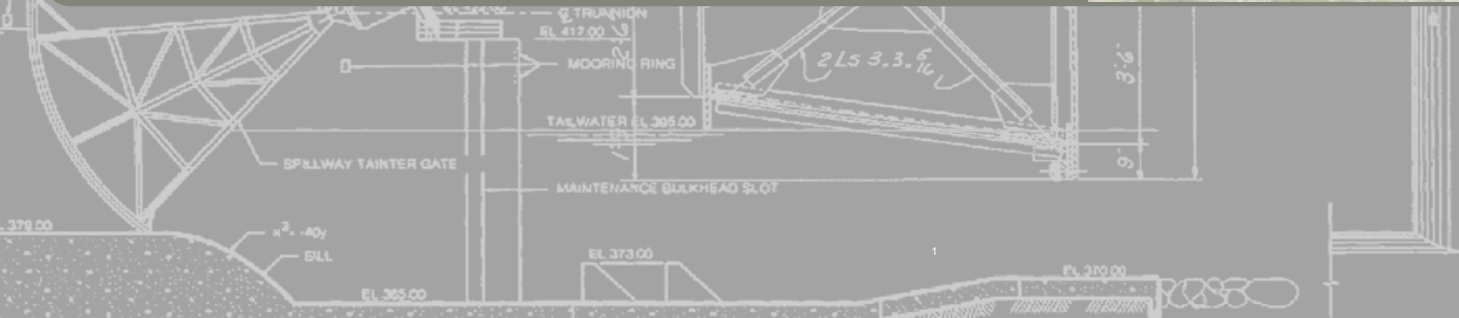


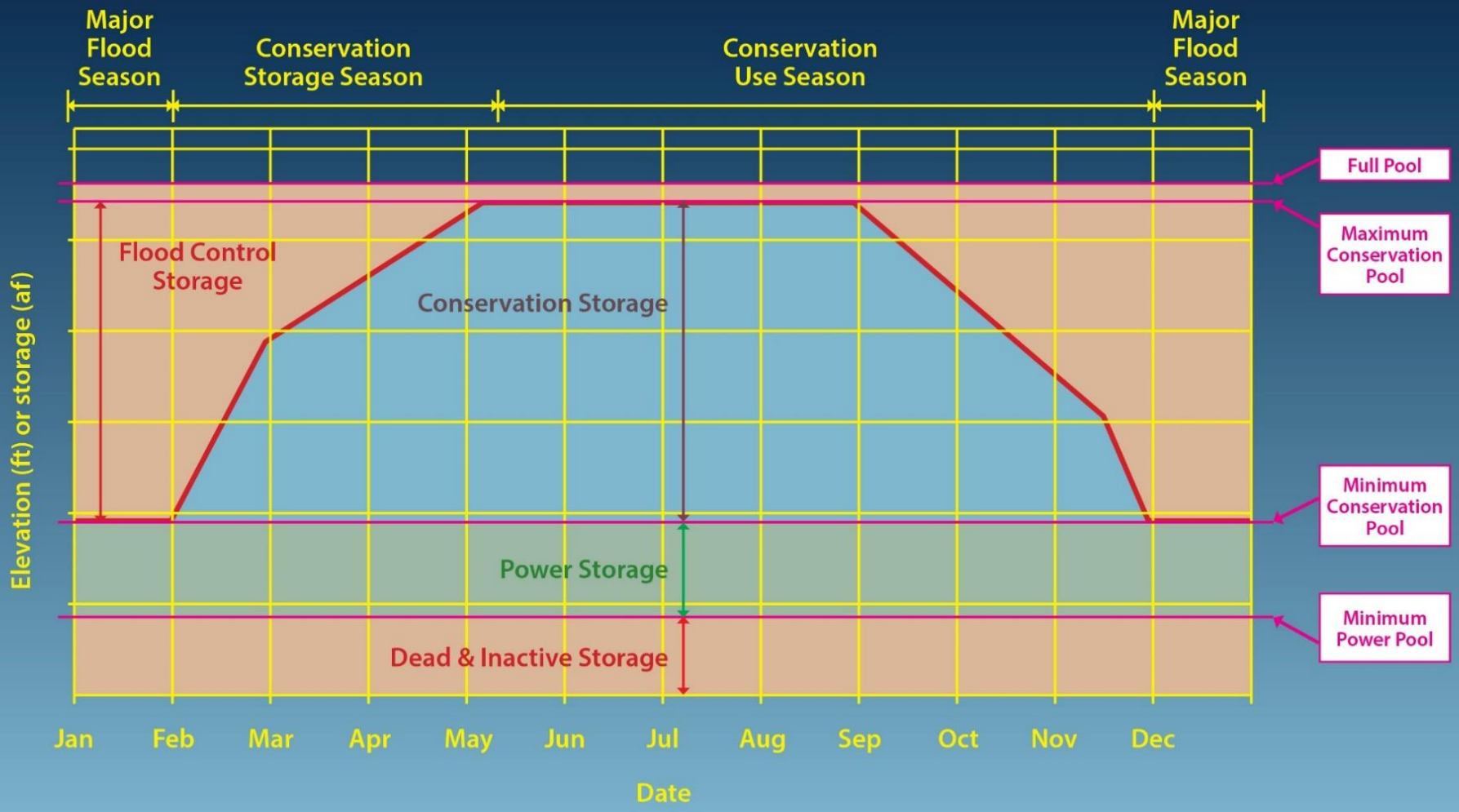
# WATER MANAGEMENT IN THE WILLAMETTE BASIN – INSIGHTS FROM THE 2018 WATER YEAR. WHAT HAVE WE LEARNED? HOW DO WE MANAGE BETTER?

