



Flooding



Water Supply

Fish



COMPARISON OF THE ALTERNATIVES

ALTERNATIVE	FISH ABUNDANCE	FLOOD EFFECTS	WATER RIGHTS	COST
Current Operation	No change	No change	No change	N/A
Fish Passage Only	Steelhead + Coho + Spring Chinook = Fall Chinook =	No change	Small but increased risk of water rights curtailments in drought years	\$8.3 million
Flood Storage Only	Steelhead = Coho - Spring Chinook - Fall Chinook -	Substantial reductions in flood extent and depth; less benefit in late-century	Small but increased risk of water rights curtailments in drought years	\$42.2 million
Combined Fish-Flood	Steelhead + Coho + Spring Chinook - Fall Chinook -	Substantial reductions in flood extent in depth; less benefit in late-century	Small but increased risk of water rights curtailments in drought years	\$50.5 million
Dam Removal	Steelhead ++ Coho + Spring Chinook + Fall Chinook +	Small increases in flood extent and depths	Higher risk of water rights curtailments in drought years	\$25-\$35 million (median) +\$80 million (water rights)

ECOSYSTEM DIAGNOSTIC AND TREATMENT (EDT)

INPUTS



Calculation



Output

Stream Geometry
Flow

Temperature
Wood

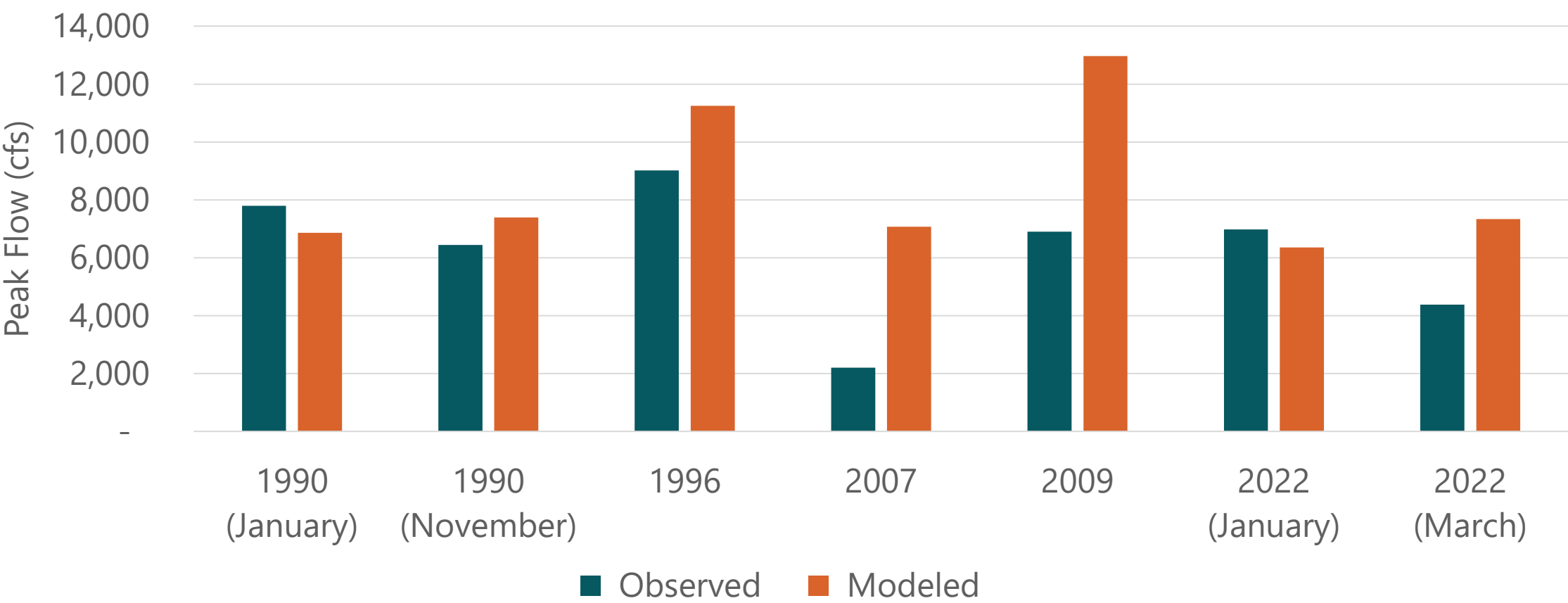
Life Histories

Relationships between
inputs and survival

Salmonid Populations*

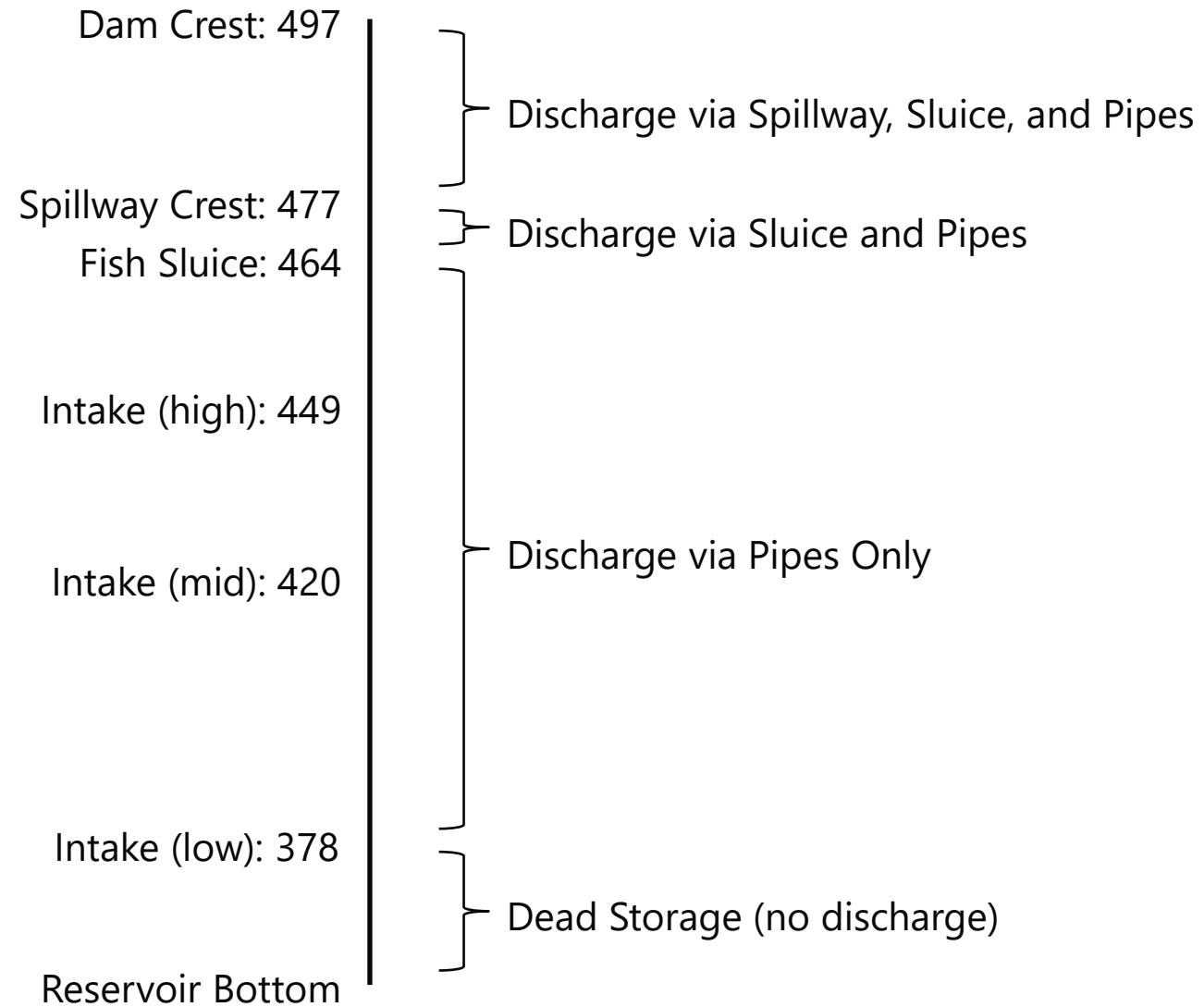
(that the habitat can
support)

