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

November 5, 2024

MEMORANDUM

TO: **Council Members**

FROM: **Kris Homel, Kate Self, Leslie Bach, and Patty O'Toole**

SUBJECT: **Fish and Wildlife Program performance: habitat categorical assessment**

BACKGROUND:

Presenters: Kris Homel, Kate Self, Leslie Bach, and Patty O'Toole

Summary: Current staff and contracted support staff will present excerpts from the third categorical assessment focused on implementation of the Columbia River Basin Fish and Wildlife Program's (Program) habitat measures. The habitat assessment is broad and covers implementation of measures across five topic areas: habitat restoration, habitat protection, wildlife, non-native and invasive species, and predator management. The presentation will begin with a review of our approach toward assessing program performance and key concepts. For each topic area, we describe Program strategies, measures, the status of implementation, and key points. Implementation is described using Strategy Performance Indicators or other data sources. The implementation examples we present under each topic characterize the range of actions implemented throughout the basin over the last 40 years. These high-level examples will be described with an emphasis on discussion points rather than technical details. We will conclude with a discussion of Program-scale observations from these examples. This assessment, along with recent categorical assessments on the Hydrosystem and Artificial Production, provides critical information to the Council and region on the

implementation and performance of the Program in anticipation of the upcoming Program amendment.

Relevance: Beginning with the first Program in 1982, every fish and wildlife Program has included references to aspects of Program performance. The 2020 Program addendum addresses Program performance through (1) reorganizing and compiling Program goals and objectives and (2) developing strategy performance indicators. Council staff are assessing Program performance through three complementary efforts: the first is the Program Retrospective (presentations in 2022 and 2023), the second is assessments of implementation by major category of work (Categorical Assessments), and the third is an evaluation of progress toward reaching Program Goals and Objectives.

Workplan: Item 4.2 Program Performance- Habitat Categorical Assessment

Background: The Northwest Power and Conservation Council's Columbia River Basin Fish and Wildlife Program represents a 40-year effort to mitigate the effects of the hydropower system on fish and wildlife in the Columbia Basin. The scope of and investment in this Program make it one of the largest fish and wildlife mitigation efforts in the world and a significant part of the tapestry of mitigation efforts in the Columbia Basin. There is limited precedent for assessing the performance of a program of this size. Given this scale, we developed an overall approach to manage the volume and complexity of information.

The performance assessment includes three complementary efforts- the Program Retrospective, assessments of Program implementation by major category of work (Categorical Assessments), and an evaluation of progress toward Program Goals and Objectives.

In 2024, staff released a retrospective of the Northwest Power and Conservation Council's Fish and Wildlife Program that included a review of the Program's history and key events. This historical context provided information on why different elements have been included in the Program over time, what kind of changes were expected to occur, where those changes could occur, and when they could occur. In preparing this retrospective, we went through a detailed process to assemble the full set of measures called for across 40 years of Programs. These were organized by topic so that we could determine how the Program has changed over time and when different topics came to prominence, along with identifying major topics in each Program. Staff presented on the Retrospective in 2022 and 2023 and it was a one-time review of past Programs.

The categorical assessments provide more detailed information on implementation of the major topics identified in the retrospective. These

are organized according to four main *categories* in the Program: Hydrosystem, Artificial production, Habitat, and Program Adaptive Management. In 2024, we are presenting a summary of the first three categories. In each assessment, we describe (1) what was called for in the Program, (2) what was implemented, and (3) how implementation compares to available benchmarks. These assessments incorporate content from existing summaries (e.g., the Program Tracker with Strategy Performance Indicators, published research or reports, and dashboards on particular topics) and also include new summaries from a variety of information sources. Strategy Performance Indicators are updated annually on Program Tracker, and categorical assessments will be updated prior to Program amendments, approximately every five years.

The third piece of program performance is evaluating progress toward the goals and objectives described in the 2020 addendum. The status and trends of these goals and objectives will be presented in December 2024 and will be available on the Council's expanded Program Tracker web tool at that time. Evaluating progress relies on multiple sources of data, including the SPIs. Goals and objectives will be updated annually on Program Tracker.

The habitat assessment is broad and covers implementation of measures across five topic areas: habitat restoration, habitat protection, wildlife, non-native and invasive species, and predator management. In this inaugural habitat categorical assessment, over 500 Program measures were reviewed. Staff met with individual regional managers who were topical experts on these actions to better understand the context around implementation. Those discussions led to the development of key topics for the region to consider. For this presentation, we selected a subset of actions implemented throughout the basin. Examples include restoring habitat quantity and quality, adaptation of project work for climate change, implementation and status of wildlife mitigation, review of efforts to control invasive species, and predator management targeting birds, sea lions, and fish. Implementation of these actions will be described at a high level and we will conclude with a discussion of Program-scale observations from these examples.

Staff will release supplementary documentation on the habitat assessment prior to the call for recommendations to amend the Fish and Wildlife Program. The staff considers this work to be iterative and welcomes feedback even as this particular category of work wraps up for 2024 in order to assess implementation of other categories before the start of the amendment process. In future years, assessments will build off the framework developed this year and will include additional measures, expanded documentation, and further opportunities for feedback. Collectively, the retrospective, categorical assessments, and status and trends assessment will provide critical information to the Council and

region on the Fish and Wildlife Program and serve as an educational resource leading up to the next Program amendment.

More Info: October 2024 Council presentation on the Artificial Production categorical assessment available here:

https://www.nwcouncil.org/f/18942/2024_10_1.pdf
https://vimeo.com/1018001208#t=8m17s

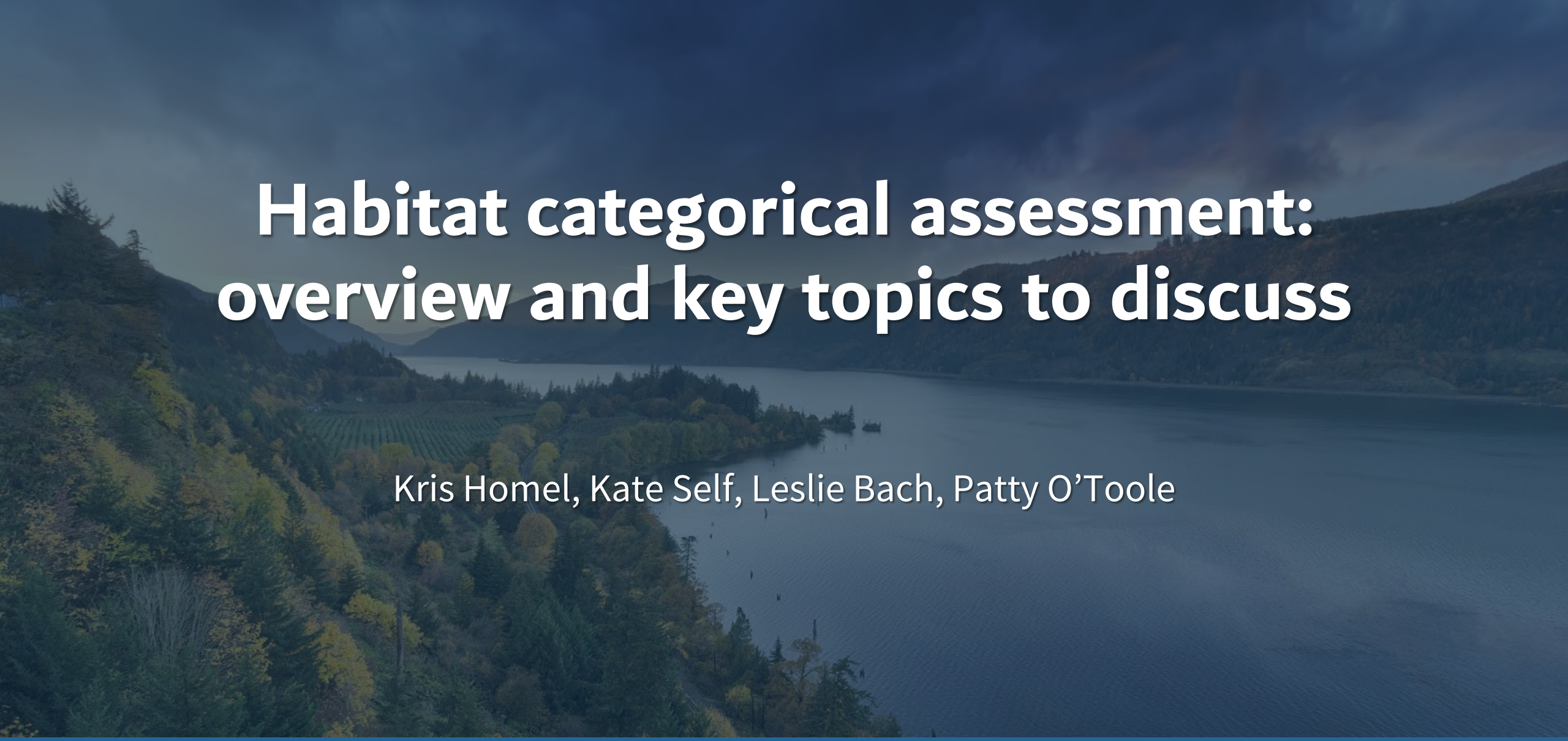
September 2024 and October 2023 Council presentations on the Hydrosystem categorical assessment available here:

2024: https://www.nwcouncil.org/f/18487/2023_10_f4.pdf
2024: https://vimeo.com/874878458#t=143m59s
2023: https://www.nwcouncil.org/fs/18487/2023_10_f4.pdf
2023: https://vimeo.com/874878458#t=143m59s

Fish and Wildlife Committee (2022) and Council (2023) presentations on Program Retrospective available here:

August 2022: https://www.nwcouncil.org/fs/17876/2022_08_f1.pdf
September 2022: https://www.nwcouncil.org/fs/18031/2022_09_f2.pdf
May 2023: https://www.nwcouncil.org/fs/18305/2023_05_1.pdf

The retrospective is available on the Council's website here:
https://www.nwcouncil.org/fs/18802/retrospective.pdf



Habitat categorical assessment: overview and key topics to discuss

Kris Homel, Kate Self, Leslie Bach, Patty O'Toole

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

Outline

- Approach to Categorical Assessments
- Topics in Habitat Categorical Assessment
- Description of strategies and implementation
    - Discussion after each topic

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

- **Fish and Wildlife Program**
- **Steps in assessment**
- **One-to-many relationship between implementation and achieving objectives**

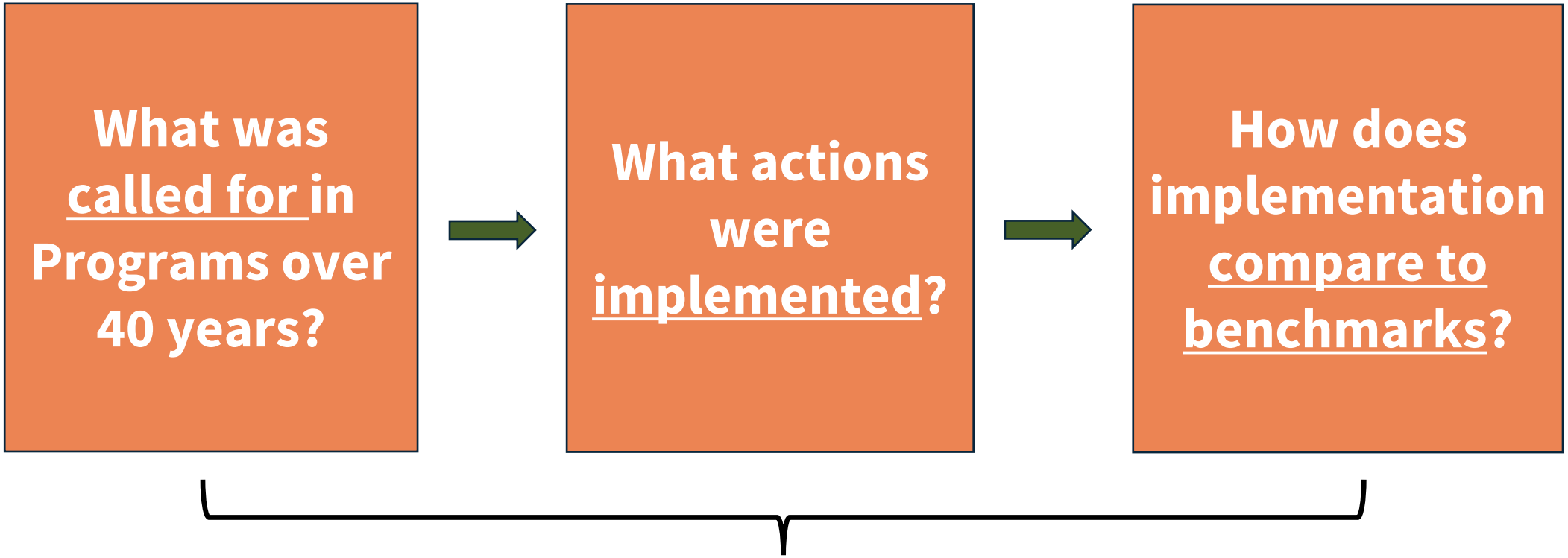
The Fish and Wildlife Program includes:

- **<u>Measures describing actions</u>**
  - At the dams
  - Offsite (in mainstem/ tributaries/ estuary/ ocean)

  Implemented by action agencies, Federal, State, and Tribal Fish and Wildlife Managers, Council, and through projects
- **<u>Measures are organized by strategy</u>**
  - 23 Program strategies
- **<u>Goals and objectives</u>**
  - 5 goals, 37 objectives

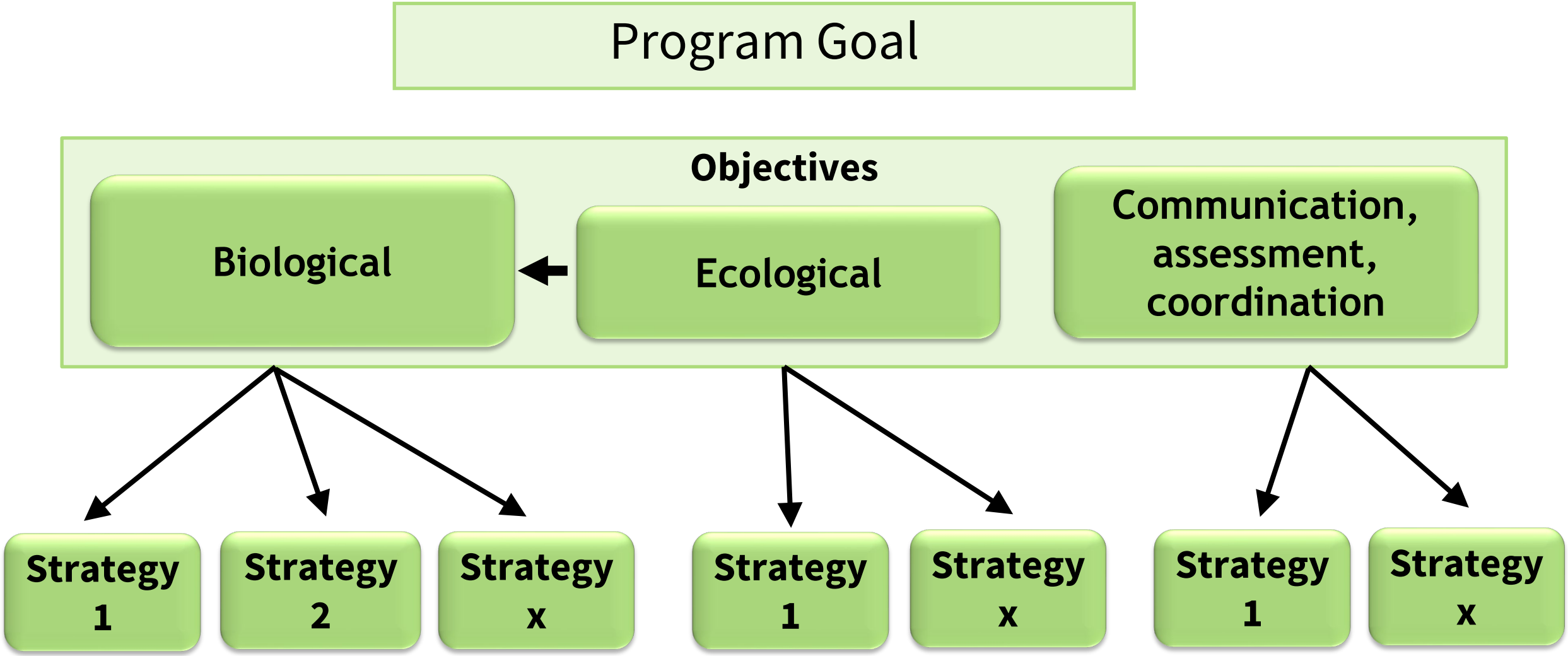
Protection and mitigation for all Fish and Wildlife affected by the hydrosystem – not just listed species

Categorical assessment steps



- Report on implementation, progress, challenges
- Identify key questions for region to consider

One-to-Many Relationship



Objectives may include broader regional targets to which the program contributes through its hydrosystem mitigation efforts.

Outline

- Approach to Categorical Assessments
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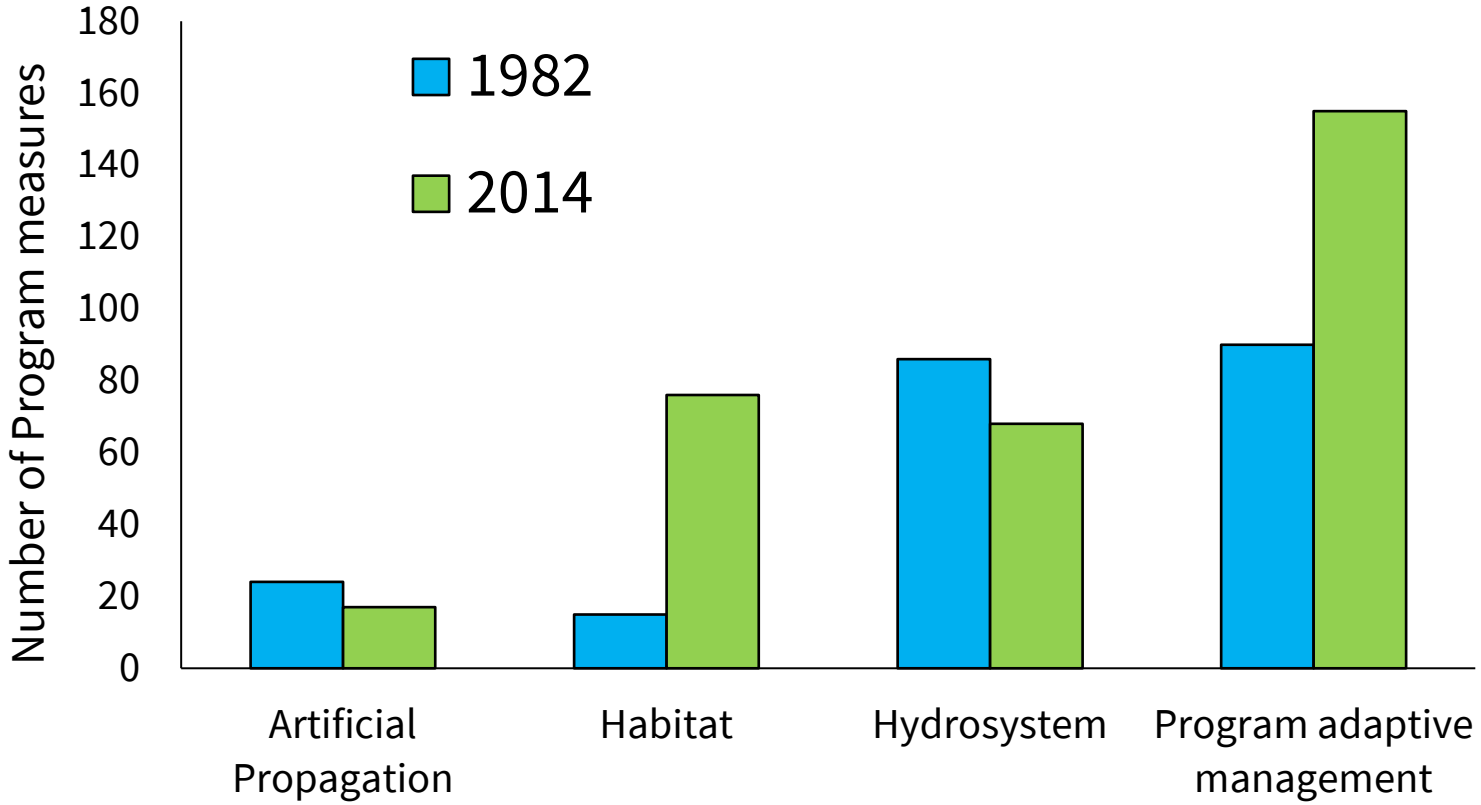
- Offsite mitigation
- Five topics to assessment
- High level set of measures within each topic

Offsite mitigation

- The Northwest Power Act calls for mitigation using a combination of onsite actions and offsite mitigation Section [4(h)(1)(A); 4(h)(5); 4(h)(8)(A)]

- Offsite mitigation actions increase survival, reproduction, or abundance of fish and wildlife affected by the hydrosystem to offset losses that have not been mitigated directly at dams.

- Examples include artificial production, habitat restoration, wildlife mitigation, predator management, research, and more.



Offsite mitigation is substantial part of Program, particularly post-2000

Habitat measures can be grouped by:

Restoration

Protection

Wildlife

Non-native and invasive species

Predator management

Restoration

Habitat restoration in tributaries, mainstem, blocked areas, estuary

- Habitat quality
- Habitat quantity

Water transactions

Water quality

Non-native and invasive species

Zebra/ Quagga mussels

Shad

Vegetation

And others

Protection

Screens

Fish lands

Protected areas

Predator management

Avian

- Double-crested cormorants
- Terns

Marine mammals

- California sea lions
- Stellar sea lions
- Seals

Fish

- Northern Pike
- Northern Pikeminnow
- And others

Wildlife

Status and loss assessments

Crediting

Mitigation plans and settlement agreements

Criteria for protection and monitoring

Goals and objectives

Decision making and planning

FCRPS mitigation by subregion

- Upper Columbia tributaries
- Upper Columbia mainstem
- Mid-Columbia tributaries
- Lower Columbia
- Upper Snake River
- Lower Snake River
- Willamette Basin

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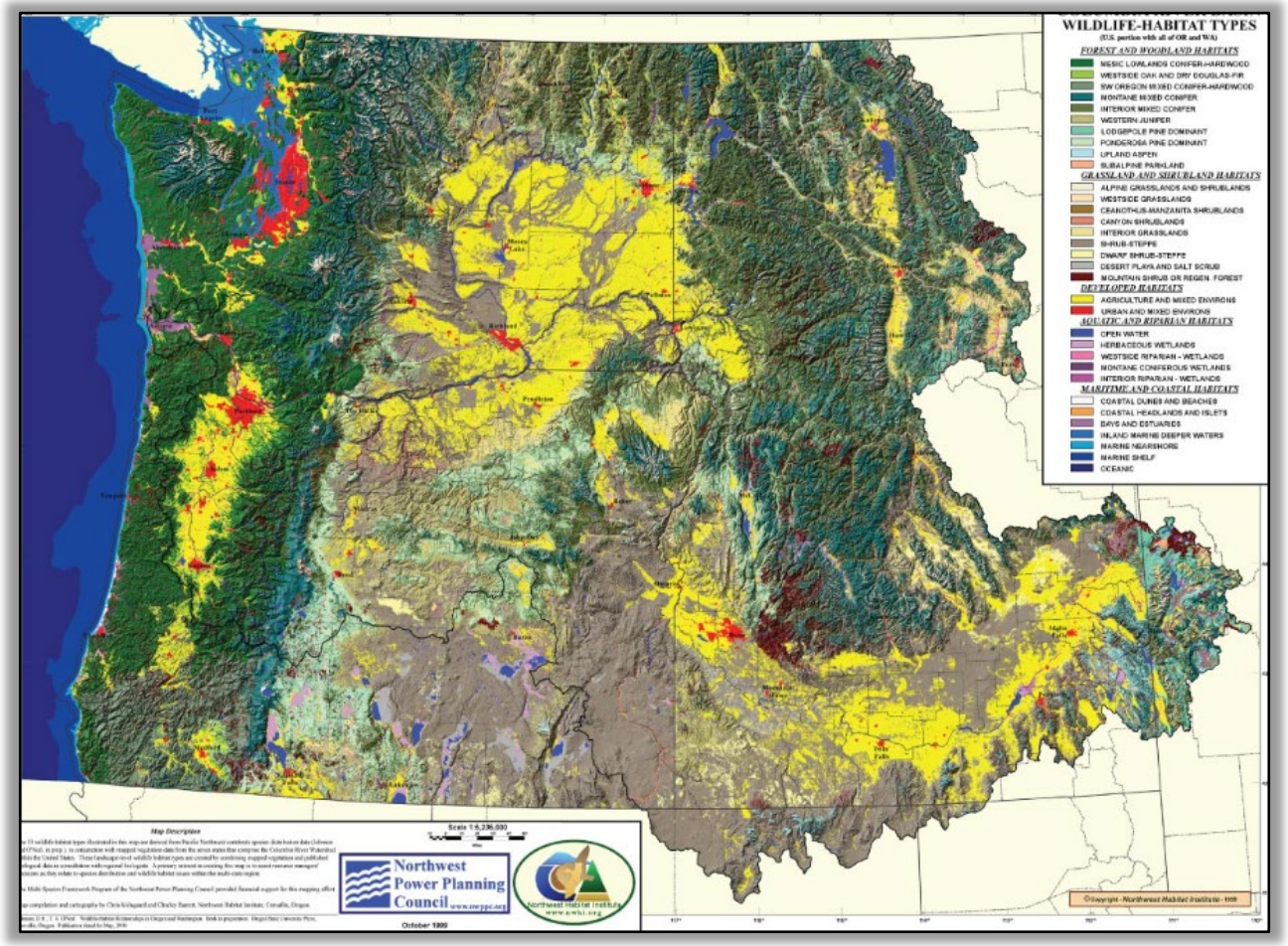
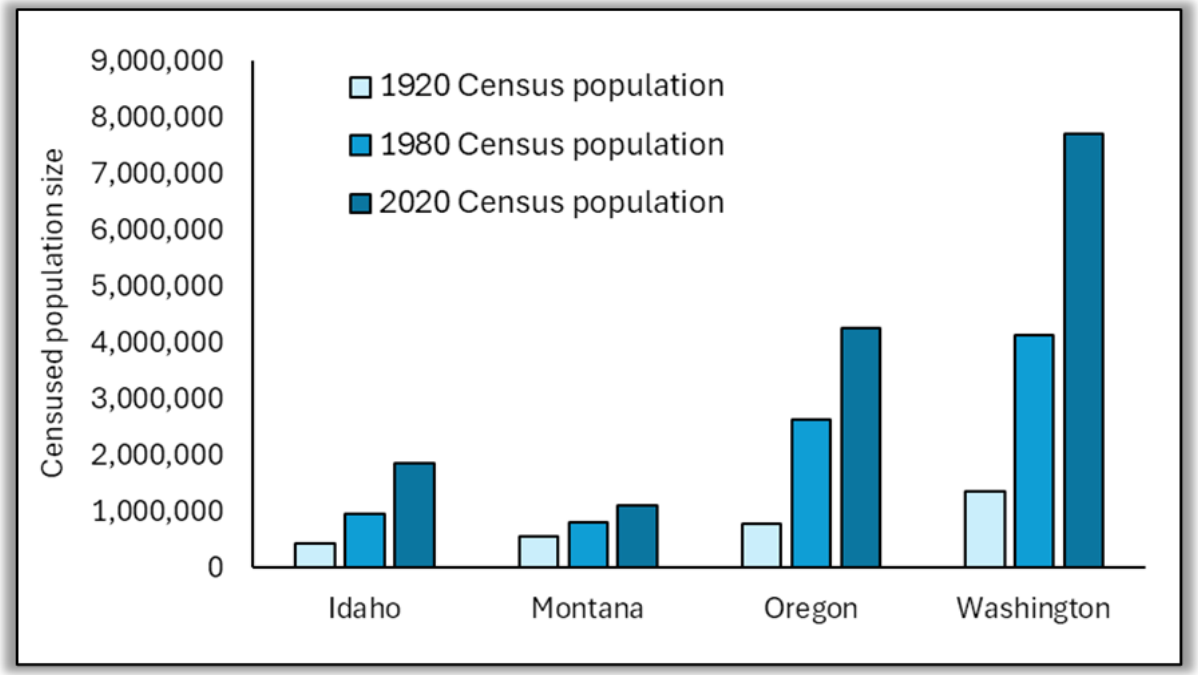
Restoration

