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December 6, 2022

MEMORANDUM

TO: Council Members

FROM: Patty O'Toole, Fish and Wildlife Division Director

SUBJECT: Overview and Update of Syilx (Sockeye) Salmon Restoration in the Okanagan Basin

BACKGROUND:

Presenter: Casey Baldwin, Sr. Research Scientist, Colville Confederated Tribes
Chris Fisher, Principal Biologist, Colville Confederated Tribes
Ryan Benson, Fisheries Biologist and Skaha Lake Sockeye Reintroduction Program Coordinator, Okanagan Nation Alliance, Fisheries Department

Summary: The Council will hear a presentation on Okanagan Basin sockeye salmon from representatives of the Colville Confederated Tribes and the Okanagan Nation Alliance. The presentation will include an overview and update on restoration activities.

Relevance: Efforts to restore Okanagan basin sockeye are showing promising results against a backdrop of caution regarding changing climate conditions.

Workplan: Program Planning and Policy: A. Coordination of regional information.

Background:

The Columbia River sockeye population, of which the Okanogan stock is a part, may have numbered more than 4 million fish around the end of the 20th century (Fryer, 1995). Only the Okanogan stock and the Wenatchee stock in Washington State remain from the many sockeye populations which existed in the Columbia River Basin historically.

A transboundary multi-agency workshop occurred in November of 1997 to discuss the potential risks and benefits of reintroducing sockeye salmon into Okanogan Lake. These discussions were summarized into a Draft Action Plan that recommended that sockeye be re-introduced to Skaha Lake as an experimental management strategy to resolve some of these uncertainties (Peters et al. 1998).

The Council has recommended funding for projects associated with Okanogan River sockeye salmon. One project was an assessment of the risks associated with disease and exotic species passage, as well as an assessment of habitat potential. The other project was to support passage efforts at McIntyre Dam.

Beginning in 2000, the Colville Tribes in a joint effort with the Okanogan Nation Alliance (ONA), submitted a project proposal (Project #2000-013-00, Evaluate an Experimental Re-introduction of Sockeye Salmon into Skaha Lake) to the Council and Bonneville Power Administration. This project successfully secured funds and evaluated the risks associated with extending the range of anadromous salmonids, specifically sockeye, into their historical habitat in Skaha Lake. The assessment concluded that risks associated with extending the range of sockeye salmon were nominal, and that sockeye reintroduction into Skaha Lake should be pursued in an adaptive management experiment.

In the spring of 2004, fry were released into Skaha Lake beginning the process of reintroducing sockeye into their historic range. Consequently, fisheries managers have agreed that passage by anadromous fish at McIntyre Dam (downstream of Skaha Lake) should be pursued, allowing adult of sockeye salmon, Chinook salmon and steelhead to migrate in the Okanogan River, to the outlet dam at Skaha Lake. In 2006, the NPCC recommended funding for a project to investigate several fish passage options, including laddering, bypassing, or removal of McIntyre Dam (Project #2006-001-00, *McIntyre Dam – Feasibility study*). A 2006 Review by the ISRP found the Skaha Lake work “..important and... should be given highest possible priority for funding as the project will likely have highly significant benefits to fish and wildlife that will persist.”

In 2008 the Council supported a project sponsored the Columbia River Intertribal Fish Commission intended to understand the factors limiting production of Okanogan and Wenatchee sockeye salmon stocks¹.

Today funding for restoration is largely from Grant, Chelan, and Douglas Public Utility Districts, along with the Canadian Department of Ocean and Fisheries, and occasionally others.

At the December Council meeting, Council members will hear a presentation on Okanogan Basin sockeye salmon from representatives of the Colville Confederated Tribes and the Okanangan Nation Alliance. The presentation will include an overview and update on restoration activities.

More Info: <https://www.nwcouncil.org/fish-and-wildlife/topics/sockeye/>

¹ Project #2008-503-00, *Studies into Factors Limiting the Abundance of Okanogan and Wenatchee Sockeye Salmon*

