Northwest **Power** and **Conservation** Council

May 9, 2023

MEMORANDUM

TO: **Council Members**

FROM: **Stacy Horton, Washington Policy Analyst/Biologist**

SUBJECT: **Hanford Reach Fall Chinook Protection Program**

BACKGROUND:

Presenter: Tom Dresser, Public Utility District No. 2 of Grant County, Washington, Fish, Wildlife and Water Quality Manager.

Summary: The Hanford Reach Fall Chinook Protection Program (HRFCPP) is an excellent example of how competing resource interests can co-exist. The HRFCPP provides flow protections which are guided by the life-cycle of fall Chinook. This is done by providing specific, managed, or designed flows, for each of the freshwater life stages of fall Chinook in the Hanford Reach. The HRFCPP is highly successful and has a documented record of successfully protecting and enhancing this regionally important stock.

Relevance: The Hanford Reach Fall Chinook Protection Program Agreement (Agreement) signed in 2004 is a key element of the Public Utility District No. 2 of Grant County, Washington's (Grant PUD's) stewardship obligations in achieving No-Net-Impact for fall Chinook. This Agreement was the result of a collaborative effort among state, federal, tribal entities, Public Utility District No. 1 of Chelan County, Public Utility District No. 1 of Douglas County, and the Bonneville Power Administration.

In 2014, the Council's Columbia River Basin Fish and Wildlife Program included specific flow measures to protect the Hanford Reach fall Chinook population, calling on federal action agencies to work in collaboration with

the state and federal agencies, tribes and the Mid-Columbia Public Utility Districts (PUDs) to reliably implement operations intended to protect spawning and emergence of fall Chinook in the Hanford Reach consistent with the 2004 Hanford Reach Fall Chinook Protection Program Agreement. The Columbia River Basin Fish and Wildlife Program also included a request that parties to the agreement report to the Council periodically to demonstrate that flow measures continue to be effective in protecting fall Chinook redds and juveniles from flow and river elevation fluctuations (P. 63, 2014 Columbia River Basin Fish and Wildlife Program)

Background: The 2004 Hanford Reach Fall Chinook Protection Program Agreement is designed to help manage Columbia River flows to protect all freshwater life stages of central Washington's Hanford Reach fall Chinook salmon population. The program is intended to ensure the population, continues to be productive, healthy, and harvestable. Prior to the 1988 Vernita Bar Agreement and the 2004 Agreement, fluctuating river levels caused by hydropower operations varied widely, ranging from 36,000 to 150,000 cubic feet per second. This caused fall Chinook redds to become exposed, potentially desiccating salmon eggs and causing juvenile salmon to be stranded along the margins of the shoreline. It was a problem with a variety of power-production, environmental, and economic dimensions and solving it required a collaborative approach.
https://nwcouncil.org/news/2020/07/17/hanford-reach-flow-protections-help-keep-fall-chinook-healthy-productive/

Grant County
PUBLIC UTILITY DISTRICT

No-Net-Impact

The Public Utility District No. 2 of Grant County Washington, (Grant PUD) is one of the greatest contributors to the enhancement and protection of anadromous fish, resident fish, and habitat conservation in the region. While generating and delivering energy is our mission, it cannot be accomplished without regard for our surroundings and being a leader in environmental stewardship.

Grant PUD achieves its No-Net-Impact environmental stewardship responsibilities through a three-pronged approach; hydroelectric operations and improvements, hatchery production, and habitat restoration and enhancement. These enhancement and protection projects cover a broad area of the Columbia River Basin; from Penticton, British Columbia downstream to the Hanford Reach.

In collaboration with the Priest Rapids Coordinating Committee (PRCC), comprised of the Confederated Tribes of the Umatilla Reservation, US Fish and Wildlife Service, Confederated Tribes of the Colville Reservation, Washington Department of Fish and Wildlife, Yakama Nation and the National Marine Fisheries Service, Grant PUD has achieved the performance standard for anadromous fish listed under the Endangered Species Act (Upper Columbia River spring Chinook and steelhead), as well as non-listed species (fall Chinook, sockeye, and coho), releases over 8.3 million smolts annually and invests more than $2.3 million in habitat restoration project annually.

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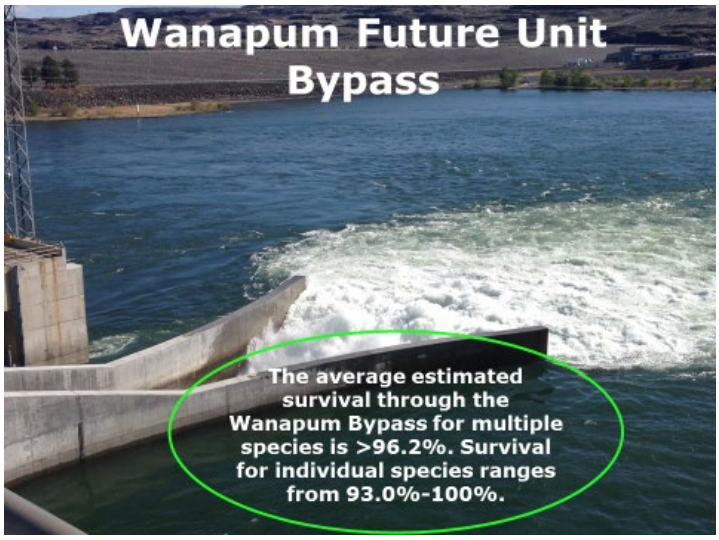
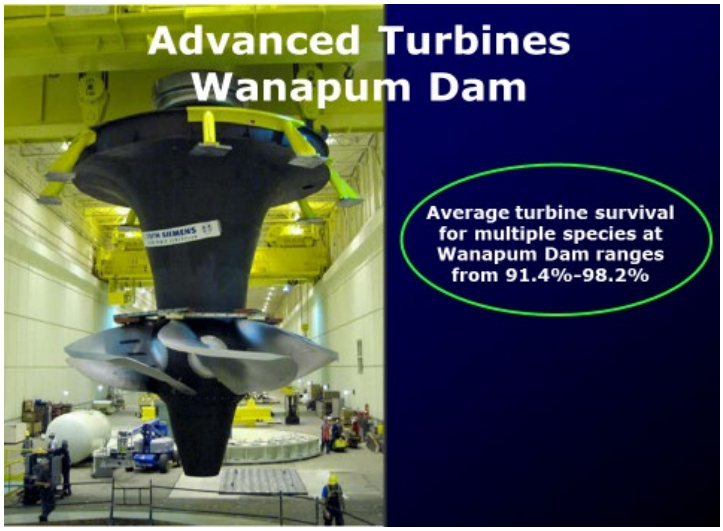
Committed to Safe Fish Passage

Grant PUD has invested hundreds of millions of dollars to ensure the protection and safe passage of juvenile fish through the Priest Rapids Project. A myriad of capital and operational improvements have been completed at Wanapum and Priest Rapids dams, which include the Wanapum and Priest Rapids Fish Bypasses, Advanced Hydro Turbine System (at Wanapum Dam), turbine upgrades at Priest Rapids Dam, enhanced avian wire arrays (at Wanapum and Priest Rapids dams), enhanced predator removal programs, and implementation of “fish mode” at both dams.

These enhancements have resulted in high survival for yearling Chinook, sockeye, and juvenile steelhead. For example, survival for yearling Chinook utilizing the various passage routes at Wanapum and Priest Rapids dams (bypass, spillway, and powerhouse) is >96%, with the exception of powerhouse survival at Priest Rapids Dam (92.6%). Steelhead survival through the bypasses at both dams is >97% (97%-100%), while turbine survival for juvenile steelhead at both dams ranges from 91.8%-95.5%. The estimated survival for juvenile sockeye migrating through the Priest Rapids Project is 91.7%.

These data illustrate how clean energy can coincide with safe passage for juvenile salmon and steelhead.





Grant County
PUBLIC UTILITY DISTRICT

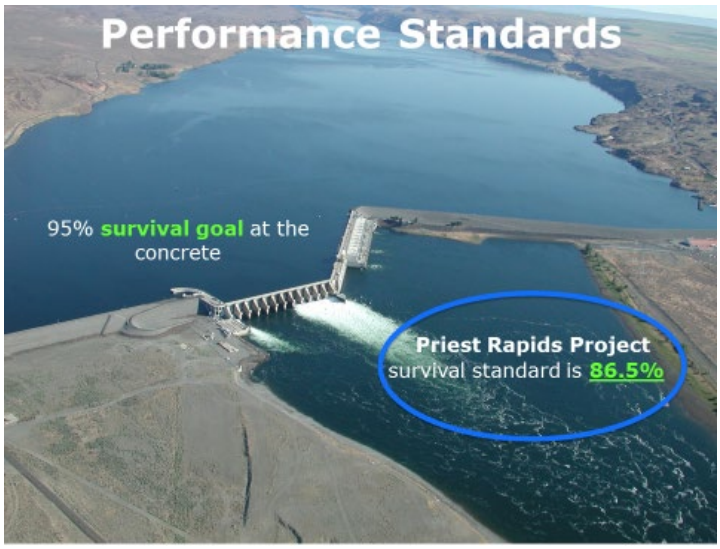
Performance Standards

Grant PUD, in collaboration with the PRCC, uses the most current and best available scientific information and analyses as the standard of care to estimate survival for spring Chinook, summer subyearling Chinook, sockeye, and coho. The required performance standard for each of these species migrating through the Priest Rapids Project is 86.5%.

Using state of the art technology (acoustic tags), Grant PUD has been able to collect detailed information on juvenile salmonid survival within the reservoirs and survival and behavioral information on individual fish as they approach and pass through Wanapum and Priest Rapids Dams.

Grant PUD is achieving performance standards for yearling Chinook, sockeye, and coho. Based on three consecutive years of studies (2003-2005) and a single year (2014), yearling Chinook survival was estimated at 86.6% and 90.8% respectively. Survival for juvenile sockeye migrating through the Priest Rapids Project was estimated at 91.7%. Based on PIT tag data assessments, coho survival is comparable to yearling Chinook survival.

Estimated survival for juvenile steelhead is 87.0%, which also exceeds the required performance standard (86.5%). Predation on juvenile steelhead by Caspian terns nesting on islands located outside the Priest Rapids Project continues to be major concern.