OBSERVED VS MODELED FLOWS



OUTMIGRATION TIMING

Species	Jan	Feb	Mar	Apr	May	Jun	Jul
Steelhead							
Chinook Salmon							
Coho Salmon							



An aerial photograph of a fish sluice, a narrow channel in a dam designed to allow fish to pass. The water is highly turbulent, creating white foam and rapids as it flows through the concrete structure. The surrounding landscape is rugged and covered in green vegetation. The text "Fish Sluice" is overlaid in white on the right side of the image.

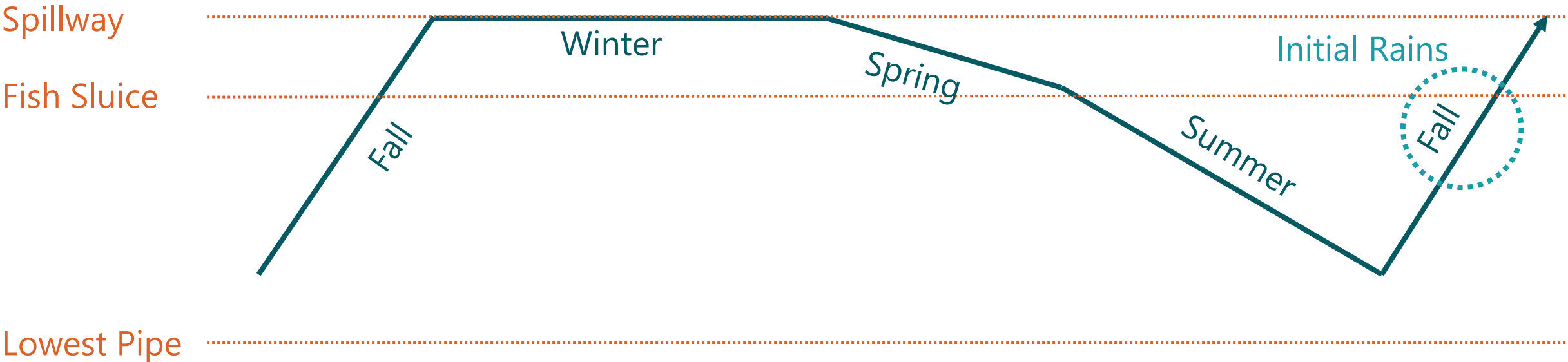
Fish Sluice

FLOOD MATH

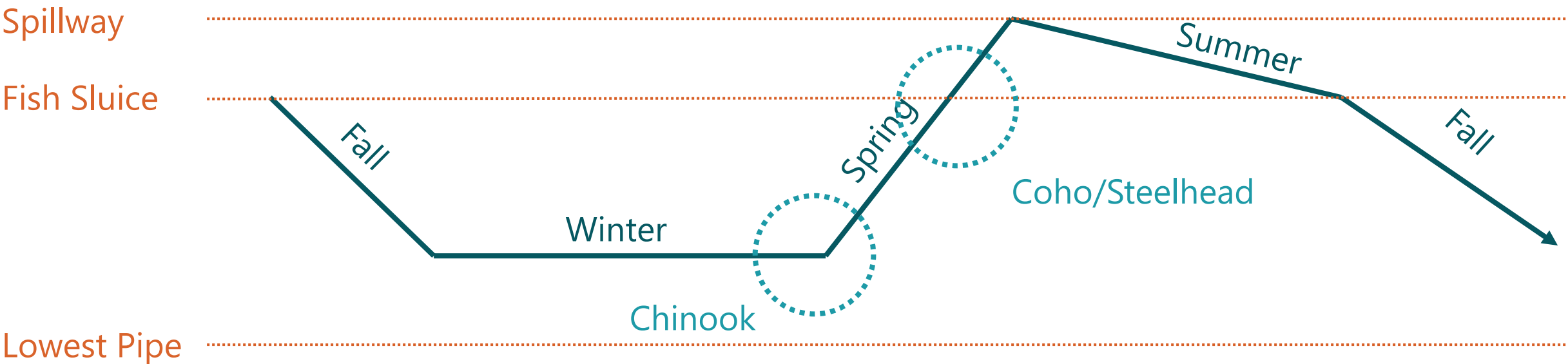
$$\begin{array}{ccccccc} 35,000 & / & 600 & = & 55 \\ \text{acre feet} & & \text{acre feet/day} & & \text{days} \end{array}$$