SOCKEYE SALMON STATUS, CHALLENGES AND MANAGEMENT IN THE OKANAGAN RIVER BASIN

**NORTHWEST POWER PLANNING AND CONSERVATION COUNCIL
DECEMBER 14, 2022**

Kirk Truscott, Casey Baldwin and Chris Fisher
Colville Confederated Tribes



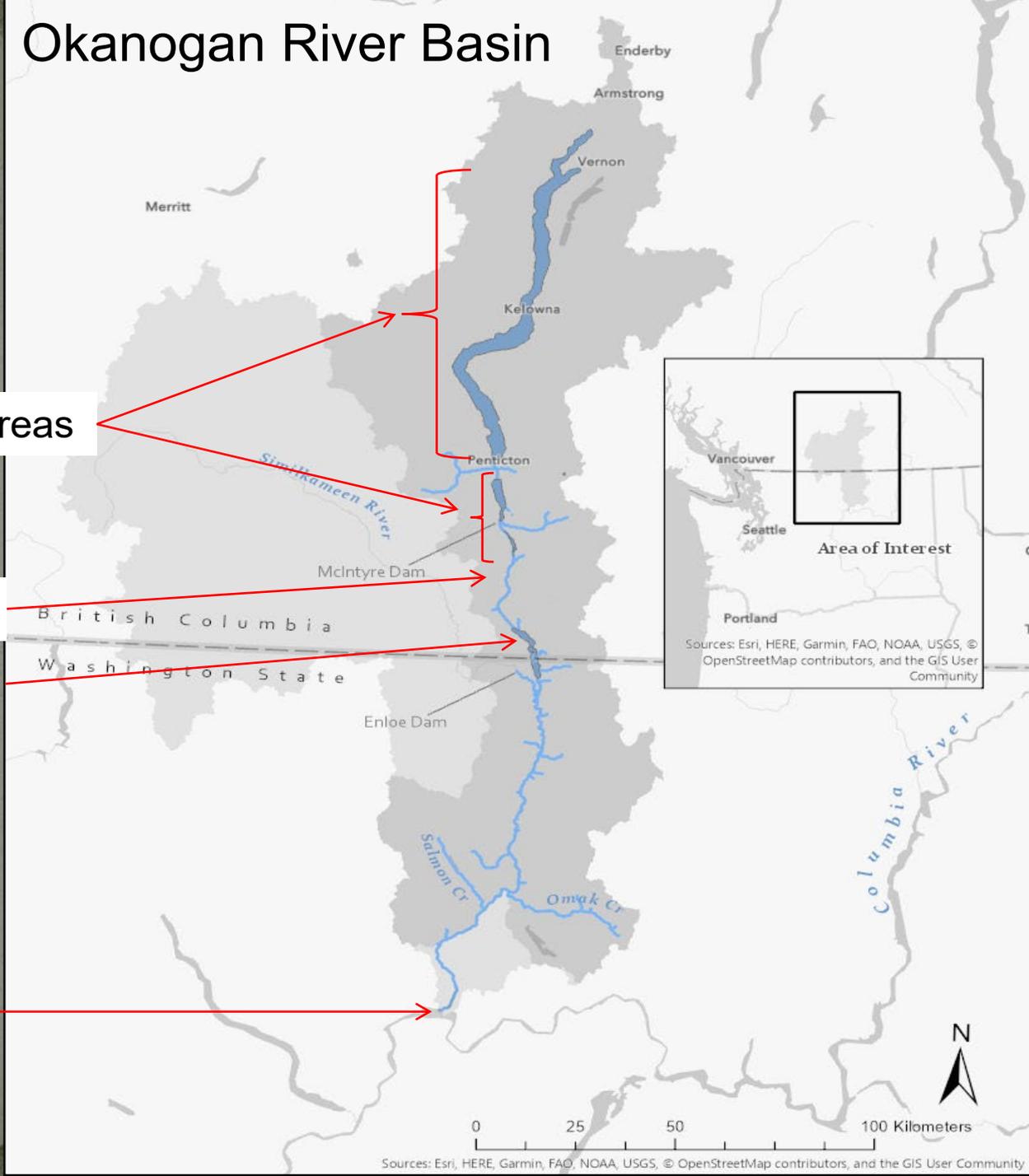
Okanogon River Basin

More recent, reintroduction areas

Natural spawning reach

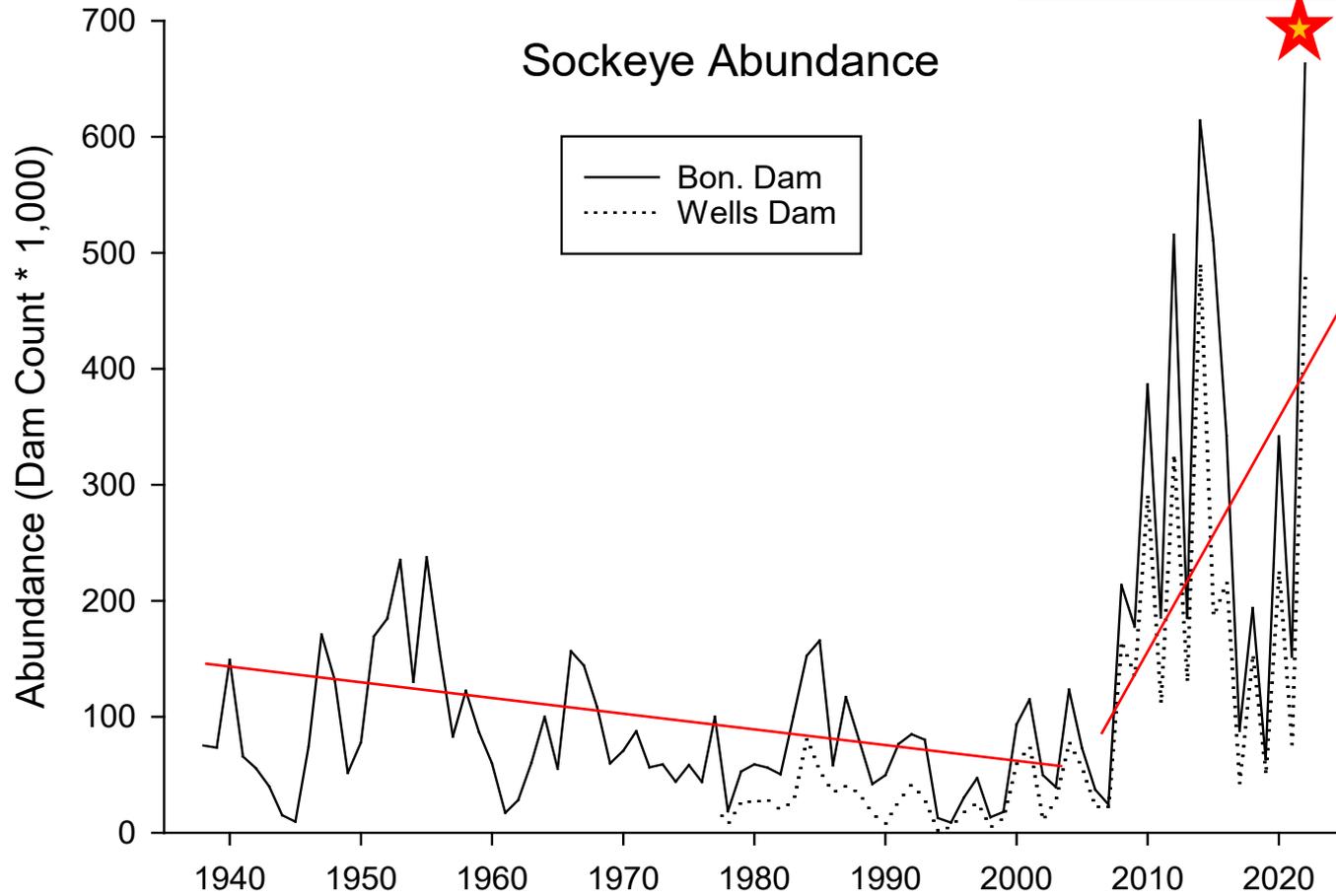
Osoyoos Lake rearing

Okanogon confluence



Columbia River Sockeye

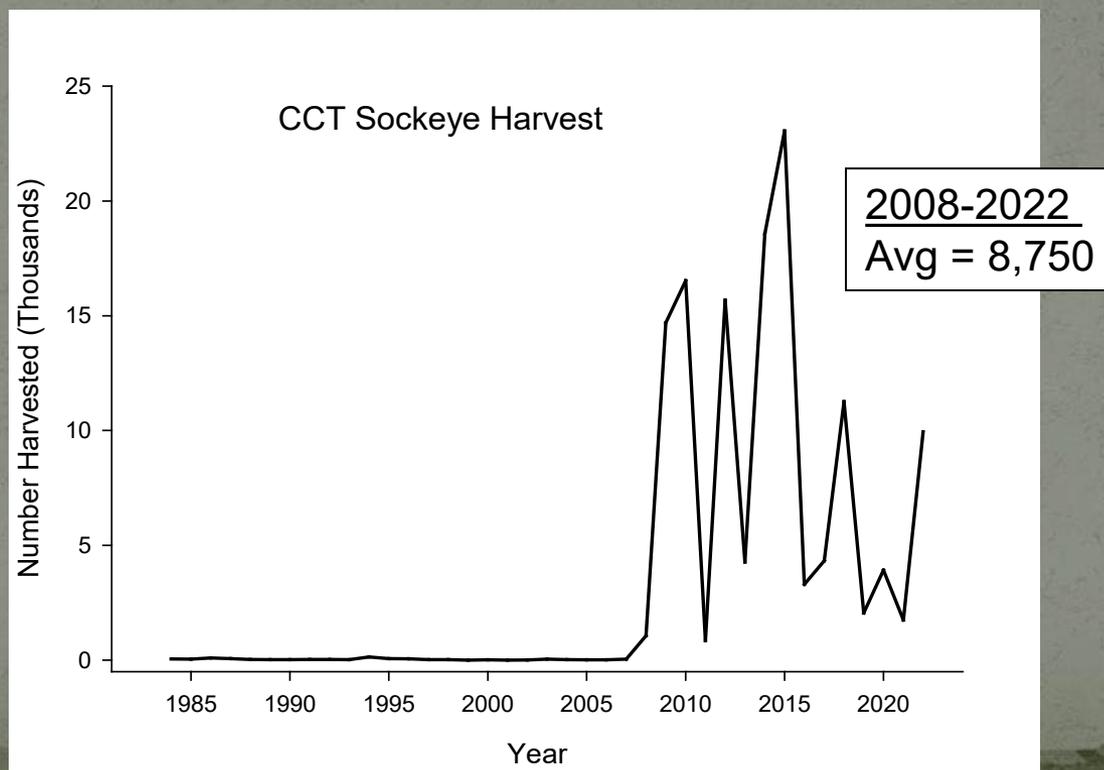
1999-2021
80% Okanogan
20% Wenatchee
<1% other



Avg/yr = 65,000 310,000

Harvest/Reintroduction/Broodstock

- ~15% harvest rate in the U.S. Columbia
 - Very little ocean harvest
 - Zone 6 treaty fisheries constrained by Snake R. ESA
 - Very popular sport fishery above PRD
 - Very important C&S fishery for Colville Tribe

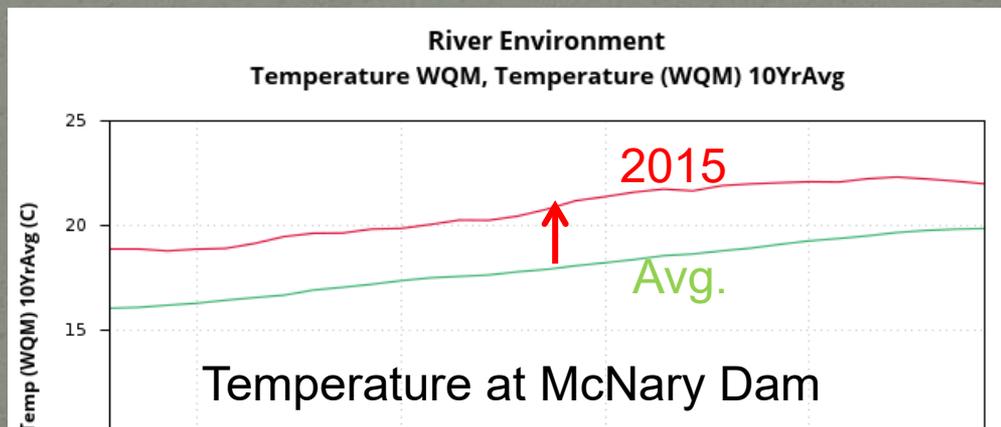


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- Canadian Harvest
 - Tribal and sport
- Yakama/Cle Elum Reintro. (up to 10,000 /yr since 2009)
- Penticton Hatchery Brood (<5,000)

Adult Migration Challenges

- Fish ladders (slight delay, energy, temperature)
- Temperature in the Columbia (2015)
 - Normally the survival is >90% to Wells Dam
 - 2015 the survival was 37% to Wells Dam
 - ~3% of Okanogan Sockeye at Bon. Dam survived to spawn



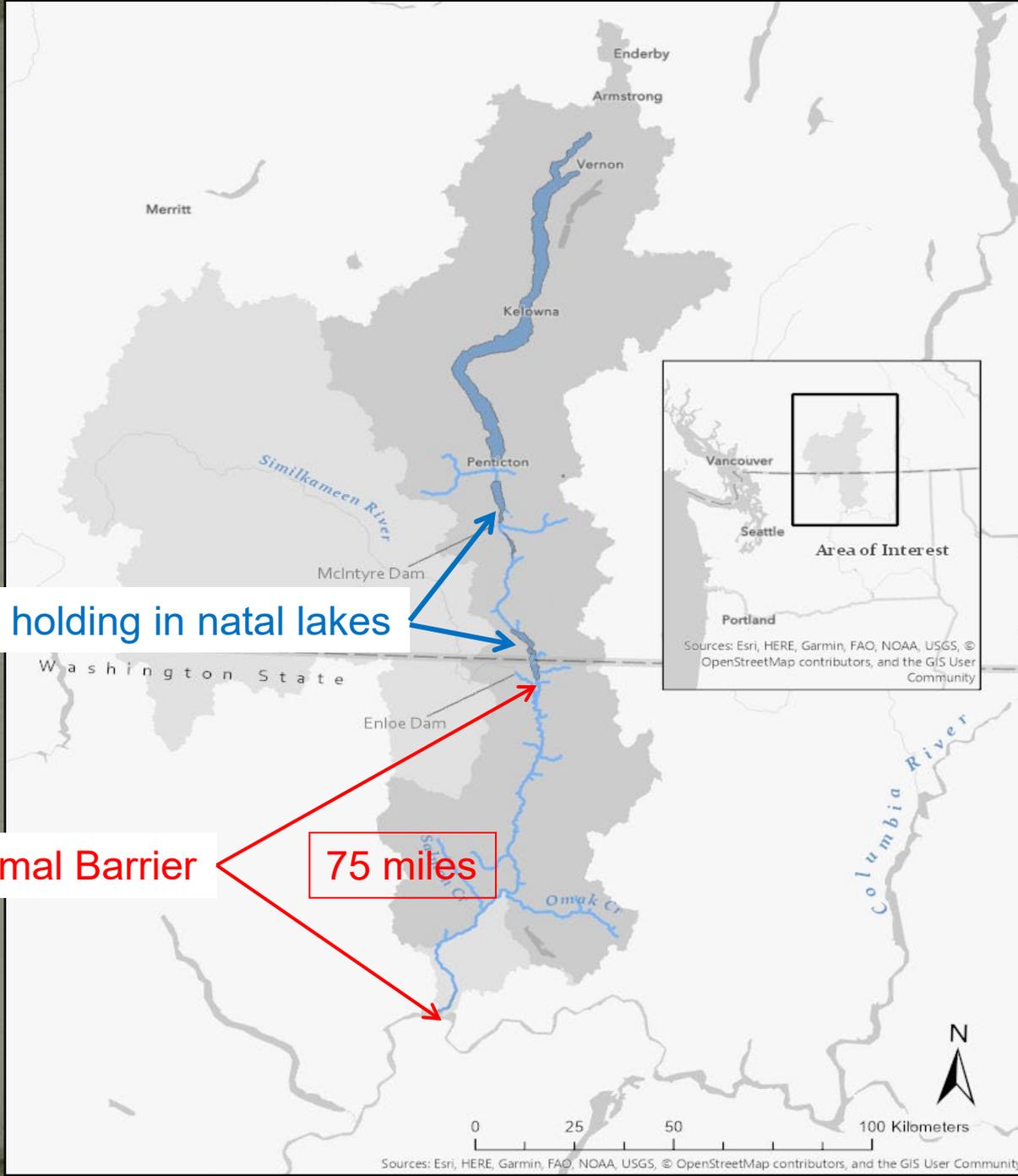
Mid June to Mid July,
Mean Difference
= 2.7 °C (~5 °F)

If 2015 becomes the new normal under climate change.....sockeye are in trouble!