Grant County
PUBLIC UTILITY DISTRICT

Avian Predation

Avian predation along the Columbia River has become an increasing challenge which could threaten the millions of dollars invested in protecting salmon and steelhead.

Past evaluations developed to determine the level of avian predation on juvenile salmon and steelhead indicate that Caspian terns have been the primary reason for lower-than-expected survival of juvenile steelhead migrating through the Priest Rapids Project. For example, during 2008-2010 the estimated predation rates by terns on steelhead smolts averaged 15.7% (95% CI 14.1-18.9%), indicating that predation by terns was a substantial source of smolt mortality on juvenile steelhead migrating through the Mid-Columbia.

Under a required regional management action for the US Army Corps of Engineers and US Bureau of Reclamation, colony-based habitat management actions were implemented on an island located approximately 30 miles outside the Priest Rapids Project.

Management actions have included both passive (matrix of ropes and flagging) and active nest dissuasion measures (hazing, walk-throughs, boat-based activities, kites, lasers, etc.). Tern nest dissuasion measures employed between 2014-2018 were largely successful.

However, recent data indicates that without sustained dissuasion at locations where tern colonies previously existed such as Goose Island (in Potholes reservoir) or at developing nesting colonies (Lake Lenore) juvenile steelhead survival will continue to be depressed by Caspian terns.

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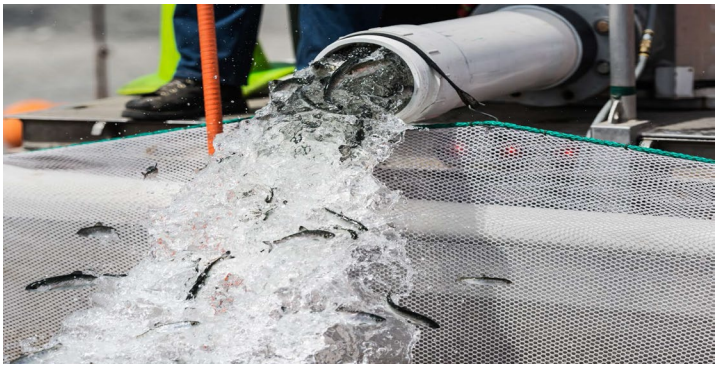
Hatchery Production

Grant PUD believes that native fish populations are vital to the heritage of our region, and we are committed to preserving them.

To help recover natural salmon and steelhead populations to self-sustaining and harvestable levels, Grant PUD collaborates with the Priest Rapids Coordinating Hatchery Subcommittee, comprised of the Confederated Tribes of the Umatilla Reservation, US Fish and Wildlife Service, Confederated Tribes of the Colville Reservation, Washington Department of Fish and Wildlife, Yakama Nation, and the National Marine Fisheries Service to implement eleven anadromous fish hatchery programs.

These hatchery programs include spring and summer Chinook in the Wenatchee, Methow, and Okanogan Basins, sockeye fry and juvenile steelhead in the Okanogan Basin, coho salmon in the Wenatchee and Methow Basins and fall Chinook released from the Priest Rapids Hatchery. In total Grant PUD releases an average of approximately 8.3 million smolts annually.

The committee uses the most current and best available scientific information and analyses collected through an extensive monitoring and evaluation program to set the standard of care designed to protect and enhance Columbia Basin salmon and steelhead populations and to achieve No-Net-Impact for the Priest Rapids Project.



Grant County
PUBLIC UTILITY DISTRICT

Habitat Enhancement, Protection and Restoration

Grant PUD has contributed $47.7 million to for habitat enhancement, protection, and restoration efforts in the upper Columbia River Basin to improve survival and aid recovery of spring and summer Chinook, steelhead, sockeye, and coho.

Grant PUD, in collaboration with the Priest Rapids Coordinating Habitat Subcommittee (PRCC HSC) comprised of the Confederated Tribes of the Umatilla Reservation, US Fish and Wildlife Service, Confederated Tribes of the Colville Reservation, Washington Department of Fish and Wildlife, Yakama Nation, and the National Marine Fisheries Service, determines which habitat enhancement, protection or restoration projects will be funded.

Since 2006, 140 total projects have been unanimously approved by the PRCC HSC and PRCC using one of the three funding accounts setup by Grant PUD.

These projects cover a wide variety of habitat enhancement, protection, and restoration projects have been implemented throughout the Columbia River Basin, extending from Oliver, British Columbia downstream to the Priest Rapids Project, and include valuable imaging of the upper Columbia River system, removing fish barriers, replacing inefficient stream culverts, purchasing conservation lands and water rights, and determining fish and avian predation impacts on juvenile salmon and steelhead.

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PUBLIC UTILITY DISTRICT

Northern Pikeminnow and Non-Native Fish Predator Removal and Monitoring Program

Grant PUD implements an extensive Northern Pikeminnow and non-native predator removal and early detection program within the Priest Rapids Project Area (PRPA). The PRPA includes 56 miles of the mid-Columbia and extends from the tailrace of Rock Island Dam (river mile 453.0) to the forebay of Priest Rapids Dam at river mile 397.0.

Based on a 5-year average, 304,909 Northern Pikeminnow and 221 non-native fish predators (Walleye, Bass, and Channel Catfish) are removed from the PRP using a combination of fish sampling methodologies (e.g., angling, setlines, boat-based electrofishing, and beach seining). Using varied sampling techniques allows for the removal of multiple life history stages of fish predators (young-of-year, juvenile, sub-adult, and adult) over a wide range of habitat types and seasons. Since 2017, Northern Pikeminnow and non-native predators have been removed from over 830 separate locations representing various littoral habitats.

Boat-based electrofishing was added as a sampling method (in 2018) in areas that one could expect to encounter Northern Pike if they were present. This includes potential spawning and nursey areas, which are characterized as off channel and shallow backwater areas with aquatic vegetation (e.g., tributary outlets, Crab Creek, Buckshot slough, etc.).

Video fish counting at Priest Rapids and Wanapum Dams also serve as an early detection program. This program is installed in the fish ladders at both dams and are operated 24/7 between April 15 and November 15 of each year.

Other early detection efforts for non-native fish predators includes annual fish salvage activities associated with turbine dewatering and fish ladder maintenance, a juvenile White Sturgeon indexing program, angling, and a native resident fish survey conducted every 5- years (most recently conducted in 2023).

A total of 40 eDNA samples are also collected annually from five separate locations between March through October of each year from within the PRP to monitor for the presence of Northern Pike. As of April 2023, no Northern Pike have been observed or detected within the PRP.

Grant PUD and PRCC have also contributed $750,000 via the NNI Fund for Northern Pike removal efforts in Lake Roosevelt.

Hanford Reach Fall Chinook Salmon Protection Program

Northwest Power and Conservation Council
May 17, 2023

Grant PUD

Powering our way of life.

Operate Responsibly by Attaining Environmental, Cultural Resource and Regulatory Compliance

The Hanford Reach

Chief Joseph Dam
(River Mile 541.1)
Capacity 2,614 MW
Corps of Engineers

Wells Dam
(River Mile 515.1)
Capacity 840 MW
Douglas PUD

Rocky Reach Dam
(River Mile 473.0)
Capacity 1,300 MW
ChelanPUD

Rock Island Dam
(River Mile 453.4)
Capacity 624 MW
Chelan PUD

Bonneville Dam
(River Mile 145.5)
Capacity 1,227 MW
Corps of Engineers

The Dalles Dam
(River Mile 191.5)
Capacity 2,160 MW
Corps of Engineers

John Day Dam
(River Mile 215.8)
Capacity 2,480 MW
Corps of Engineers

McNary Dam
(River Mile 292.0)
Capacity 980 MW
Corps of Engineers

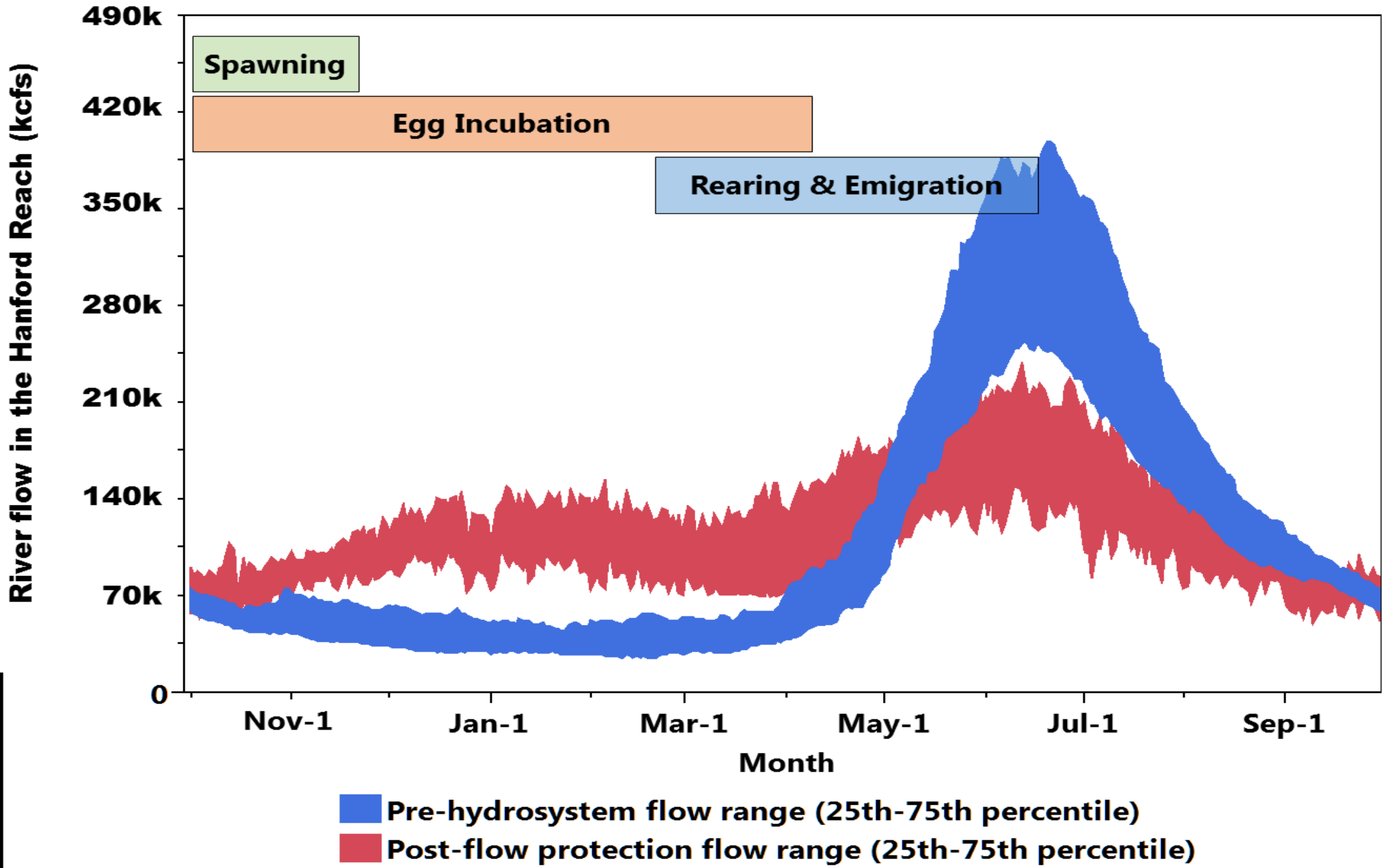
Grand Coulee Dam
(River Mile 596.6)
Capacity 6,809 MW
Bureau of Reclamation