- Changes to Columbia Basin
- Regional restoration efforts
- Considerations
- Program strategies and measures
- Implementation at Program scale over time
- Climate change effects in Basin
- Adaptation of project work for climate change
- Discussion

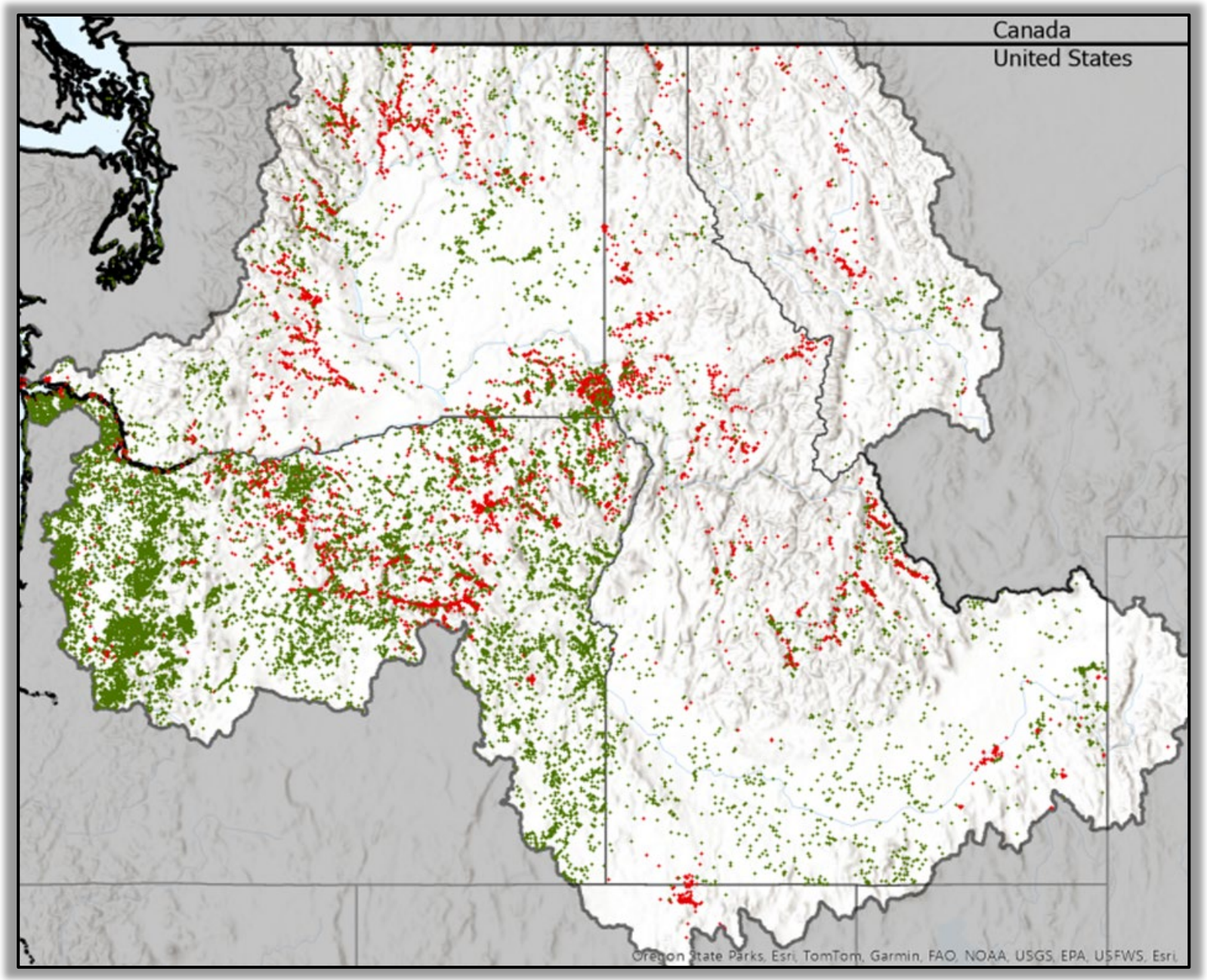
A diverse and changing Columbia Basin



- Diverse landscape with many different land and resource uses



- Increasing human population
  - Larger footprint
  - Energy demands
  - Natural resource extraction
  - Water consumption
  - And other impacts
- Collectively cause a non-static backdrop against which mitigation occurs



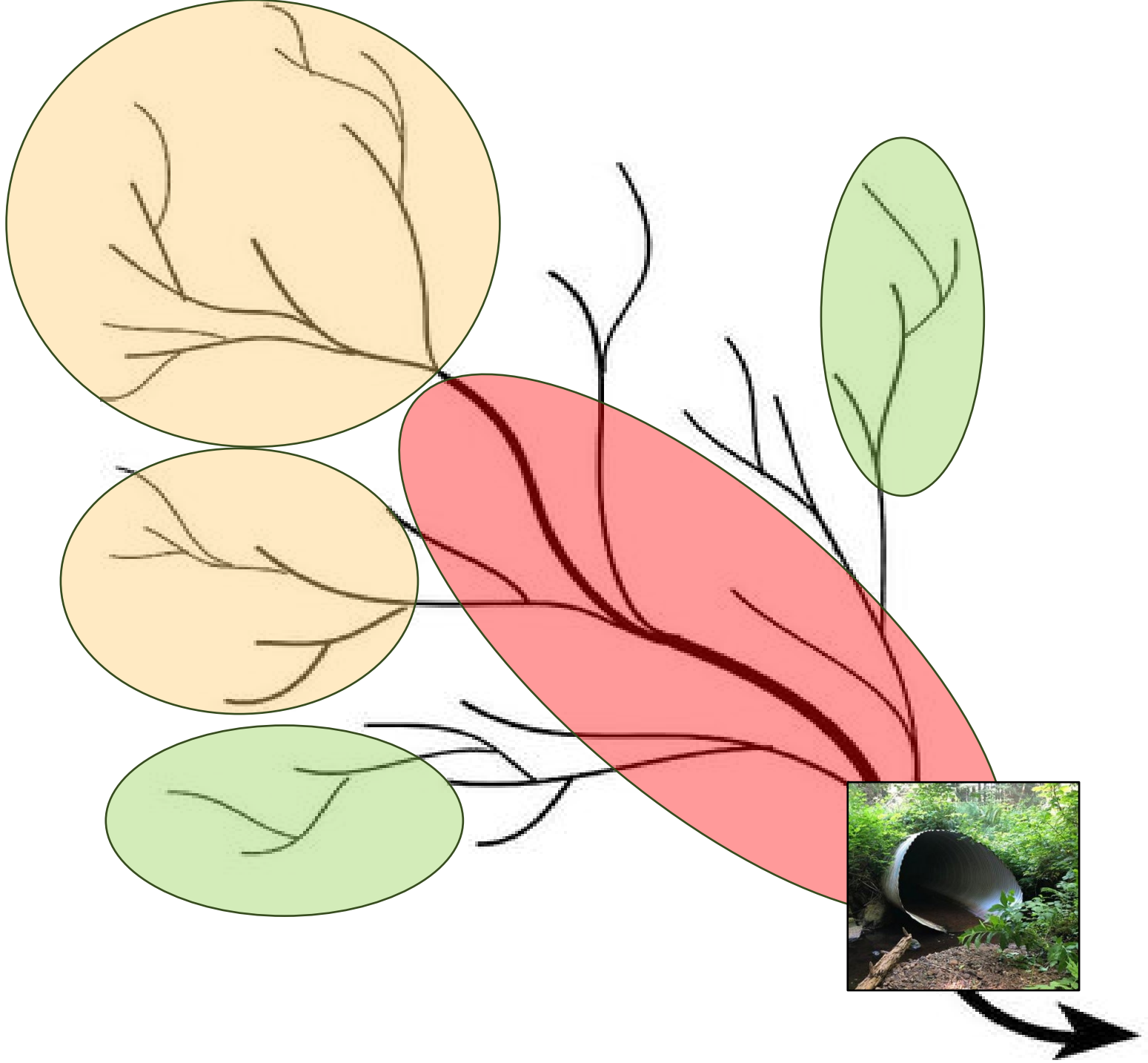
Location of restoration projects included in the Pacific Northwest Salmon Habitat Restoration Project Tracking Database in green (PNSHP). Available online at: https://www.webapps.nwfsc.noaa.gov/apex/f?p=409:13:::::P13_CATEGORY: Location of BPA-funded Projects overlayed in red. Data available on Cbfish.

Regional efforts

- Restoration implemented by many partners in the Columbia Basin for various purposes
- NPCC Program restoration is part of this tapestry
- Not attempting to characterize specific effect of NPCC Program restoration

Limiting factors

- Multiple partners working in basin addressing multiple limiting factors
- There are local habitat-scale limiting factors (e.g., structure is limited, culvert blocks passage, etc.)
- There are also big picture limiting factors that negatively affect reproduction or survival at a particular life stage



Considerations

- Ongoing habitat degradation affects benefit of work
- Detecting outcomes from restoration depends on <u>spatial and temporal scale</u>

Photo from Rayonier.com

U.S. Forest Service Sandy River Basin Restoration

Photo from Maestas et al. 2023

Restoration

Program strategies
(not covered in prior assessments)

Climate Change

- Better understand how the effects of climate change may impact fish and wildlife populations and mitigation and restoration efforts implemented under the Columbia River Basin Fish and Wildlife Program.

Estuary

- Restore ecosystem function to protect and enhance critical habitat and spawning and rearing grounds in the estuary and lower Columbia River.

Program measures over time…

1980's – 1990's	2000's - Contemporary
• Specific actions	• General principles
• Early focus in Yakima Subbasin, some tributaries, blocked areas	• Basin-wide implementation with targeted actions in anadromous zones (mainstem, tributary, estuary), resident fish habitat, and blocked areas
• Action plan in Program/ first subbasin plans (not adopted)	• Descriptions of specific actions in Subbasin Plans
• Single-species focus	• Multi species or ecosystem focus

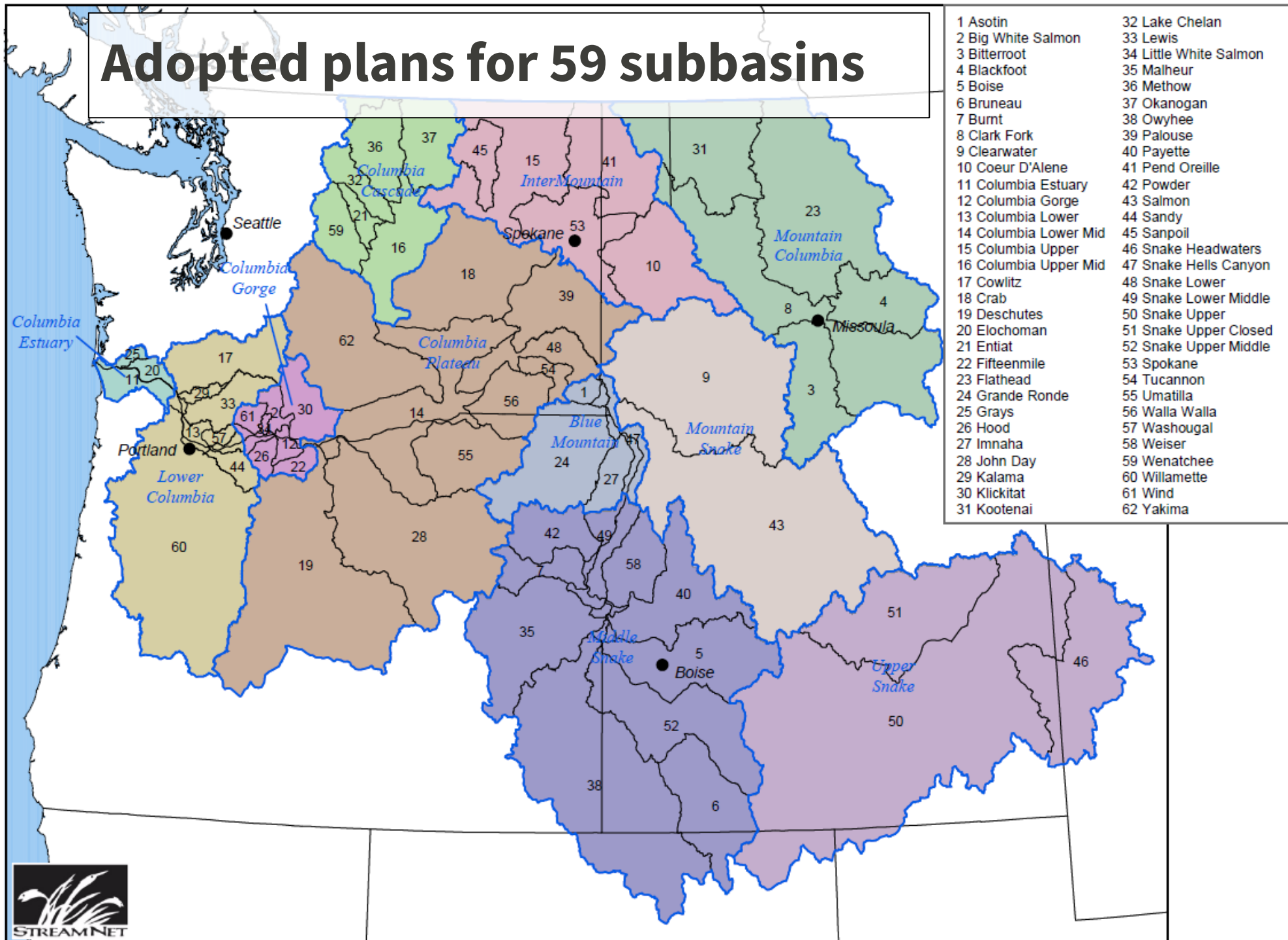
- Species listings
- NAS- Upstream: Salmon and Society in the PNW
- ISG- Return to the River

- ISG- multi species framework
- New Program framework
- BiOps

Implementation at Program scale, over time

- Summarizing efforts to address major topics
  - Regional planning
  - Habitat quality- restoration within existing access
  - Habitat quantity- restoration outside existing access- barrier removal, floodplain reconnection
  - Water quantity- increasing stream flows through leasing or acquisition of water rights
  - Water quality- tributary and mainstem temperatures, toxics
- Our focus is on implementation at scale of Program (not projects)
- Summaries use SPIs and other data sources
- Big picture view of implementation and issues to consider, not action effectiveness (this is covered by ISRP and others)

Regional planning



Examples of actions to improve habitat

Project 1996-083-00 Confederated Tribes of the Umatilla Indian Reservation

Project 1998-028-00 Jefferson County Soil and Water Conservation District and 1994-042-00 ODFW

Examples of actions to improve habitat

Project 2007-393-00 Nez Perce Tribe

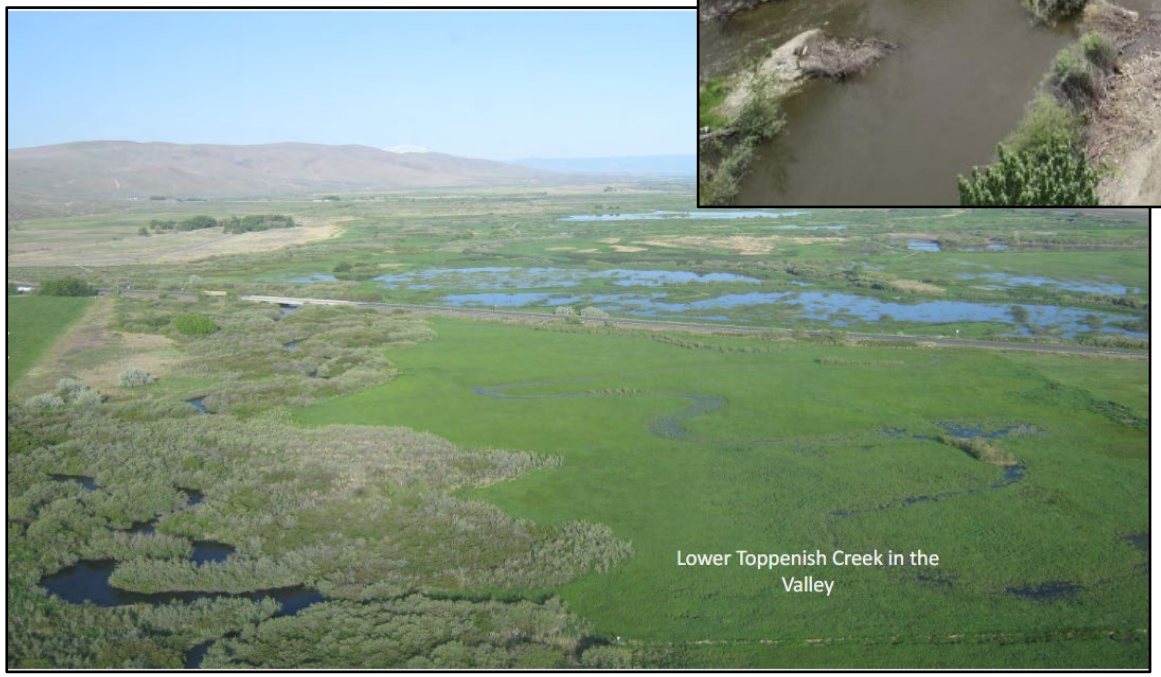
Project 1991-019-01
Confederated Salish and Kootenai Tribes

Project 1998-019-00 U. S. Forest Service

Examples of actions to improve habitat

Project 2010-072-00
Idaho Office of Species Conservation

Project 1996-035-01
Yakama Nation Fisheries

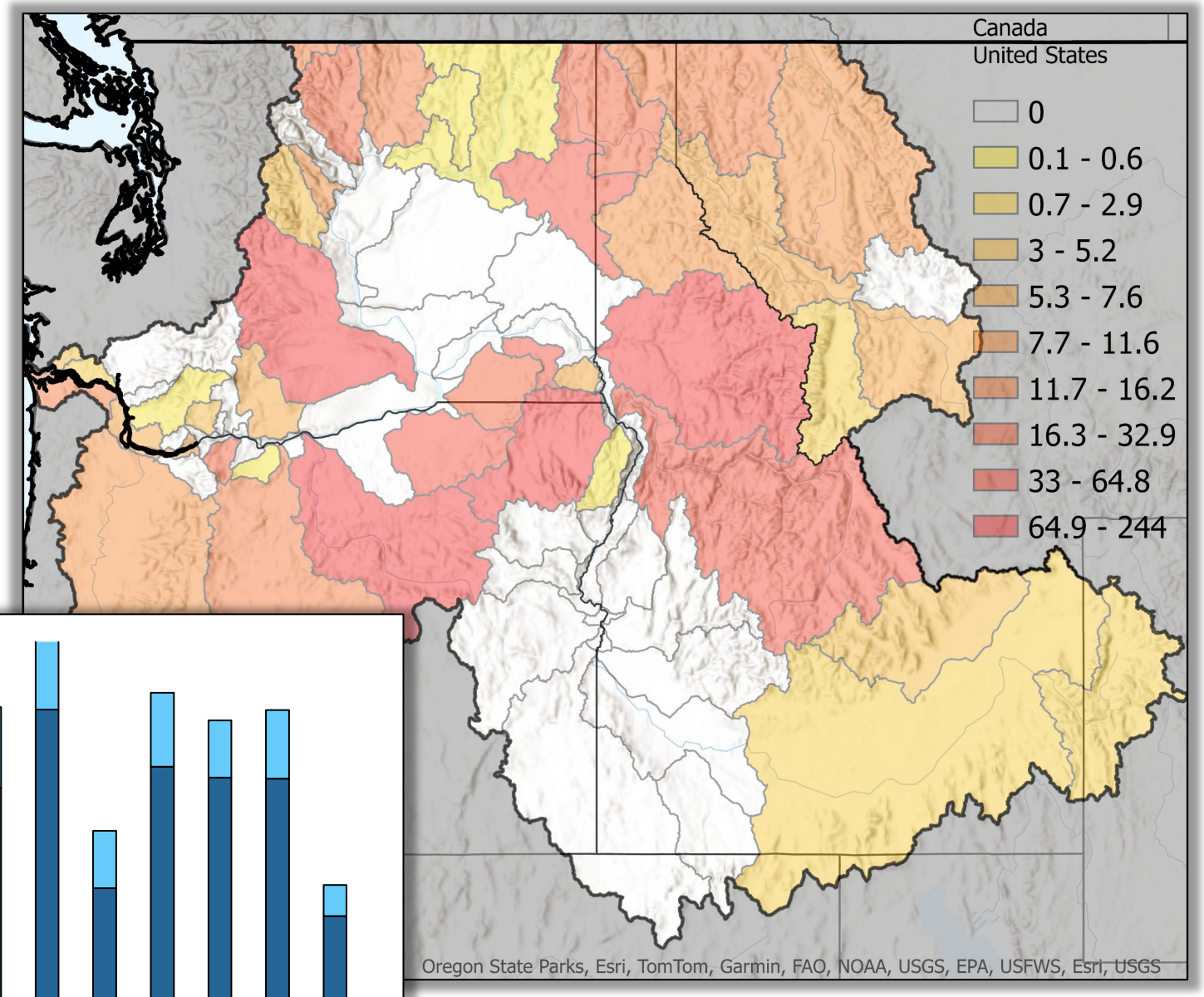


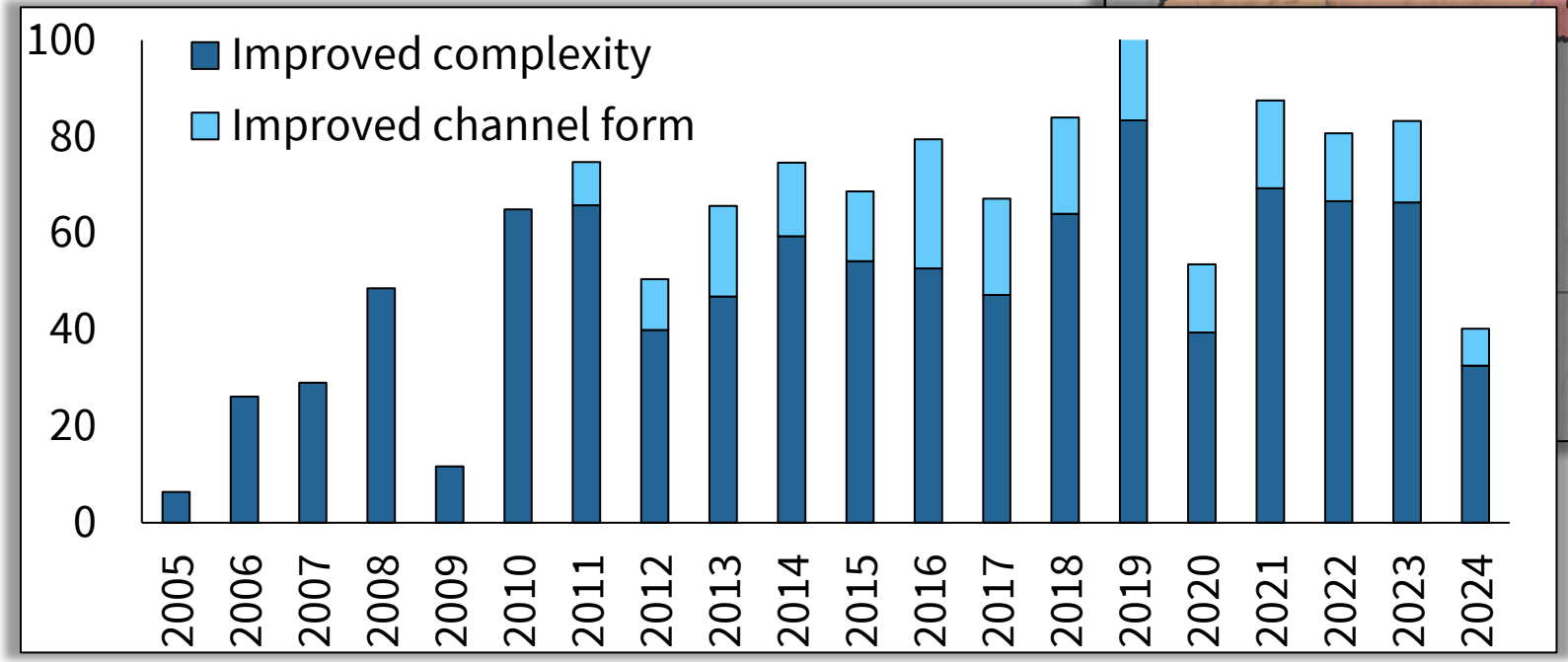
Project 2002-061-00
Latah Soil and Water Conservation District