Adult Migration Challenges

- Temperature in the Okanogan (most years)
 - Exceeds 22 °C (72 °F) in early July
 - Halts migration and forces holding in the Columbia R. at the Okan. Confluence.
 - Mortality is highly variable, but generally 30-40% (excluding harvest and brood collection)





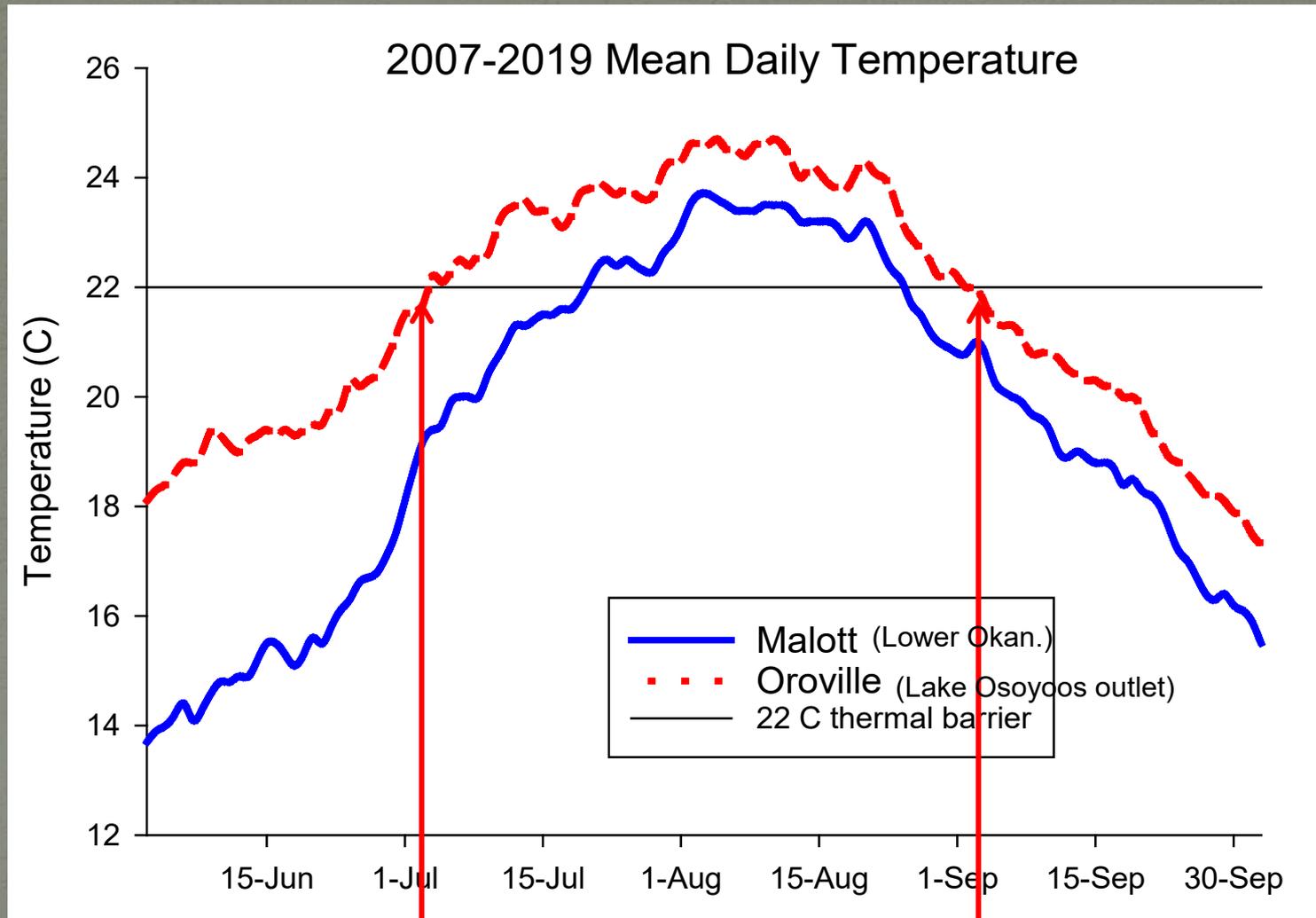
Pre-spawn holding in natal lakes

Thermal Barrier

75 miles

Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Thermal barrier in the Okanogan



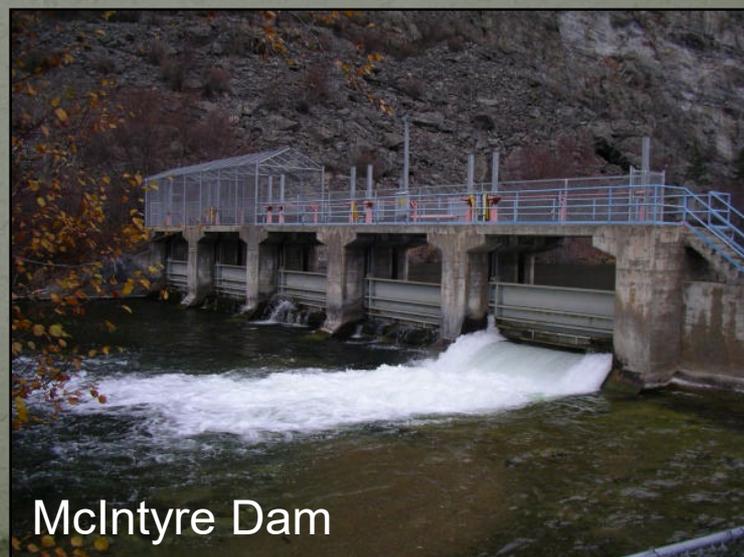
Generally 40-60 days of migration delay, or extreme stress.
If this gets much worse under future climate change then ???

In-basin Water Management and Habitat Actions that contribute to increase sockeye salmon in Okanagan River Basin

- Fish water management tool
- Gate conversion at McIntyre Dam
- Activation of Fishway at Skaha Lake Dam
- Construction of spawning platforms within channelize reach



Okanagan Lake



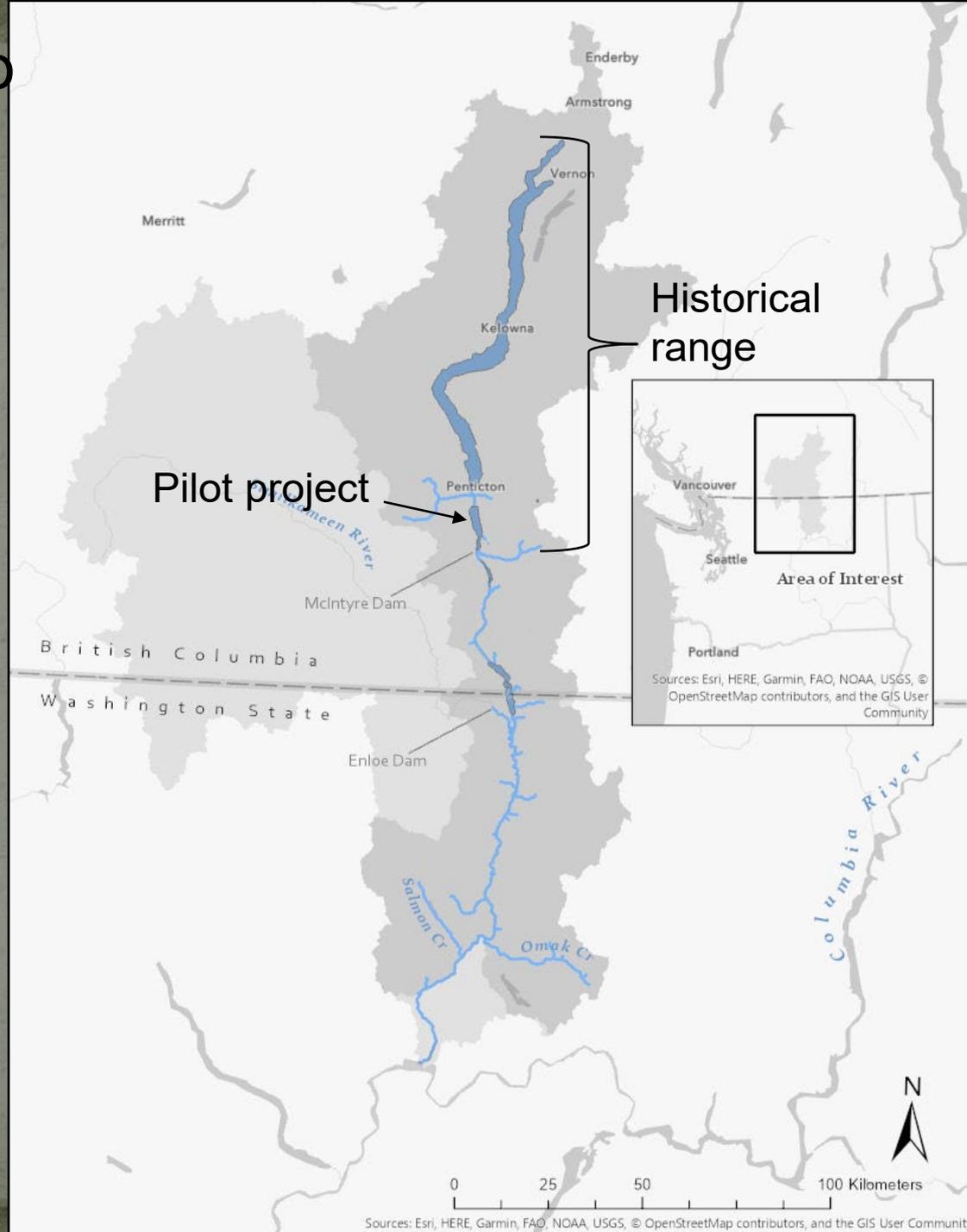
McIntyre Dam

Reestablish sockeye to historical range (Okanagan Lake)
Okanagan Nation Alliance ~ 1997

Project development:

- Included a multi-agency workshop
- Department of Fisheries & Ocean
 - Provincial Government
 - Okanagan Nation Alliance
 - Colville Confederated Tribes

Skaha Lake selected as a pilot project site.