Wanapum Dam
(River Mile 415.8)
Capacity 1,185 MW
Grant PUD

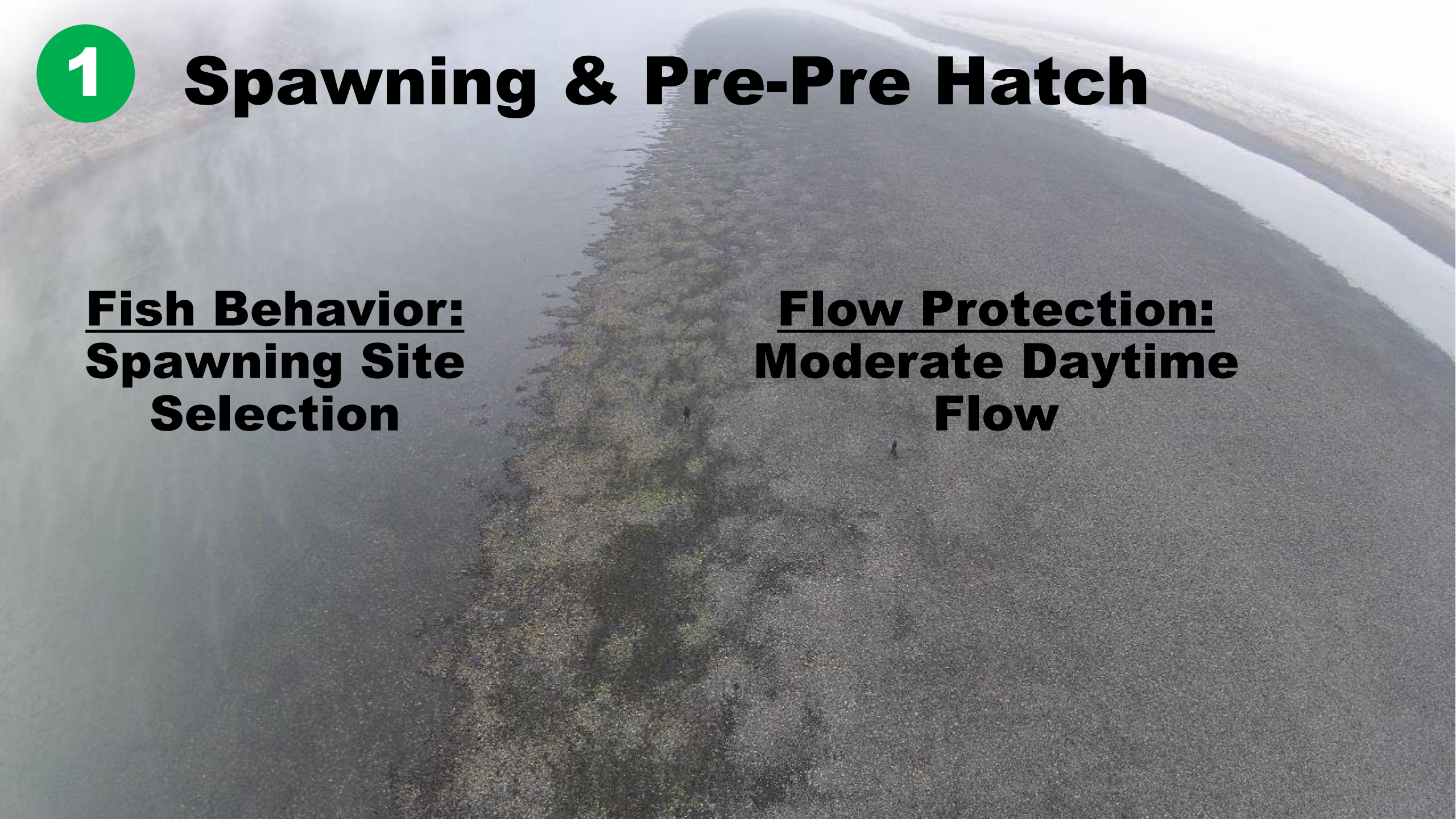
Priest Rapids Dam
(River Mile 397.1)
Capacity 953 MW
Grant PUD

Background

- 1961: Priest Rapids Dam Completed.
- 1970s: Grant PUD funds studies on flow controls.
- 1983: Experimental flow protections.
- 1988: Vernita Bar Settlement Agreement (VBSA) formalizes protections for spawning Chinook.
- 2004: Hanford Reach Fall Chinook Protection Program (HRFCPP) signed expanding VBSA protections to include emergence and rearing.
- 2012: Productivity assessments begin on protection flow outcomes.


490k
420k
350k
280k
210k
140k
70k
0
River flow in the Hanford Reach (kcfs)
Spawning
Egg Incubation
Rearing & Emigration
Nov-1
Jan-1
Mar-1
May-1
Jul-1
Sep-1
Month
Pre-hydrosystem flow range (25th-75th percentile)
Post-flow protection flow range (25th-75th percentile)