Habitat restoration

Miles of stream with improved complexity or channel form, 2005 - 2024

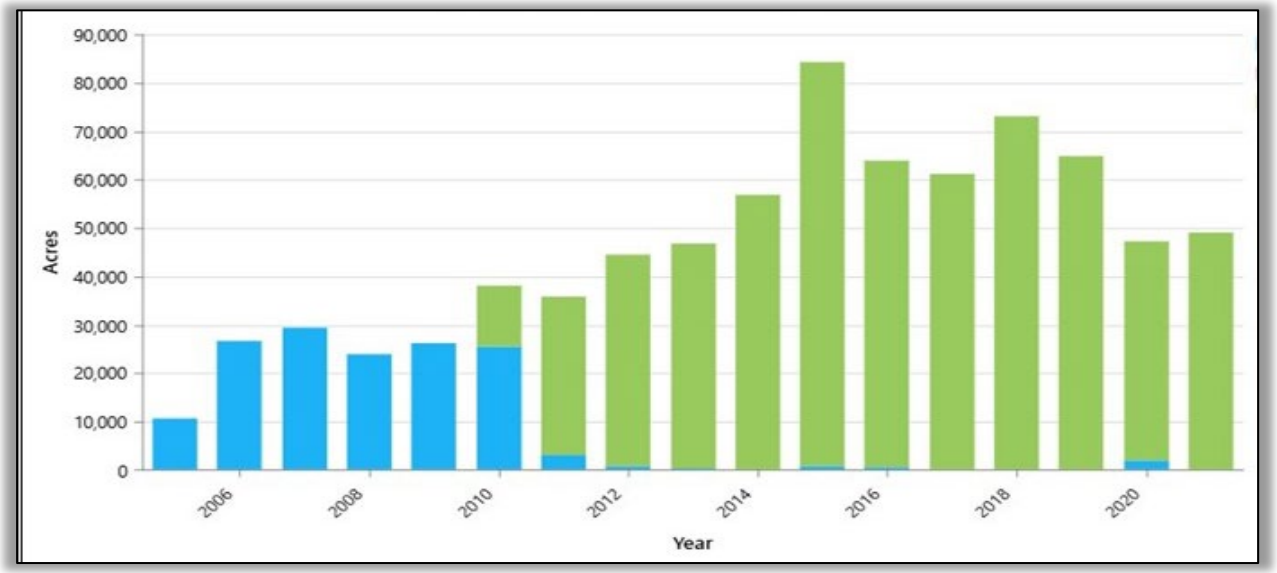
- SPI E1-4
- CBfish measures 6 and 70

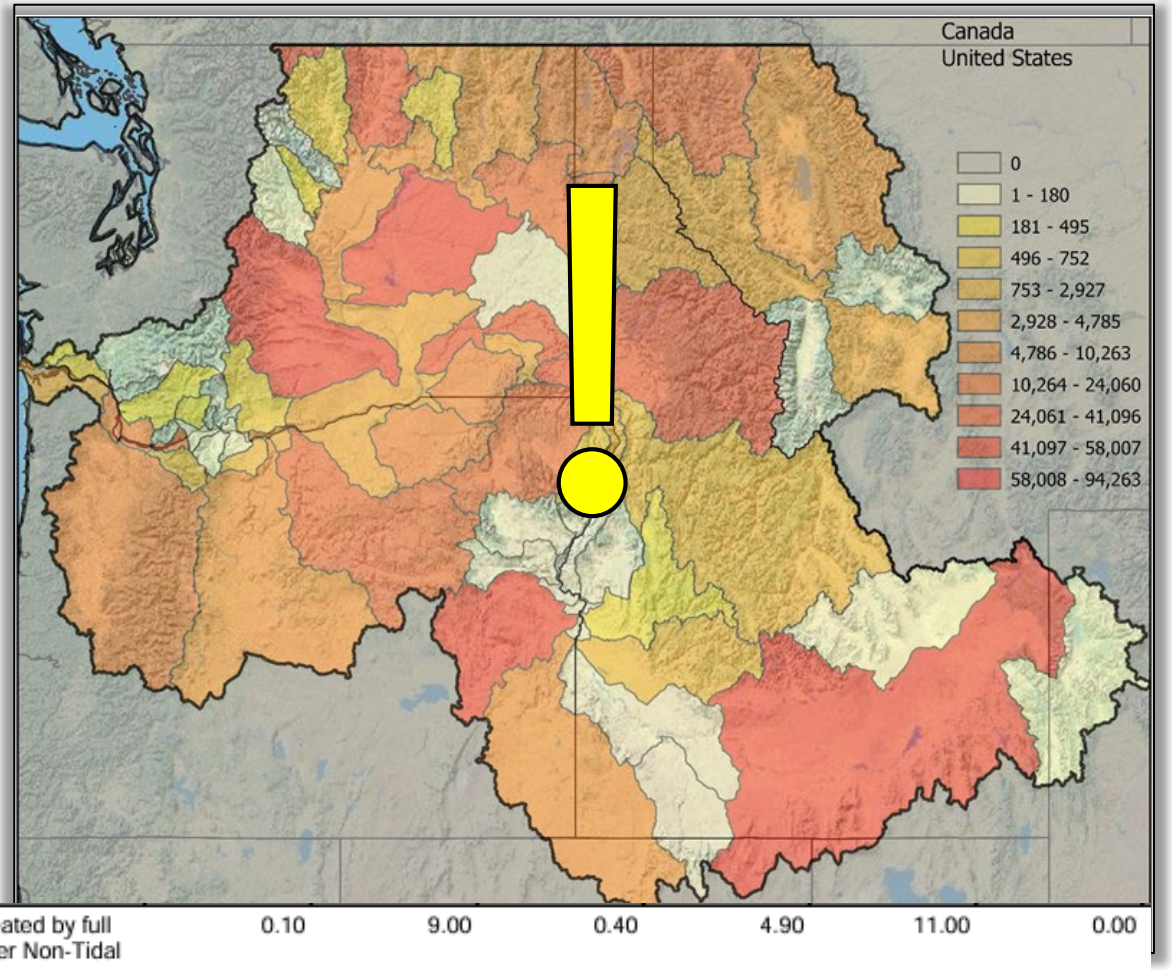




Acres of habitat improved, 2005 - 2022

- SPI E1-5
- CBFish measures 2, 71, and 72



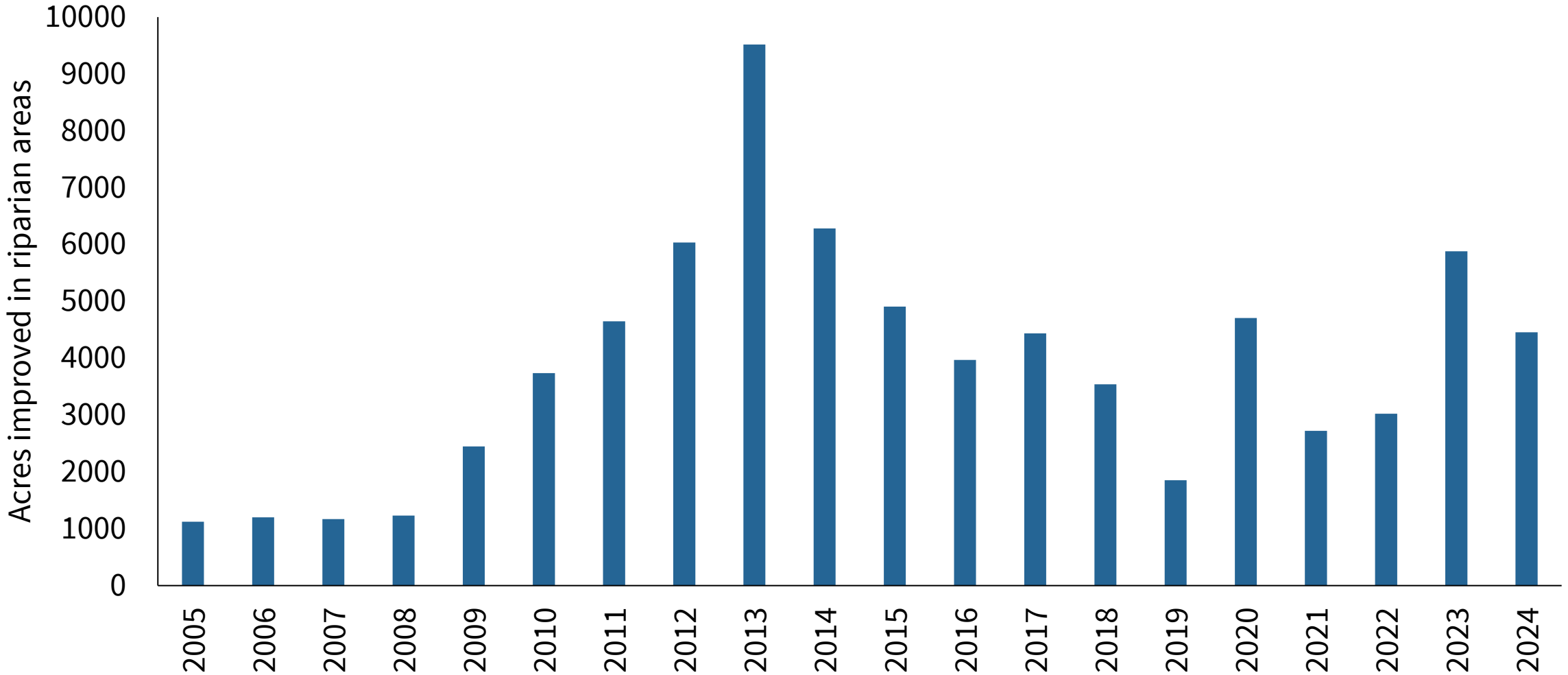


Habitat Acres	acres improved in various ways	180: Enhance Floodplain/Remove, Modify, Breach Dike	1674: # of acres of habitat treated by full dike removal in the Freshwater Non-Tidal zone	0.10	9.00	0.40	4.90	11.00	0.00
			1675: # of acres of habitat treated by dike breaching in the Riparian zone	0.00	0.00	0.00	28.78	0.00	0.00
			1676: # of acres of habitat treated by dike breaching in the Estuarine zone	90.00	100.00	0.00	0.00	0.00	0.00
			1677: # of acres of habitat treated by dike breaching in the Freshwater Non-Tidal zone	0.00	0.00	0.00	0.00	0.00	0.00
			1678: # of acres of habitat treated by dike setbacks in the Riparian zone	0.00	16.00	0.00	0.00	1,199.50	1,187.00
			1679: # of acres of habitat treated by dike setbacks in the Estuarine zone	0.00	0.00	0.00	0.00	0.00	0.00
			1680: # of acres of habitat treated by dike setbacks in the Freshwater Non-Tidal zone	0.00	0.00	14.00	0.00	1,199.50	1,187.00

When updating SPI for 2023 and 2024, noted instances of double-counting *within* measures and inconsistencies in how data assigned to metrics

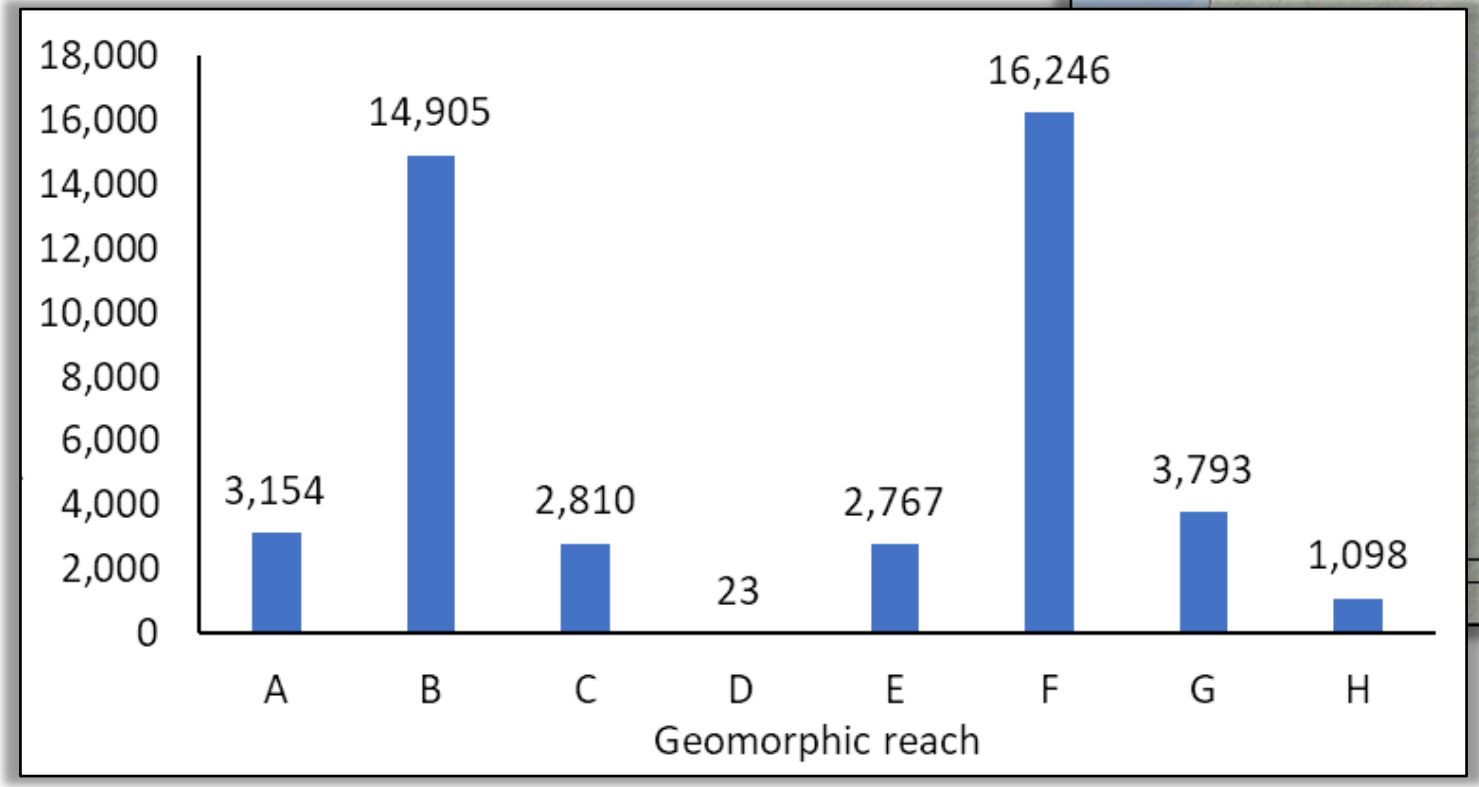
Acres of habitat improved in riparian areas, 2005 - 2024

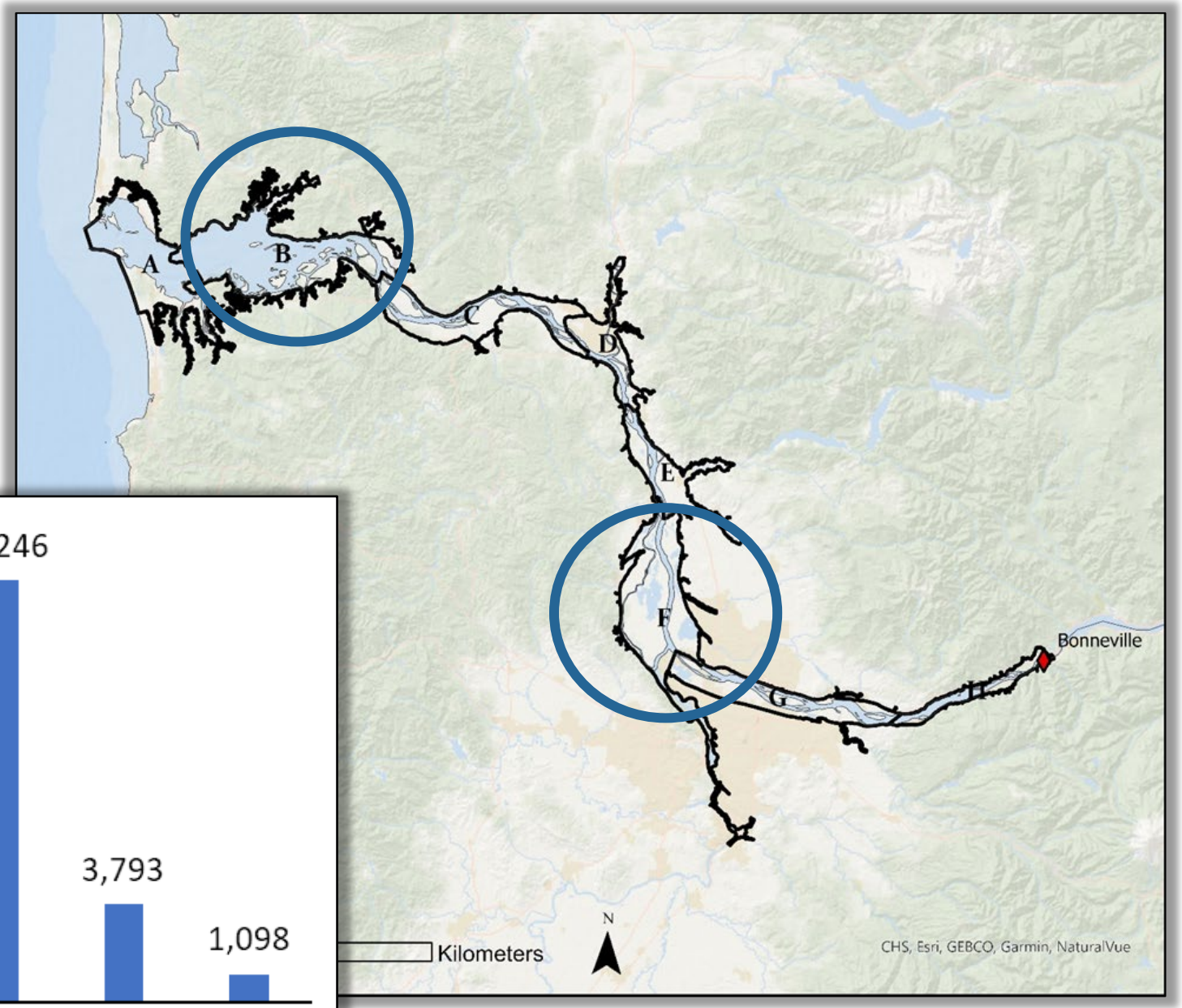
- SPI E1-7
- CBfish measure 83

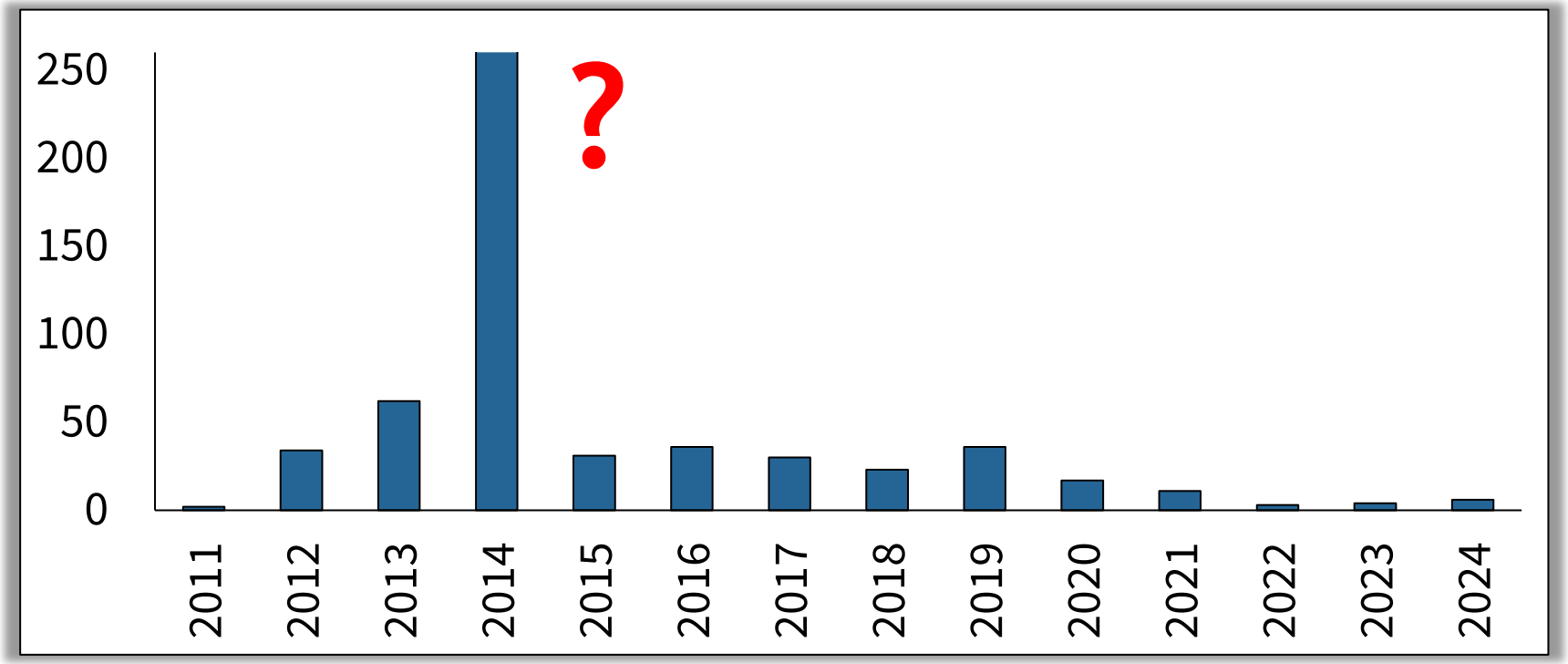


Acres of land impacted by restoration and/or acquisition projects or protected by a refuge

- SPI E1-7
- Data provided by Lower Columbia Estuary Partnership







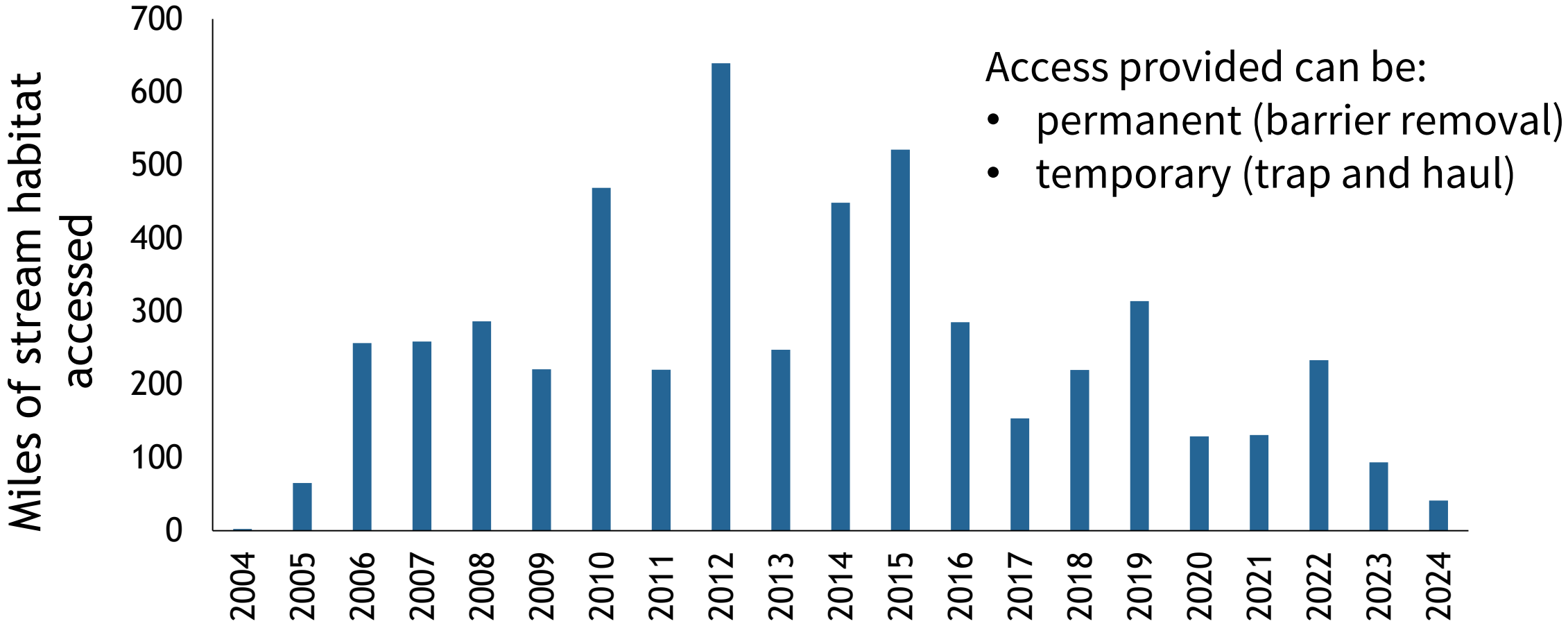
Number of barriers removed, 2011 - 2024

- CBfish measure 69

Metric	Planned	Actual	Contractor Comments	Measures
1408. Did the tailings create a fish passage barrier?	No	No		
1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.00	0.00		miles of habitat accessed
1634. # of mine tailing partial passage barriers addressed in the freshwater zone	250	250	The tailings piles are NOT a fish migration barrier to any life stage.	barriers removed
1638. # of acres of riparian habitat treated	3.90	3.90		acres treated acres treated instream acres improved in riparian areas