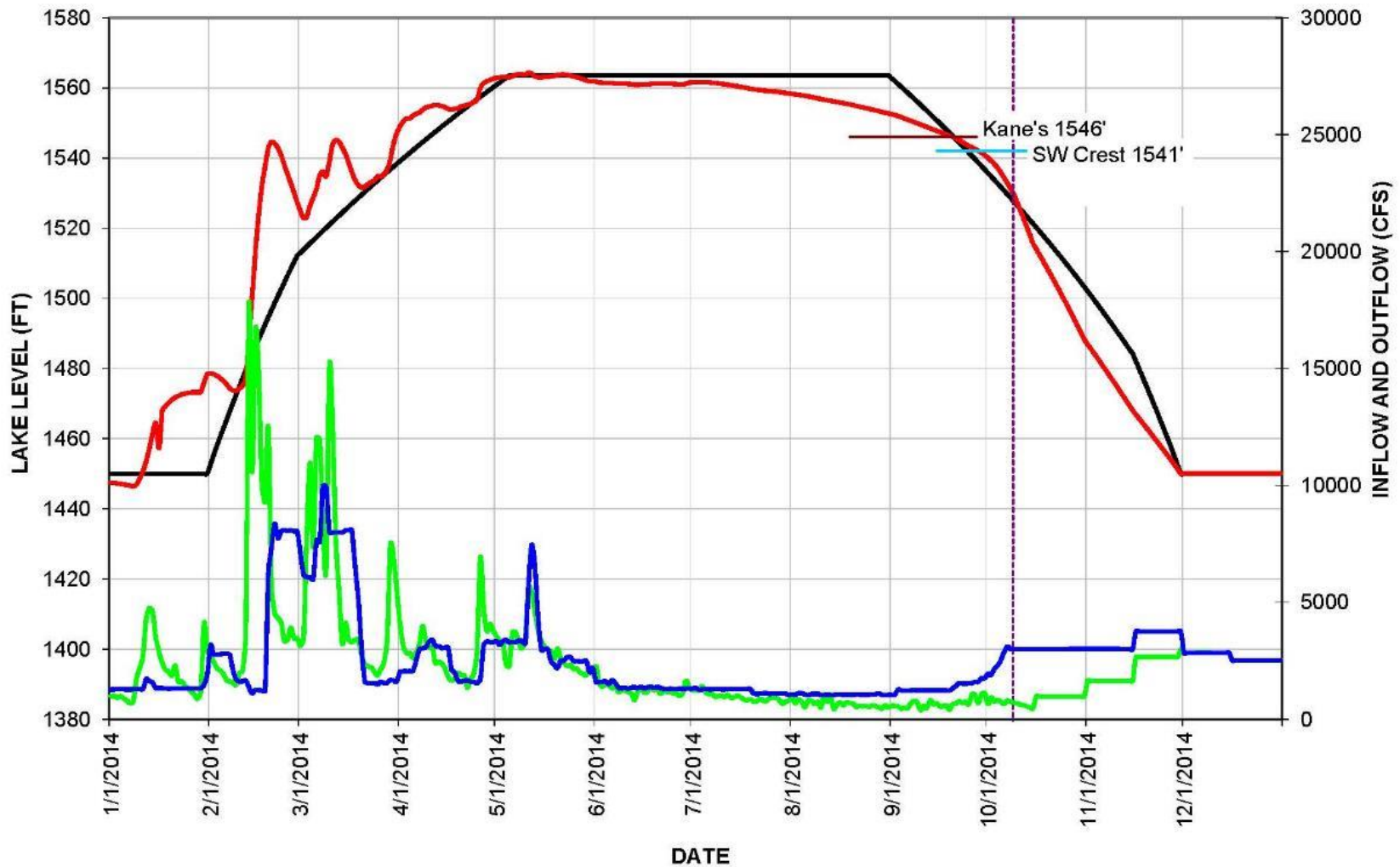
Greg Taylor  
State of the Willamette  
16 Jan 2020



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Portland District









1999 – Following the listing of Chinook salmon and winter steelhead USACE made substantial changes in the management of flows in the Willamette Basin



Adaptive approach working collaboratively with state and federal resource management agencies

Most significant specific adaptation to reservoir system operations has been the adoption of spring mainstem flow targets.

# WATER MANAGEMENT SUMMARY

13 dams of the Willamette Valley are operated as a single system

Corps must balance between competing authorized purposes

Water management decisions include collaboration with agency partners

## The Willamette Basin



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- Weather, water supply
- Rule curve
- Downstream control points
- Minimum flow
- Mainstem flow objectives
- Tributary flow objectives
- Hydropower, outage schedule
- Temperature operations
- Minimizing TDG
- Recreation - ramps
- Special operations request – RME, construction projects, maintenance
- Interim operations – temperature control, fish passage
- Fish life history requirements
- Algae
- Downstream water users

North Santiam R below Big Cliff Dam - Anadromous Species												
Timing Unit ID: 10115												
Life Stage/Activity/Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Upstream Adult Migration</b>												
Winter Steelhead												
Summer Steelhead												
Spring Chinook salmon												
Fall Chinook salmon												
Coho salmon												
<b>Adult Spawning</b>												
Winter Steelhead												
Summer Steelhead												
Spring Chinook salmon												
Fall Chinook salmon												
Coho salmon												
<b>Adult Holding</b>												
Winter Steelhead												
Summer Steelhead												
Spring Chinook salmon												
Fall Chinook salmon												
Coho salmon												
<b>Egg Incubation through Fry Emergence</b>												
Winter Steelhead												
Summer Steelhead												
Spring Chinook salmon												
Fall Chinook salmon												
Coho salmon												
<b>Juvenile Rearing</b>												
Winter Steelhead												
Summer Steelhead												
Spring Chinook salmon												
Fall Chinook salmon												
Coho salmon												
<b>Downstream Juvenile Migration</b>												
Winter Steelhead												
Summer Steelhead												
Spring Chinook salmon												
Fall Chinook salmon												
Coho salmon												
	Represents periods of peak use based on professional opinion.											
	Represents lesser level of use based on professional opinion.											
	Represents periods of presence, either with no level of use OR uniformly distributed level of use ind											





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**BUILDING STRONG®**

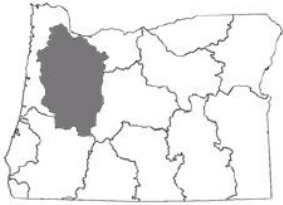
# Water Supply

Snowpack Summary by Basin	Basin Snowpack % of Median		
	# of Sites	Current Yr	Last Yr
Clackamas Basin	11	84%	125%
McKenzie Basin	17	66%	125%
Middle Fork Willamette Basin	7	71%	125%
North Santiam Basin	4	106%	197%
South Santiam Basin	4	112%	196%