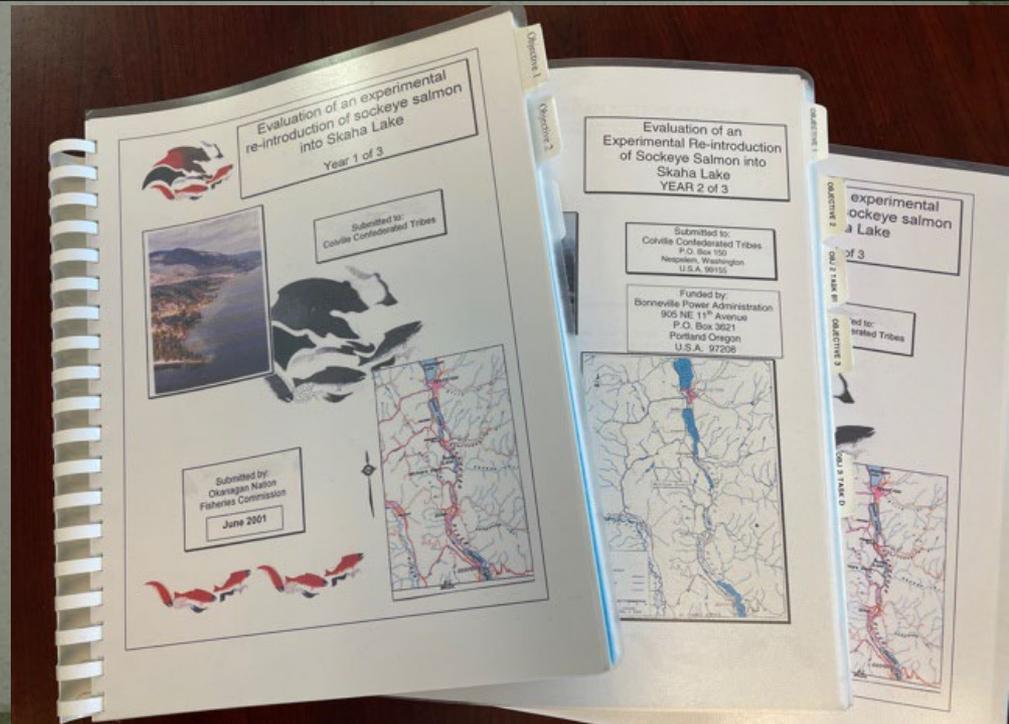




Risk assessment - 3 years (2000-2002)*

- 1) Disease risk assessment
- 2) Habitat assessment
- 3) Exotic species risk assessment
- 4) Develop Life-cycle model

* Funded by Bonneville Power Administration



Results of Risk Assessment

- 1) Disease risk assessment - low risk (pathogen was present in Skaha Lake or not found downriver of McIntyre Dam)
- 2) Habitat assessment - spawning limited, rearing measurable increase
- 3) Exotic species risk assessment - low risk
- 4) Develop Life-cycle model - similar rearing capacity to existing habitat but more habitat (Skaha Lake)