Miles of stream habitat accessed, 2004 - 2024

- SPI E1-3
- CBfish measure 10

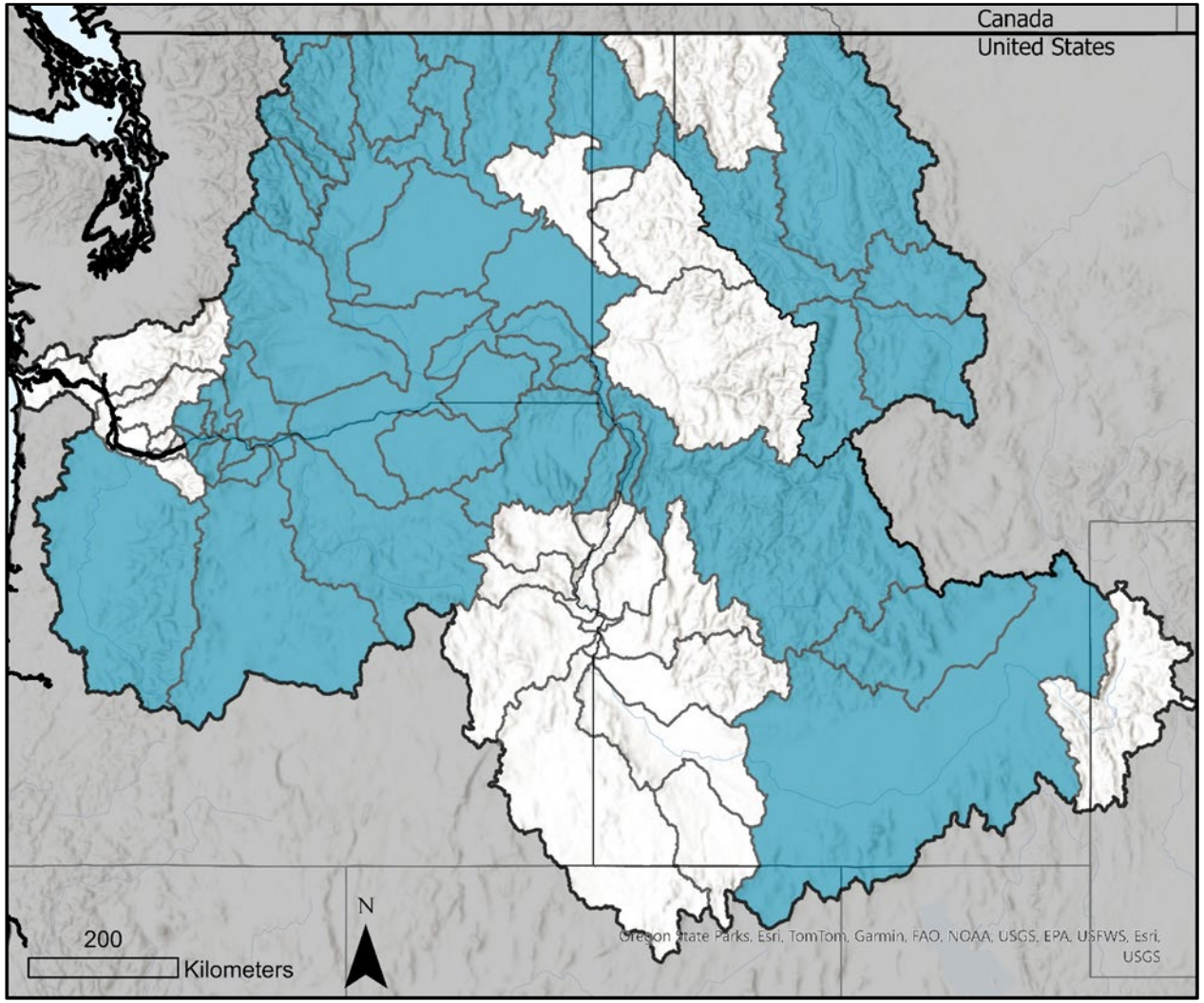


Restoration to increase instream water quantity

Columbia Basin Water Transactions Program

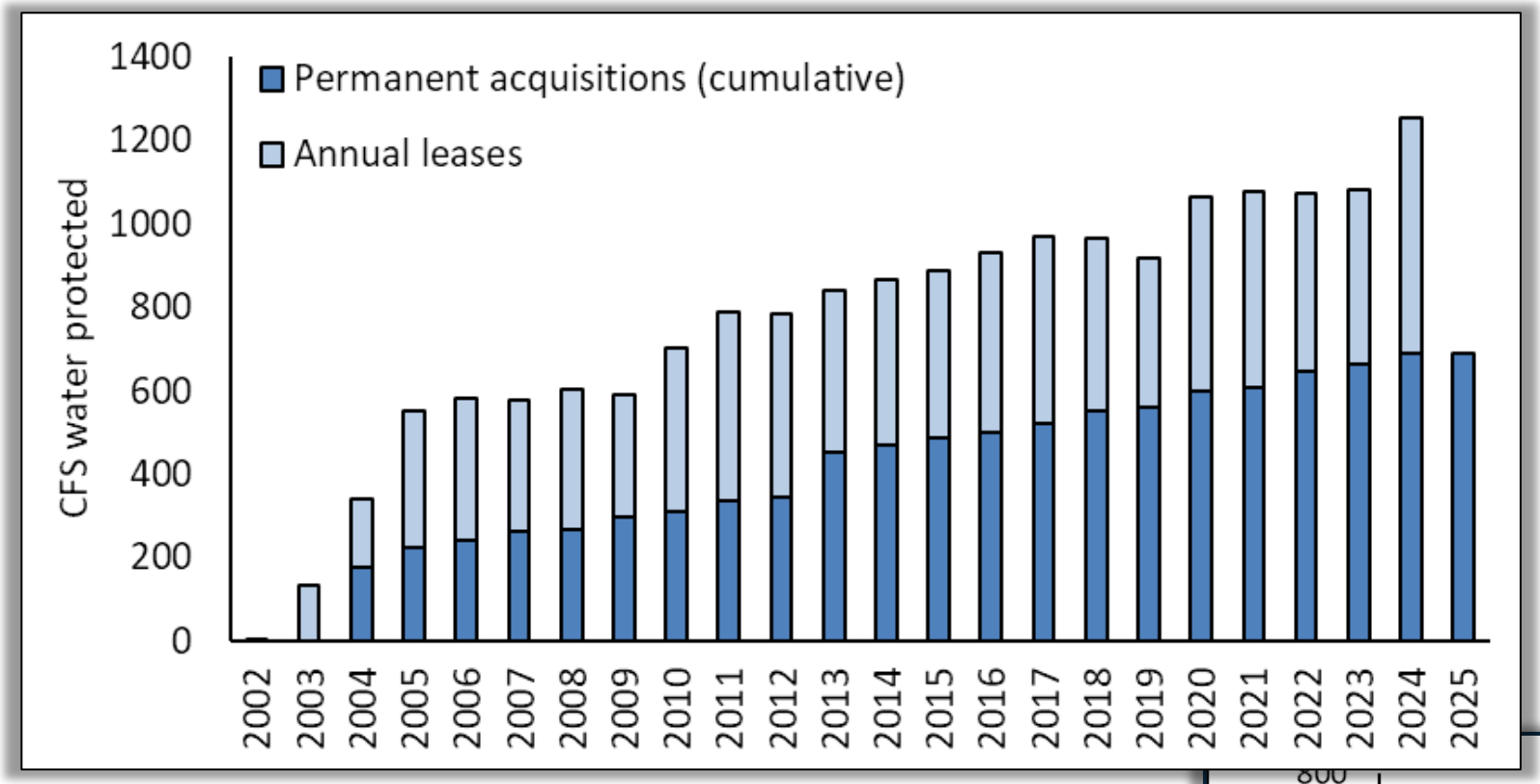
Types of Transactions:

- Permanent Acquisition
- Lease/lease market
- Source Switch
- Irrigation Efficiency
- Forbearance
- Diversion Reduction
- Stored Water

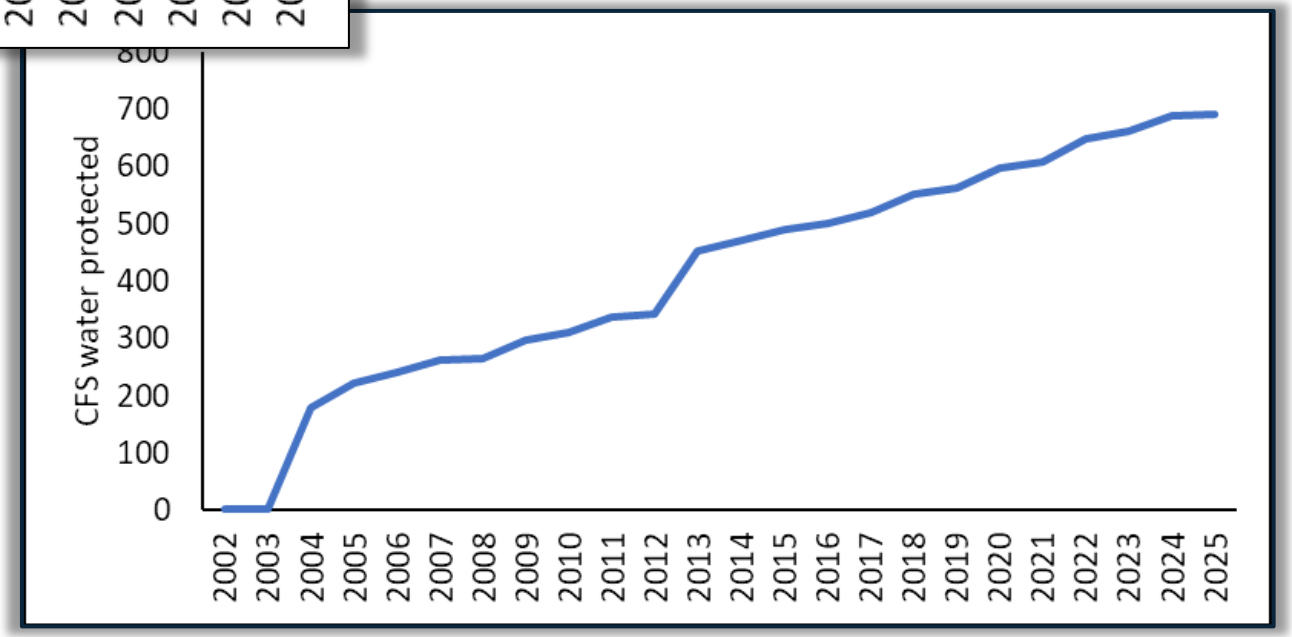


Subbasins that are part of the Columbia Basin Water Transaction Program

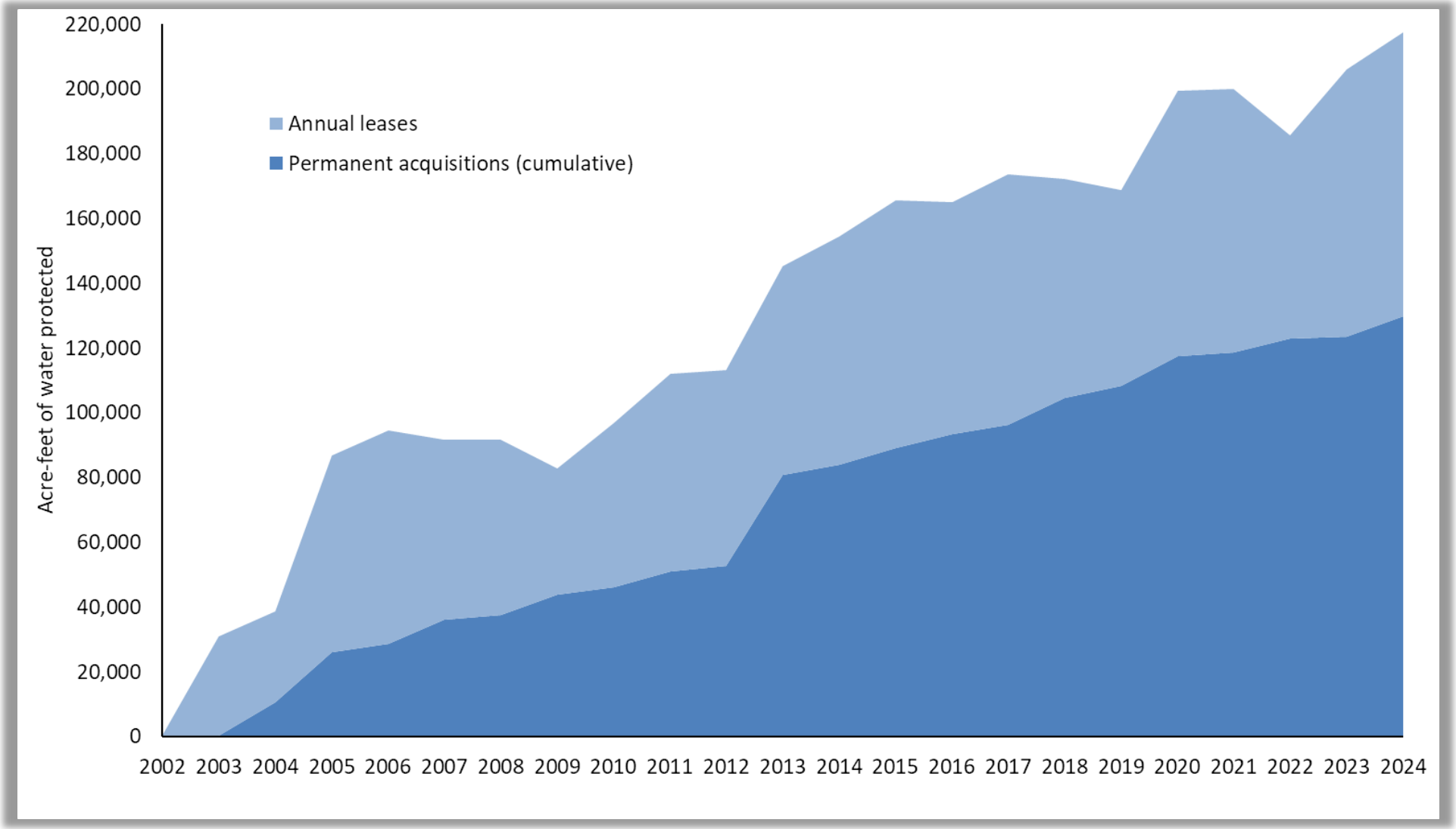
Summary of water quantity



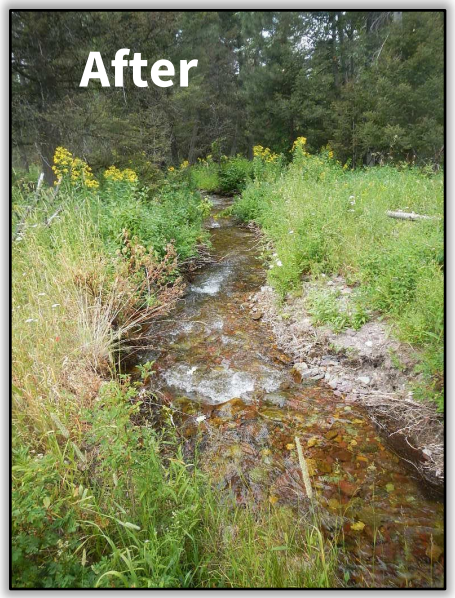
Racetrack Creek; Source: Clark Fork Coalition, Montana



Summary of water quantity



Park Creek



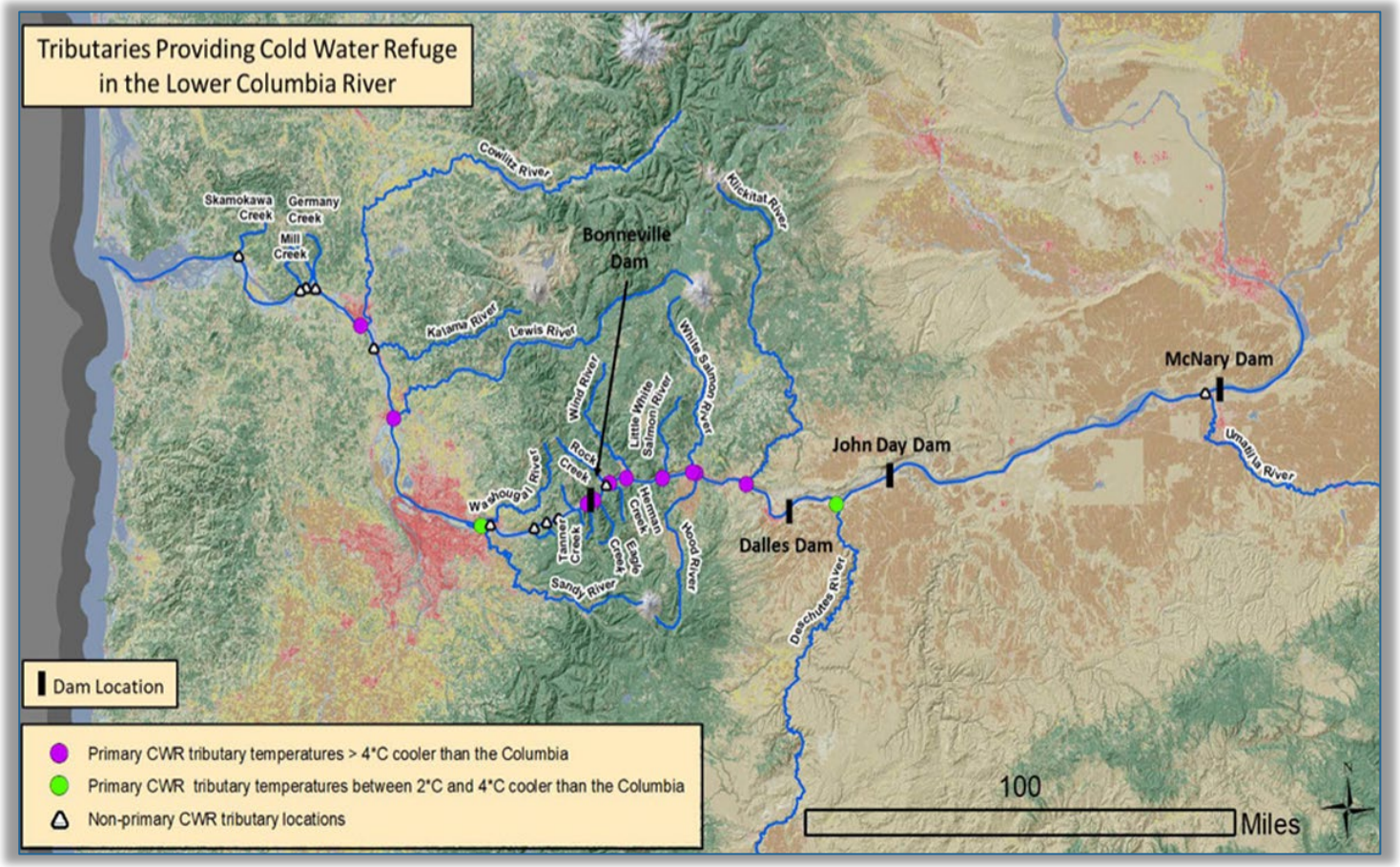
Source: Clark Fork Coalition, Montana

Examples of restoration actions to improve water quality

Water quality measures call for maintaining water temperatures relative to species thresholds and standards, and reducing toxics including those released at dams or from other activities in the basin

This can be done through:

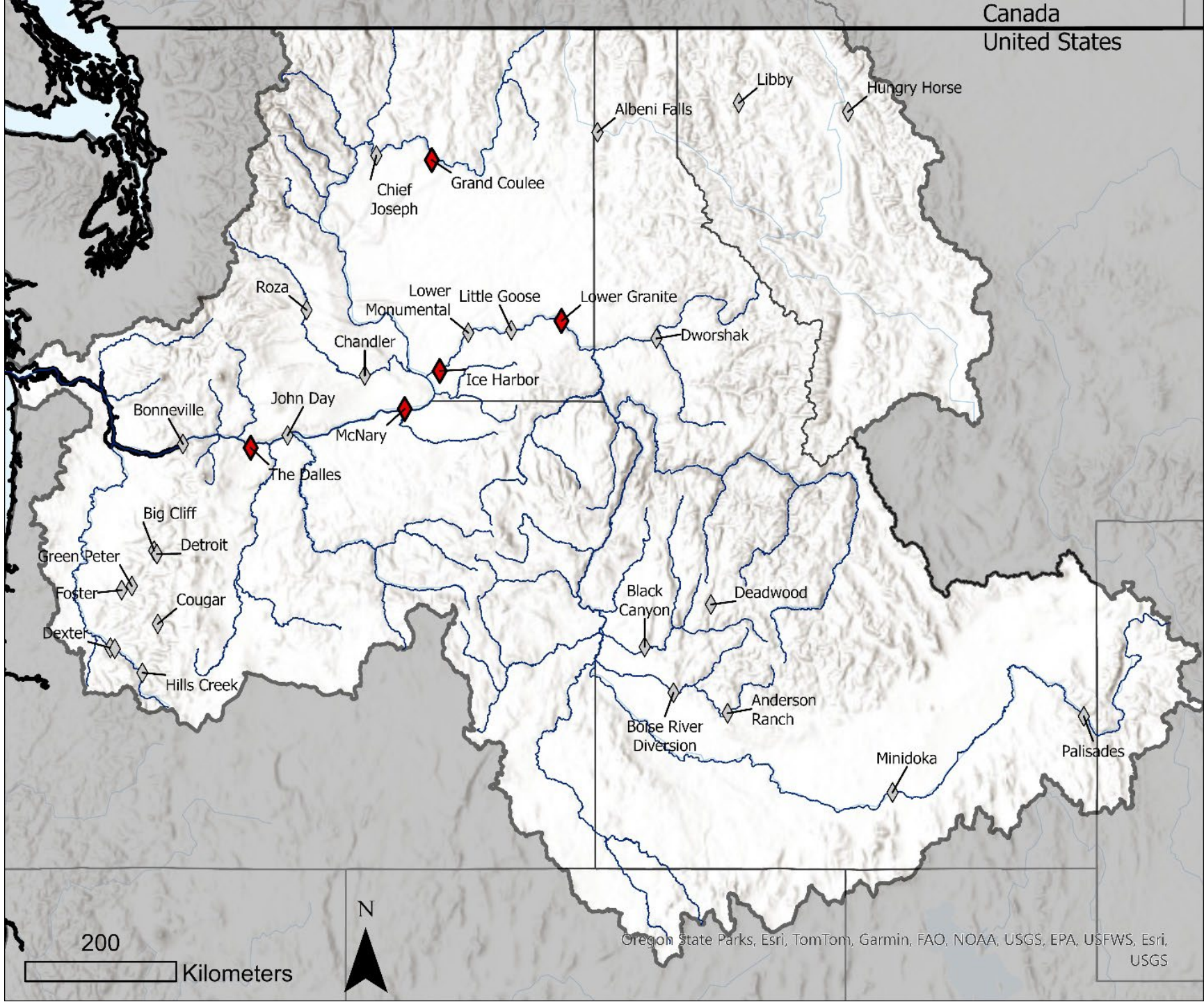
- Fencing and planting riparian vegetation in tributaries
- Protecting or creating cold water refugia
- Implementing cold water releases from certain storage dams
- Addressing sources of toxics in mainstem and tributaries



https://www.epa.gov/columbiariver/columbia-river-cold-water-refuges-plan

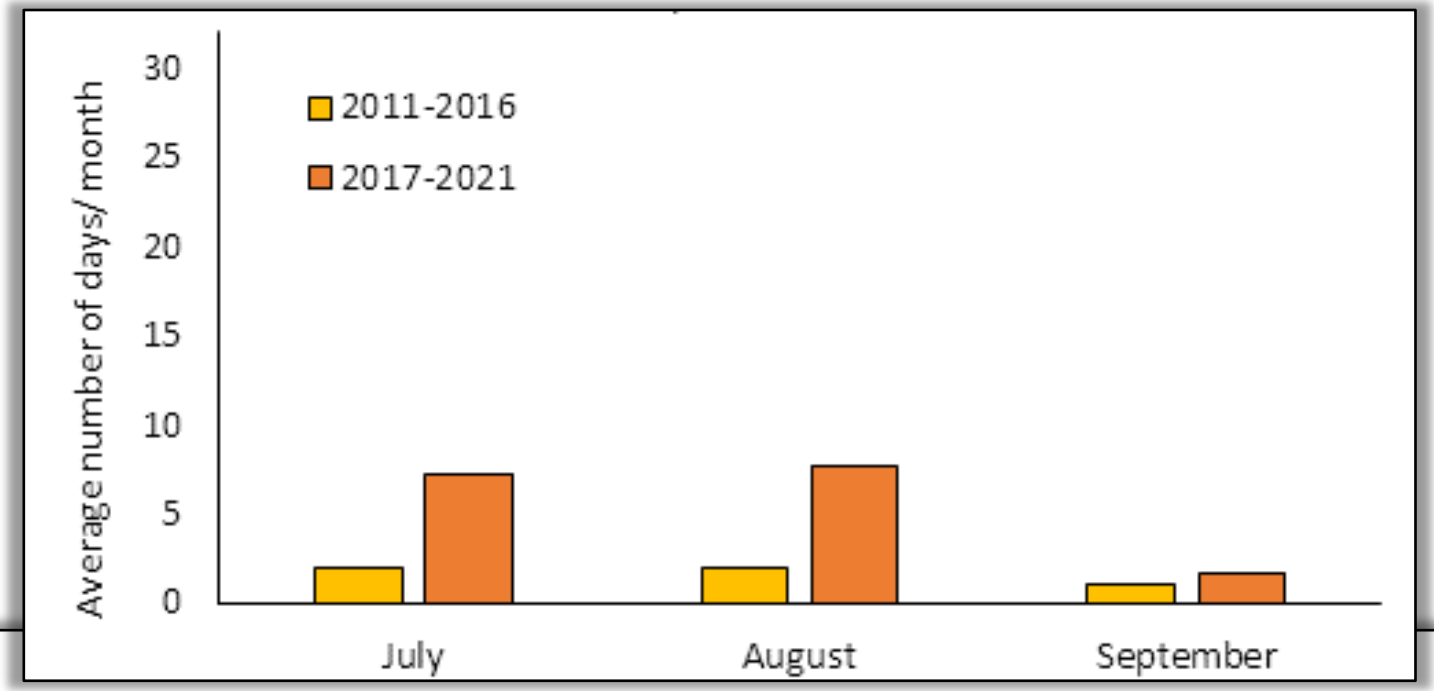
Summary of water quality

- Average number of days/ month exceeding daily maximum water quality standard
- Contrasting **2011-2016** (EPA TMDL report) with **2017-2021** (SPI data)
- Daily maximum temperatures 2017-2021

