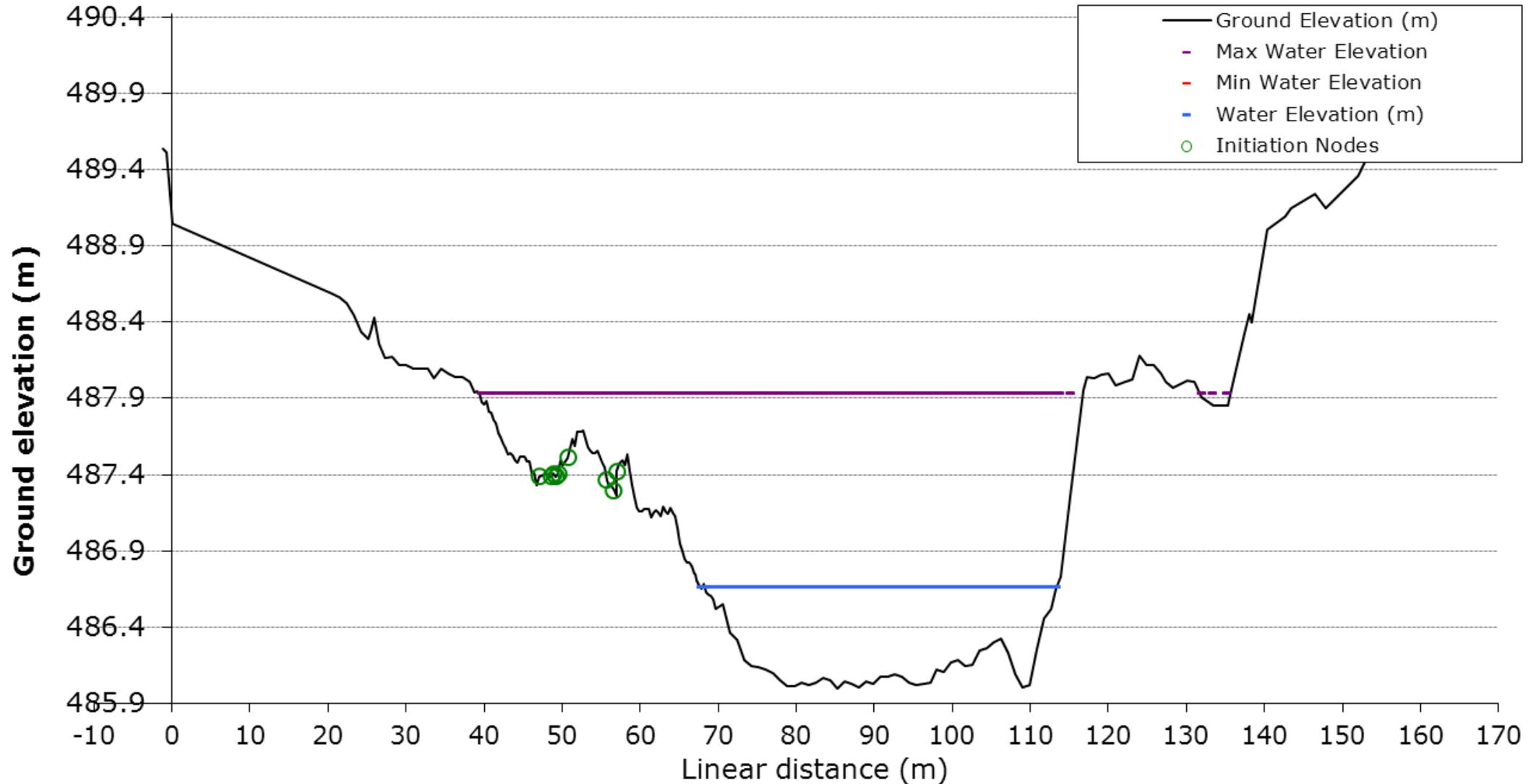
CREDIT: James Lee
Hoopa Valley Tribal Fisheries
With support from John Bair, McBain
Associates

MODEL DESCRIPTION

- Predicts ability of cottonwood seedlings to initiate
 - Roots must grow fast enough to track receding water
- Runs on specific cross sections of the river
- Measurement: Total number of potential initiation sites summed across 3 cross sections
 - Sites that are further away are better