- **Varies Annually**
  - ▶ **Quantity, Location, Timing**



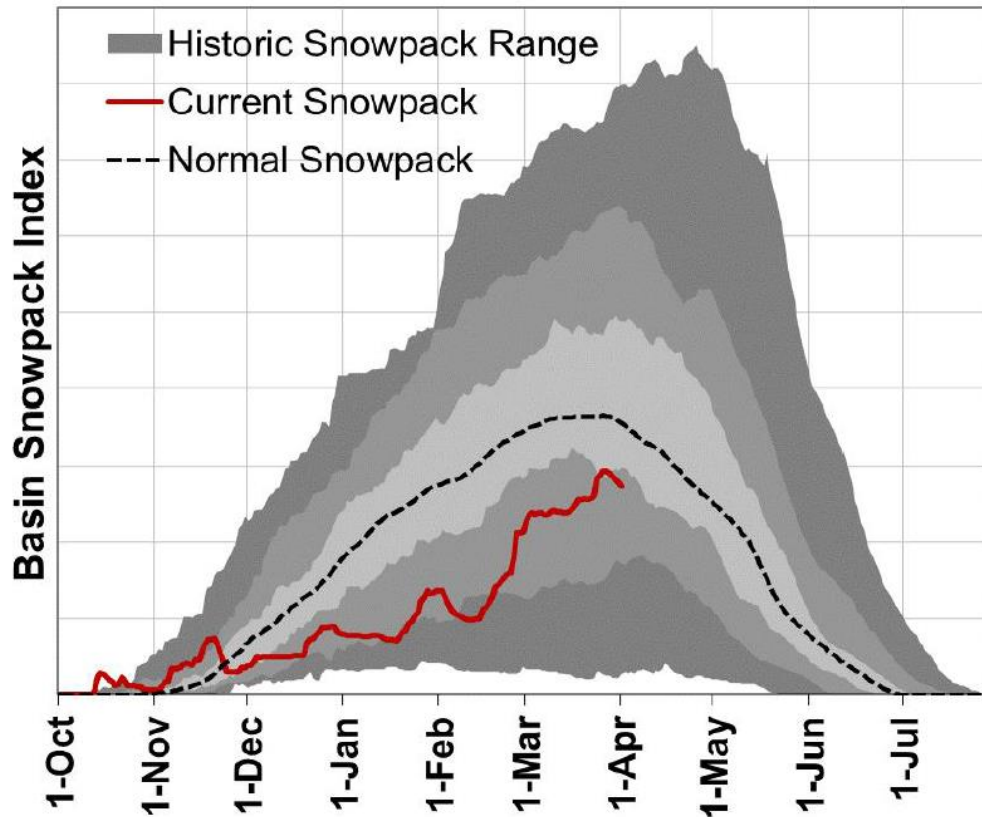




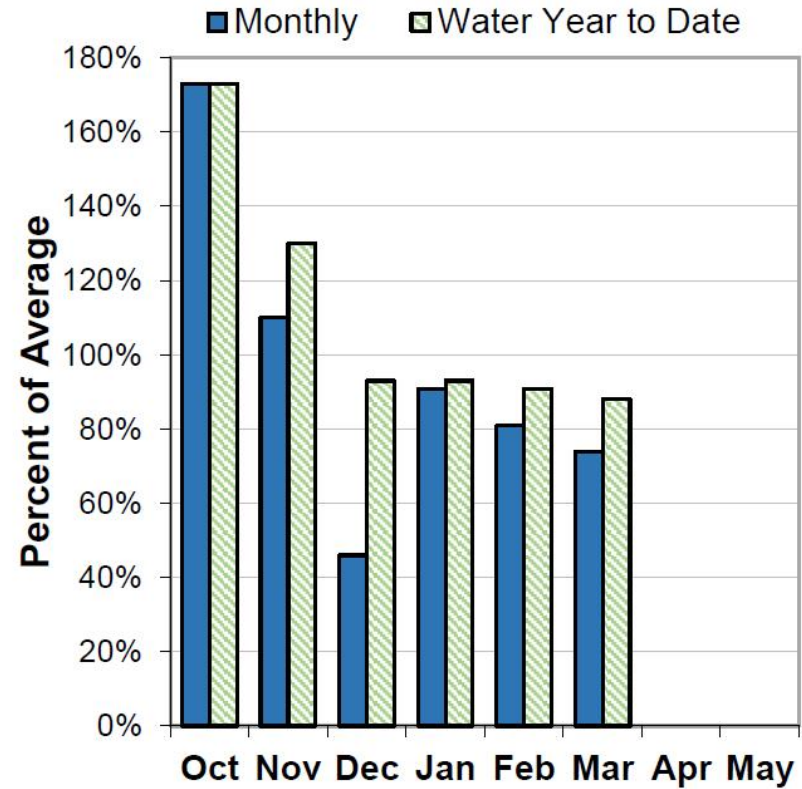
# Willamette Basin

April 1, 2018

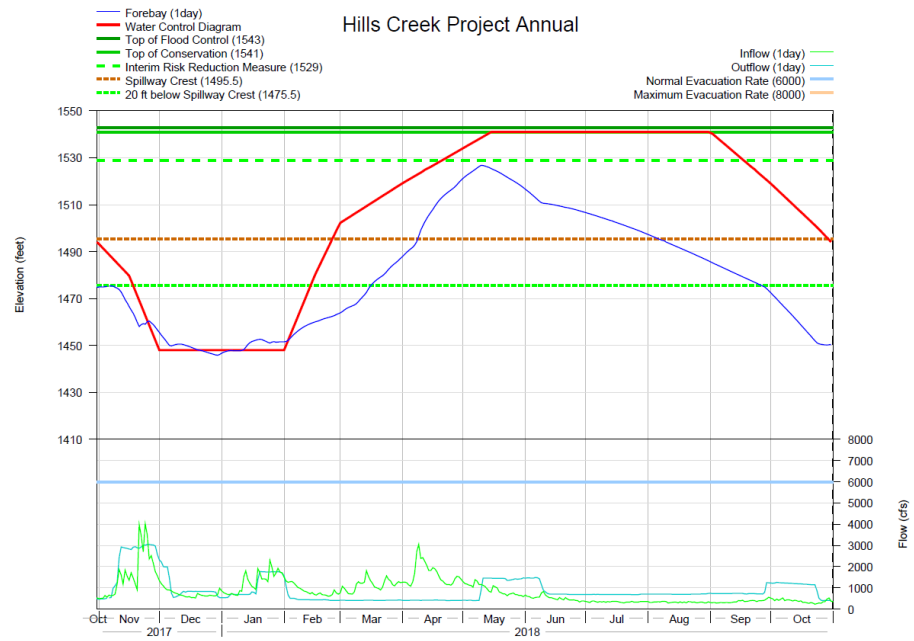
## Mountain Snowpack



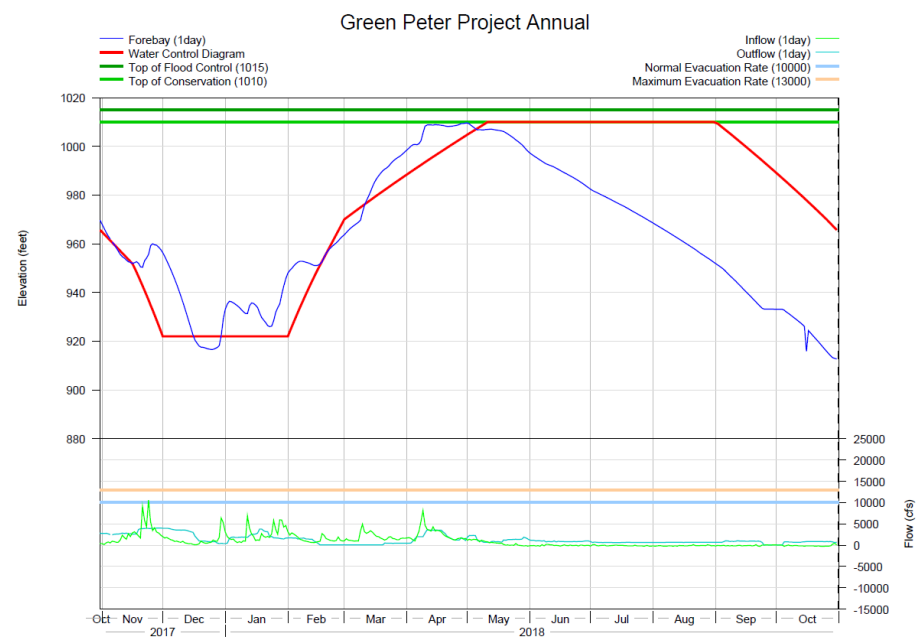
## Basin Precipitation



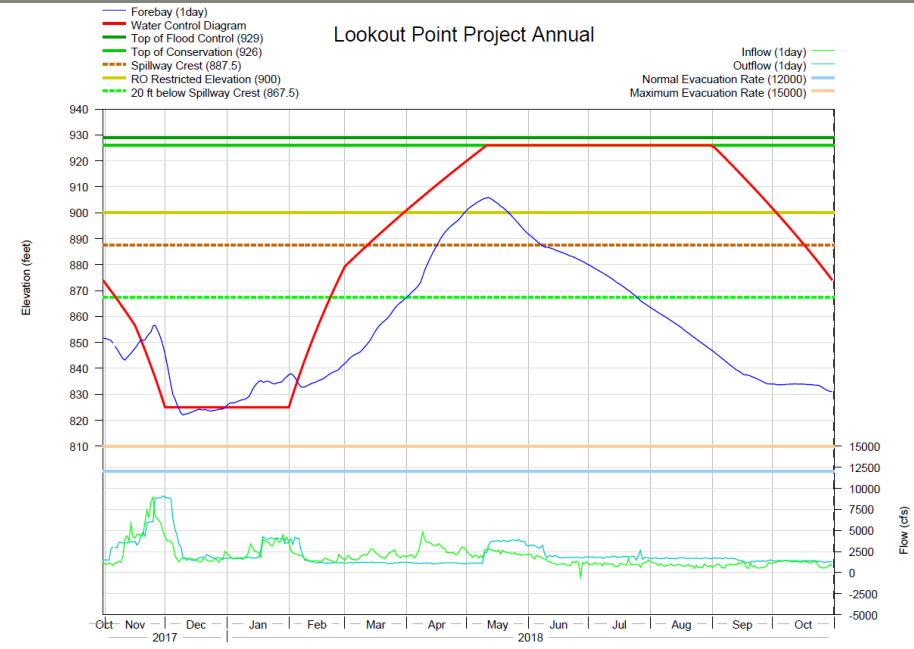
### Hills Creek Project Annual



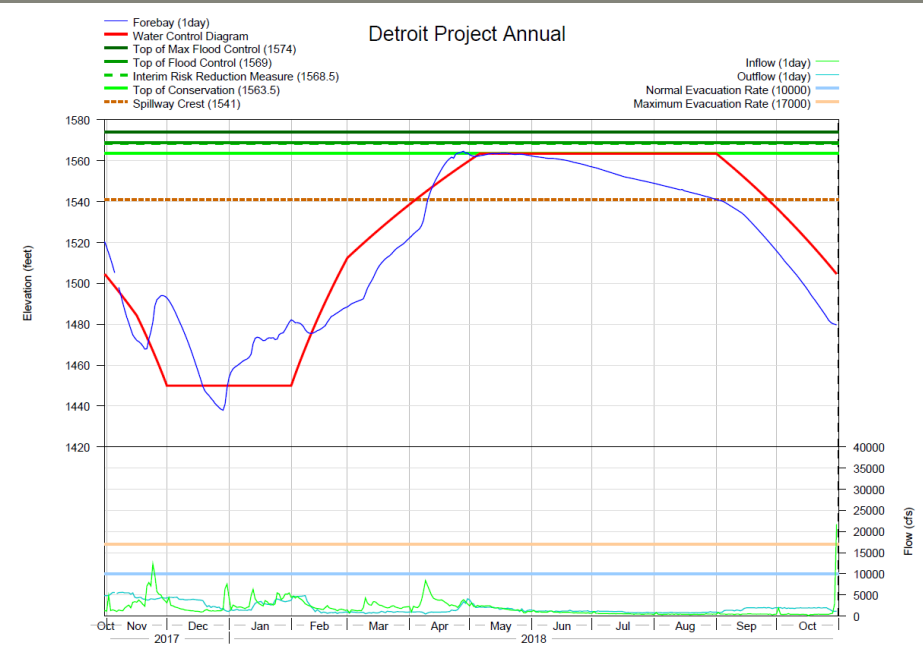
### Green Peter Project Annual



### Lookout Point Project Annual



### Detroit Project Annual







## Mainstem and Tributary Flow Objectives

From 2000 through 2003, the USACE worked with other federal and state agencies to develop a flow management strategy for the Willamette Basin.

Strategy established a framework for meeting mainstem Willamette River flow objectives as recommended by NMFS and ODFW (Friesen and Buckman 2003) (April 1-June 30).

Based on the mid-May system-wide storage forecast, and makes adjustments based on hydrologic conditions

# BIOLOGICAL AND CONGRESSIONALLY AUTHORIZED MINIMUM FLOW OBJECTIVES FOR THE WILLAMETTE RIVER AT SALEM

## APRIL 1 TO OCTOBER 31

Table 7. Willamette Mainstem Flow Thresholds for Adequate and Abundant Years

<b>Period</b>	<b>ALBANY</b>	<b>SALEM</b>	<b>SALEM</b>