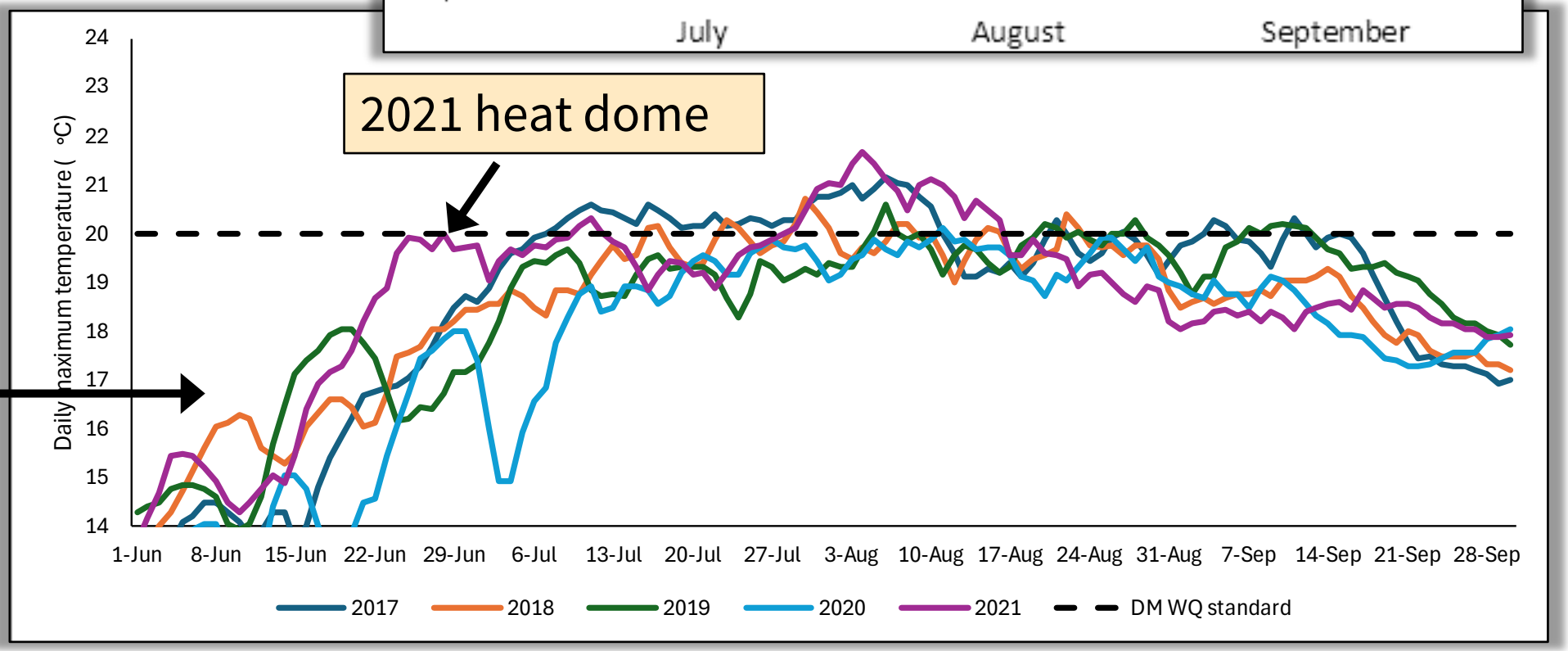


Lower Granite Dam
Standard = 20° C

Average number of days/ month exceeding daily maximum water quality standard

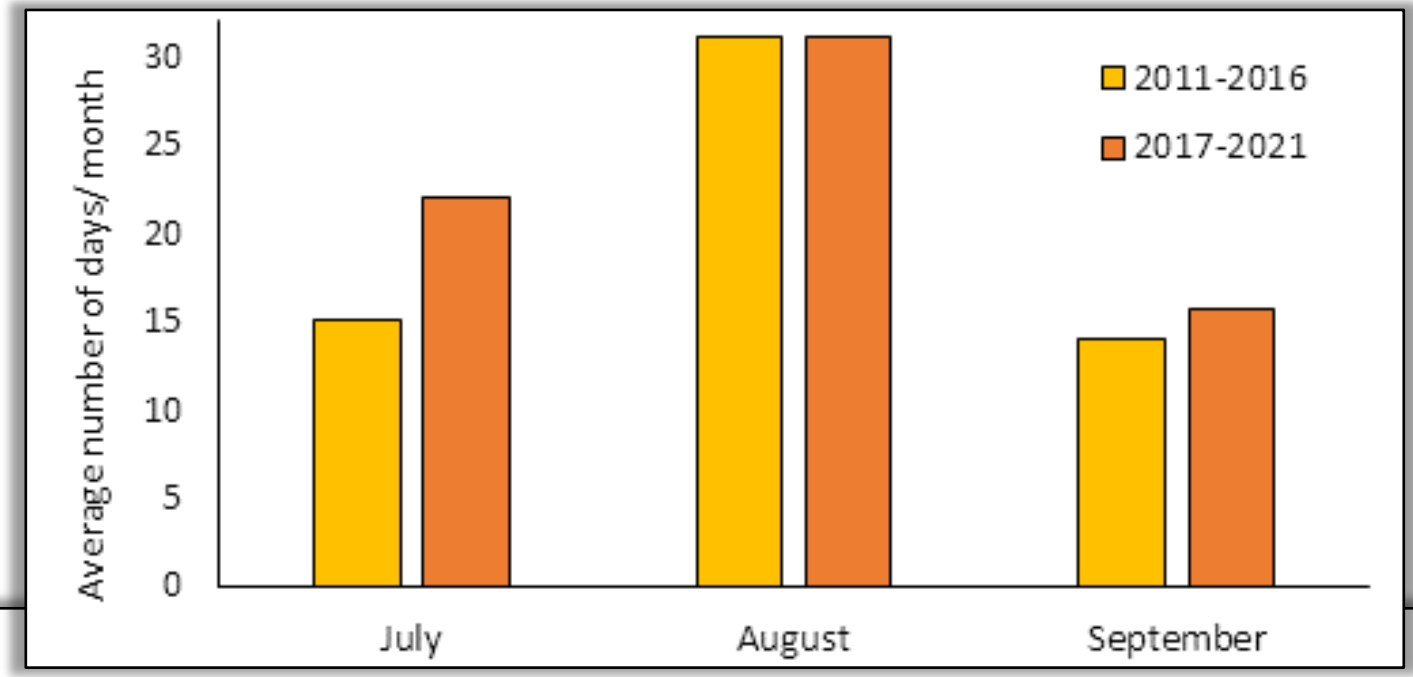


Daily maximum temperatures 2017-2021

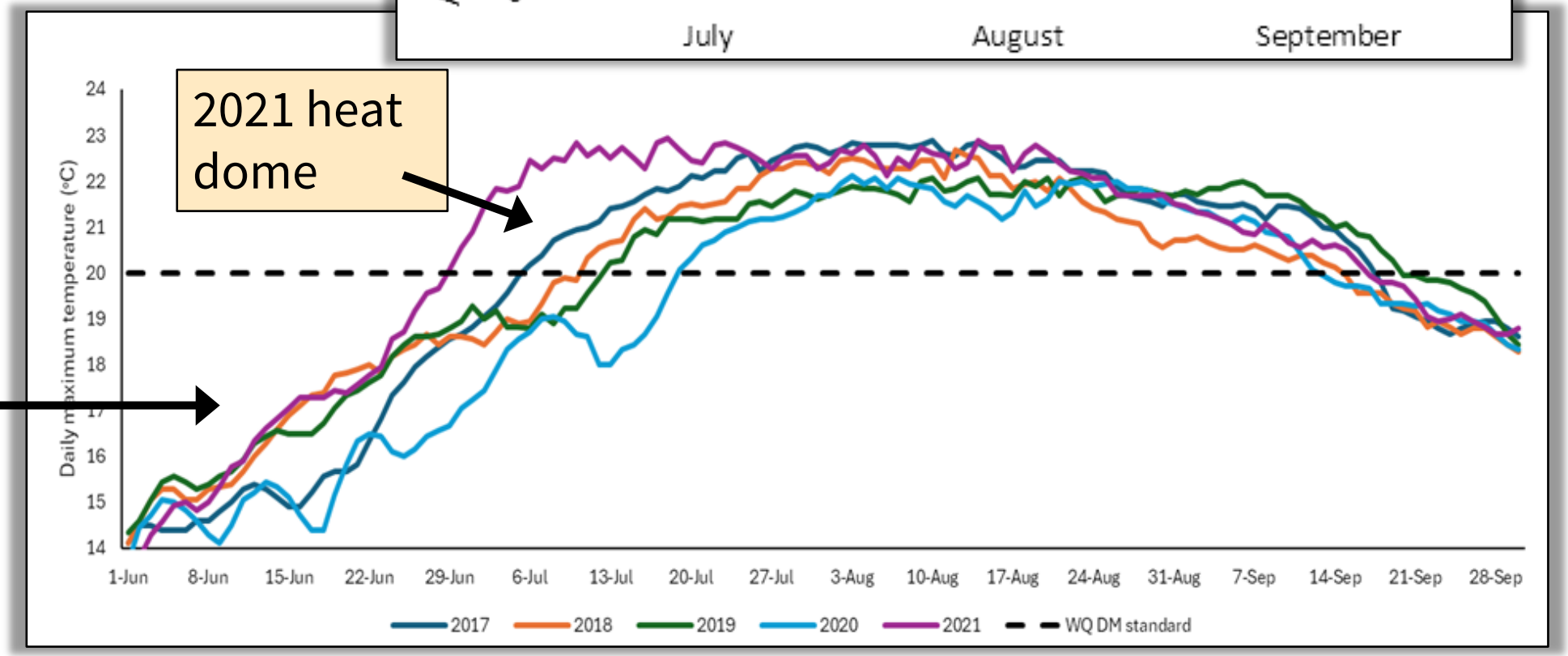


Ice Harbor Dam
Standard = 20° C

Average number of days/ month exceeding daily maximum water quality standard

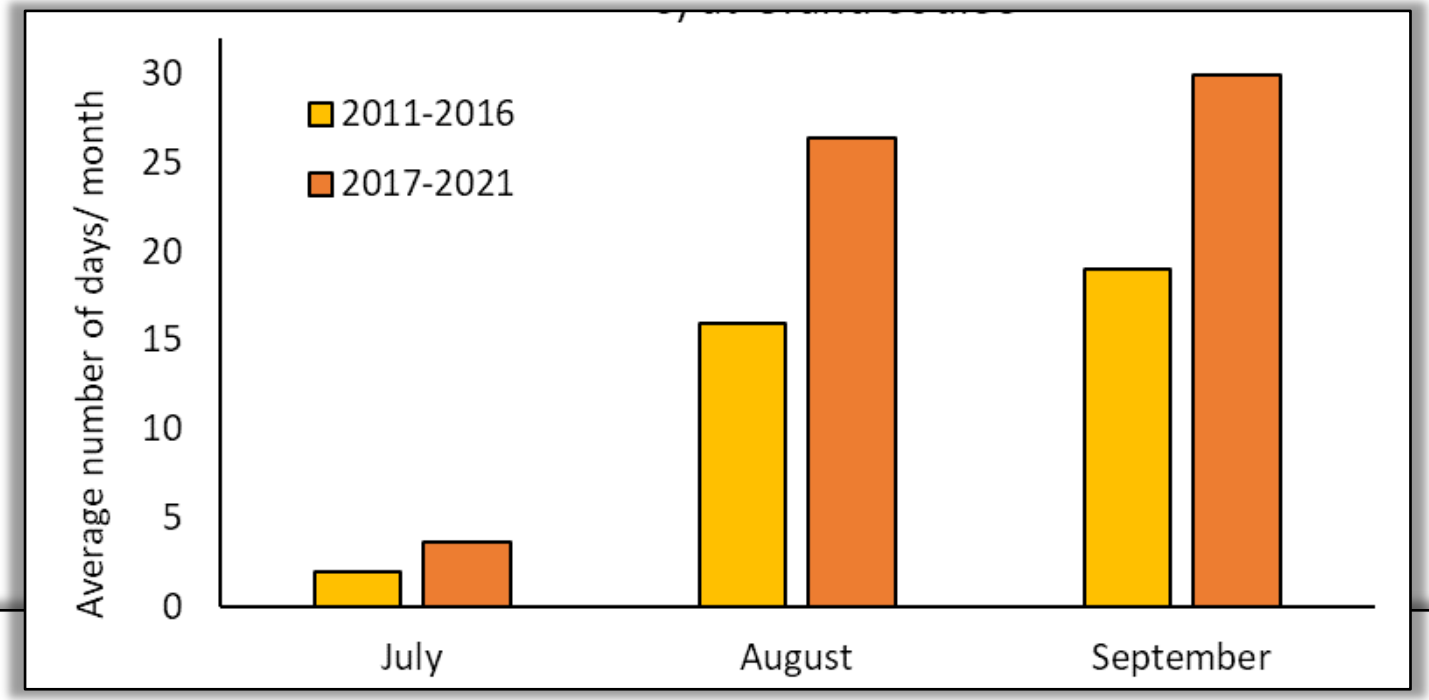


Daily maximum temperatures 2017-2021

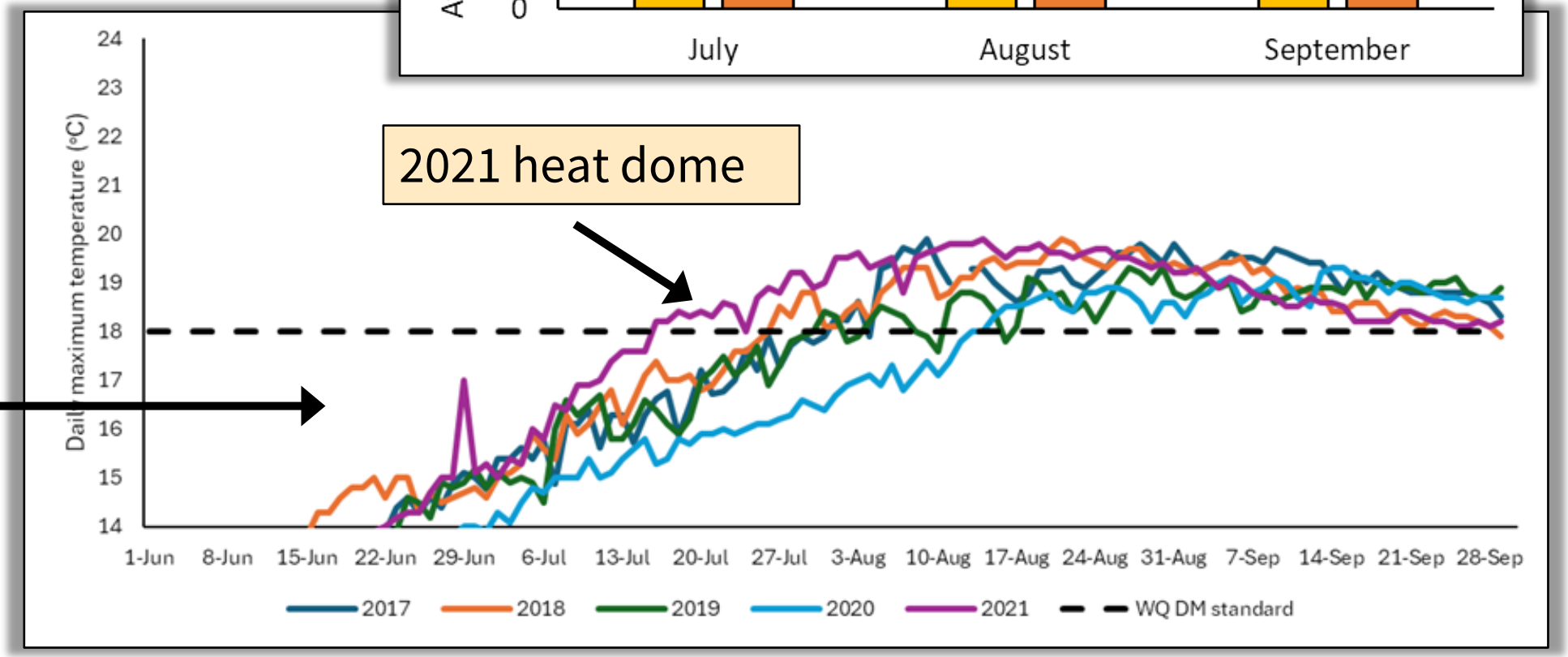


Grand Coulee Dam
Standard = 18° C (CCT)
or 17.5° C (WDFW)