RM 92.47 READING CREEK MODELED INITIATION NODES USING THE ROD NORMAL HYDROGRAPH

**XS 1067+00: zone of successful initiation (as of 9/30/2016) - Black
Cottonwood 2015 seed dispersal**



RANKING BASED ON NUMBER OF INITIATION NODES

#1 USBR WY 2012 NORMAL Actual Release

- 23 predicted nodes

#2 Record of Decision NORMAL

- 10 predicted nodes

#3 Salmon River Scaled NORMAL

- 9 predicted nodes

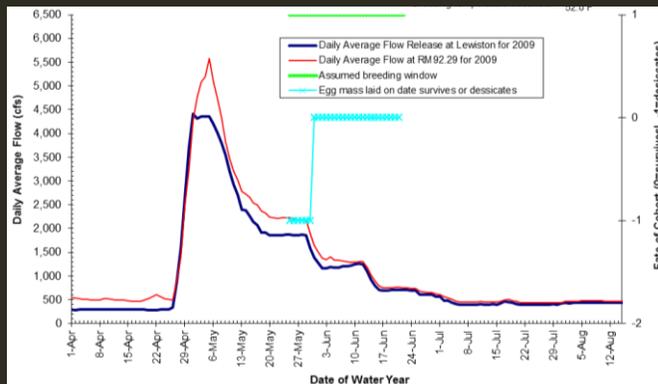
PREDICTING YELLOW LEGGED FROG REPRODUCTIVE SUCCESS ACROSS THREE HYDROGRAPHS

CREDIT: Scott McBain and Sarah Kupferberg
McBain Associates



MODEL DESCRIPTION

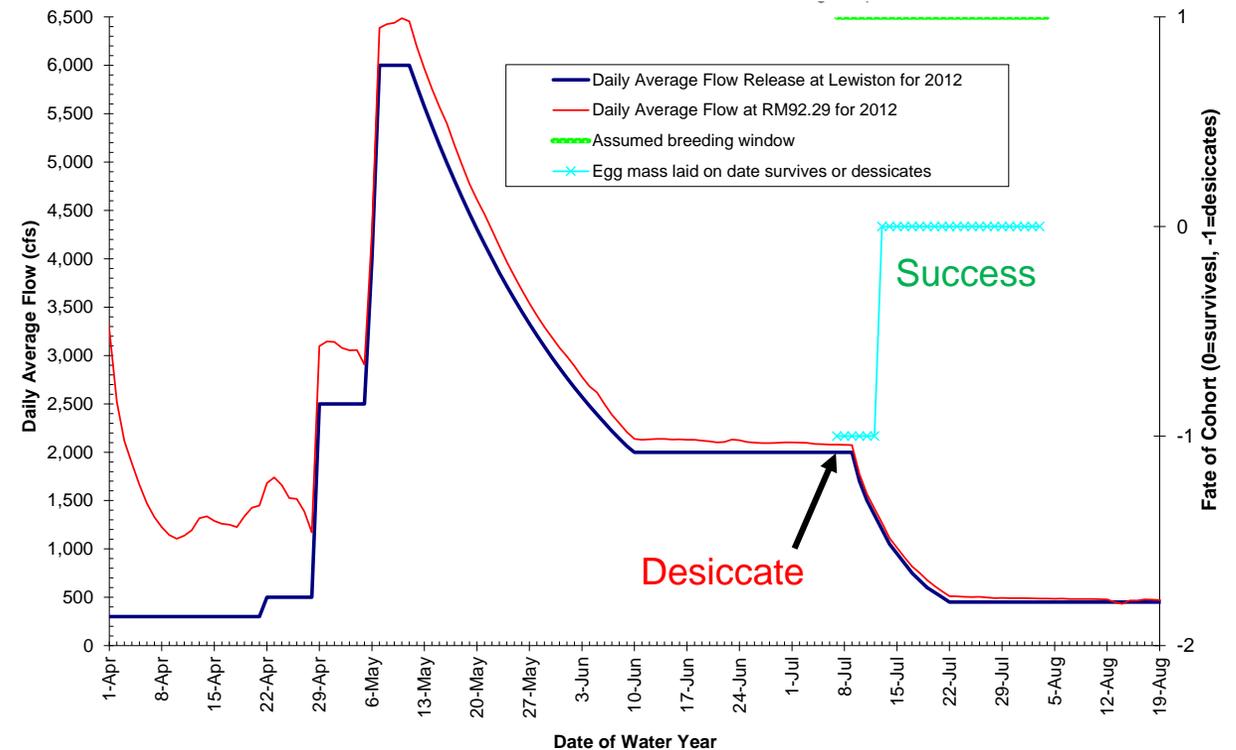
- Predicts ability of yellow legged frog eggmasses to survive
 - Must not become desiccated by receding water
 - Earlier eggmass laying is better – allows for pre-winter growth
- Measurement: Total number of days with successful reproduction



ROD hydrograph, $> 11.1^{\circ}\text{C}$ breeding date start (July 7!!)

Key Points:

- High (cold) releases delay breeding until July 7
- 22 of 28 breeding days could have successfully hatched egg masses,
- BUT reproduction success likely very low due to short metamorph time before onset of winter



Summary of successful breeding days

Flow/Temp Scenario	May 25 fixed breeding start date	>11.1°C breeding start date	Notes
ROD	21	22	11.1°C start date is too late
TRRP	6	22	11.1°C start date is too late
Natural	28	6	

	Historic	Natural	ROD
Fish Production			
Total Fish Abundance (millions)	5.0	5.0	5.0
Fry Abundance(millions)	4.2	3.8	4.2
Parr Abundance (millions)	0.8	1.2	0.8
Total Fish Biomass (metric ton)	5.5	7.4	5.5
Healthy River			
Bar Area Mobilized (%)	48.5	60.2	48.5
Bar Area with Shallow Scour (%)	17.4	27.2	17.4
Bar Area with Deeper Scour (%)	9.8	16.8	9.8
Cottonwood Potential Initiation Sites (#)	23	9	10
Frog Potential Reproduction Success (days)	22	6	22

CONCERN: Later egg laying leaves little time for pre-winter growth

Notes for Improvement

- Convert smolt production into potential adult returns
 - Should be addressed by the fish group
- Be sure that decisions help answer Big Questions
 - Keep the focus on improving management and restoring the river
- Include additional species – coho? Steelhead?
- Should include uncertainty around estimates