	<b>Minimum Instantaneous Flow (cfs)</b>	<b>Minimum Weekly Flow Threshold (cfs)</b>	<b>Minimum Instantaneous Flow (cfs)</b>
April	Not defined	17,800	14,300
May	Not defined	15,000	12,000
1-15 June	4,500	13,000	10,500
16-30 June	4,500	8,700	7,000
July	4,500	6,000	Not defined
1-15 Aug	5,000	6,000	Not defined
16-31 Aug	5,000	6,500	Not defined
September	5,000	7,000	Not defined
October	5,000	7,000	Not defined

Characteristics of Water Year Types	Abundant	Adequate	Insufficient	Deficit
Mid May Storage (MAF)	$\geq 1.48$	1.2 – 1.47	0.9-1.19	$< 0.90$
Frequency	58%	17%	9%	16%
Meet All Mainstem Flow Objectives?	Yes	Yes	No	No
Alternative Flow Targets below Objectives	N/A	N/A	Linear sliding scale based on flow targets used during 2001 water year	Balance seasonal flows to retain some control of discharge
Likely Status of Priority Recreation Reservoirs	Full throughout most or all of the recreation season	Full throughout most or all of the recreation season	May fill; unlikely to remain full throughout the season	Unlikely to fill
Likely Status of other Reservoirs	Likely to fill; drafted as necessary to meet mainstem flows	May fill; unlikely to remain full throughout season	Unlikely to fill	Unlikely to fill