Average number of days/ month exceeding daily maximum water quality standard

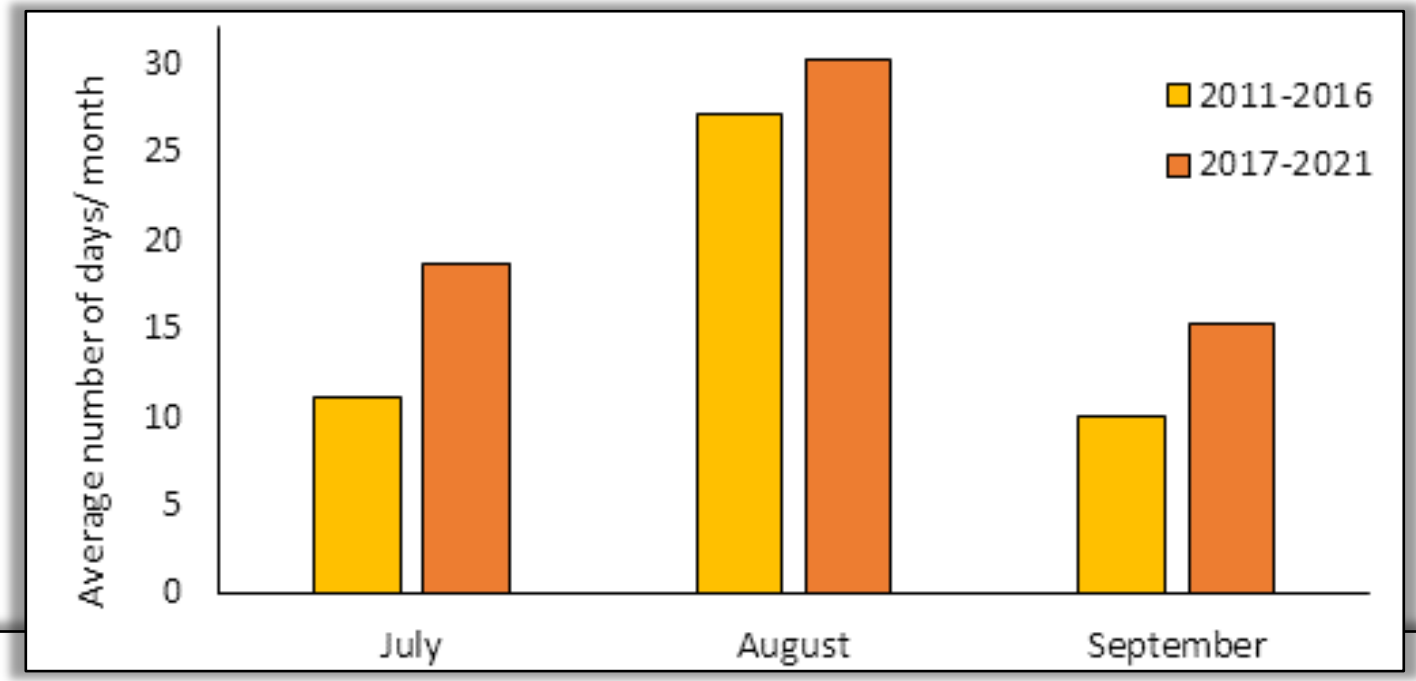


Daily maximum temperatures 2017-2021

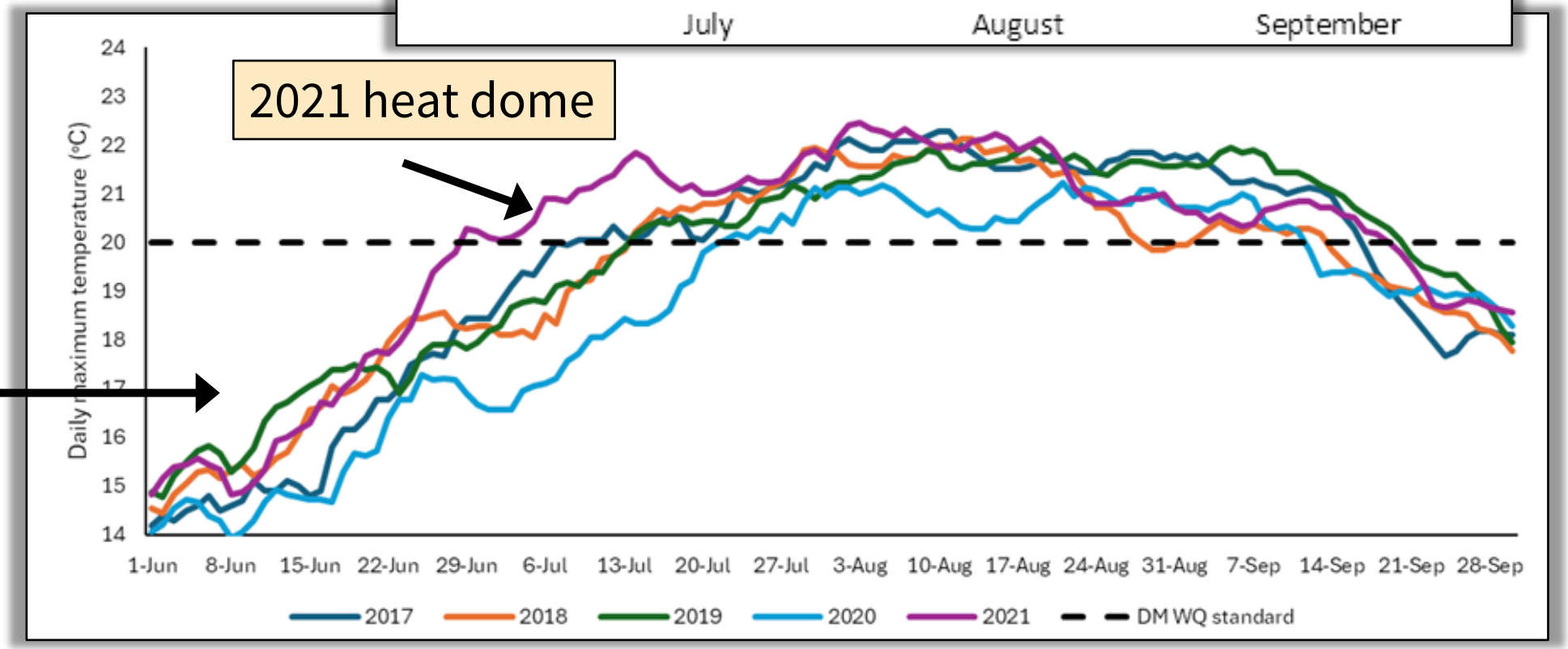


McNary Dam
Standard = 20° C

Average number of days/ month exceeding daily maximum water quality standard

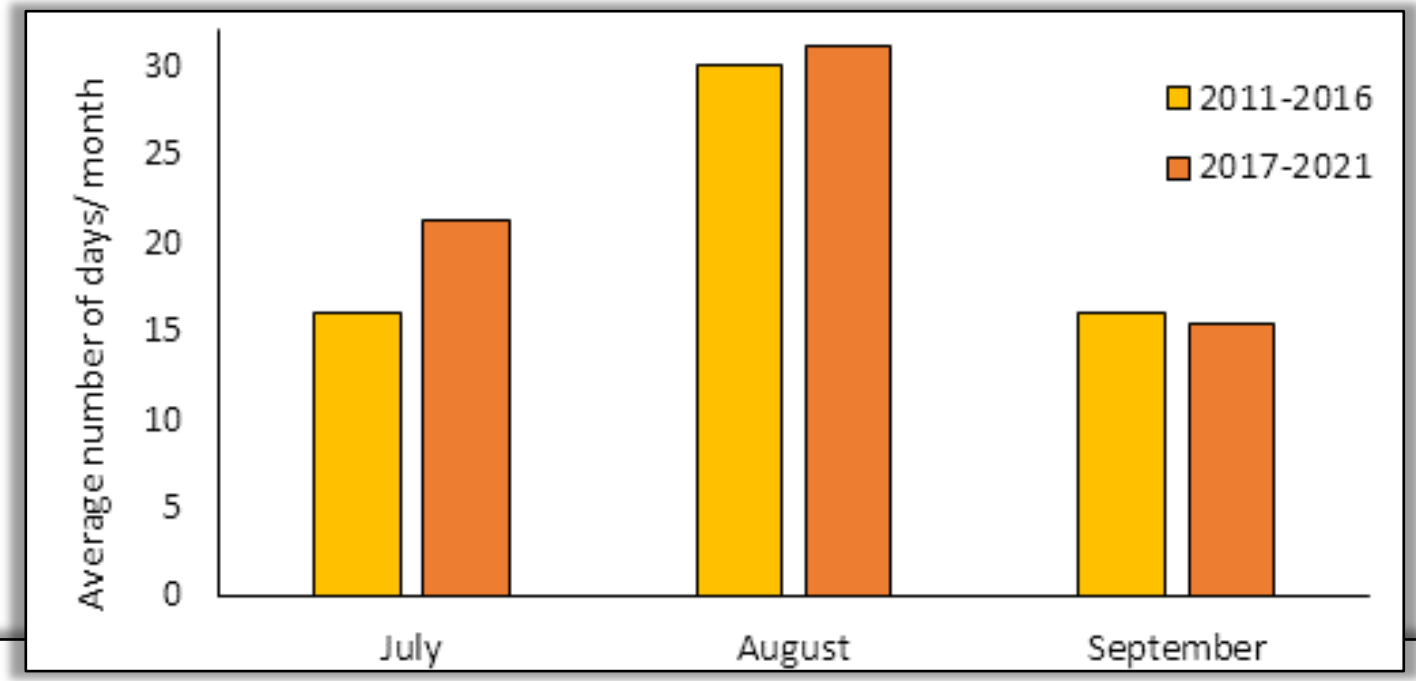


Daily maximum temperatures 2017-2021

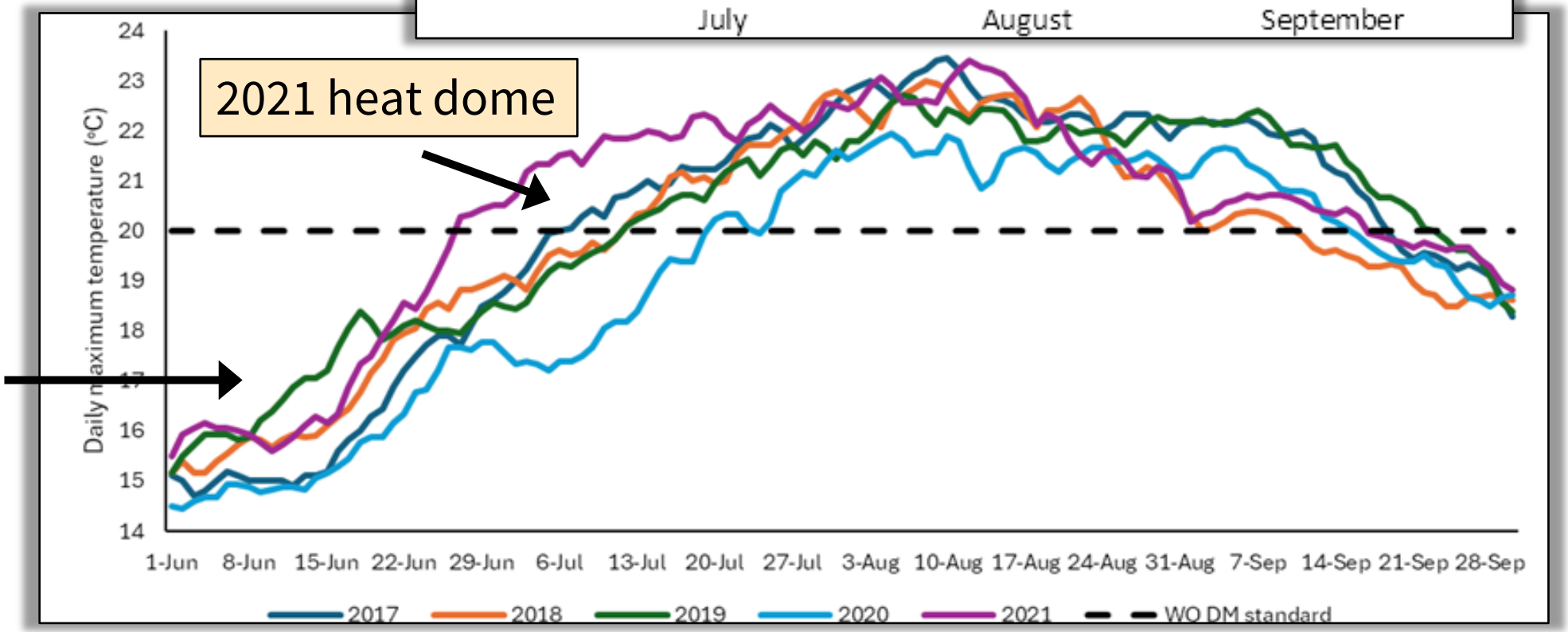


The Dalles Dam
Standard = 20° C

Average number of days/ month exceeding daily maximum water quality standard



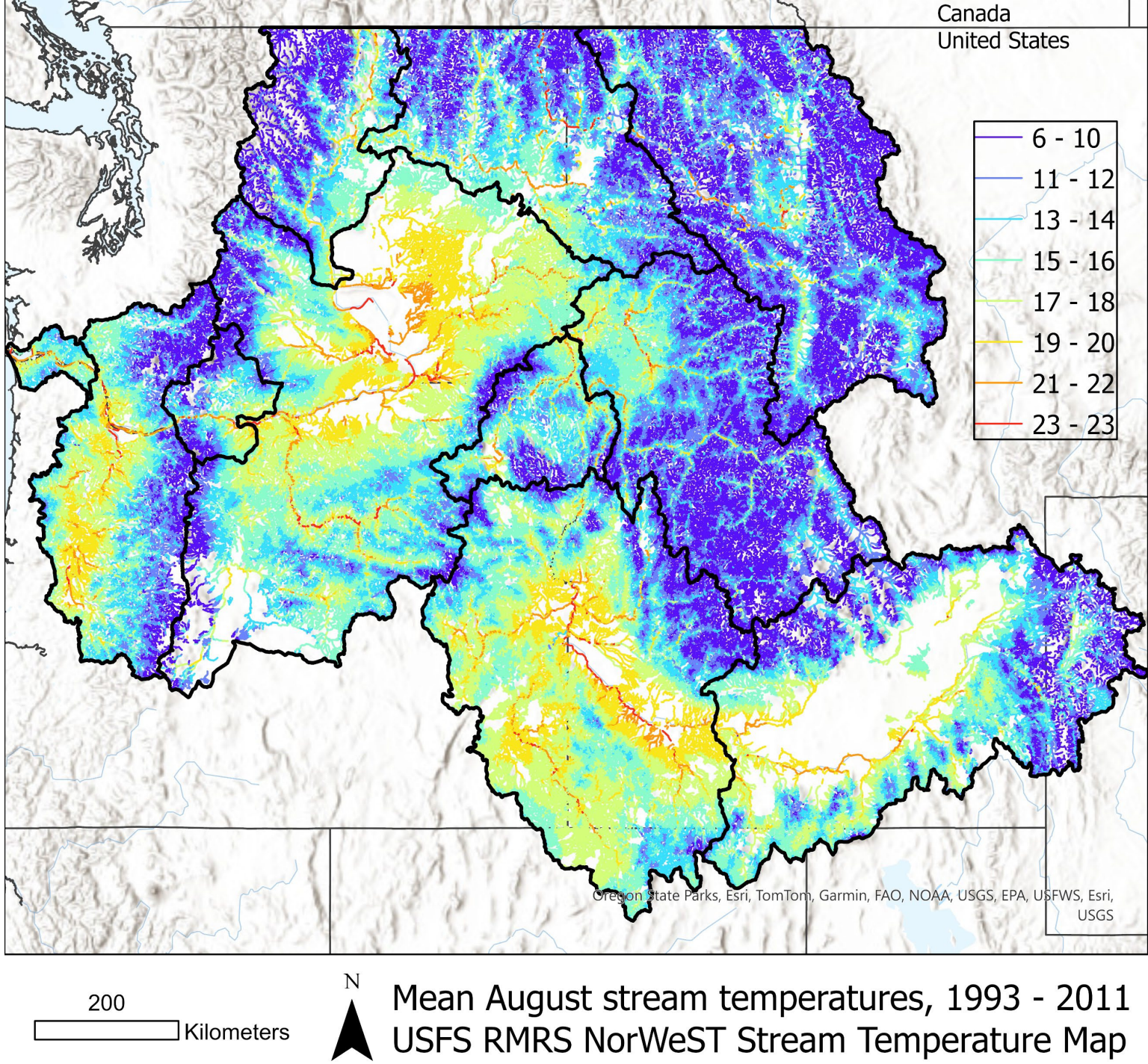
Daily maximum temperatures 2017-2021



Current and forecast stream temperatures

- USFS RMRS developed NorWeST stream temperature map
- Mean August temperatures (°C)

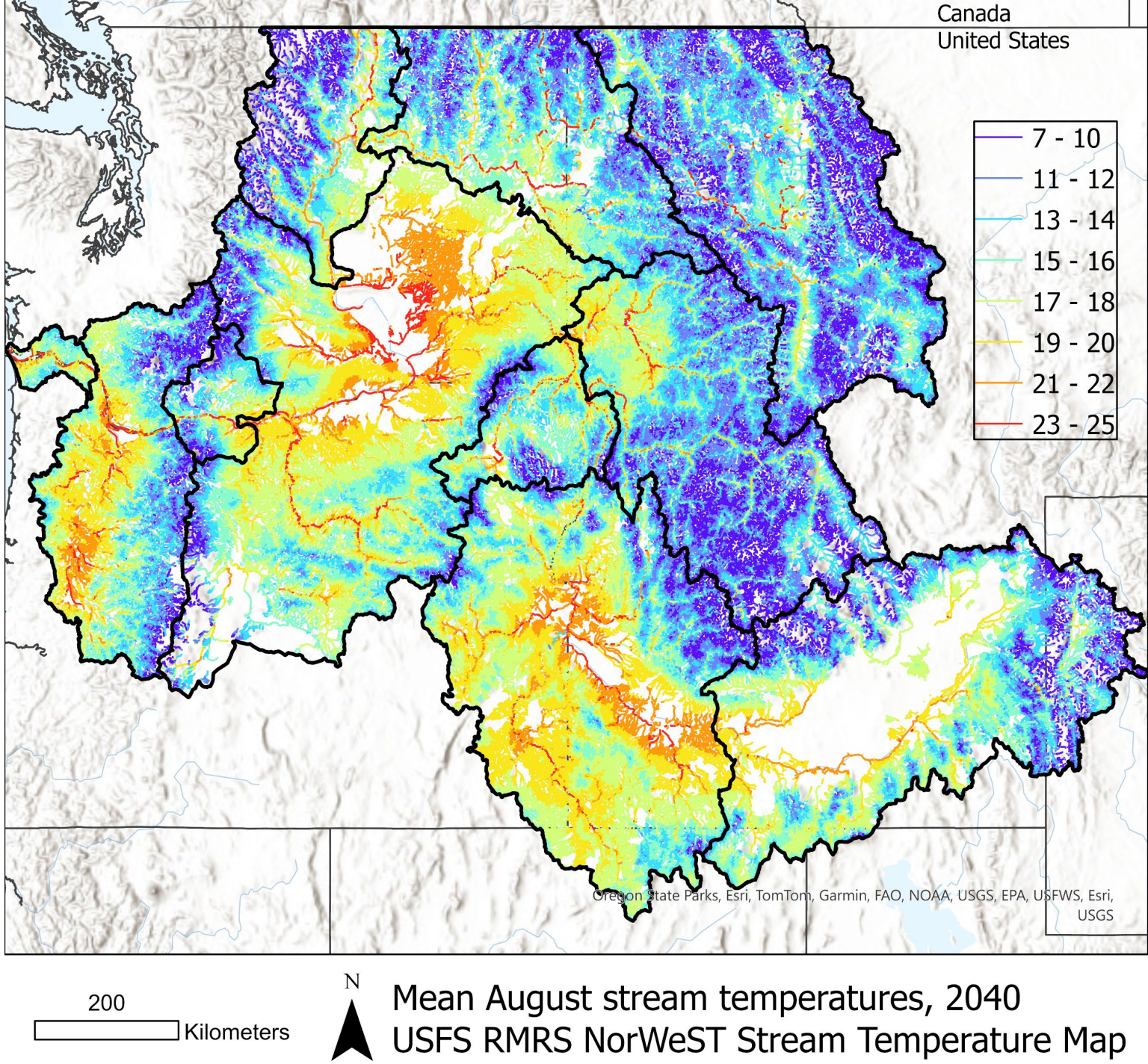
Baseline = 1993-2011



Current and forecast stream temperatures

- USFS RMRS developed NorWeST stream temperature map
- Mean August temperatures (°C)

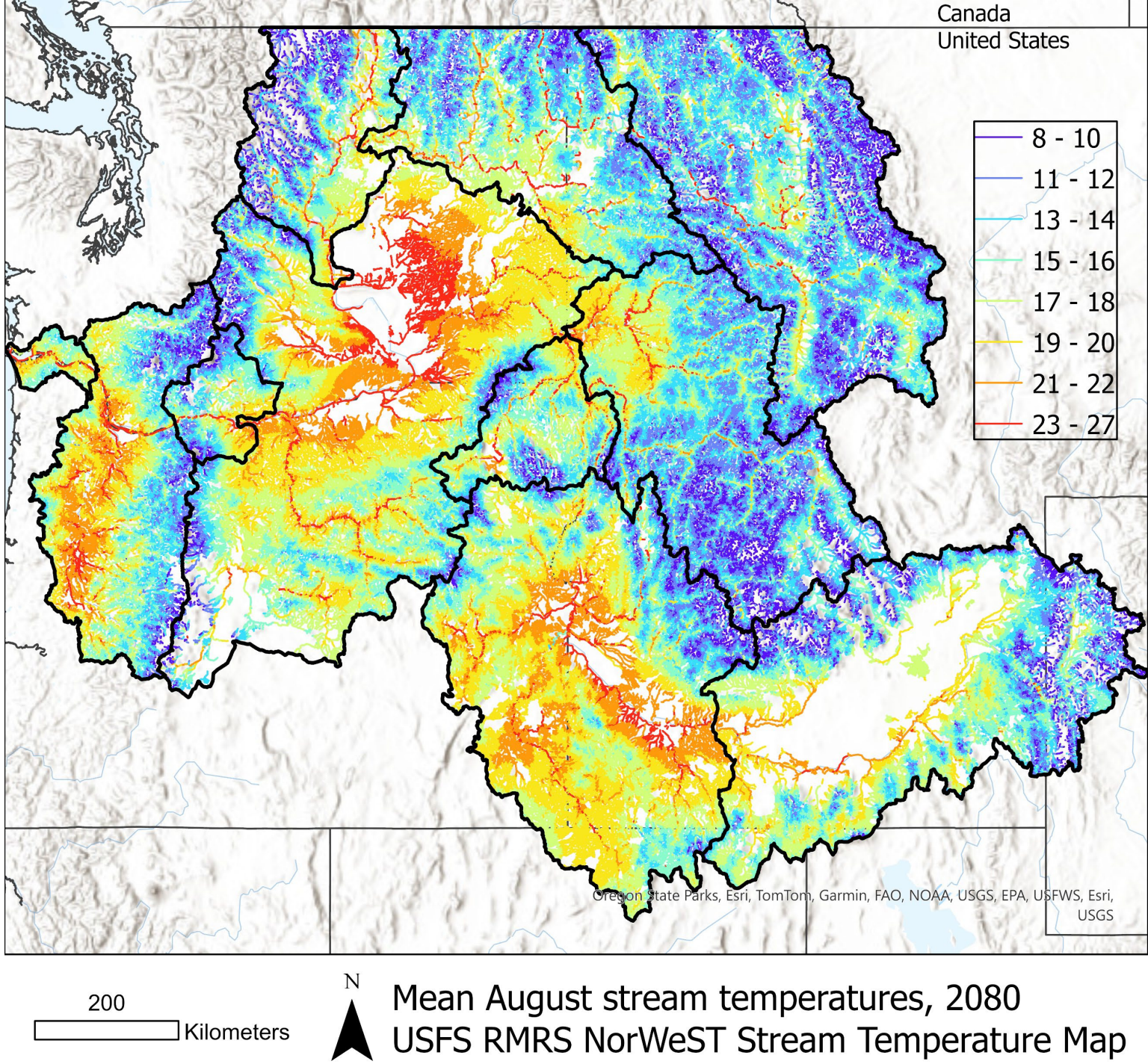
Forecast = 2040



Current and forecast stream temperatures

- USFS RMRS developed NorWeST stream temperature map
- Mean August temperatures (°C)

Forecast = 2080

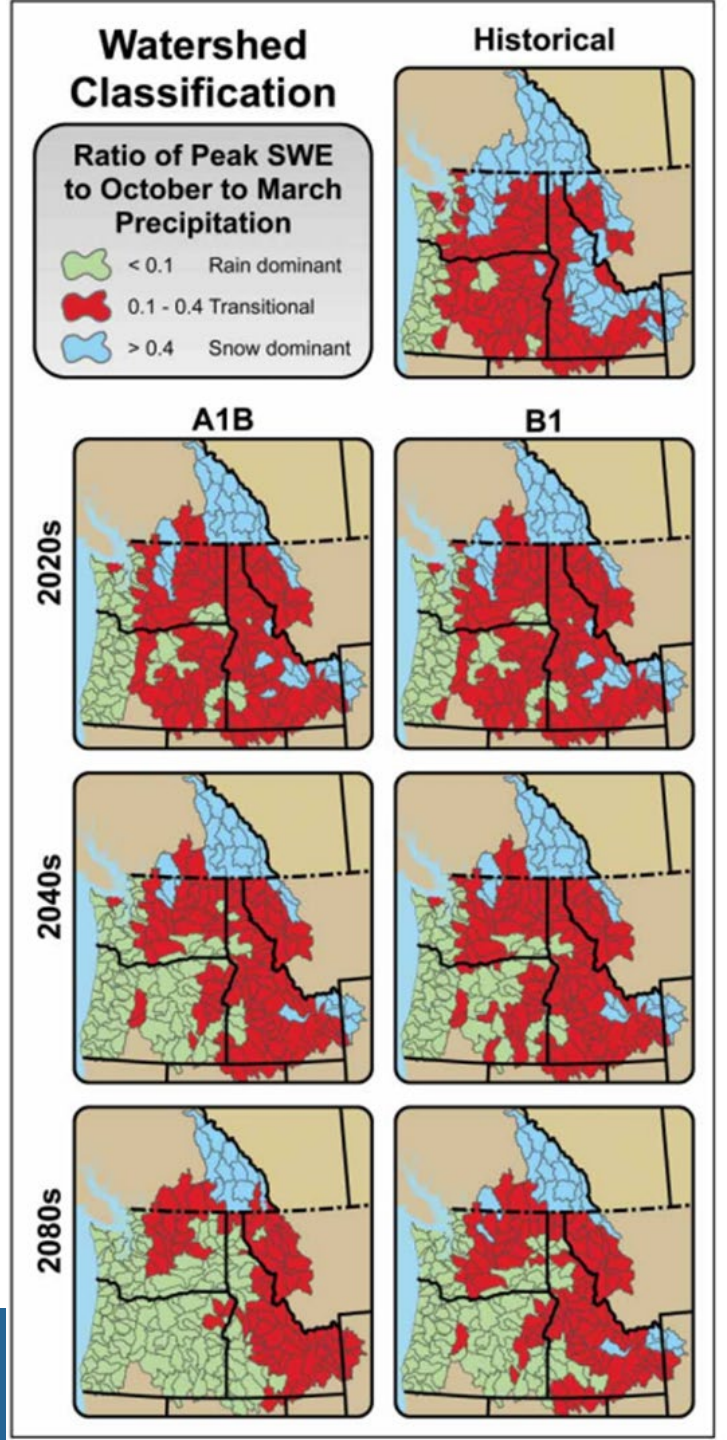


Climate change effects on Basin habitat

2020 addendum identified climate change as a near-term priority for the Council

Potential Impacts from Climate Change:

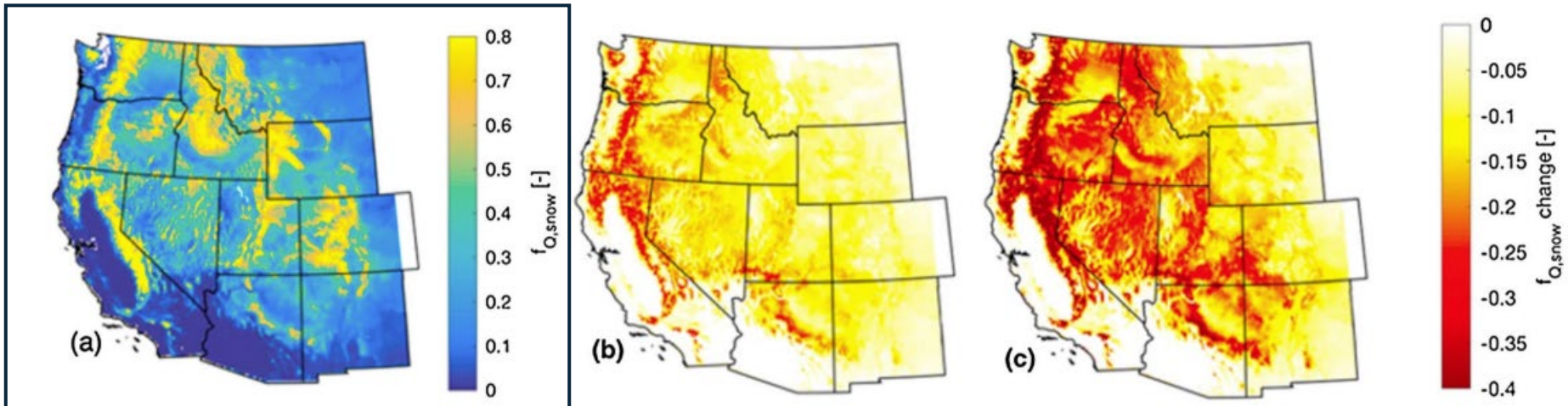
- Transition from snow to rain hydrographs
- Change in timing and volume of precipitation and runoff
- Increased water temperatures
- Higher peak flows and lower summer flows
- Increased frequency, duration, severity of weather events like heat domes
- Increased intensity of wildfire and more extreme fire behavior



How much of the total runoff comes from snowmelt now and in the future?

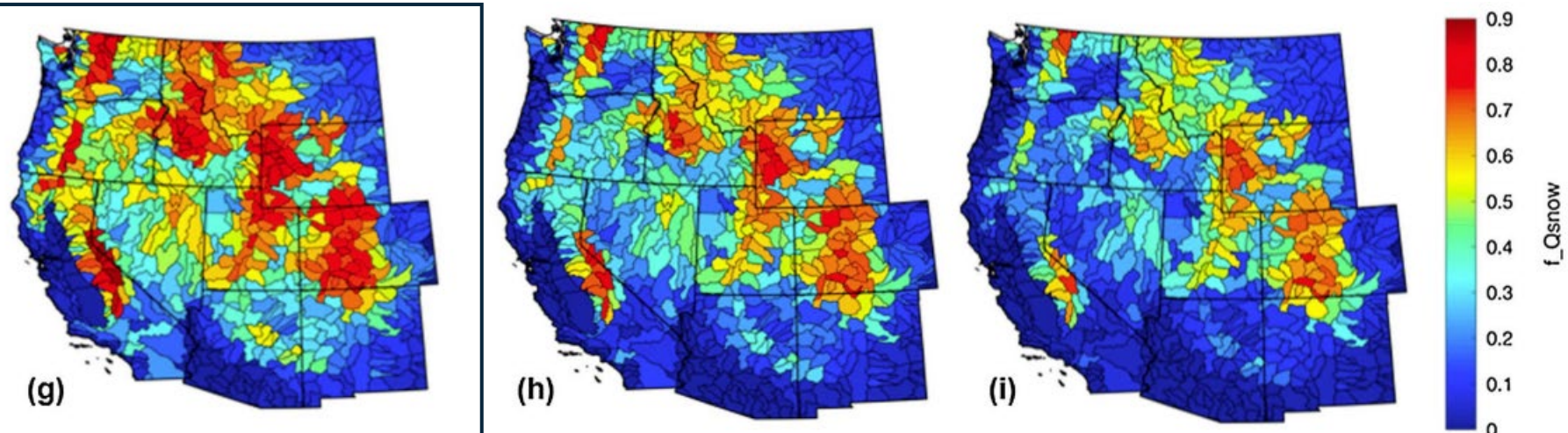
The ratio of the snow-derived runoff to the total runoff is called **$f_{q,snow}$**

Mean historical f_q,snow and changes under future climates



Mean historical | RCP4.5 scenario | RCP8.5 scenario

The runoff-weighted average f_q,snow of each 8-digit hydrologic basin



Average historical | RCP4.5 scenario | RCP8.5 scenario

Adaptation of project work for climate change

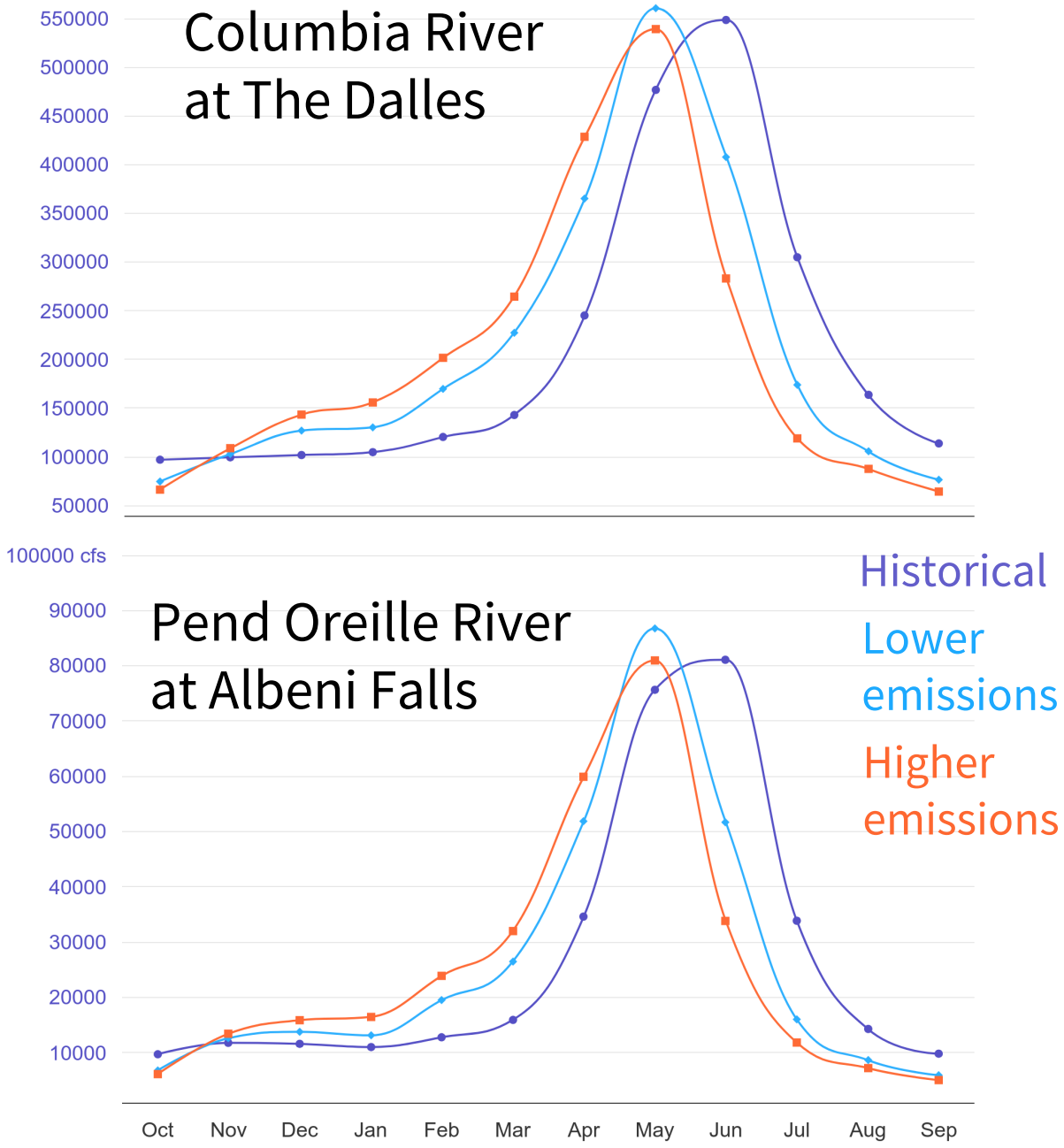
Examples of stepwise analysis:

- Applying broad-scale analyses to local areas and conditions
- Utilizing existing tools (Climate toolbox, NorWeST, etc.)
- Developing local-scale models
- Developing Climate Adaptation Plans

Examples of restoration actions:

- Prioritizing resilient habitats
- Designing for higher flood stages
- Revising planting regimes for future climate
- Identifying and connecting cold-water sources
- Ensuring connectivity under altered hydrologic conditions

Projected non-regulated flow (2070-2099)



Habitat restoration discussion

Detecting change

- What information do we have vs what information do we need to detect changes in habitat or biological response?
  - Spatial and temporal scale of effects
- Data limitations and need for better reporting of geographic pieces and updated summary reports on CBfish to address redundancies or inaccuracies in data.

Targets

- Program doesn’t have specific targets on amount or type of restoration required to achieve outcomes at watershed or biological scales
- Guidance appears in planning docs like subbasin plans, watershed plans, BiOps
- Program doesn’t define scope of problem to be addressed through offsite mitigation
- What does mitigation mean in this context? How much are we trying to achieve?

Habitat restoration discussion

Restoration in a landscape context

- Only so much footprint available to be restored
- Landscape is changing, as are priorities
- Need to adapt implementation for future climates
- Restoration under Program integrated with broader legal requirements and implementation guidelines
  - BiOps, TMDLs, and more;
  - FERC relicensing
  - HCPs at non-federal facilities
- Maximize benefit through developing collaborations

Outline

- Approach to Categorical Assessments
- Topics in Habitat Categorical Assessment
- Description of strategies and implementation
  - Discussion after each topic

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

Protection

- Protected areas
- Screens
- Fish lands
  - Referenced in wildlife section and covered in supplementary documentation
- Discussion

Photo of dead fish in unscreened irrigation diversion in Idaho, provided by IDFG

Protection

Program strategies (not covered in prior assessments)

Protected areas and hydroelectric development

- Protect fish and wildlife from the adverse effects of future hydroelectric project construction and operations. As part of this strategy, the Council supports protecting streams and wildlife habitats from any hydroelectric development where the Council believes such development would have unacceptable risks to fish and wildlife.