Flow protections guided by salmon life-cycle

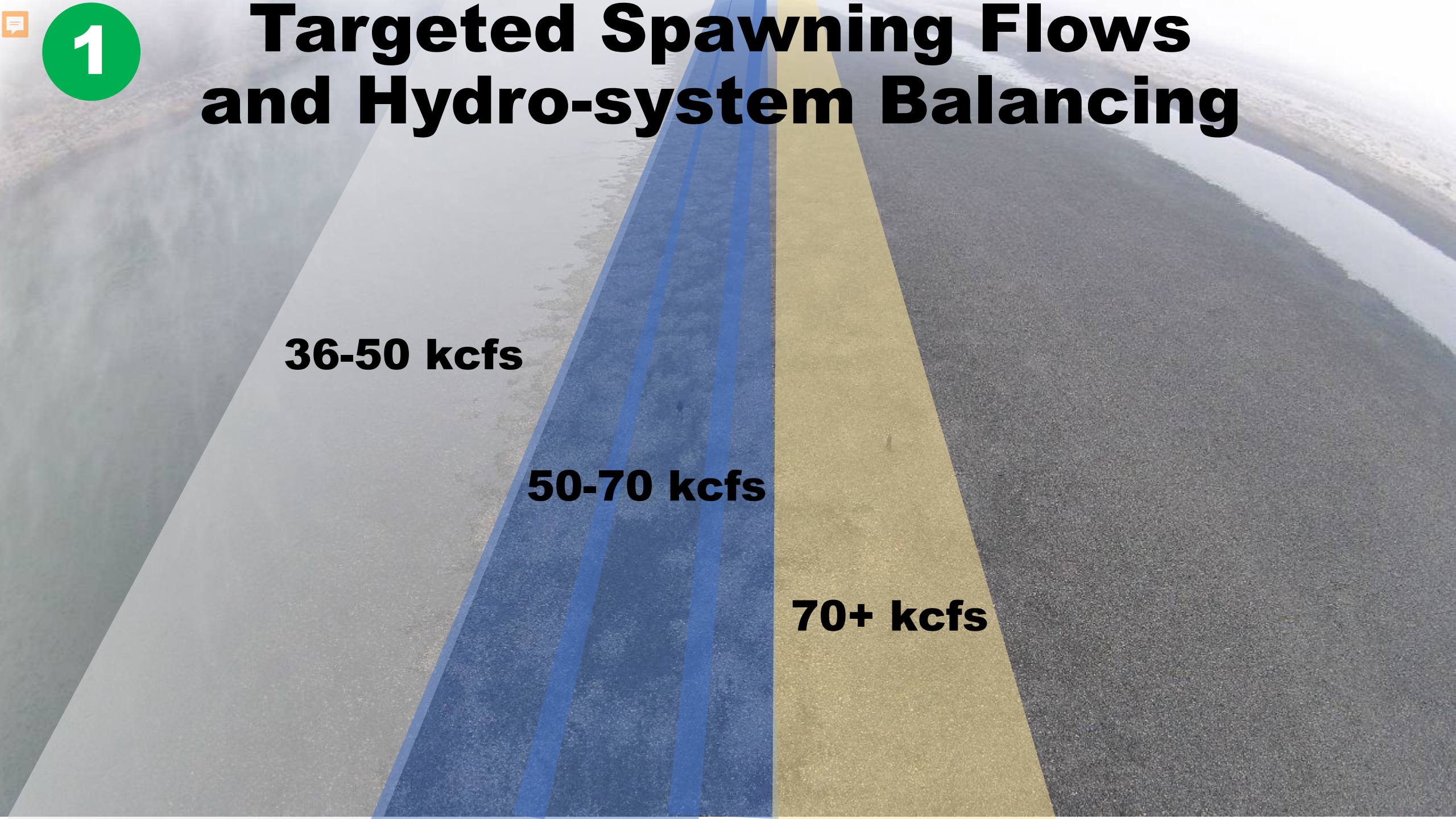


1 Spawning & Pre-Pre Hatch

Fish Behavior:
Spawning Site Selection

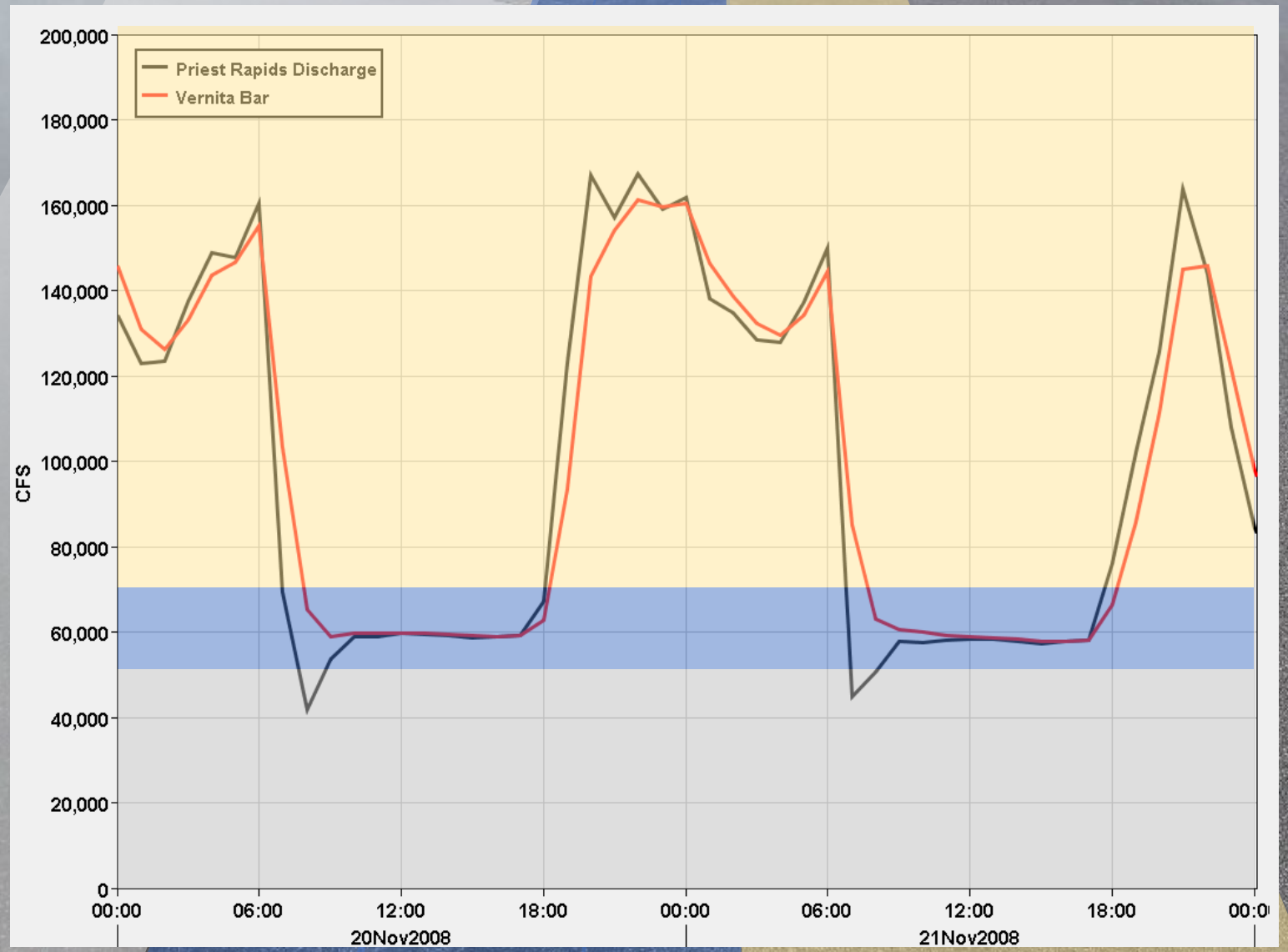
Flow Protection:
Moderate Daytime Flow

1 Targeted Spawning Flows and Hydro-system Balancing



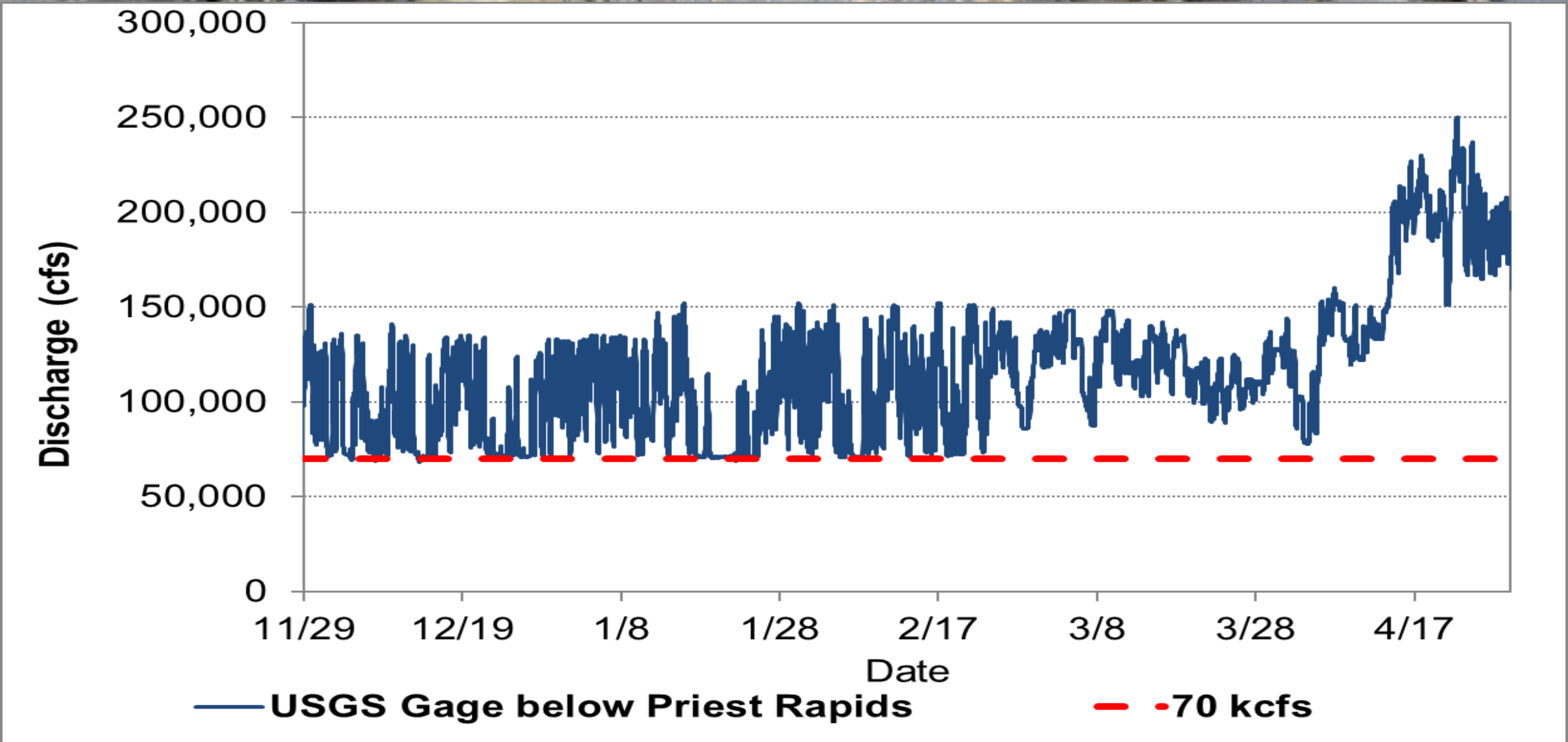
Spawning & Pre-Hatch

Reverse Load Factoring target 55 -70 kcfs during daylight




2
Egg Incubation

2 Egg Incubation



3 Emergence and Rearing

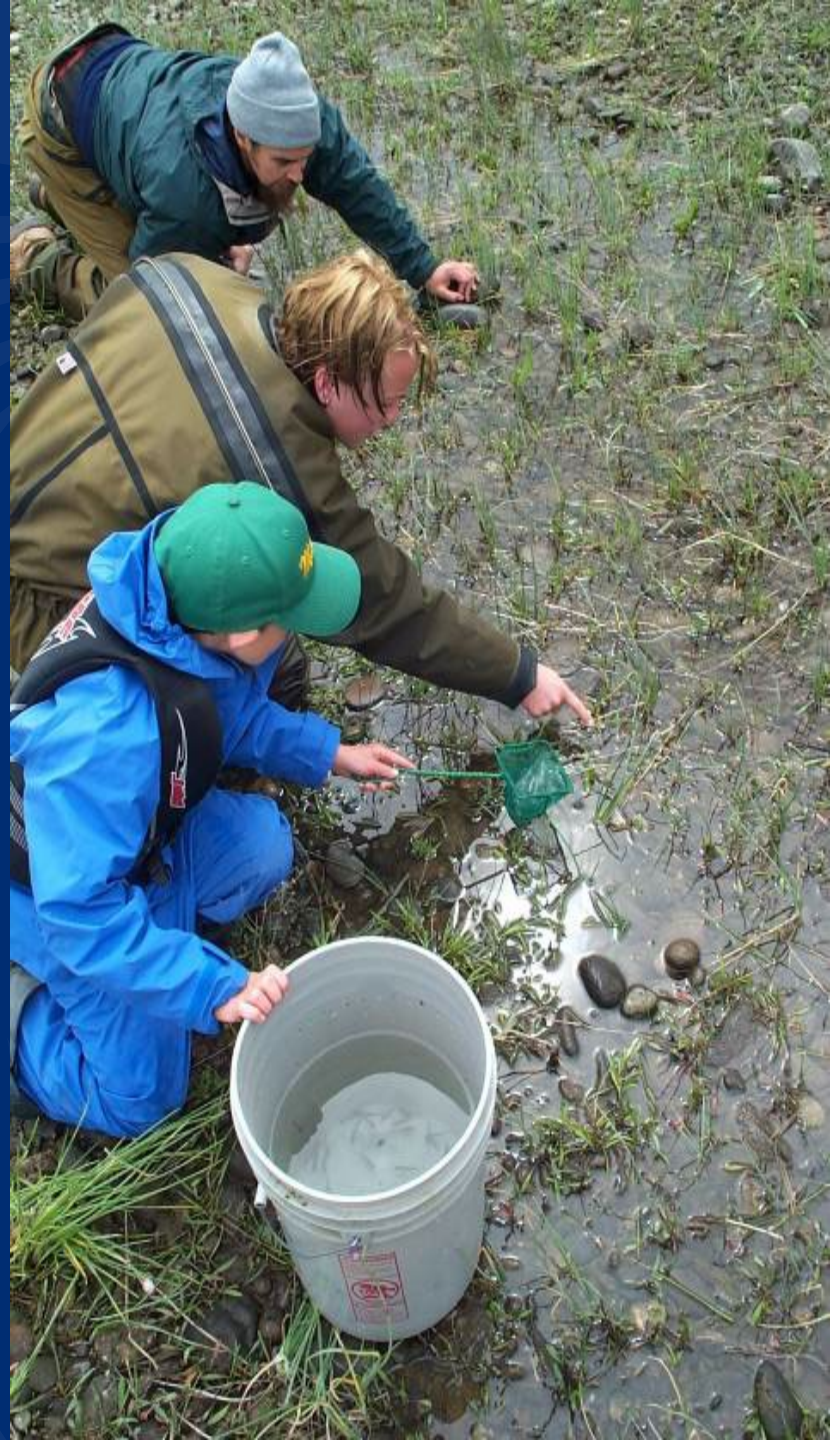
Fish Behavior:

Juveniles emerging, rearing, feeding along shoreline

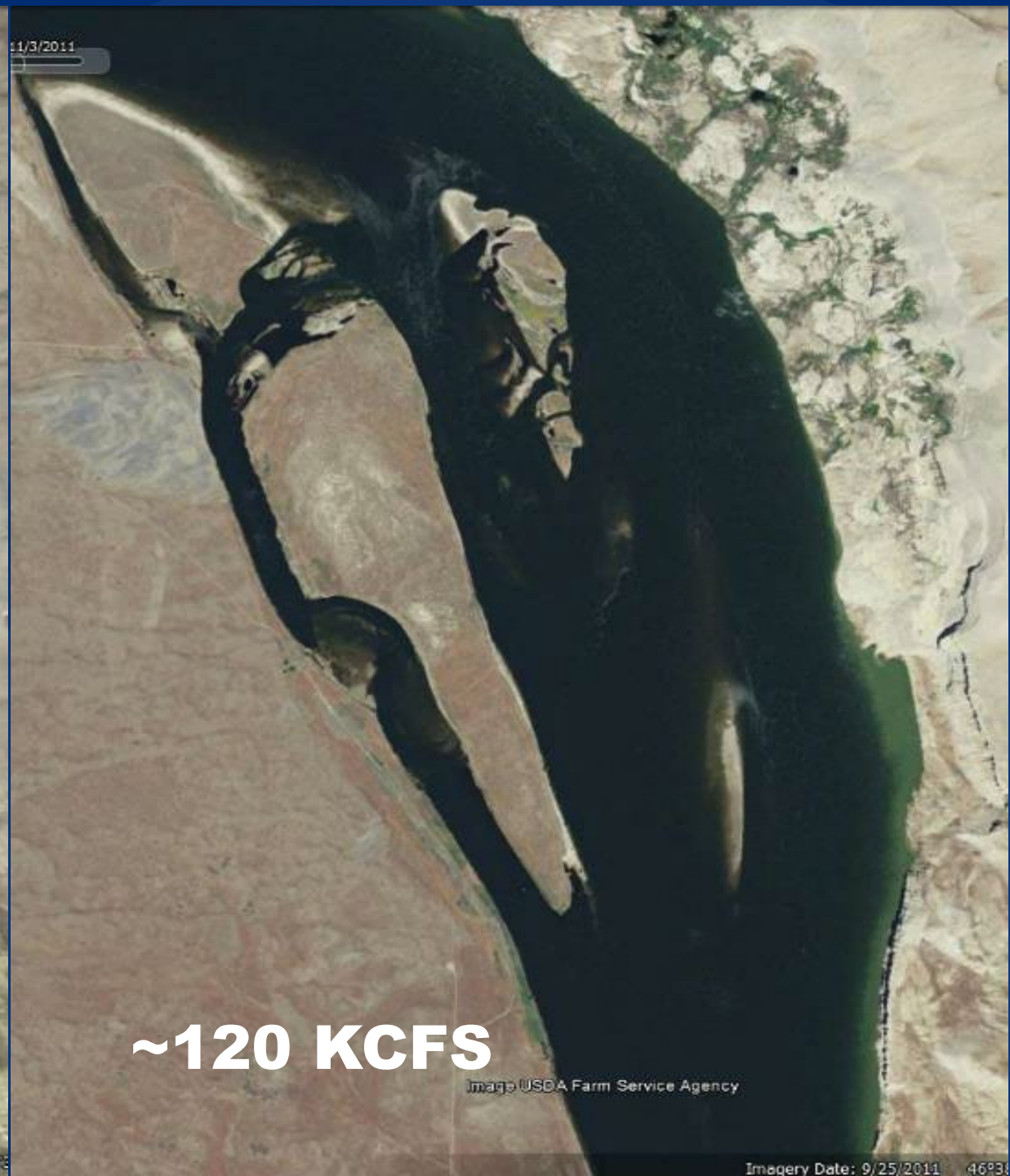
Flow Protections:

Minimum flows

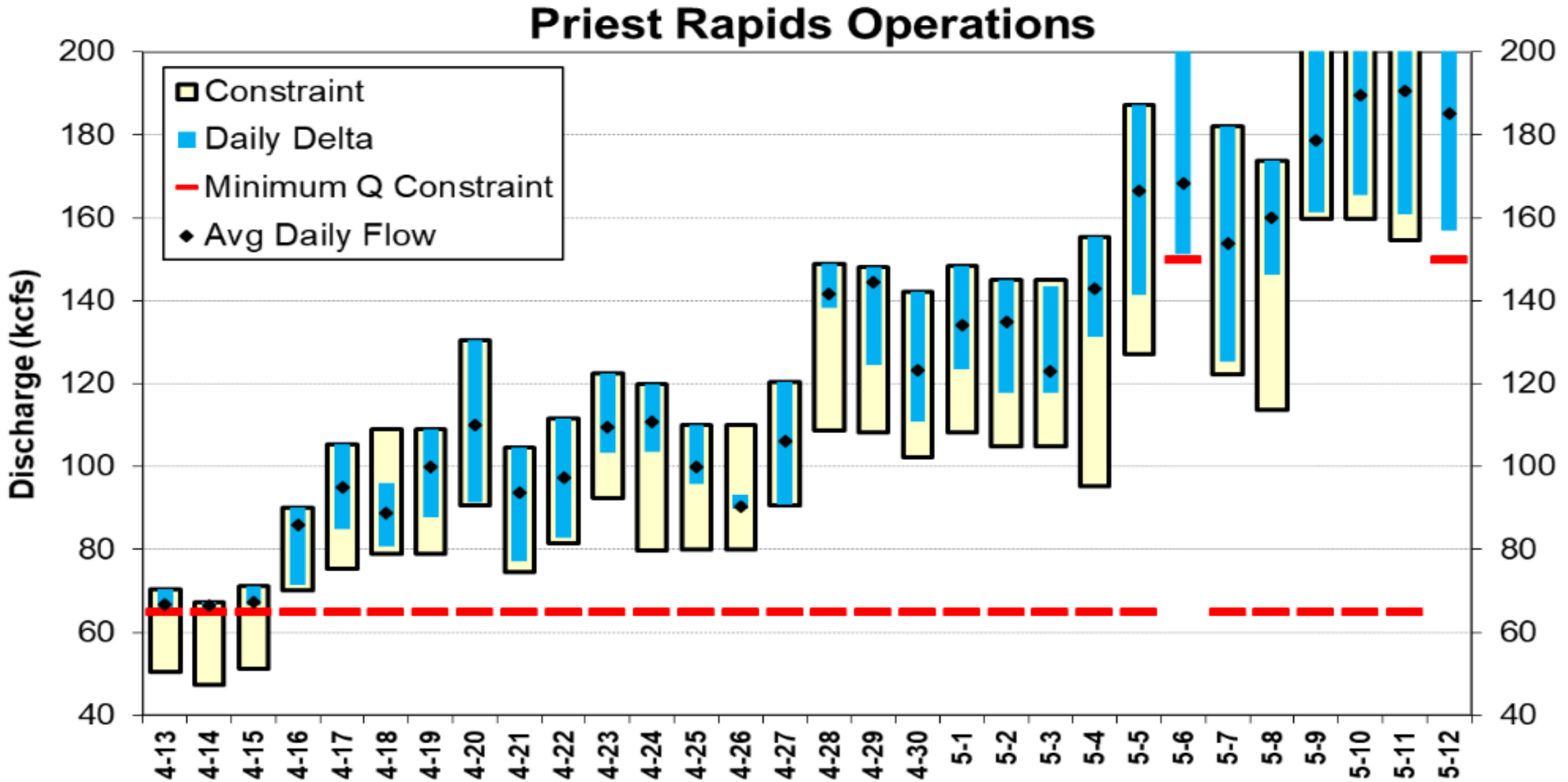
Flow fluctuation constraints



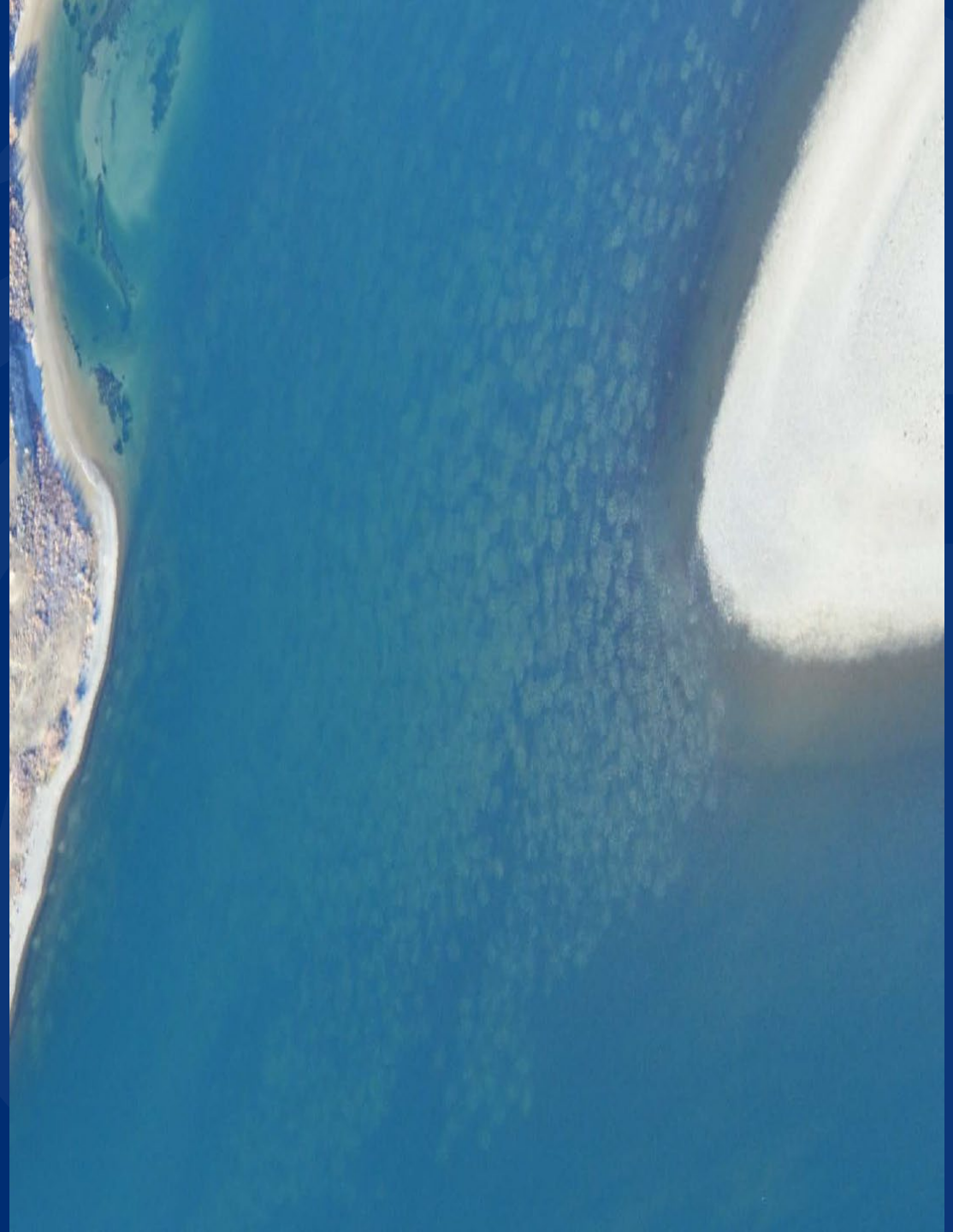

9/6/2012
~80 KCFS
Imagery Date: 9/6/2012


11/3/2011
~120 KCFS
Image USDA Farm Service Agency
Imagery Date: 9/25/2011

Flow fluctuations Constraints



Outcomes and Compliance

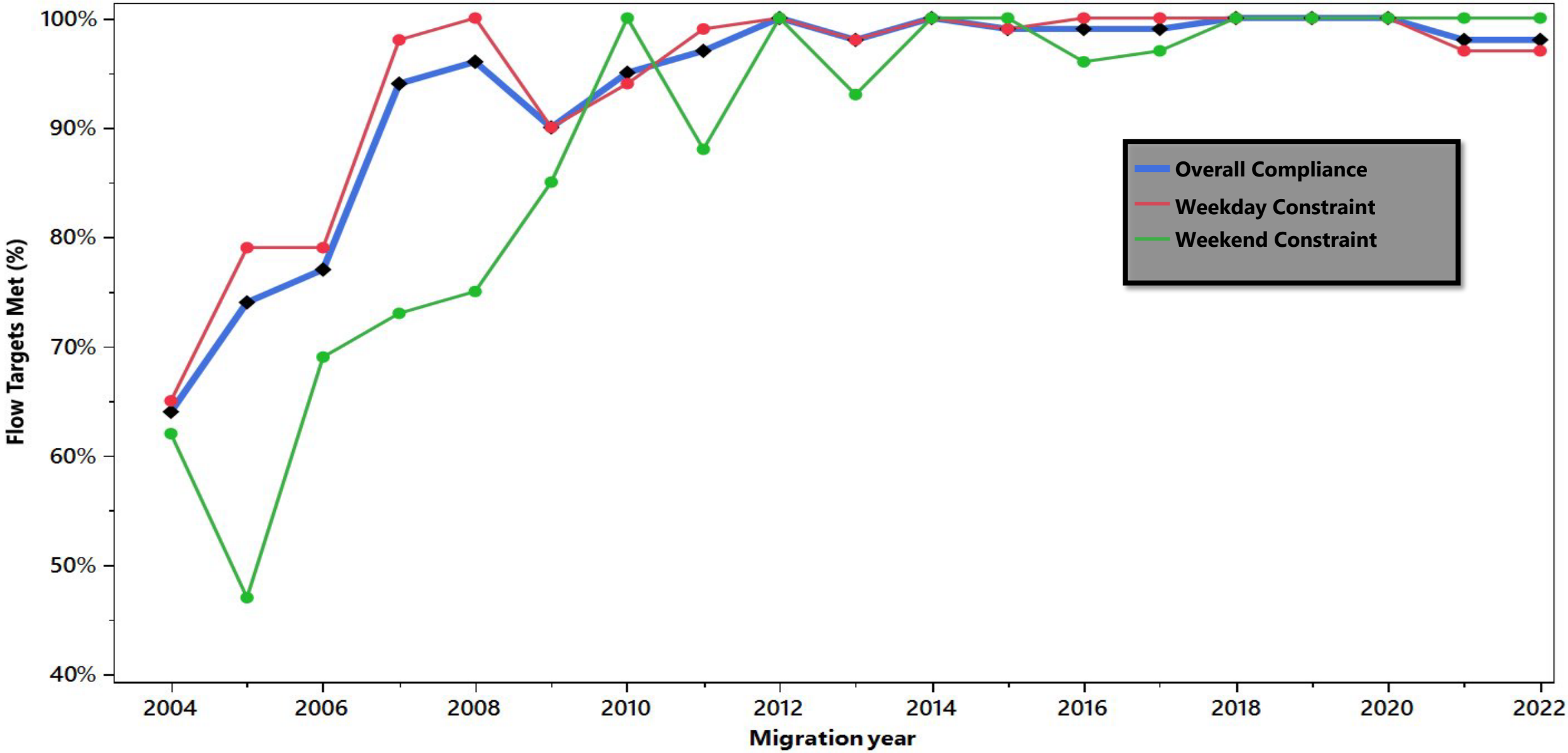


Compliance Learning Curve

Summary of constraints and performance during the Emergence and Rearing Periods under the HRFCPPA, 2004-present.

Migration year	Weekday Constraint		Weekend Constraint		Combined			CJAD II weekends – difference between minimum discharge and constraints (kcfs)			
	Targets	Met	Targets	Met	Targets	Met	%	1	2	3	4
2022	77	75	20	20	97	95	98%	3.5	2.9	26.6	20.4
2021	70	68	30	30	100	98	98%	0.3	2.6	24.9	3.4
2020	68	68	26	26	94	94	100.0	13.1	1.0	1.7	24.1
2019	69	69	27	27	95	95	100.0	19.4	1.4	32.6	17.2
2018	61	61	24	24	85	85	100.0	5.4	27.1	128.6	3.6
2017	72	72	30	29	102	101	99.0	28.2	25.3	1.1	6.5
2016	68	68	28	27	96	97	99.0	1.1	49.8	-4.0	3.0
2015	70	69	28	28	98	97	99.0	1.1	3.2	7.6	10.3
2014	64	64	25	25	89	89	100.0	4.6	6.0	20.1	21.9
2013	65	64	14	13	79	77	97.5	10.9	36.4	4.5	-27.0
2012	72	72	15	15	87	87	100.0				
2011	81	80	17	15	98	95	96.9				
2010	72	68	14	14	86	82	95.3				
2009	63	57	13	11	76	68	89.5				
2008	57	57	12	9	69	66	95.7				
2007	56	55	11	8	67	63	94.0				
2006	84	66	16	11	100	77	77.0				
2005	76	60	15	7	91	67	73.6				
2004	60	39	13	8	73	47	64.4				
Mean	68.3	62.6	16.0	13.6	84.4	76.2	90.2				