# TRIBUTARY FLOWS

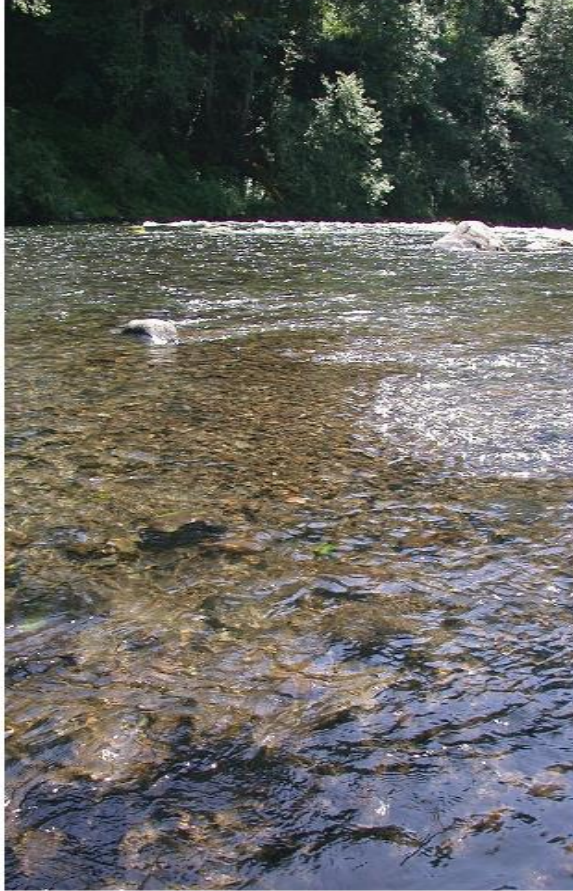
Table 9. Minimum flow objectives below Willamette Basin dams

Minimum Flow (cfs)	BCL	FOS	DEX	HCR	FAL	CGR	BLU	FRN	COT	DOR
January 1	1200	1100	1200	400	50	400	50	30	50	100
February 1	1000	800	1200	400	50	400	50	50	75	190
March 1	1000	800	1200	400	50	400	50	50	75	190
March 16	1500	1500	1200	400	50	400	50	50	75	190
April 1	1500	1500	1200	400	80	400	50	50	75	190
May 1	1500	1500	1200	400	80	400	50	50	75	190
May 16	1500	1100	1200	400	80	400	50	50	75	190
June 1	1200	1100	1200	400	80	400	50	50	75	190
July 1	1200	800	1200	400	80	400	50	30	50	100
July 16	1000	800	1200	400	80	400	50	30	50	100
September 1	1500	1500	1200	400	200	400	50	30	50	100
October 16	1200	1100	1200	400	50	400	50	30	50	100
December 1	1200	1100	1200	400	50	400	50	30	50	100

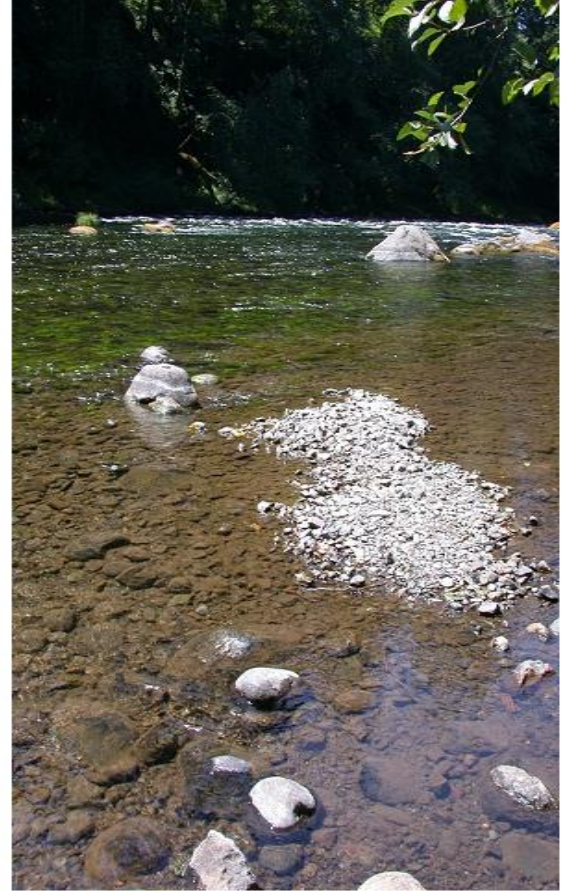
# TRIBUTARY TARGETS SPAWNING AND INCUBATION FLOWS



**2000 cfs**  
**05/08/03**



**1200 cfs**  
**06/24/03**



**850 cfs**  
**07/23/03**

# HOW DO WE MANAGE BETTER?

## Prioritization

Between: Subbasins, Species, Life Histories, Authorized Purposes, BIOP Requirements (Spring v Fall Spawning, Reservoir Rearing v Mainstem Habitat, Ramping Rates etc).