Maintenance of Fish and Wildlife Program investments

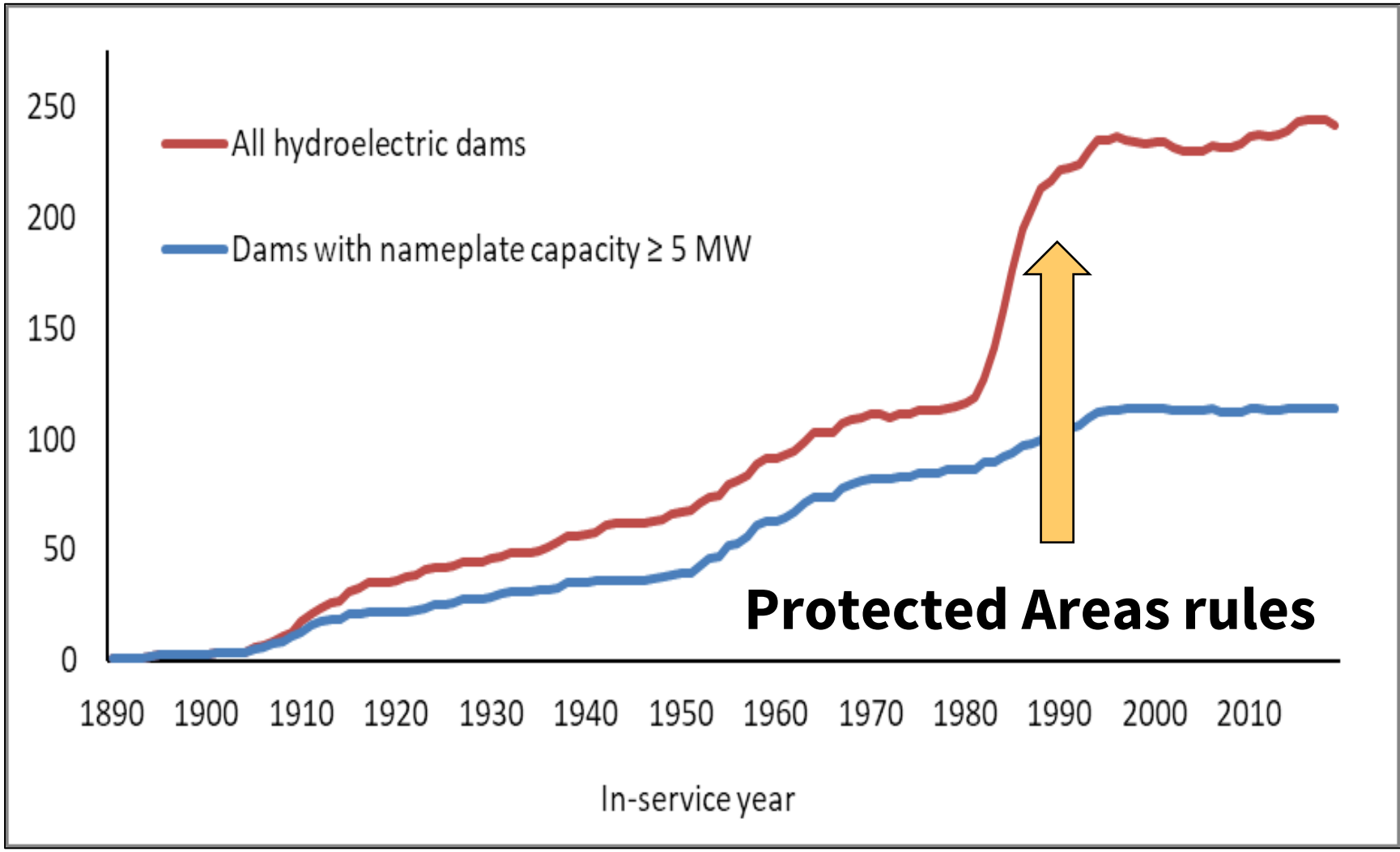
- The Council has determined adequate and dependable operation and maintenance support is needed to ensure ongoing proper functioning of past infrastructure investments by Bonneville and the action agencies intended to benefit fish and wildlife in the Columbia River Basin.

Protection measures over time- protected areas

Decade	Protected Areas
1980s	• Council will designate stream reaches and wildlife habitat areas which shall be protected from further hydroelectric development • Protected Areas rules in 1988 amendment
1990s	• BPA: Do not acquire power from hydroelectric projects located in protected areas • FERC and all other federal agencies responsible for managing, operating, or regulating federal or non-federal hydroelectric facilities located on the Columbia River or its tributaries are required to take protected area designations into account to the fullest extent practicable at all relevant stages of decision-making processes
2000s	• Same; also principles of “build from strength/ strongholds”
2010s	• Same

Protected areas

- Public Utilities Regulatory Policy Act
- Rapid development of small hydro
- Concerns with transmission/ fish and wildlife effects
- Utilities and managers support protection
- The Council takes the lead
- Designation of protected areas

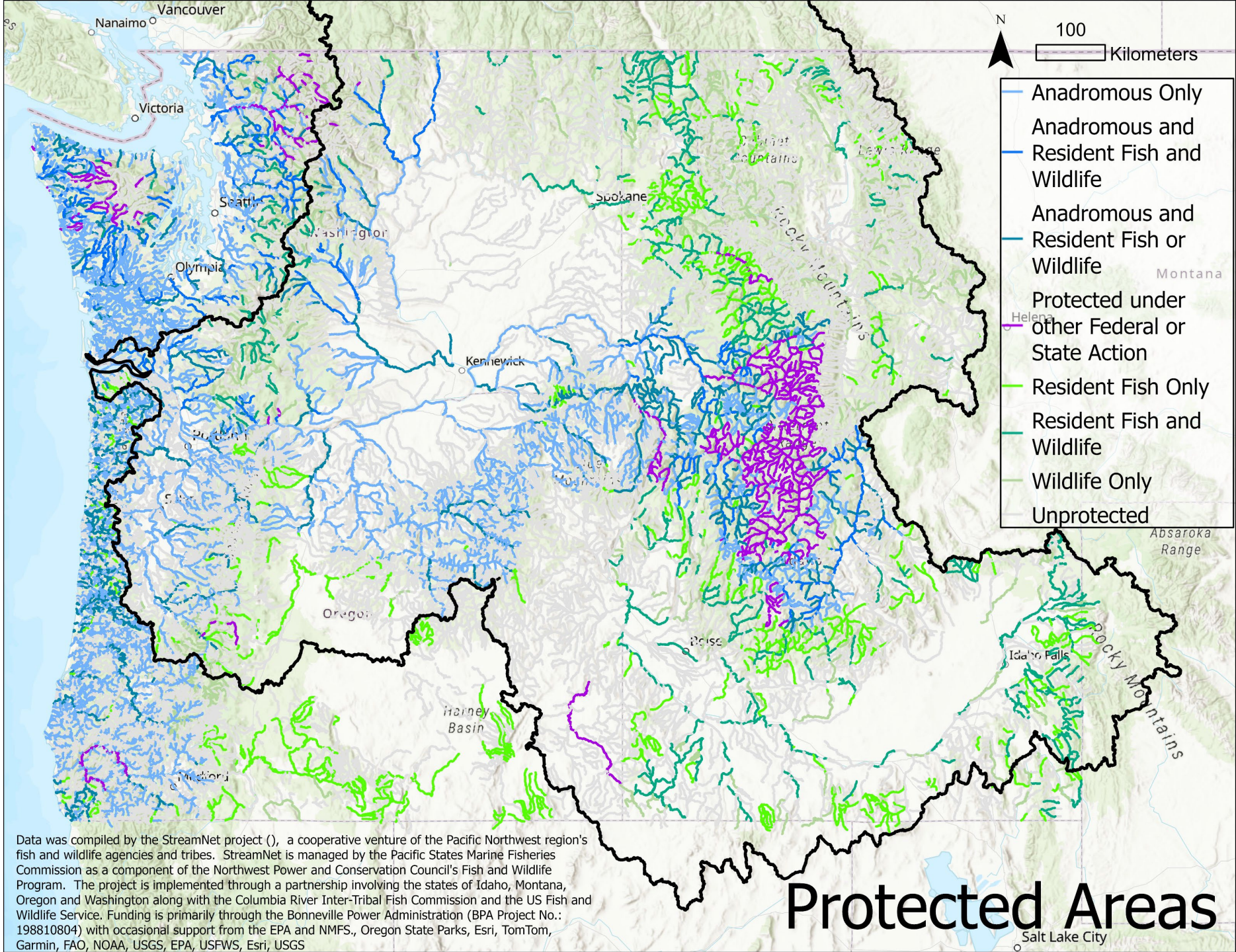


Protected areas

Licenses granted by FERC in protected areas since 1988:

0

Strategy Performance Indicator: C4-3



Protection measures over time- screens

Decade	Screens
1980s	• Design and construct screen improvements in Yakima Basin
1990s	• Large expansion in this part of Program • Require, design and install fish screens on diversions • Develop prioritized list of tributary screening …improvements for stream diversions in Columbia Basin affecting salmon and steelhead
2000s	• Projects listed in Subbasin Plans
2010s	• Same • Install appropriate and effective juvenile lamprey screening for tributary water diversions • Maintain Fish and Wildlife Program investments (FSOC; O&M) • Asset Management Strategic Plan

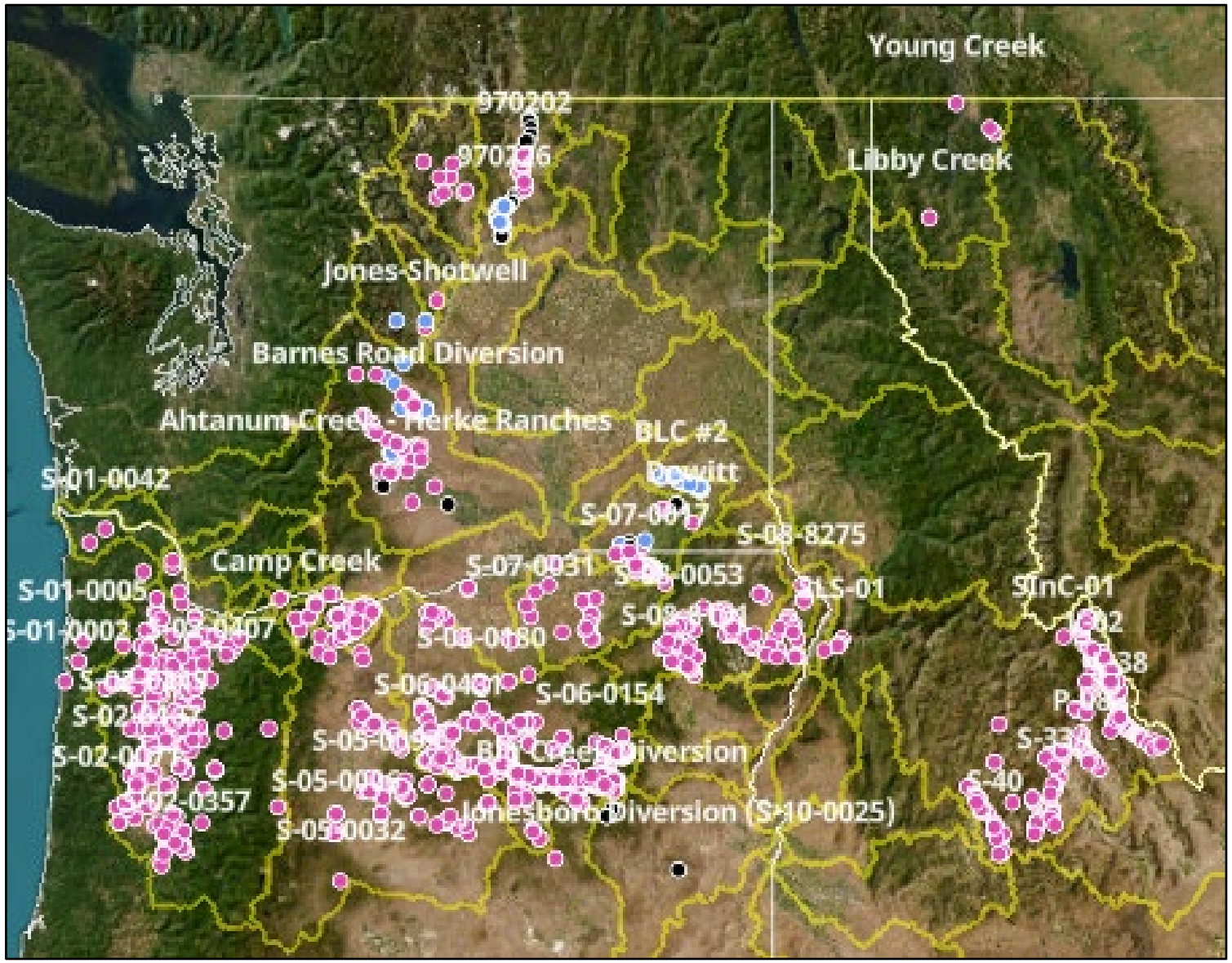
Screens - history

- Mitchell Act funding supports early screening programs but by late 1980s/90s, insufficient to cover O&M and additional screening needs
- 1990s- ESA-listings and BPA starts funding screen shop construction; advancements in technology and design around screens
- Fish Screen Oversight Committee develops screen inventory and prioritized list in need of non-recurring maintenance

Fish Screen Story Map

Unscreened irrigation ditches can entrain fish- photo: IDFG

Screens - implementation



Fish Screen Tracker

- 16 projects
- Oregon, Washington, and Idaho operate the five screen shops in the basin where fabrication occurs
- 1864 screens associated with Council Program
  - Data on Fish Screen Tracker
- Range of screen designs used
- O&M Strategic Plan

Habitat protection discussion

Protected areas

- Very successful
- Tracking the whole process- application through license- is challenging

Screens

- Research shows screening very effective (and cost-effective) tool to prevent entrainment mortality of wild and hatchery fish
- Screens requires maintenance to remain effective
  - Combination of screen tenders and private property owners, range of maintenance schedules
  - Screen maintenance program keeps screens running longer and functioning as designed
- Ongoing need for O&M funding- are budgets adequate to cover recurring maintenance to ensure goals and objectives of the investments are accomplished?

Habitat protection discussion

Screens- continued

- In last project review, managers discussed increasing O&M costs resulting from climate change and how they are adapting their projects
  - Planning for increased runoff at screens (more random flow events, increased debris loads- especially post-fire)
  - Drier conditions with more fluctuating water levels requires additional maintenance to keep fish passage going when water levels are low
- Opportunities to coordinate screening with fish passage and water conservation?

Outline

- Approach to Categorical Assessments
- Topics in Habitat Categorical Assessment
- Description of strategies and implementation
  - Discussion after each topic

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

Wildlife

- Hydro effects on wildlife
- Approach to mitigation
- Impact and loss assessments
- Wildlife rules
- Crediting
- Projects / settlement agreements
- Wildlife Advisory Committee/ Wildlife Crediting Forum
- FCRPS mitigation by subregion
- Discussion points

Wildlife

Program strategies

Wildlife mitigation

- Mitigate wildlife losses caused by the development and operation of hydropower dams in the Columbia River Basin.

Hydrosystem effects on wildlife

Negative effects:

- Inundation of floodplain and riparian habitats
- Fluctuating water levels that create areas barren of vegetation and increased exposure to predators
- Habitat degradation associated with roads, facilities, channelizing streams, etc.
- Other effects associated with transmission corridors

Positive effects:

- Reservoirs create habitat for waterfowl and other focal species

The Act requires mitigation for development and operation of the hydrosystem [section 4(h)(5) and others]:

1) **Construction and inundation** The wildlife losses that occurred as a direct result of construction of a dam and the flooding of the area upriver of the dam
2) **Operational** The direct wildlife losses caused by the day-to-day fluctuations in flows and reservoir levels resulting from the operation of the hydrosystem

Discussion of **secondary losses** has occurred but disagreement on definition and no longer part of Program

Approach to mitigation

Mitigation for FCRPS occurs through F&W Program

- Define losses at each dam
- Mitigate through acquiring and/or enhancing habitat
  - Habitat based- not abundance based
  - BPA provides funding for power-share of mitigation
- Develop plans to maintain conservation values
  - These values described in land management plans
- BPA receives mitigation credit against losses

Mitigation for non-federal hydroelectric dams occurs through FERC licensing agreements/ Habitat Conservation Plans (HCPs)

Decade	Wildlife mitigation measures
1980s	• Impact assessment and mitigation plans at each dam • First mitigation plans adopted • Wildlife Mitigation Rule – interim mitigation goals and 10-year mitigation effort until long-term goal adopted
1990s	• Interim goal replaced by full mitigation; losses tables added as starting point for mitigation • Loss estimates recognized as unannualized C&I losses; call for mitigation agreements
2000s	• Complete mitigation agreements by 2001 or unaddressed C&I losses mitigated at 2:1 crediting ratio; assessment of Op losses • BPA and managers to reach agreements on completing C&I losses by 2011; established the Wildlife Crediting Forum to resolve policy and crediting issues
2010s	• Complete C&I losses by 2016; asks Wildlife Advisory Committee to report on how to resolve Op losses • Track progress on mitigation; secondary losses dropped.

Impact assessments and loss assessments

- Impact assessments determine inundation area and estimate losses and gains resulting from construction and inundation
  - Losses estimated using Habitat Evaluation Procedure (HEP) to determine total Habitat Units (HUs) lost or gained
  - **HEP** developed by USFWS to quantify impacts on wildlife habitat. Instead of acre-for-acre replacement (where quality could differ), HEP combines habitat value for identified species and habitat area in acres
  - Result is "**habitat units**"- a currency for tracking mitigation; One HU = one acre of optimum habitat
- Losses adopted in Program, beginning with State of Montana in 1987

Black Canyon	
Mallard	-270
Mink	-652
Canada Goose	-214
Ring-necked Pheasant	-260
Sharp-tailed Grouse	-532
Mule Deer	-242
Yellow Warbler	+8
Black-capped Chickadee	+68

1989 Wildlife Rule

Highlights of Wildlife Rule:

- Interim goal for wildlife mitigation approximately 35% of lost habitat units over 10 years
- Independent audit of loss statements prior to final acceptance
- Mitigation plans to be evaluated against specific standards
- Establishes Wildlife Advisory Committee to set priorities
- Council review of wildlife loss assessments and mitigation plans
- Provides for BPA funding and implementation of mitigation plans
- Criteria for protection and monitoring
- BPA shall develop, …a comprehensive program to monitor and evaluate effectiveness of wildlife program

Crediting

Dam	Wildlife Management Area	Wildlife Species (1)	Protected HUs	Enhanced HUs	Total HUs (Protected + Enhanced HUs)
Albeni Falls	Albeni Cove		-	96	96
		Bald Eagle (breeding)	-	7	7
		Bald Eagle (wintering)	-	10	10
		Black-capped Chickadee	-	1	1
		Canada Goose	-	35	35
		Mallard	-	29	29
		Muskrat	-	12	12
		White-tailed Deer	-	1	1
		Yellow Warbler	-	1	1
			845	-	845
		Bald Eagle (breeding)	119	-	119
		Bald Eagle (wintering)	114	-	114
		Black-capped Chickadee	180	-	180

- BPA receives credit for parcels acquired or enhanced for the benefit of wildlife
- Crediting in acres or habitat units, depending on sponsors
- Credits count against ledger of losses
- For mitigation to be complete, set of criteria need to be met, including that management plans adopted and sufficient funding exists to maintain conservation value

Additional information on crediting, including the Beak Consultants audit of losses, issues around “wildlife stacking,” and annualized losses, in supplementary documentation

Wildlife Crediting Forum

- Over history of Program, numerous disagreements on:
  - Actual acreage, location, or crediting for parcel
  - How many habitat units for purchase or enhancement
  - Initial assessments of losses
  - Crediting for lands that benefit fish and wildlife
  - Crediting for wildlife mitigation occurring prior to Power Act
  - Other complicated elements to how HUs evaluated
- 2009- Wildlife Crediting Forum formed to establish a ledger of losses
- 2013- Wildlife Advisory Committee chartered to coordinate with region, make recommendations, guide regional HEP Team on future work

Projects and settlement agreements

Land has been protected and enhanced through settlement agreements, individual projects, and historical agreements

In settlement agreements, BPA provides agreed upon amount of money for acquisition/ enhancement and O&M in exchange for agreed upon amount of acreage to be acquired and permanent extinguishing of mitigation debt at given dam(s)

Through projects, annual budgets are applied to purchase, enhancement, and O&M

Historical (Pre-Act) mitigation has also been applied to current losses when it meets certain criteria as determined by the Wildlife Crediting Forum

Photo by Nez Perce Tribe - Precious Lands Wildlife Area

Settlement Agreements

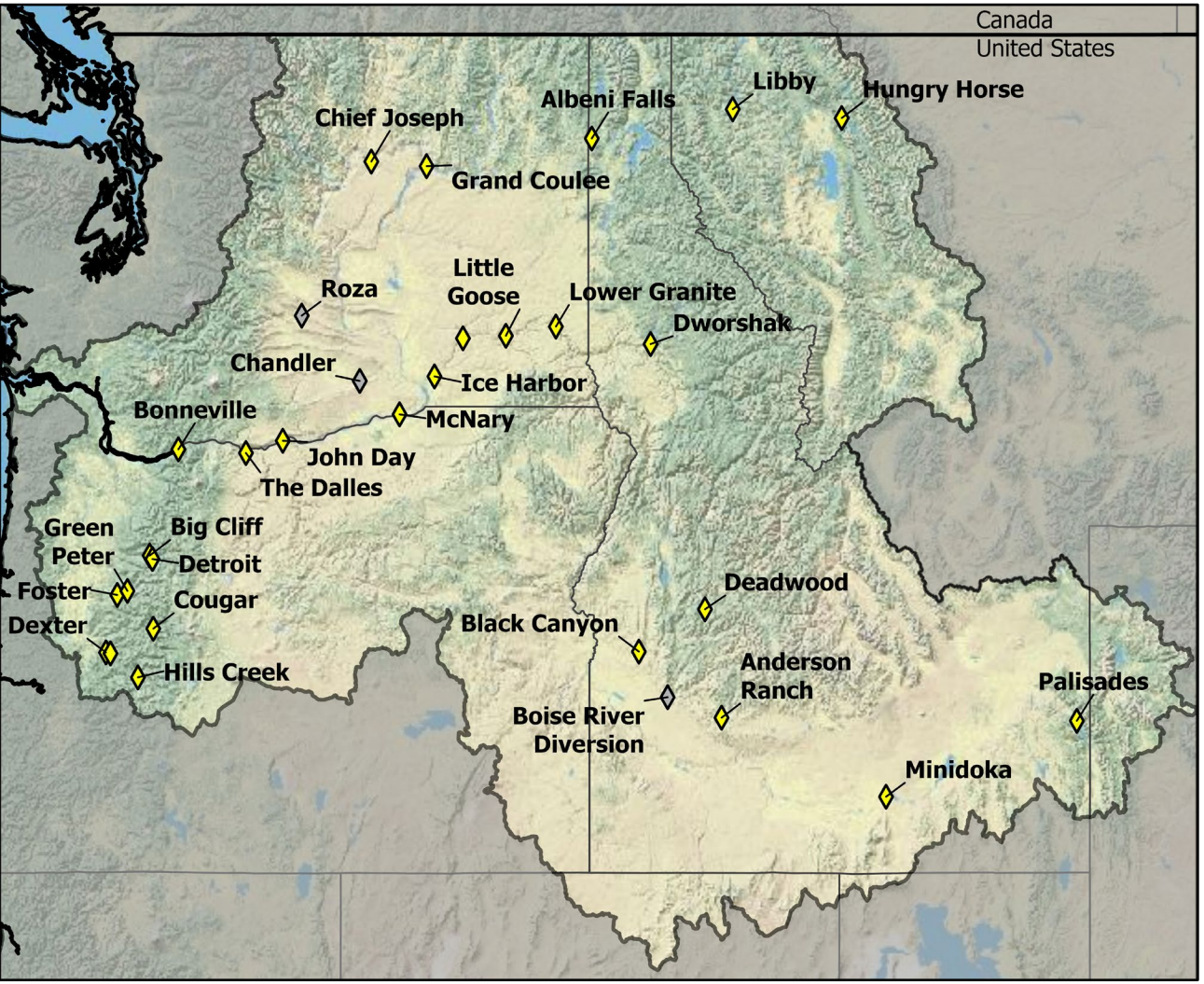
- **Montana** Settlement Agreement 1988: C&I at Libby and Hungry Horse
- **Dworshak** Settlement agreement 1992: C&I divided between IDFG and NPT
- **Willamette** Wildlife Mitigation 2010: C&I and Op losses and stewardship
- **Southern Idaho** Settlement Agreement 2014: Idaho share of C&I and Op loss
- **Northern Idaho** Settlement Agreement 2018: Idaho share of C&I and Op losses at Albeni Falls

MOAs or other agreements

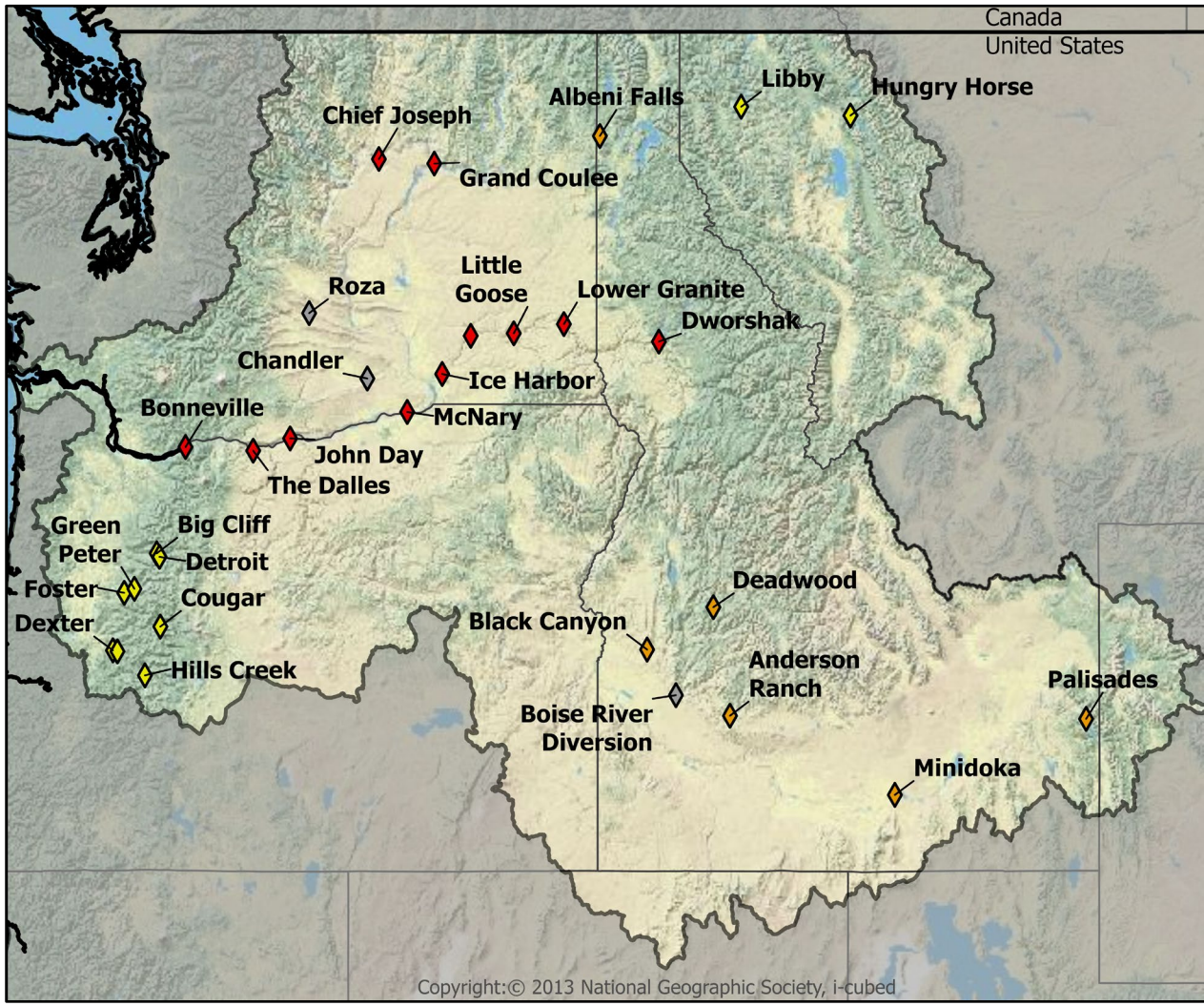
- **Washington Wildlife Mitigation** Agreement (Interim) 1993: C&I funding, commitment to long term agreement
- **MOA WDFW** 1996: Separates out WDFW share of mitigation
- **IDFG- Shoshone-Bannock Tribe- Shoshone-Paiute Tribe** 2010: 50% of losses to IDFG; 50% to Tribes
- **Shoshone- Bannock Tribe** 1997- establishes processes
- **Shoshone- Paiute Tribe** 2009 establishes processes
- Tribes divide their share of losses
- **Kalispel Tribe** 2012: Accord funding to acquire C&I, no Op losses