Fish tissue sampling

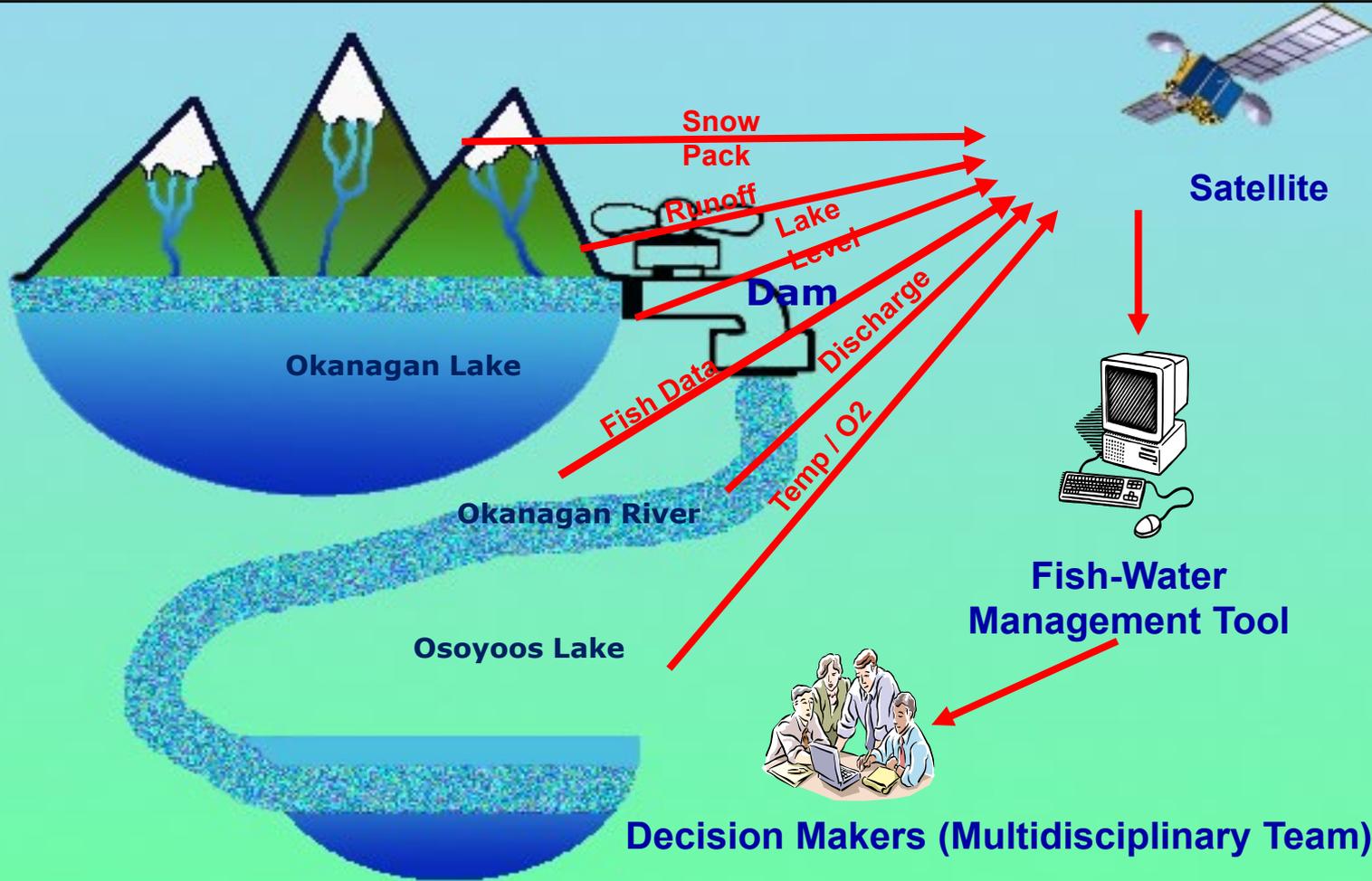


Seining for exotic fish



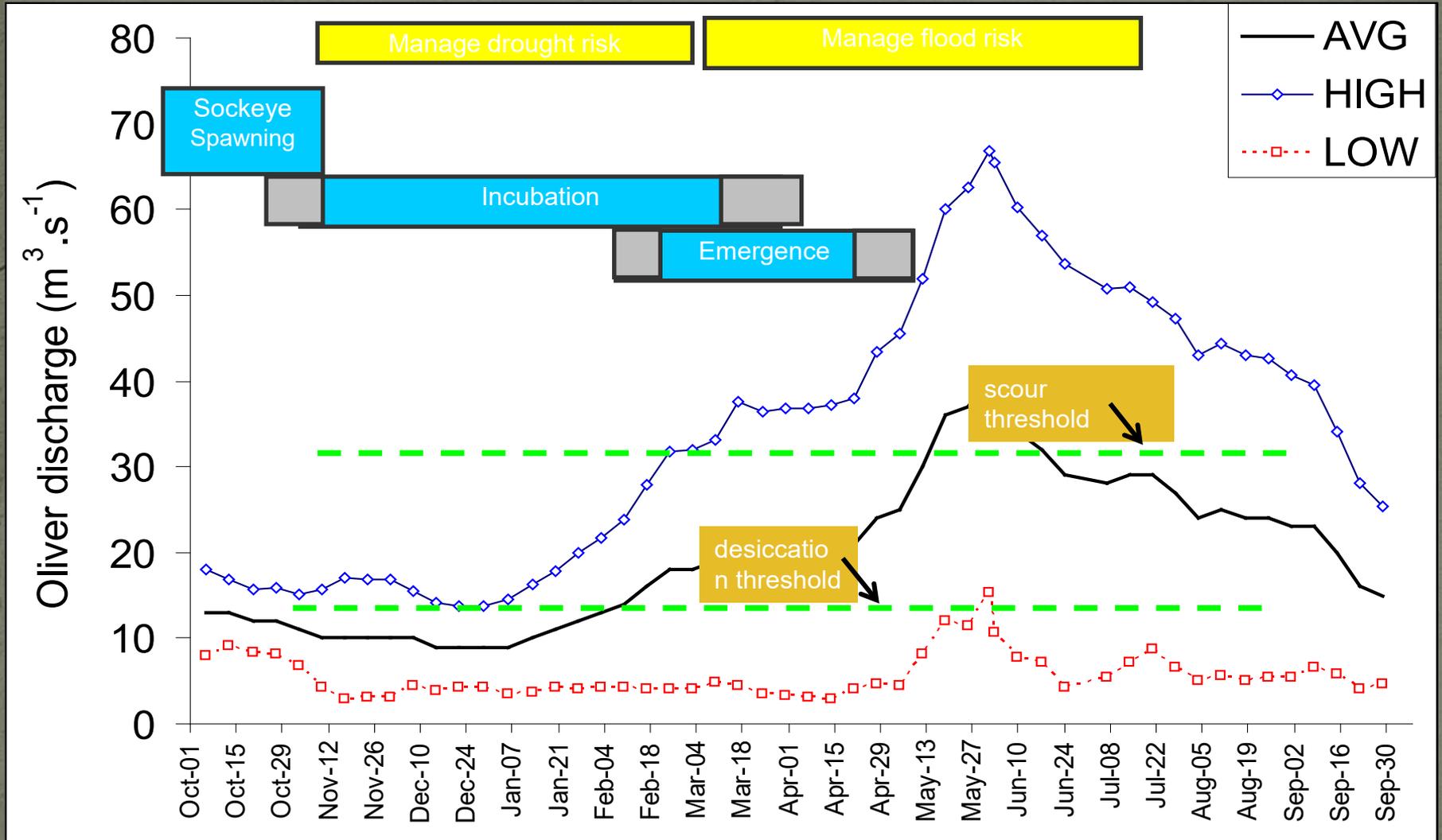
Spawning habitat assessment

OKANAGAN FISH & WATER MANAGEMENT TOOL

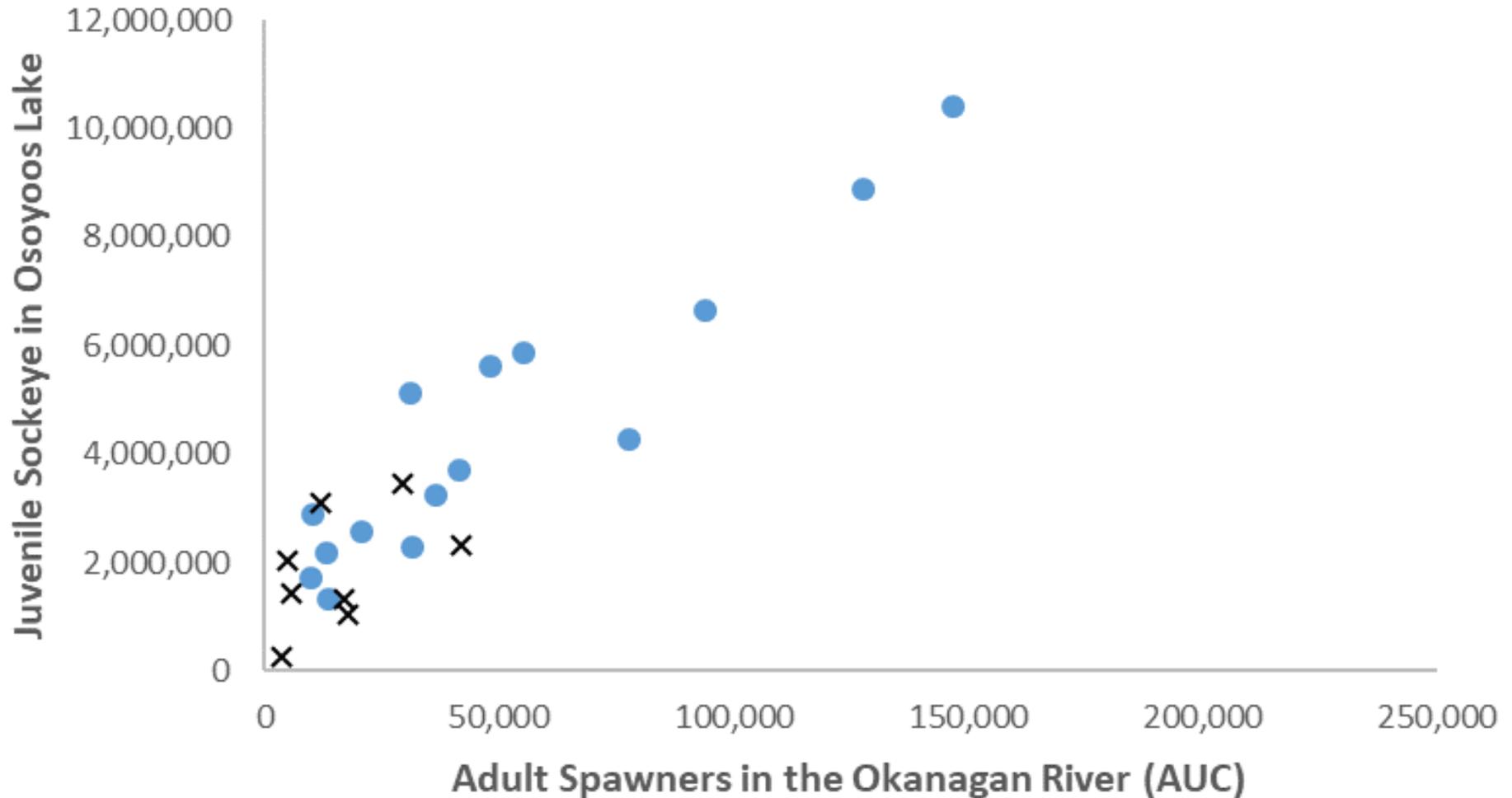


Adapted from presentation by Brian Symonds, Adaptive Management for Large-scale Water Infrastructure, New Orleans, LA, 26 July 2018

Life history, snowpack & natural variations determine whether fish and water managers satisfy competing objectives

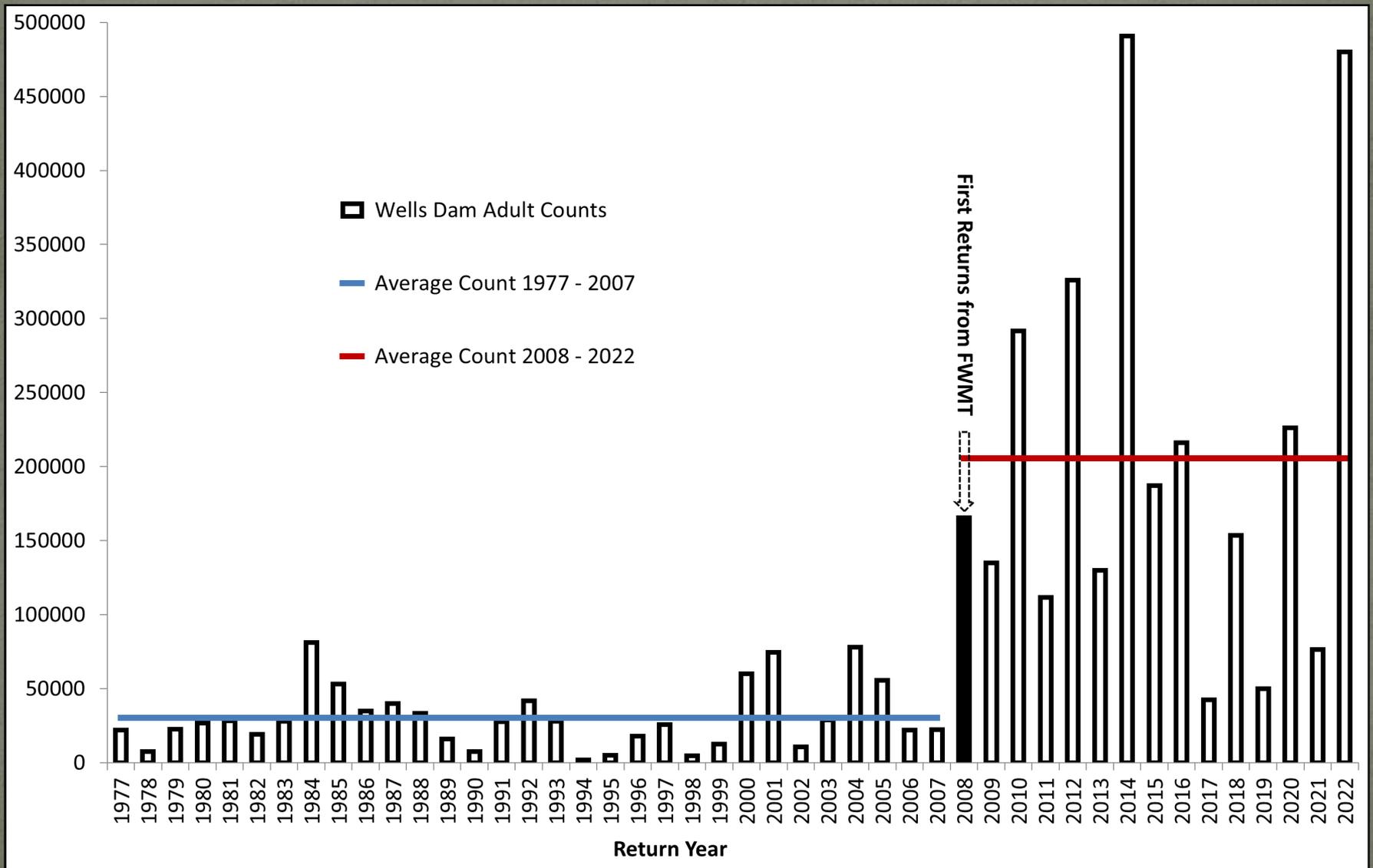


Minimizing density-independent losses from redd scour and desiccation events improves juvenile production



Black Xs are pre-FWMT brood years (1996-2002)
Blue circles are FWMT brood years (2003-2020)