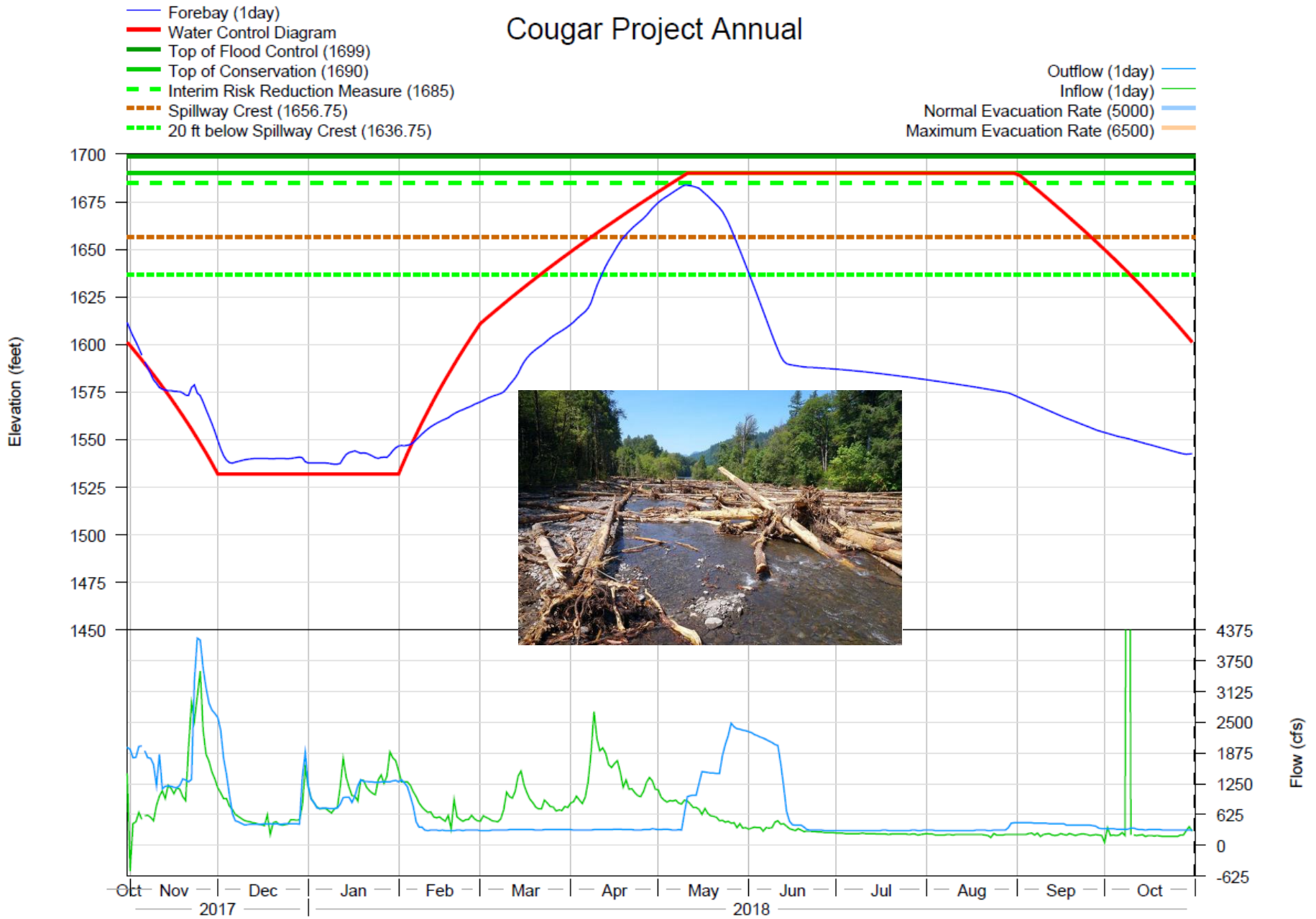
Tools for Understanding and Evaluating Trade Offs



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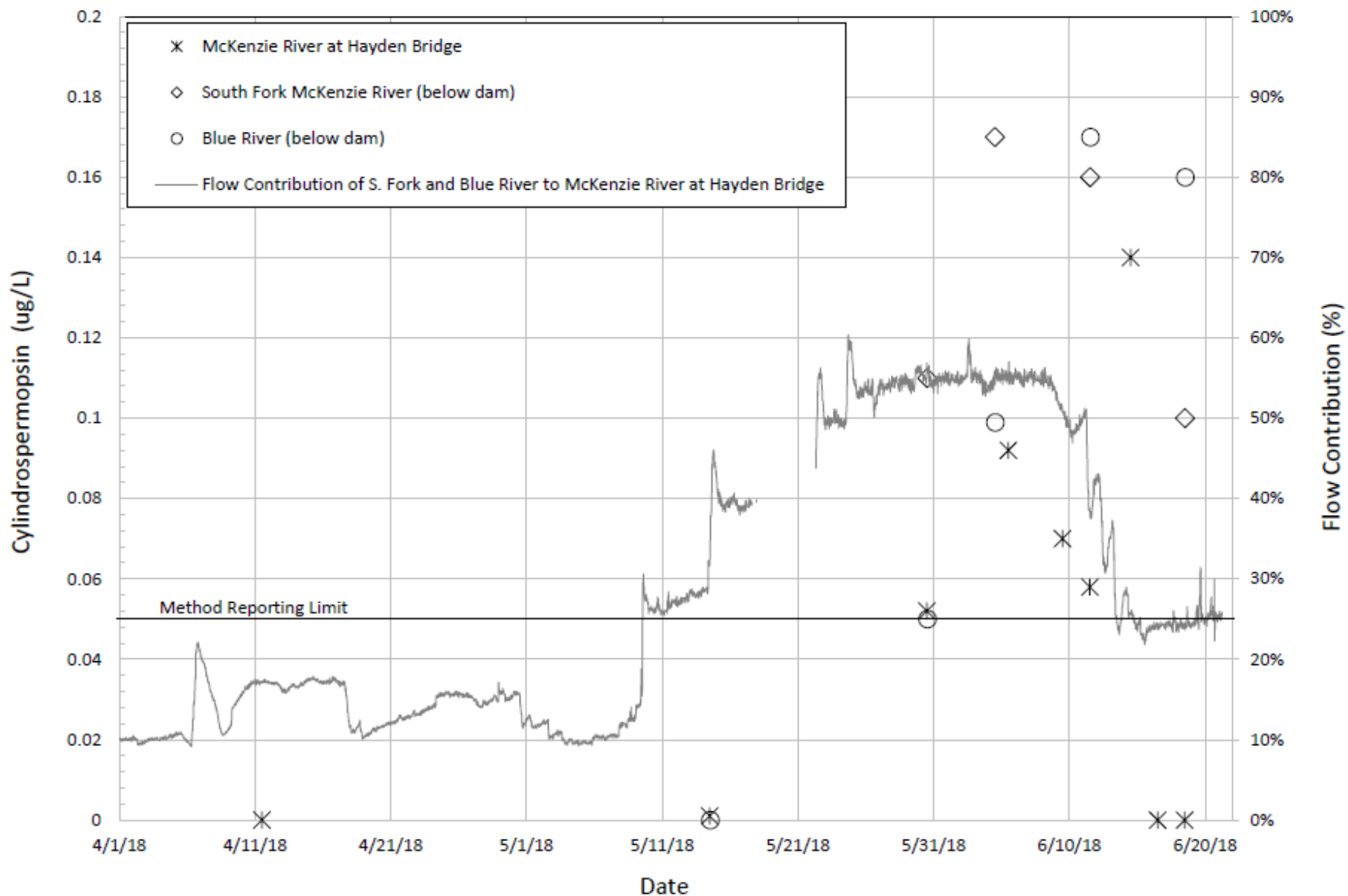