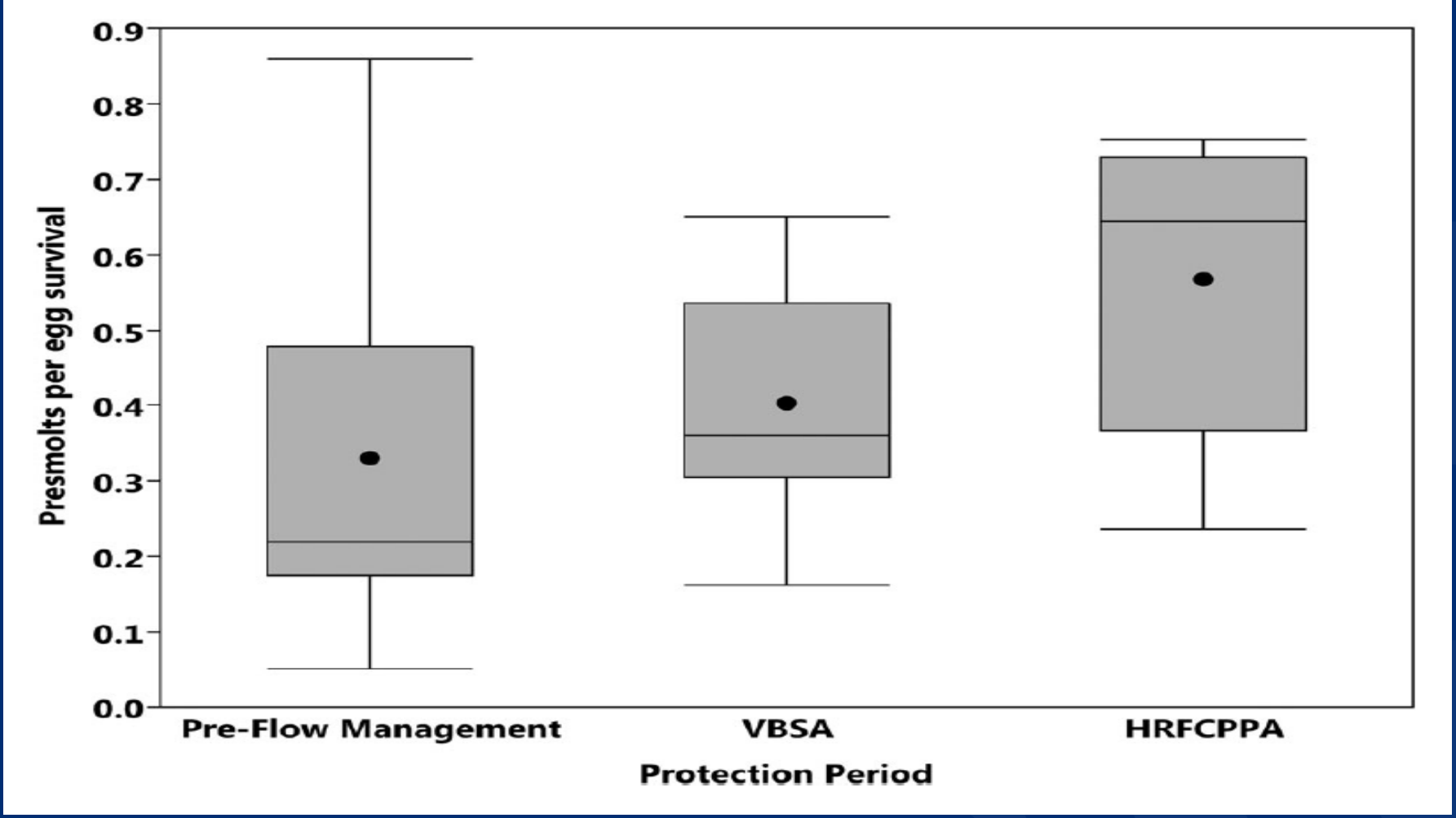
Compliance Learning Curve



Published Results on HRFCPPA

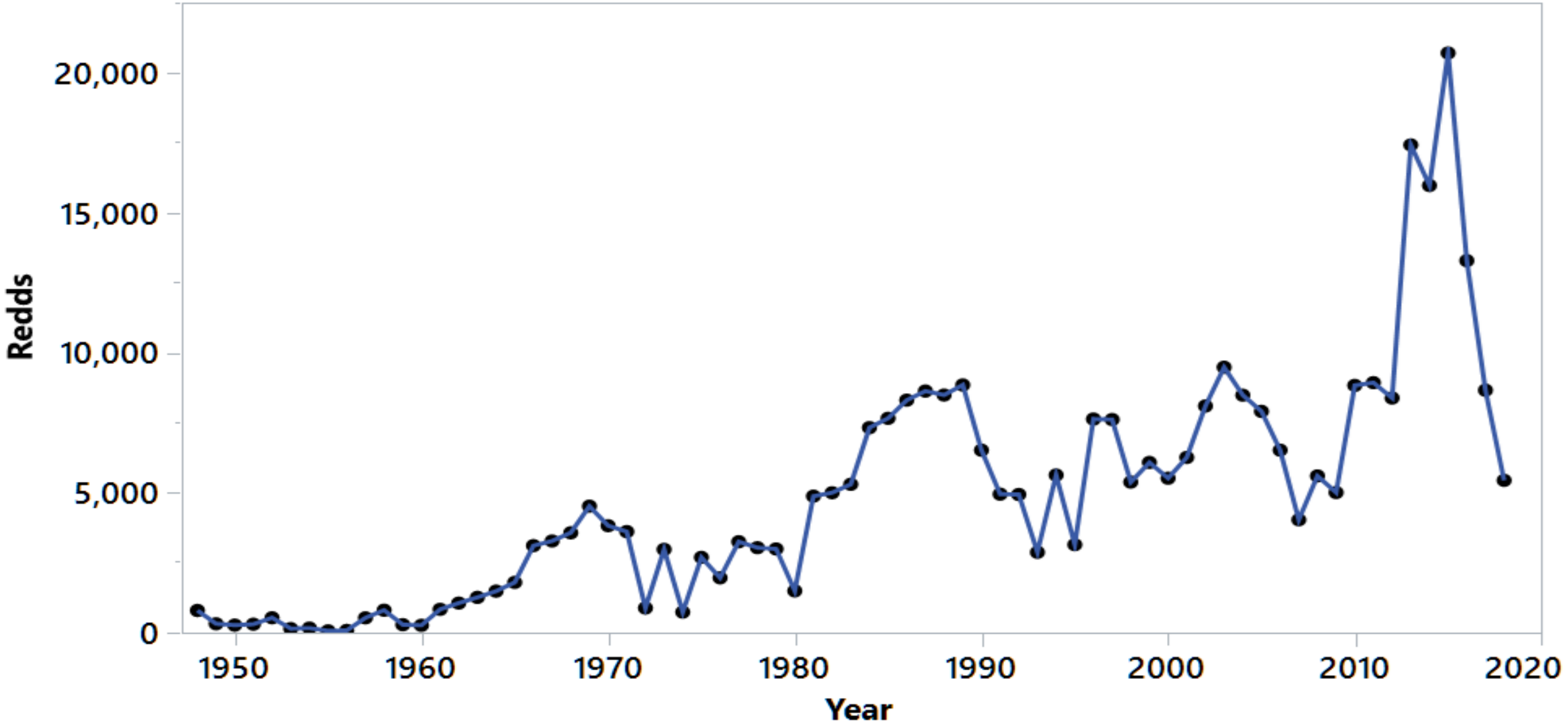
"Our results indicate that altering the timing and magnitude of discharge fluctuations can minimize the adverse effects of operating hydroelectric dams on the productivity of downstream salmon populations."

-Harnish et al. (2013)

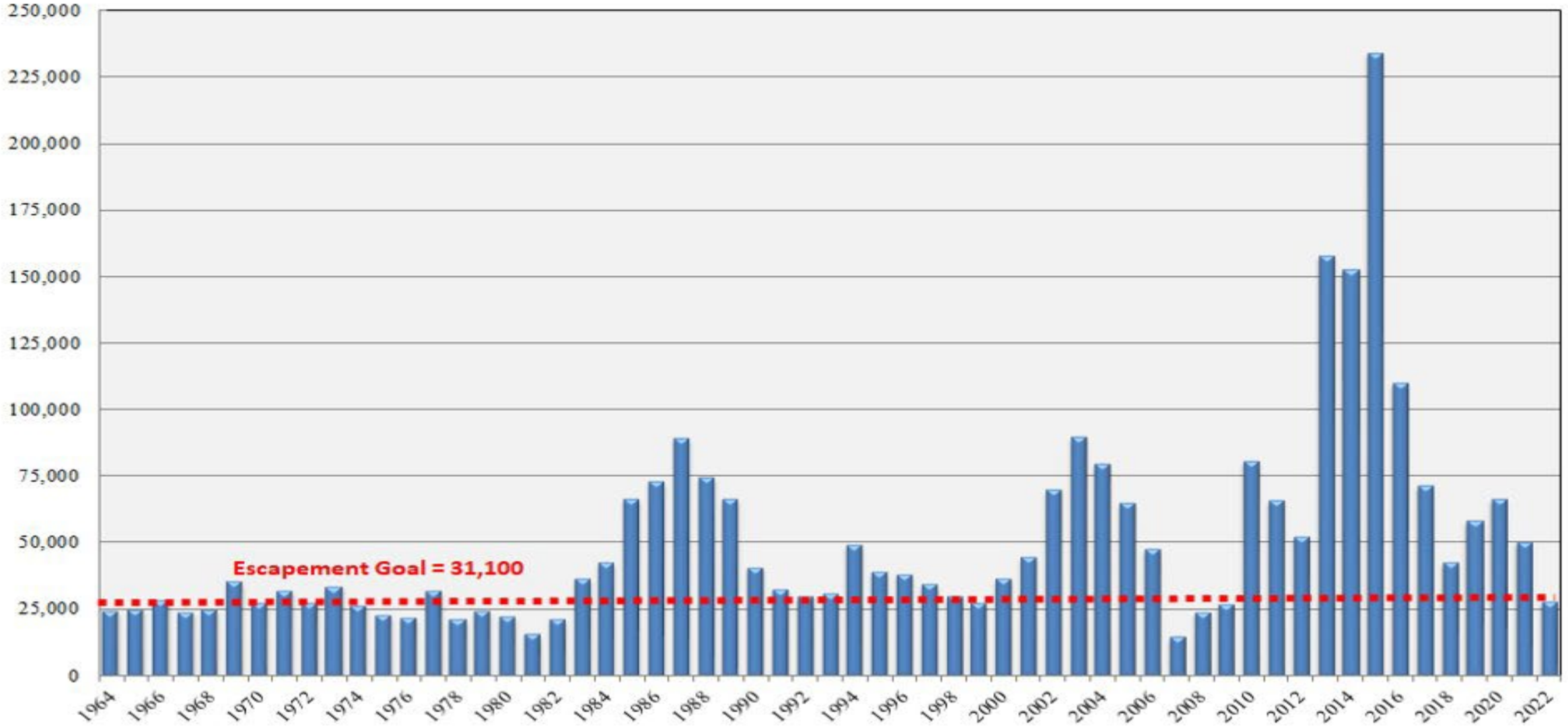


-Langshaw et al. (2018)