2 Months
to empty the reservoir

RESERVOIR ELEVATION (CURRENT)



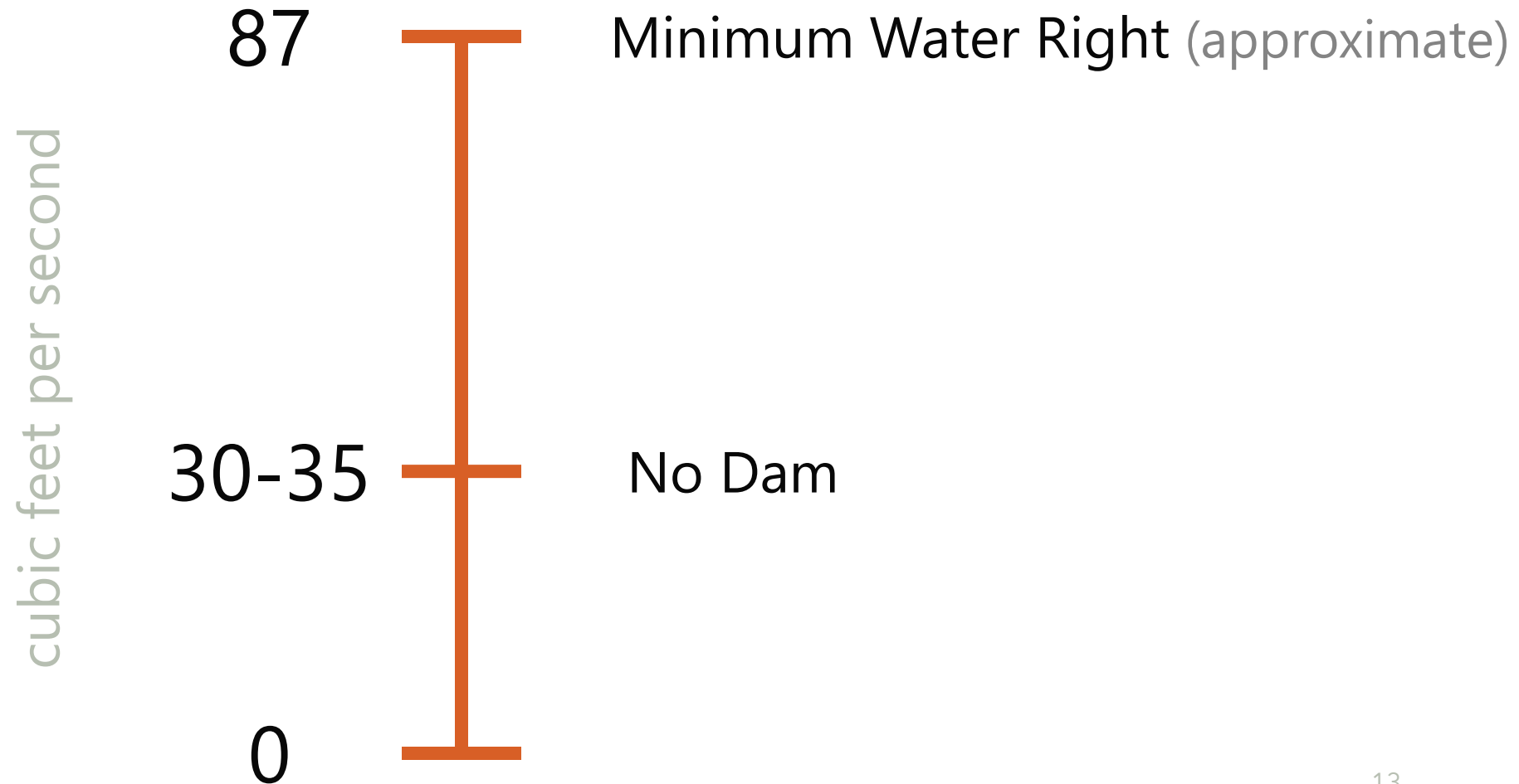
RESERVOIR ELEVATION (PROPOSED FLOOD REDUCTION)