Annual Sockeye Passage at Wells Dam, 1977 - 2022



McIntyre Dam



08.06.2008 16:14

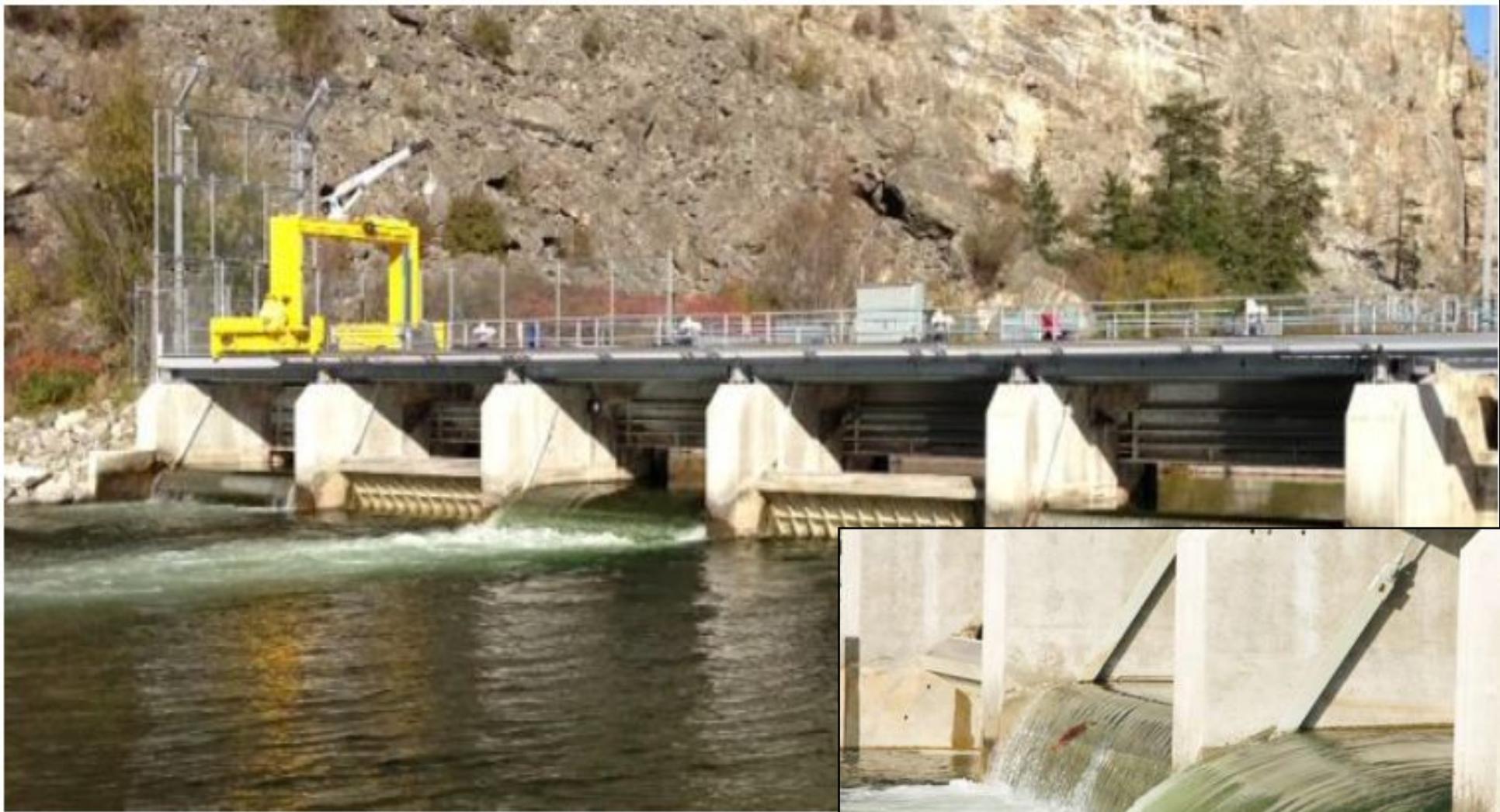
Overshot Gate components



Riffle construction – increase pool depth

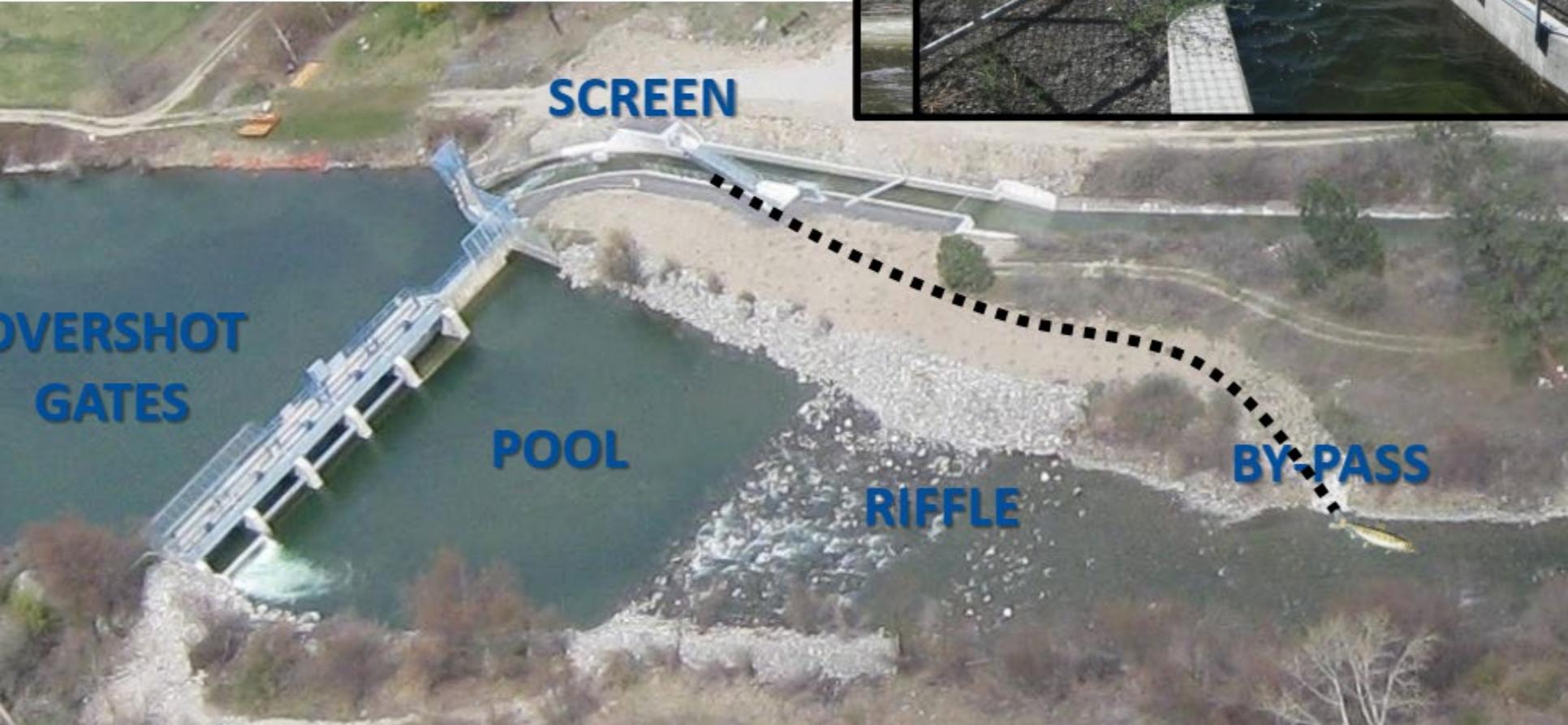


McIntyre Dam – overshot gates



Providing passage at McIntyre Dam:

- a) 11 km – Okanagan River
- b) Shuttleworth Creek
- c) To Skaha Lake





Skaha Lake

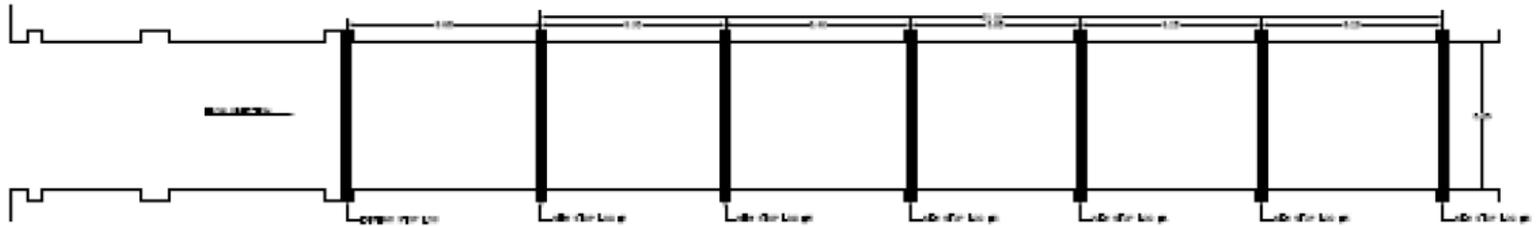
Fishway



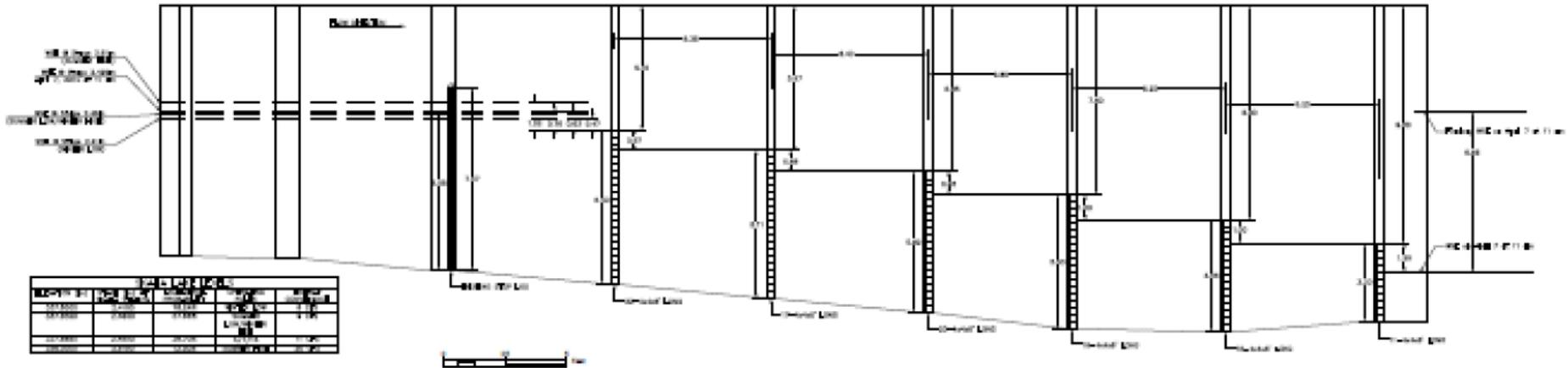
WATER TREATMENT PLANT



PLAN VIEW — FISHWAY



PROFILE VIEW — FISHWAY



NOTE 1: ALL DIMENSIONS IN METERS UNLESS OTHERWISE NOTED

NOTE 2: ORIENTED ROAD AS SHOWN BY THE MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS

NOTE 3: MINISTRY OF ENVIRONMENT (STATION COORDINATE HAS BEEN USED FOR REAL-TIME AND HISTORICAL OBSERVATIONS OF LAKE LEVELS

SKAHA DAM
FISHWAY DESIGN

Cowlitz Confederated Tribes
Fish & Wildlife Department
255 Mission Road
Omak, WA 98541



DESIGNED BY:	W. CORNWALL, P. ENG	5/9/14
DRAWN BY:	W. CORNWALL, P. ENG	5/9/14
CHECKED BY:		

REVISED:

1 of 2

Plan and Profile view of fishway design (as built in June 2014).

Cutting 4 x 4 posts to activate fishway at Skaha Lake Dam



Skaha Dam fishway – during construction





June 9, 2014:

**Skaha Lake becomes
accessible to salmon &
steelhead**

**Rearing habitat for sockeye
increase by 2.5X**

Penticton, BC – pre 1953

Okanagan Lake

Okanagan River

Skaha Lake



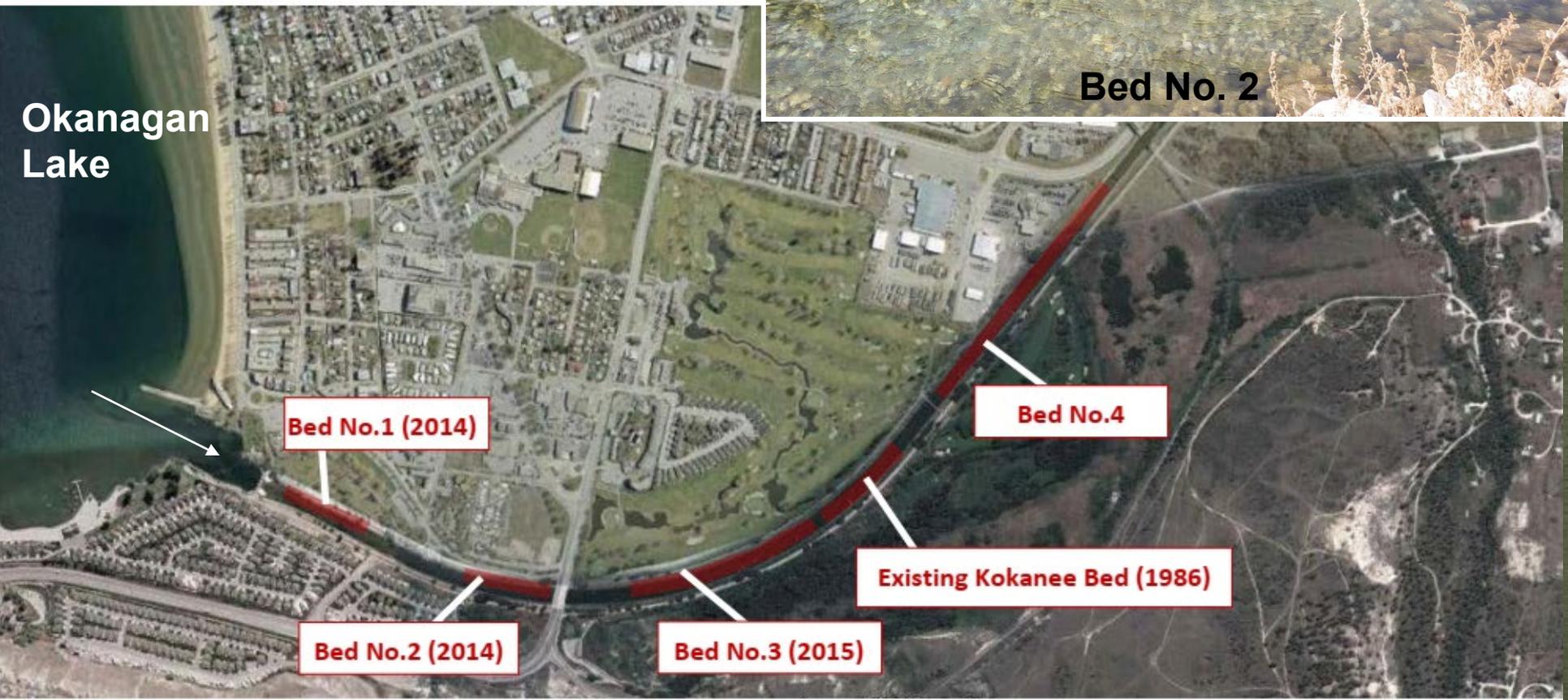
All four spawning platforms were supported by Priest Rapids Mitigation