Redd Counts 1948-20XX

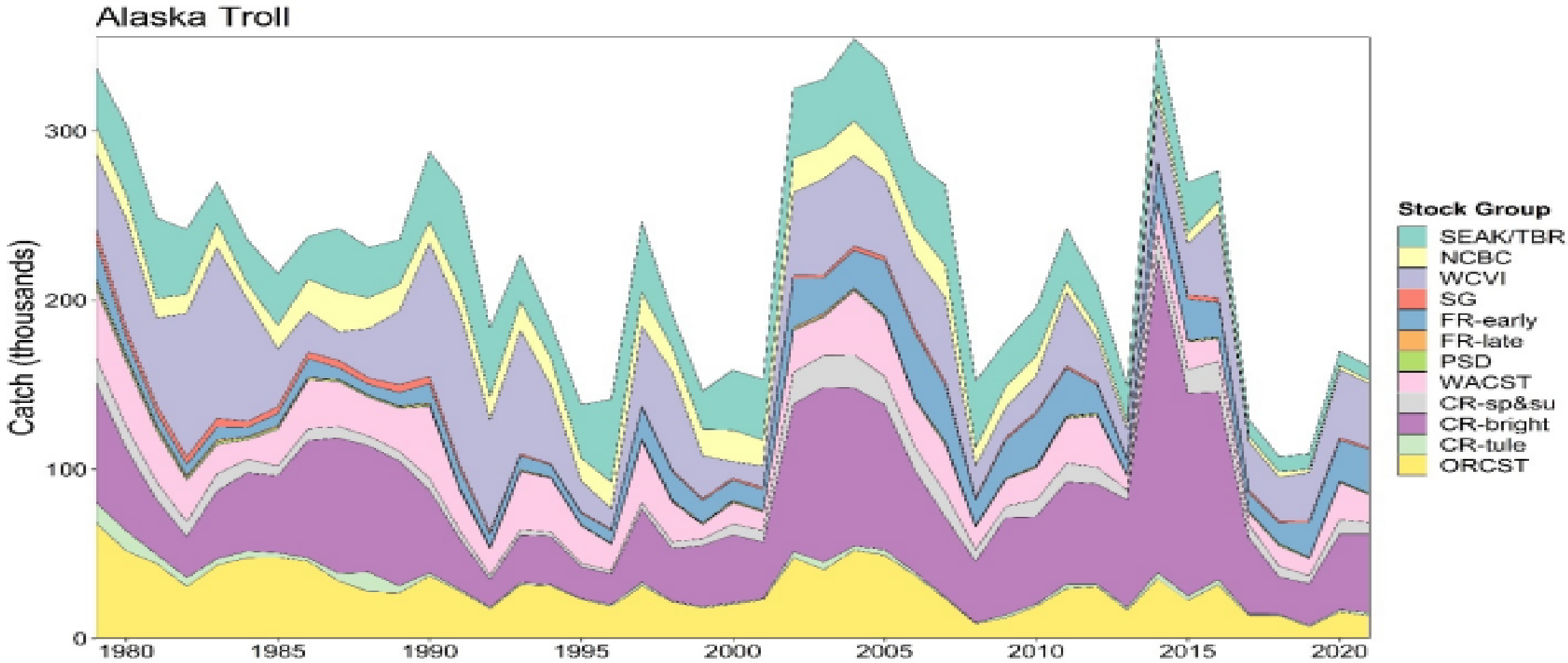


Achieving Escapement Goal



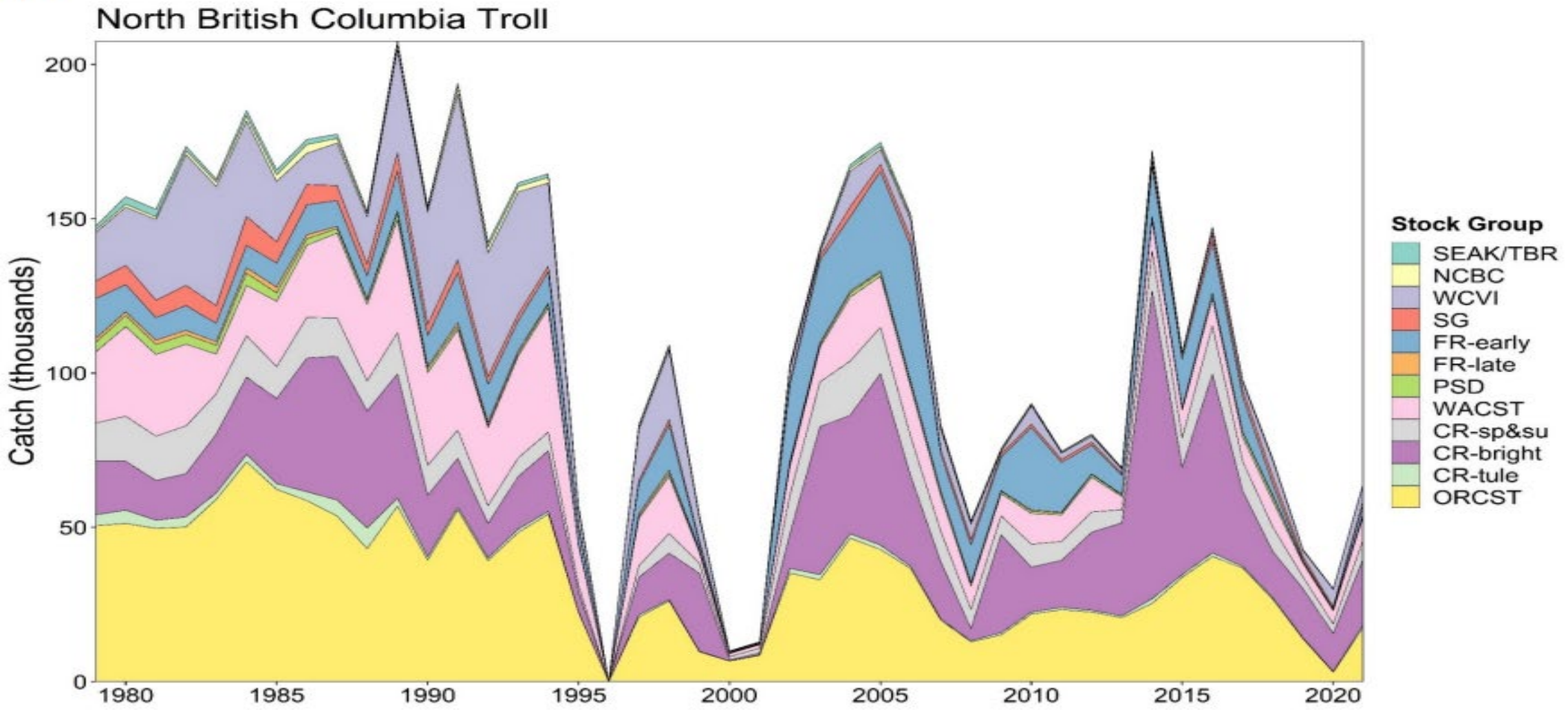
Contributing to harvest (1979-2021)

Appendix C1— Pacific Salmon Commission Chinook Model estimates of landed catch stock composition for Alaska troll with (upper) and without (lower) Alaska hatchery add-on and terminal exclusion, 1979–2021.



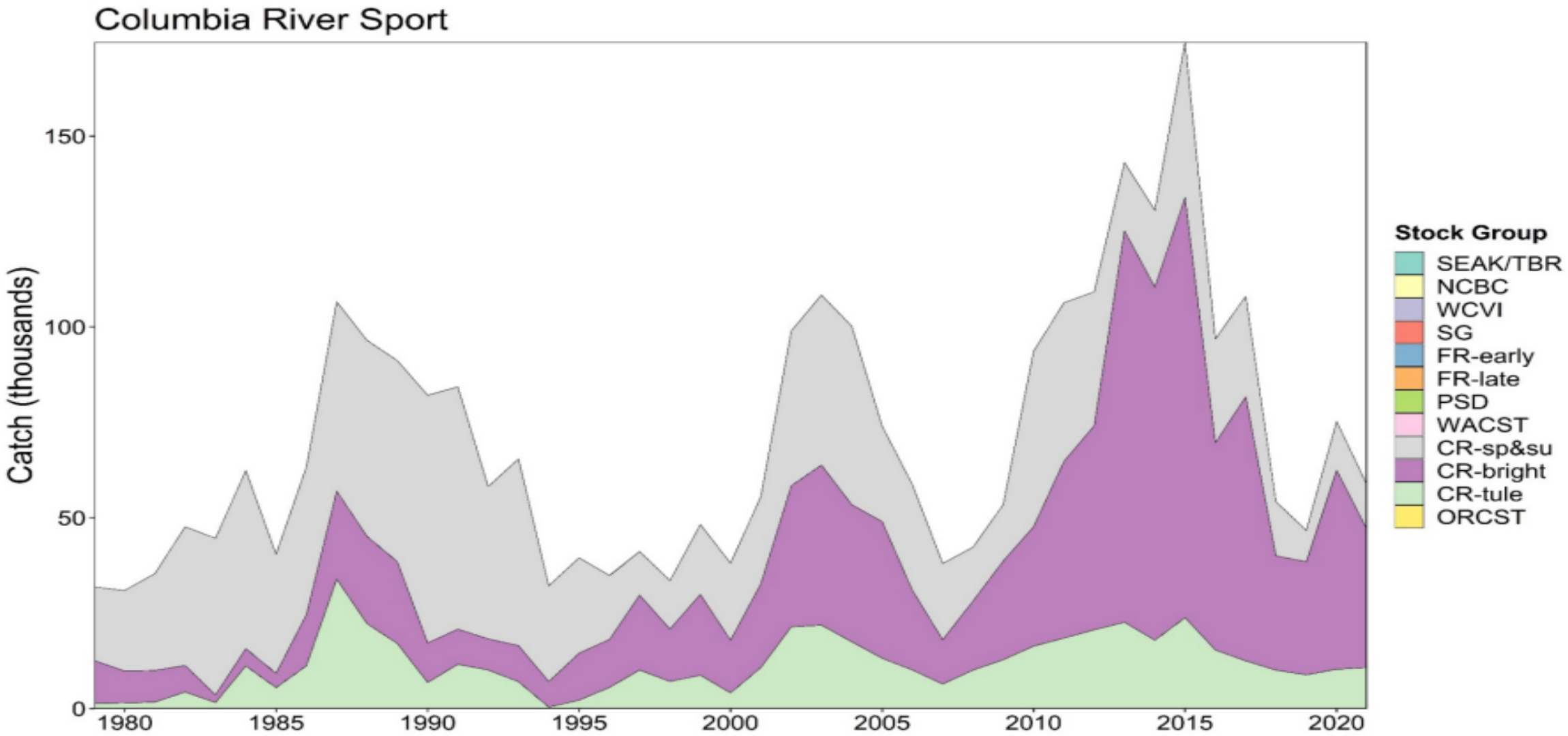
Contributing to harvest (1979-2021)

Appendix C3— Pacific Salmon Commission Chinook Model estimates of landed catch stock composition for North British Columbia Troll, 1979–2021.



Contributing to harvest (1979-2021)

Appendix C39— Pacific Salmon Commission Chinook Model estimates of landed catch stock composition for Columbia River Sport, 1979–2021.



Conclusions

- **HRFCPP is extremely successful and is a model of what can be accomplished when stakeholders work towards a balanced approach.**
- **Active Coordination and Collaboration is the key for continued success.**
- **HRFCPP has improved production in the Hanford Reach and substantially contributes to harvest.**


Questions?