# Cougar Project Annual





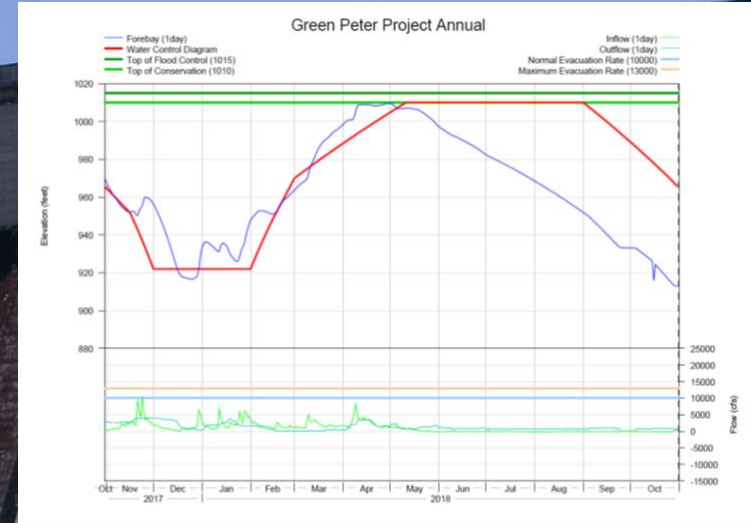
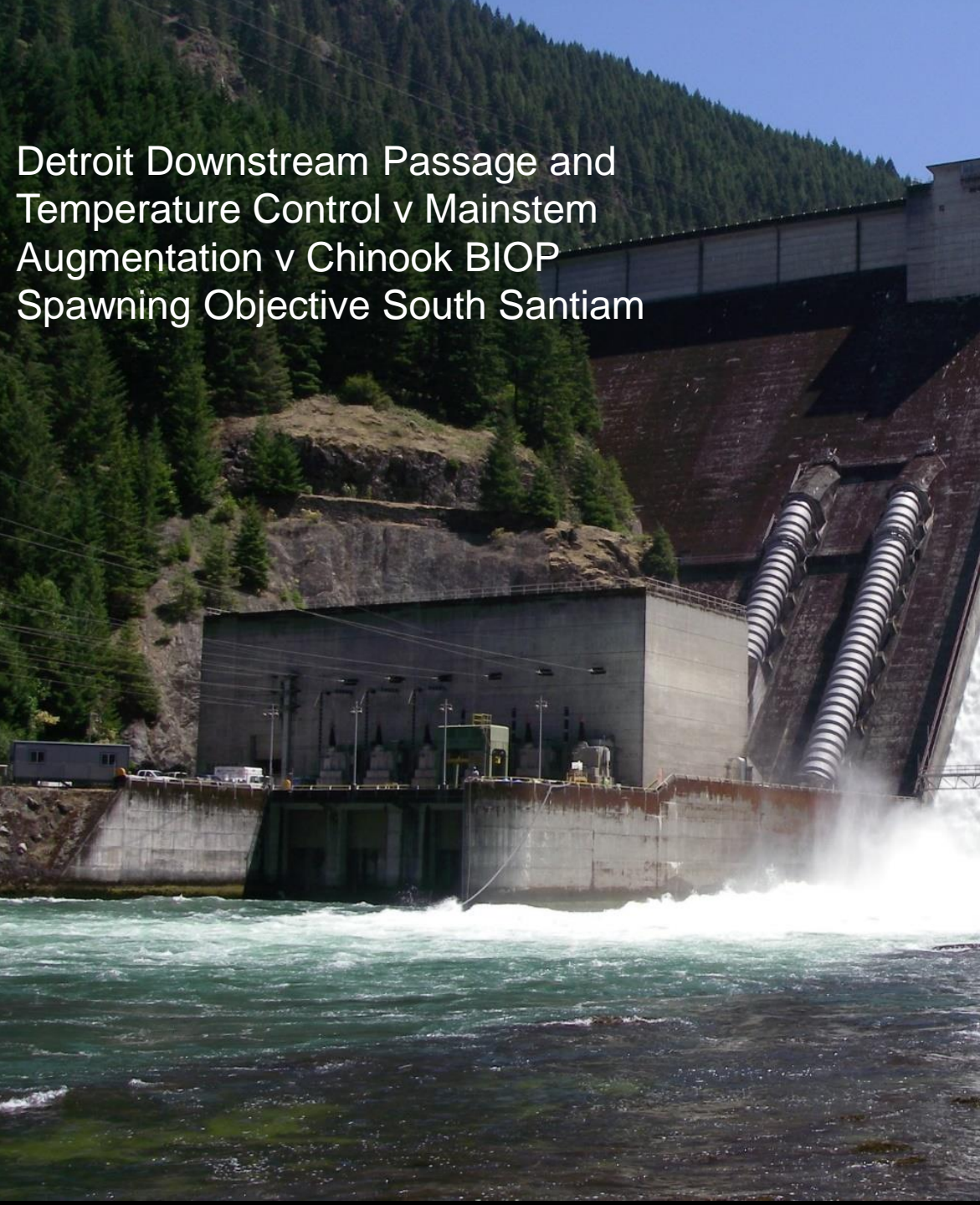
## 2018 Cyanotoxin Detections - McKenzie Subbasin



**Note:** The OHA acute or short-term drinking water toxicity value for children 5 years and younger for cylindrospermopsin is .7 ug/L.