Total spawning area: 17,640 m²

Redd density: 1 to 2.7 per m²



Bed No. 2



Okanagan Lake

Bed No.1 (2014)

Bed No.2 (2014)

Bed No.3 (2015)

Existing Kokanee Bed (1986)

Bed No.4

Okanogan Sockeye Status:

- A rare success story in Columbia River salmon recovery
- Healthy and harvestable, BUT
- Highly vulnerable and 'at risk'





Okanagan Basin Sockeye Salmon Reintroduction

Ryan Benson, ONA Fisheries Biologist & Skaha Lake Reintroduction Program
Coordinator
Northwest Power and Conservation Council – December 14, 2022

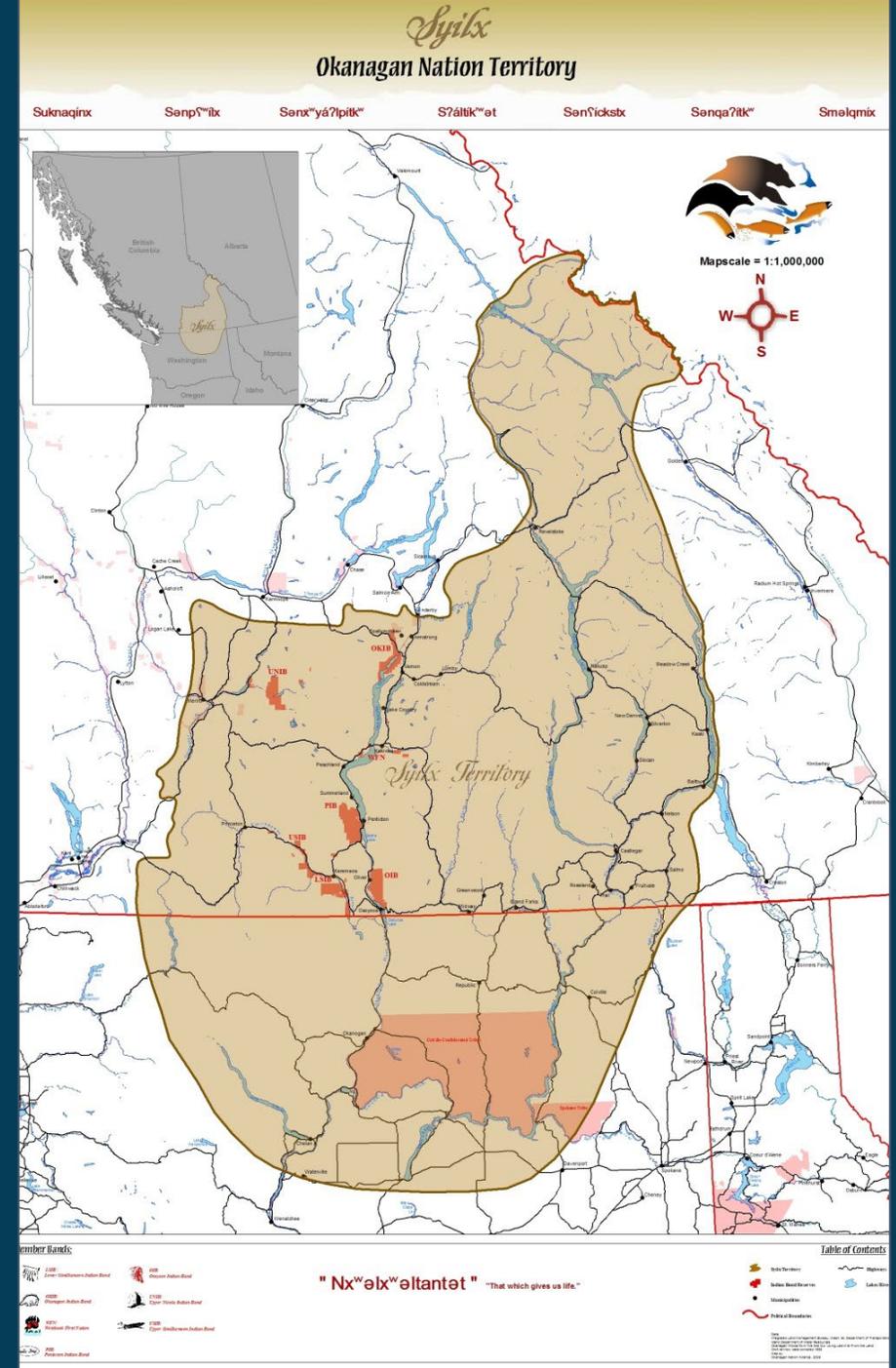


Okanagan Nation Alliance

Tribal Council with seven member band communities:

1. Osoyoos Indian Band
2. Penticton Indian Band
3. Westbank First Nation
4. Okanagan Indian Band
5. Upper Nicola Band
6. Lower Similkameen Band
7. Upper Similkameen Band

And the Colville Confederated Tribes (USA)