COMPARISON OF THE ALTERNATIVES

ALTERNATIVE	FISH ABUNDANCE	FLOOD EFFECTS	WATER RIGHTS	COST
Current Operation	No change	No change	No change	N/A
Fish Passage Only	Steelhead + Coho + Spring Chinook = Fall Chinook =	No change	Small but increased risk of water rights curtailments in drought years	\$8.3 million
Flood Storage Only	Steelhead = Coho - Spring Chinook - Fall Chinook -	Substantial reductions in flood extent and depth; less benefit in late-century	Small but increased risk of water rights curtailments in drought years	\$42.2 million
Combined Fish-Flood	Steelhead + Coho + Spring Chinook - Fall Chinook -	Substantial reductions in flood extent in depth; less benefit in late-century	Small but increased risk of water rights curtailments in drought years	\$50.5 million
Dam Removal	Steelhead ++ Coho + Spring Chinook + Fall Chinook +	Small increases in flood extent and depths	Higher risk of water rights curtailments in drought years	\$25-\$35 million (median) +\$80 million (water rights)

AVERAGE LATE AUGUST DISCHARGE



TRANSALTA WATER BANK

Very Large – One Rights Holder

Year Round – Few Restrictions

Senior – Last Curtailed



Dungeness Off-Channel Reservoir

Happy Valley Road

Dungeness River

15,000 Acre Feet

$$\begin{array}{r} 2012 \\ \times \$6,400 \\ \hline \end{array} = \$96,000,000$$

$$\begin{array}{r} 2023 \\ \times \$23,500 \\ \hline \end{array} = \$352,500,000$$

COMPARISON OF THE ALTERNATIVES

ALTERNATIVE	FISH ABUNDANCE	FLOOD EFFECTS	WATER RIGHTS	COST
Current Operation	No change	No change	No change	N/A
Fish Passage Only	Steelhead + Coho + Spring Chinook = Fall Chinook =	No change	Small but increased risk of water rights curtailments in drought years	\$8.3 million
Flood Storage Only	Steelhead = Coho - Spring Chinook - Fall Chinook -	Substantial reductions in flood extent and depth; less benefit in late-century	Small but increased risk of water rights curtailments in drought years	\$42.2 million
Combined Fish-Flood	Steelhead + Coho + Spring Chinook - Fall Chinook -	Substantial reductions in flood extent in depth; less benefit in late-century	Small but increased risk of water rights curtailments in drought years	\$50.5 million
Dam Removal	Steelhead ++ Coho + Spring Chinook + Fall Chinook +	Small increases in flood extent and depths	Higher risk of water rights curtailments in drought years	\$25-\$35 million (median) +\$80 million (water rights)

QUESTIONS?



	Observed	Current Operations	Dam Removal	Fish-Flood
1990 (January)	7,800	6,860	8,120	2,625
1990 (November)	6,440	7,390	8,900	2,750
1996	9,020	11,250	12,400	3,620
2007	2,200	7,070	8,100	2,790
2009	6,900	12,970	13,700	3,920
2022 (January)	6,980	6,360	7,700	2,690
2022 (March)	4,380	7,340	8,670	3,620