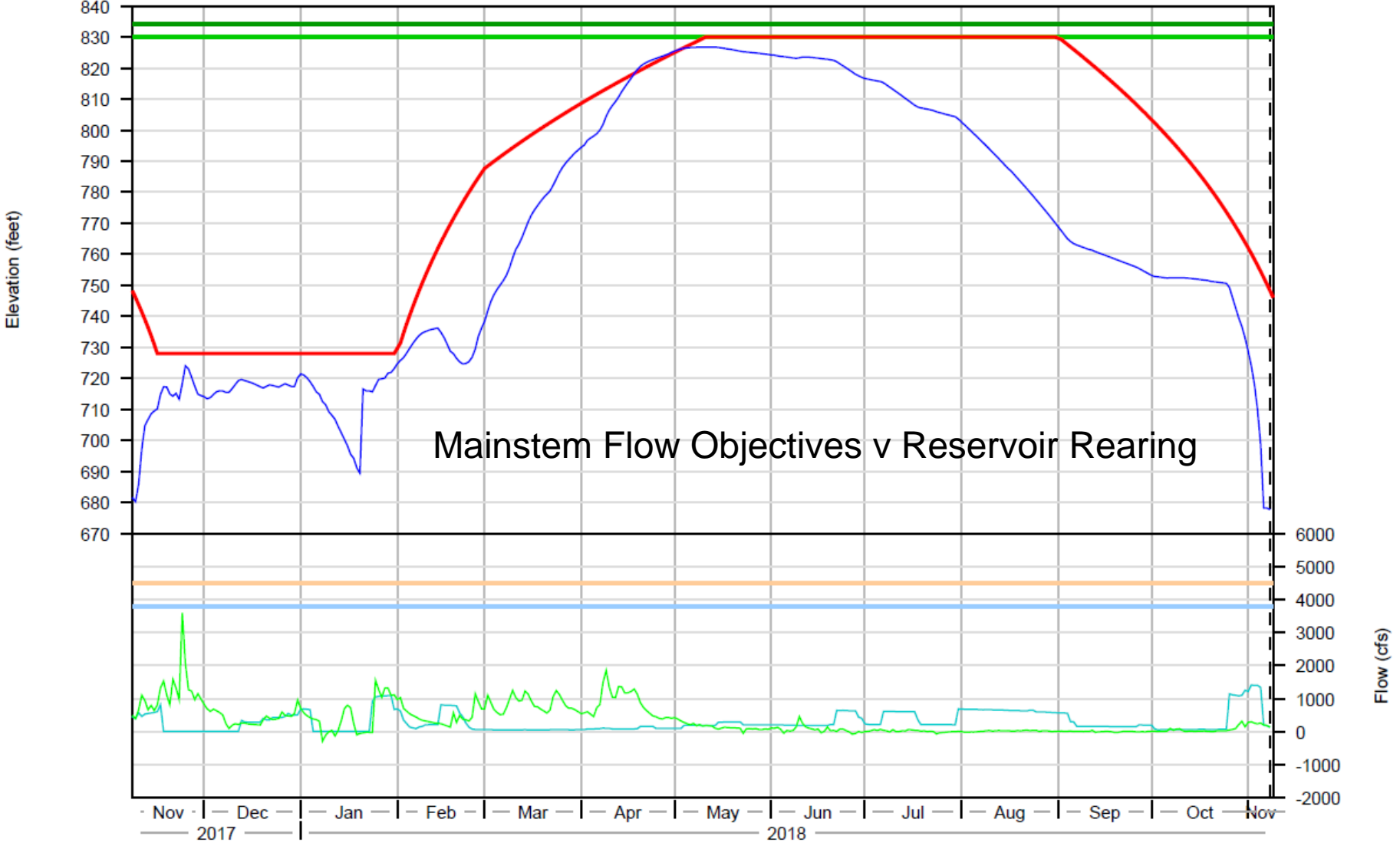


# Detroit Downstream Passage and Temperature Control v Mainstem Augmentation v Chinook BIOP Spawning Objective South Santiam



# Fall Creek Project Annual

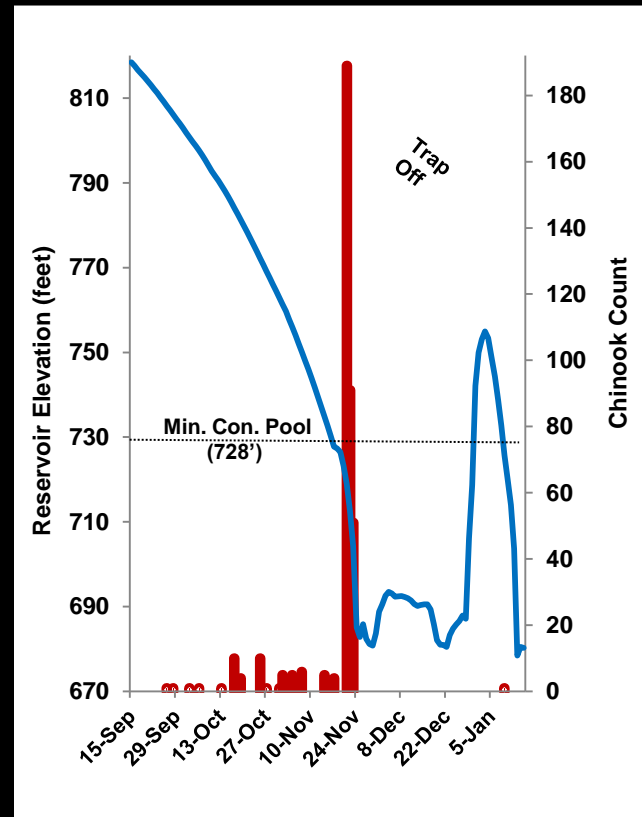
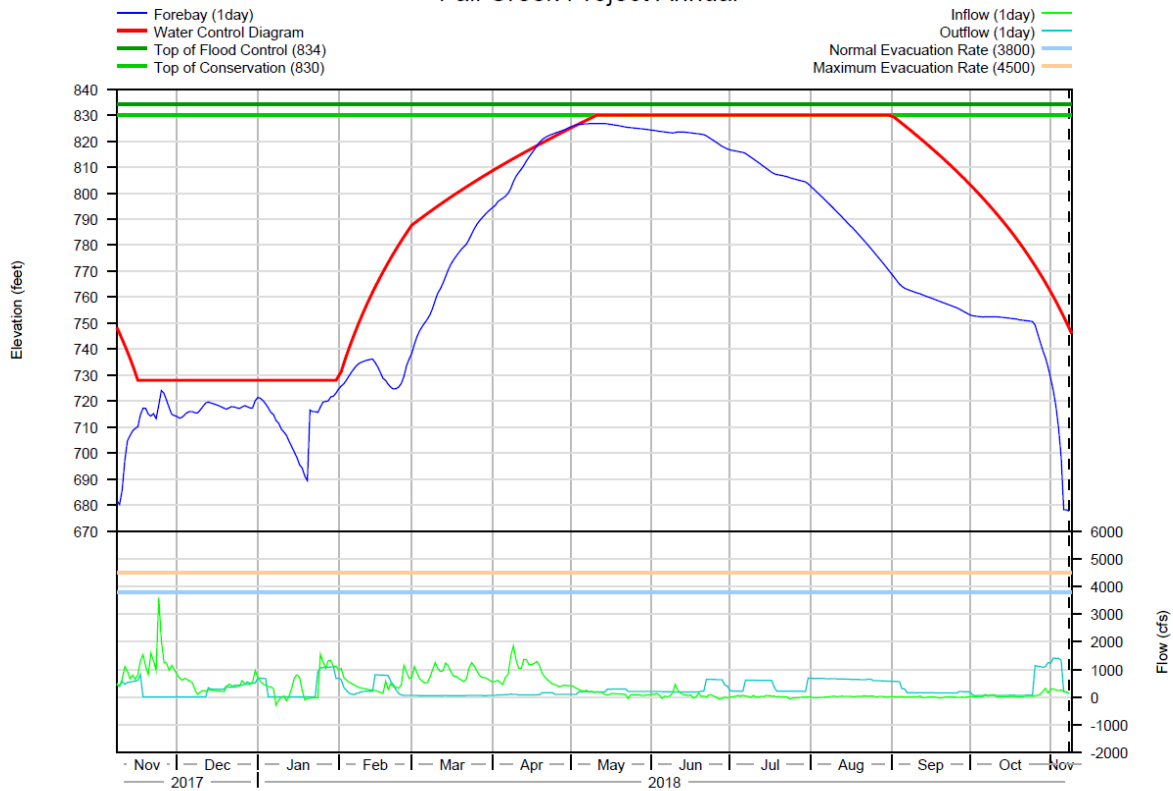
- Forebay (1day) —
- Inflow (1day) —
- Water Control Diagram —
- Outflow (1day) —
- Top of Flood Control (834) —
- Normal Evacuation Rate (3800) —
- Top of Conservation (830) —
- Maximum Evacuation Rate (4500) —



# Fall Creek Drawdown



Fall Creek Project Annual





# Summary

- Managing flows to support multiply life histories, species, and authorized purposes is complex.
- Often objectives to support one life history, species, or authorized purposes are in conflict with another.
- Adaptively managing the system to achieve maximum benefit requires prioritization and a mechanism for evaluating tradeoffs.