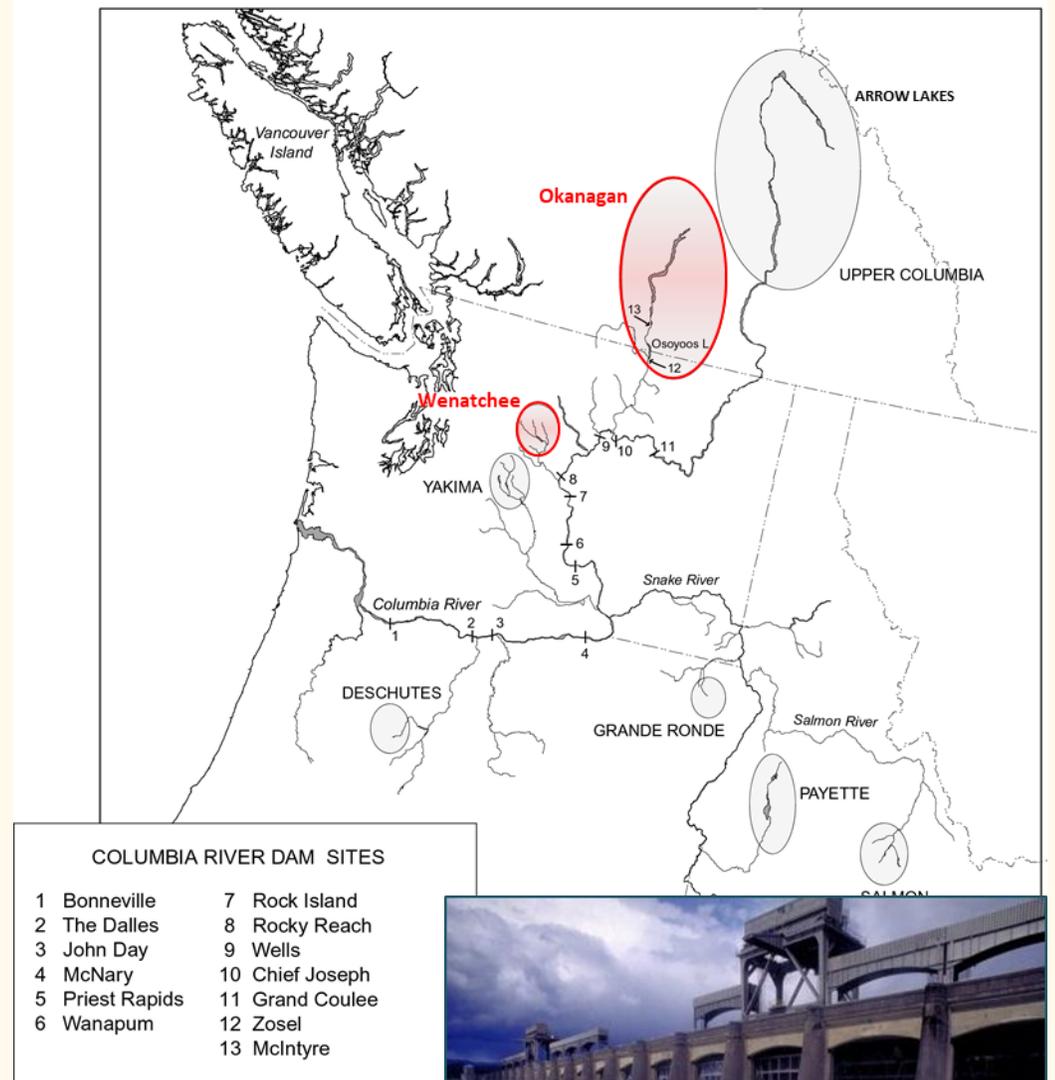


BACKGROUND

- Okanagan Sockeye population is one of two viable Columbia River stocks



-  Historically accessible to sockeye
-  Present day viable sockeye populations



1200 km and 9 major dams to get to Okanagan River



SALMON INTEGRAL TO OKANAGAN CULTURE



How Senk'lip Brought Salmon to the People

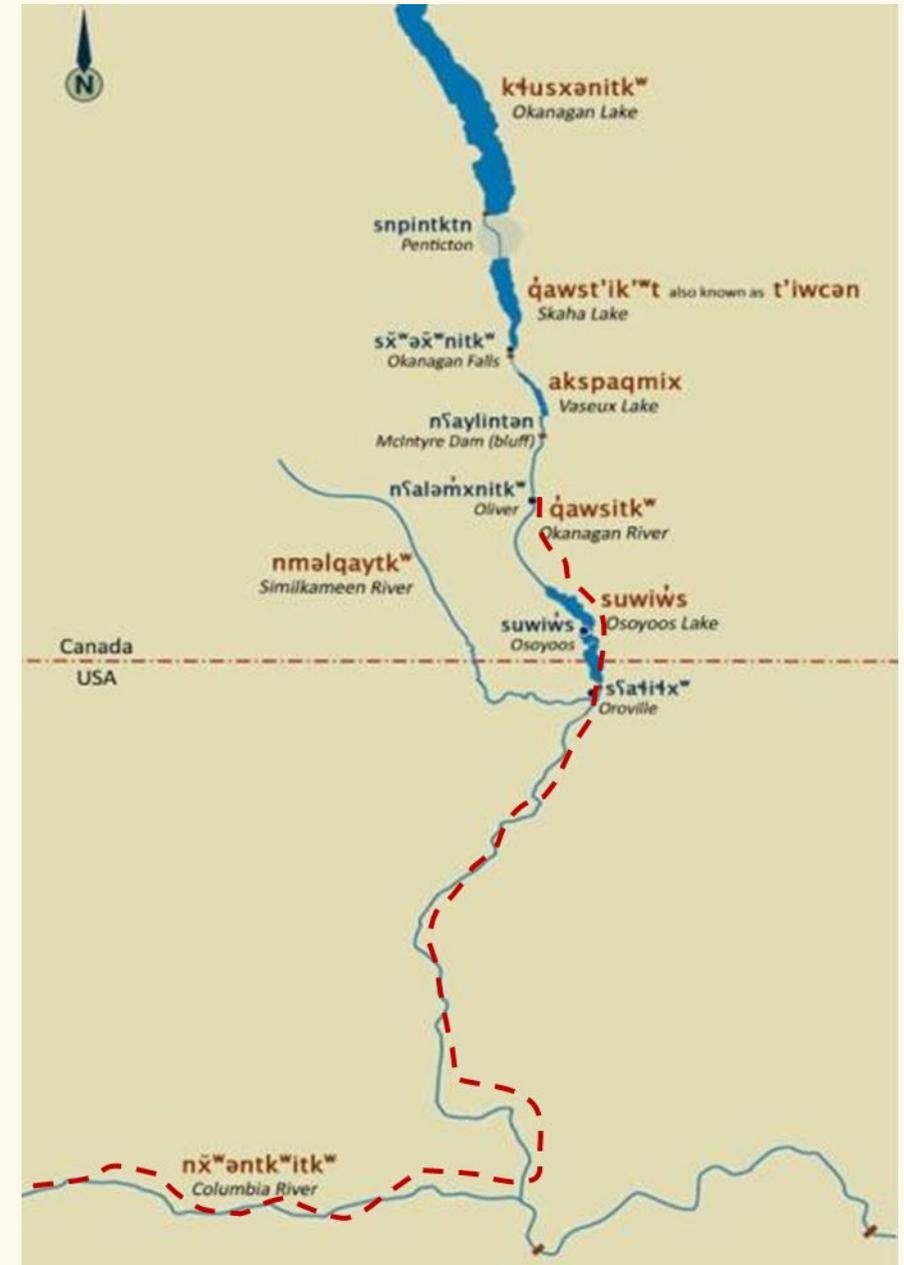


- Knowledge passed down through captik^{wł} Stories are a record of Okanagan history
- Coyote's travels are a record of natural laws
- Brought salmon to the Columbia and tributaries

captik^{wł}



1. Fish passage lost
2. Indigenous fish habitat lost
3. Invasive species (mysis shrimp)



PUT THE FISH BACK

Re-introduction of Sockeye into Skaha Lake



- Initiated in 1990's
- Discussed via Canadian Okanagan Basin Technical Working Group
- Risk assessment (1999 – 2003)
- Experimental Reintroduction Program (2004-2016)
- Continued discussion and adaptively managed



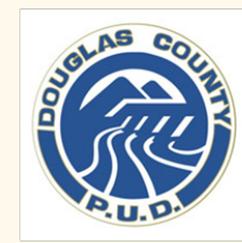
SOCKEYE RESTORATION



Fisheries and Oceans
Canada
Pêches et Océans
Canada



CHELAN COUNTY



kł cp'əlk' stim' Hatchery



Hatchery Production Fry Outplants

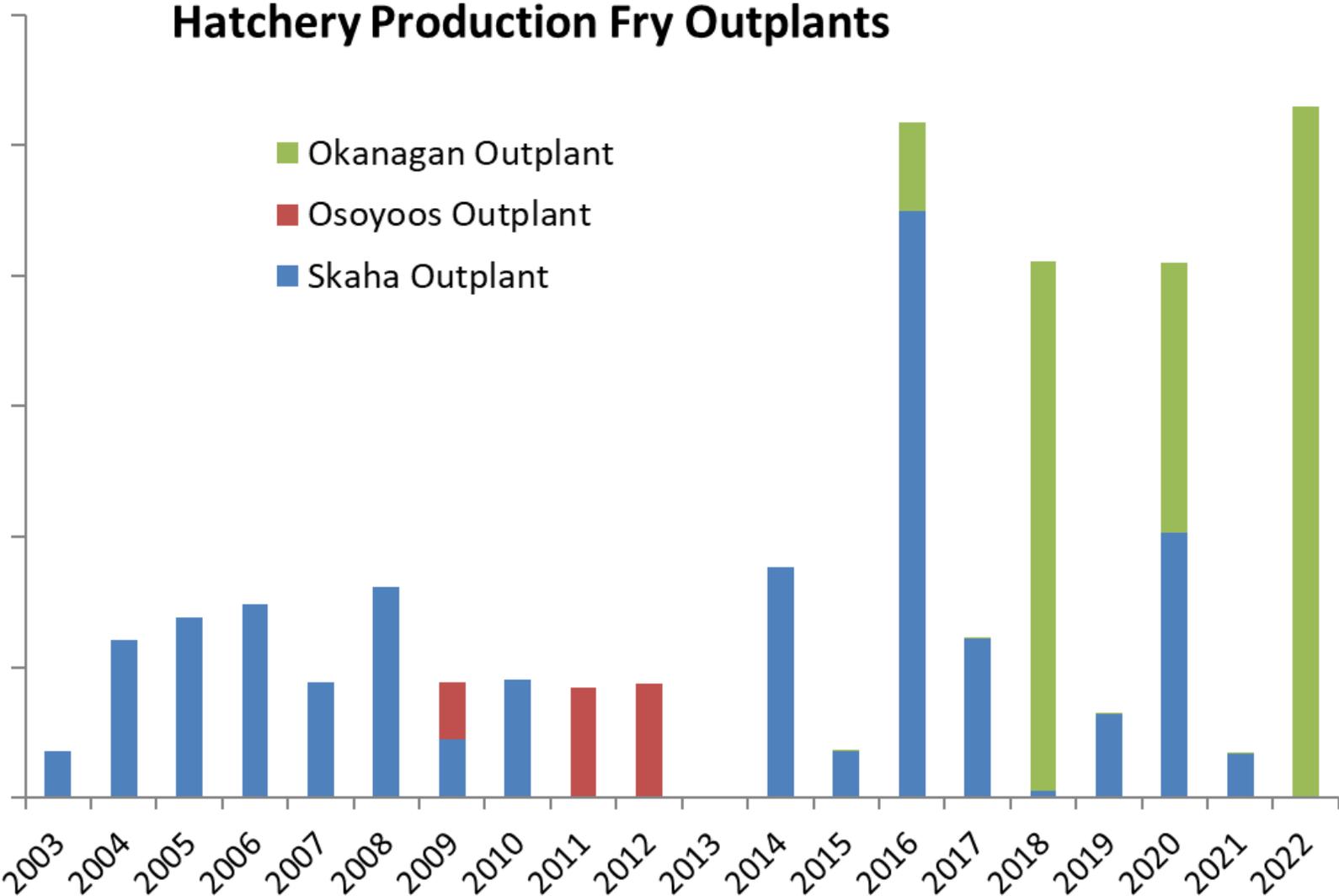
Number of Fry Released

- Okanagan Outplant
- Osoyoos Outplant
- Skaha Outplant

6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0

2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022

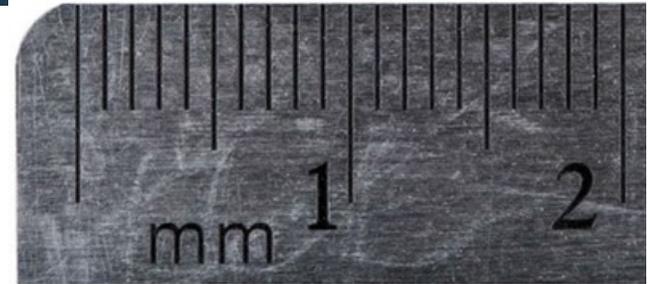
Broodyear



Monitoring and Evaluation

Intensive monitoring:

- Temperature/ DO
- Phytoplankton
- Zooplankton
- Mysis shrimp
- Acoustic Trawl Survey
 - Peer-reviewed publication
- PIT tagging (Survival, travel time, smolt-adult ratios)
- Adult return data

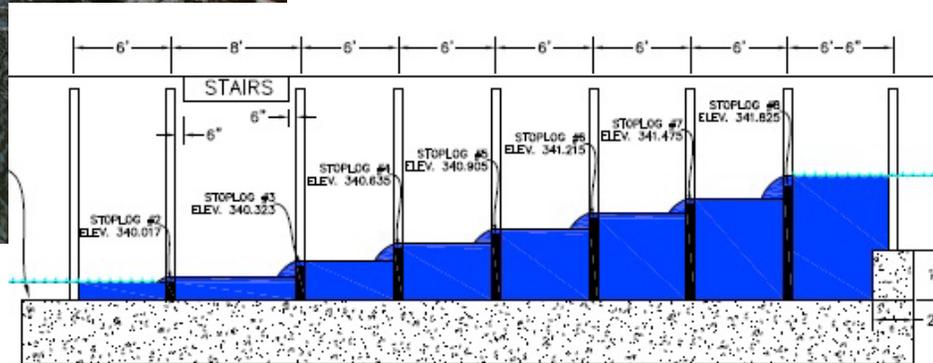




Okanagan Lake Program

- Okanagan Lake Salmon re-introduction was the original goal
 - Okanagan Basin Salmon Restoration Sub-Committee (COBTWG)
 - Monitoring and Evaluation Plan is finalized; Working on implementation
 - Working towards full Salmon passage at Okanagan Dam
- Hatchery stocking:
 - 2016 – 9,994
 - 2017 – 683,656
 - 2018 – 10,110
 - 2019 – 4,200,000
 - 2020 – 9,538
 - 2021 – 2,000,000
- Potential for high natural production; exceed Skaha and Osoyoos combined

Penticton Dam (Okanagan Lake Outlet) Passage



- Dam completed in 1953; fish ladder constructed but never activated
- Activated in 2019 to 2022 (Autumn)
- Telemetry tag 41 in 2020; 46 in 2021; 46 in 2022 – track migration and spawning tributary use in Okanagan Lake
- 2022 – Full passage implemented, approximately **4,700**
- Identify improvements for future passage/ habitat improvements, funding (e.g. automated gates, capture platform, PIT antenna)

Program Milestones



- 2003 – Pilot broodstock collection and egg take
- 2004 – Initiate 12-year Skaha Lake re-introduction experiment
- 2007 – First hatchery adult returns
- 2009 – McIntyre Dam (migration barrier) gates retrofitted to provide fish passage
- 2011 – First adult Sockeye spawners confirmed in Penticton Channel (primary Skaha L spawning grounds)
- 2014 – Trap and transport 160 adult Sockeye into Okanagan L
- 2016- present – Sockeye hatchery fry outplants into Okanagan L
- 2019 – present – Okanagan Dam fishway activated
- 2020 – present – Okanagan L. Telemetry and mark-recapture studies for tracking adult movement. Record Skaha L. adult runs: 25,600 (2020); 39,000 (2022)
- 2022 – Full Sockeye passage into Okanagan L. approved.



kt c'pəl'k' stim'
lim limpt