Loss assessments

Construction and inundation

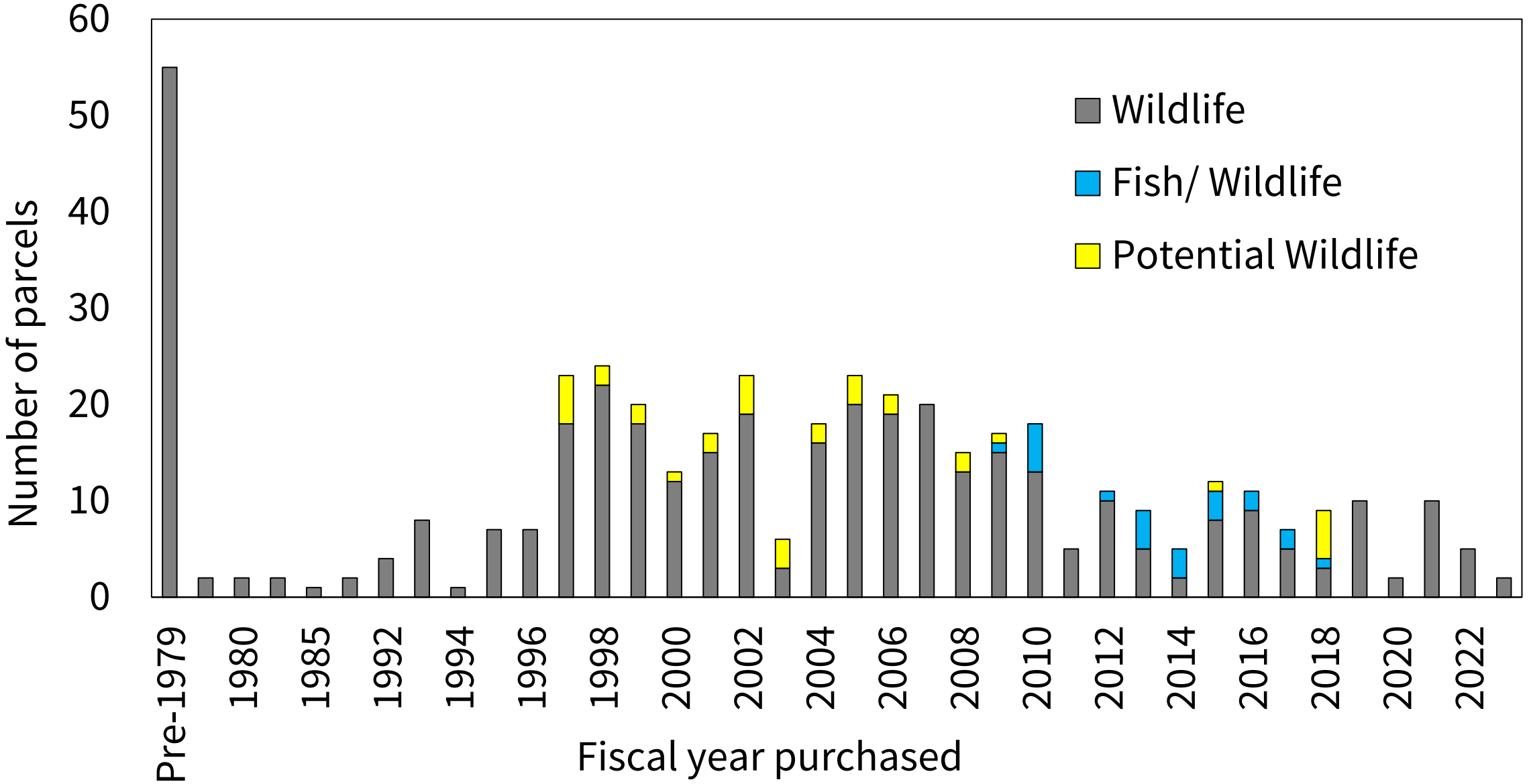


Operational



Assessed Partially assessed Not assessed Not applicable

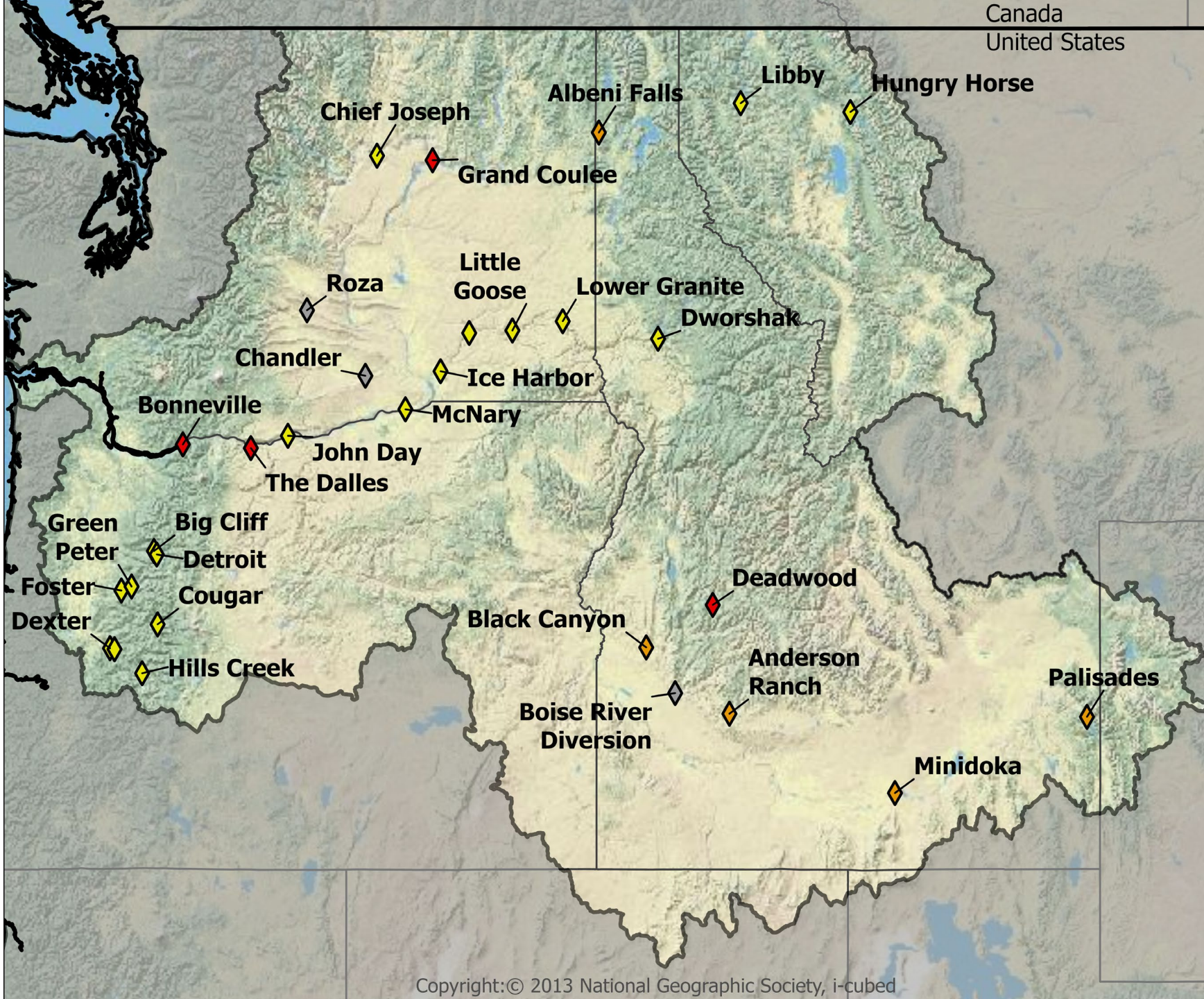
Status of mitigation



Status of mitigation

Construction and inundation losses

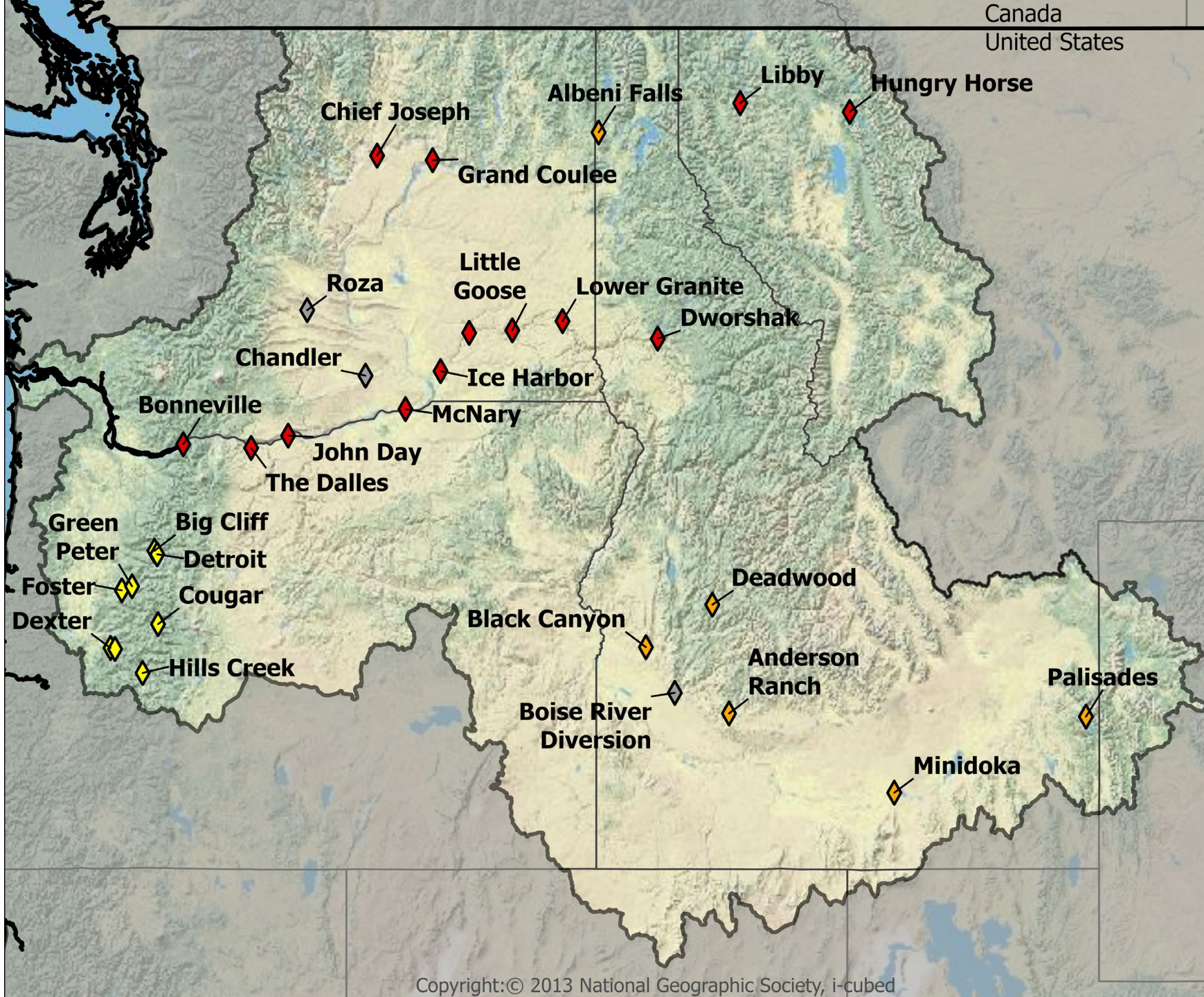
- Losses settled and/ or complete
- Partially settled or partially complete
- No settlement and incomplete
- NA



Status of mitigation

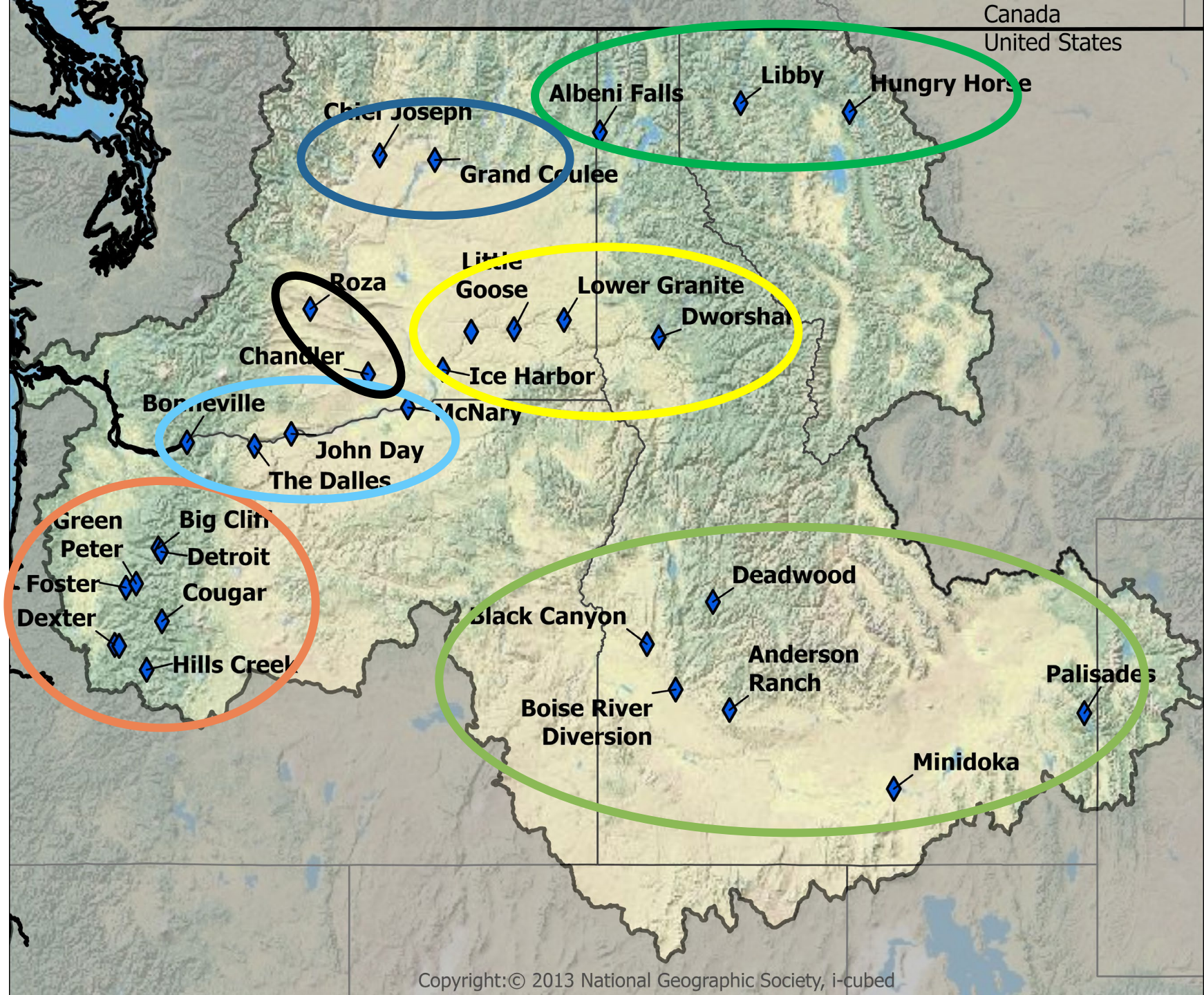
Operational losses

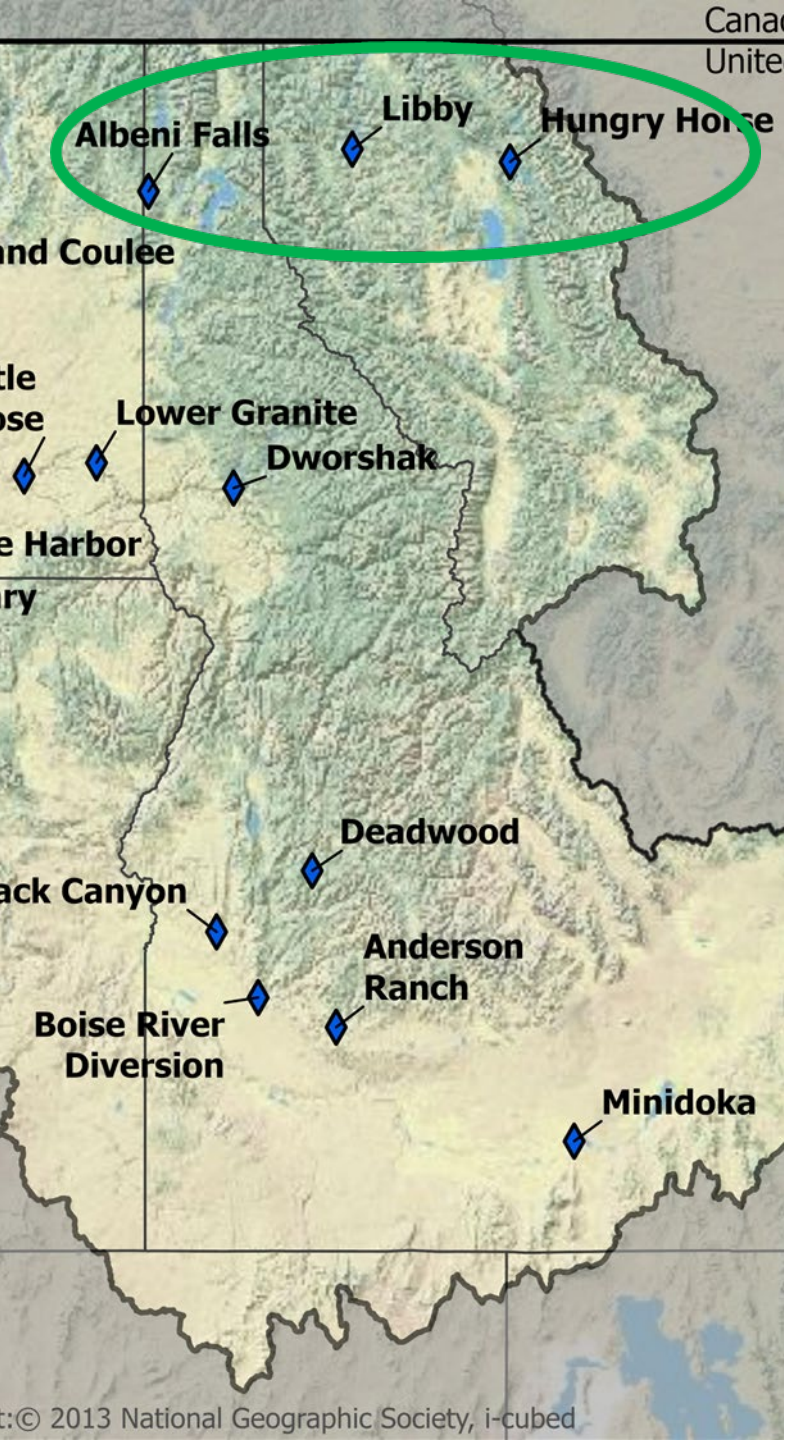
- Losses settled and/ or complete
- Partially settled or partially complete
- No settlement and incomplete
- NA



FCRPS by subregion

- Upper Columbia tributaries
- Upper Columbia mainstem
- Mid Columbia tributaries
- Lower Columbia mainstem
- Willamette
- Upper Snake River basin
- Lower Snake River basin





Upper Columbia tributaries

Hungry Horse and Libby

- FWP- C&I mitigation complete (272,104 Ac as of 2019)
- Op losses assessed, initiating mitigation

Albeni Falls

- IDFG- C&I mitigation complete; Op mitigation remains
- KT-C&I largely mitigated; Op not assessed
- CDA and KTOI-C&I mitigation remains; Op not assessed

Project	C&I remaining	Op remaining
Hungry Horse	Complete	26,321 Ac
Libby	Complete	35,463.4 Ac
Albeni Falls *IDFG*	Complete	794 Ac
Albeni Falls *KT*	941 HU[1]	Not assessed
Albeni Falls *CDA; KTOI*	13,655 HU[1]	Not assessed

[1] Remaining HUs to mitigated increased in 2001 because of 2:1 doubling

Upper Columbia tributaries

General

- Where are land management plans? Are conservation values being maintained?

Libby and Hungry Horse Dams

- C&I parcels described in annual reports but not listed in Crediting Ledger or Lands Mapper- would be valuable to have all wildlife information in one location
- Are all parties part of settlement or funded to mitigate? Do all parties agree that C&I losses are settled via Montana agreement?

Albeni Falls Dam

- Very difficult to determine status of mitigation because of (1) discrepancies in parcel acreage or HUs reported in various CBFish reports, MOAs and settlement agreements, (2) HUs no longer reported in CBFish
- No assessment of remaining operational losses
- Disagreement on HEP process used to estimate original losses

Upper Columbia mainstem

Grand Coulee

- Mitigation for C&I likely remains under two scenarios (1) losses allocated among parties and over mitigation by some does not affect remaining losses for WDFW, or (2) unmitigated losses doubled in 2001. Data issues prevent determining precisely what that total is.

Chief Joseph

- Mitigation for C&I is complete, but precise total of HUs mitigated cannot be determined

Regional HEP team analysis (Ashley 2015)

Both dams	CCT	STOI	WDFW	Total
Loss (HUs)	36,420	7,079	77,044	120,543[1]
Mitigation (HUs)	52,647	7,432	76,184	136,263
HUs remaining	**0**	**0**	**860**	**0 or 860**

[1]Total HUs in Ashley 2015 does not match Program

Accounting for doubling …

C&I losses at both dams	120,348 HU
Losses mitigated before 2001	99,311 HU
Doubling of unmitigated losses	42,074 HU
Losses mitigated after 2001	36,952 HU
Minimum losses remaining	**5,122 HU[1]**

Upper Columbia mainstem

General

- Program divided losses by dam, but WDFW, CCT and STOI divided losses among themselves; BPA does not accept this division of losses.
- Very difficult to determine status of mitigation because of (1) discrepancies in parcel acreage or HUs reported in various CBFish reports, (2) mitigation assigned to multiple dams within and outside of the upper Columbia, and (3) HUs no longer reported in CBFish
- No assessment of operational losses
- Where are land management plans? Are conservation values being maintained?

Mid Columbia tributaries

From the Brown Books: "No wildlife mitigation has been proposed or implemented for the Roza or Chandler Hydroelectric projects. USFWS (1947) and (1968) provided recommendations to [Bureau of Reclamation] for fish and wildlife enhancement/ mitigation for primarily irrigation-related impacts, but power development wildlife impacts were not discussed."

In a comment letter, USFWS notes: "In view of location, operational history, and surrounding terrain we tend to believe that the projects probably had minor impacts to wildlife of priority interest to the FWS. The Washington Department of Game may not concur …and may seek redress for wildlife resources under their purview. Should that be the case, the FWS would be supportive even though not actively involved in such efforts."

Lower Columbia mainstem

McNary

- C&I losses over mitigated
- No Op losses assessed

John Day

- C&I losses over mitigated
- No Op losses assessed

The Dalles

- C&I losses partially mitigated but total HUs mitigated cannot be determined, nor can the effect of doubling
- No Op losses assessed

Bonneville

- C&I losses partially mitigated but total HUs mitigated cannot be determined, nor can the effect of doubling
- No Op losses assessed above or below dam

Lower Columbia mainstem

Project	C&I mitigated WCS	C&I mitigated DS	C&I mitigated DAS
McNary (WA)	29,097 HU	27,993 HU	36,911 HU
McNary (OR)	33,213 HU	33,322 HU	20,546 HU
Total McNary	**62,310 HU**	**61,315 HU**	**57,457 HU**
John Day (WA)	11,587 HU	5,377 HU	22,023 HU
John Day (OR)	36,820 HU	36,820 HU	57,303 HU
Total John Day	**48,407 HU**	**42,197 HU**	**79,326 HU**
The Dalles (WA)	581 HU	576 HU	816 HU
The Dalles (OR)	0 HU	0 HU	0 HU
Total The Dalles	**581 HU**	**576 HU**	**816 HU**
Bonneville (WA)	2,225 HU	2,225 HU	2,419 HU
Bonneville (OR)	2,076 HU	2,076 HU	2,076 HU
Total Bonneville	**4,301 HU**	**4,301 HU**	**4,495 HU**
Total lower Columbia	**115,869 HU**	**108,389 HU**	**142,094 HU**

Lower Columbia mainstem

General

- McNary and John Day dams are over mitigated. The HEP reports noted that if HUs were reassigned among the lower four dams, then Bonneville and The Dalles would be fully mitigated for C&I losses. That has not occurred.
- Whether mitigation is complete depends on if each dam is considered independently or as a unit
- There are no settlement agreements covering mitigation in the lower Columbia and it is very difficult to determine status of mitigation. This is due to (1) discrepancies in parcel acreage or HUs reported in various CBFish reports, (2) mitigation assigned to multiple dams within and outside the lower Columbia, and (3) HUs no longer reported in CBFish
- No assessment of operational losses
- Where are land management plans? Are conservation values being maintained?

Willamette

Willamette Basin (8 dams)

- By the end of FY 2025, all C&I and Op loss mitigation will be complete

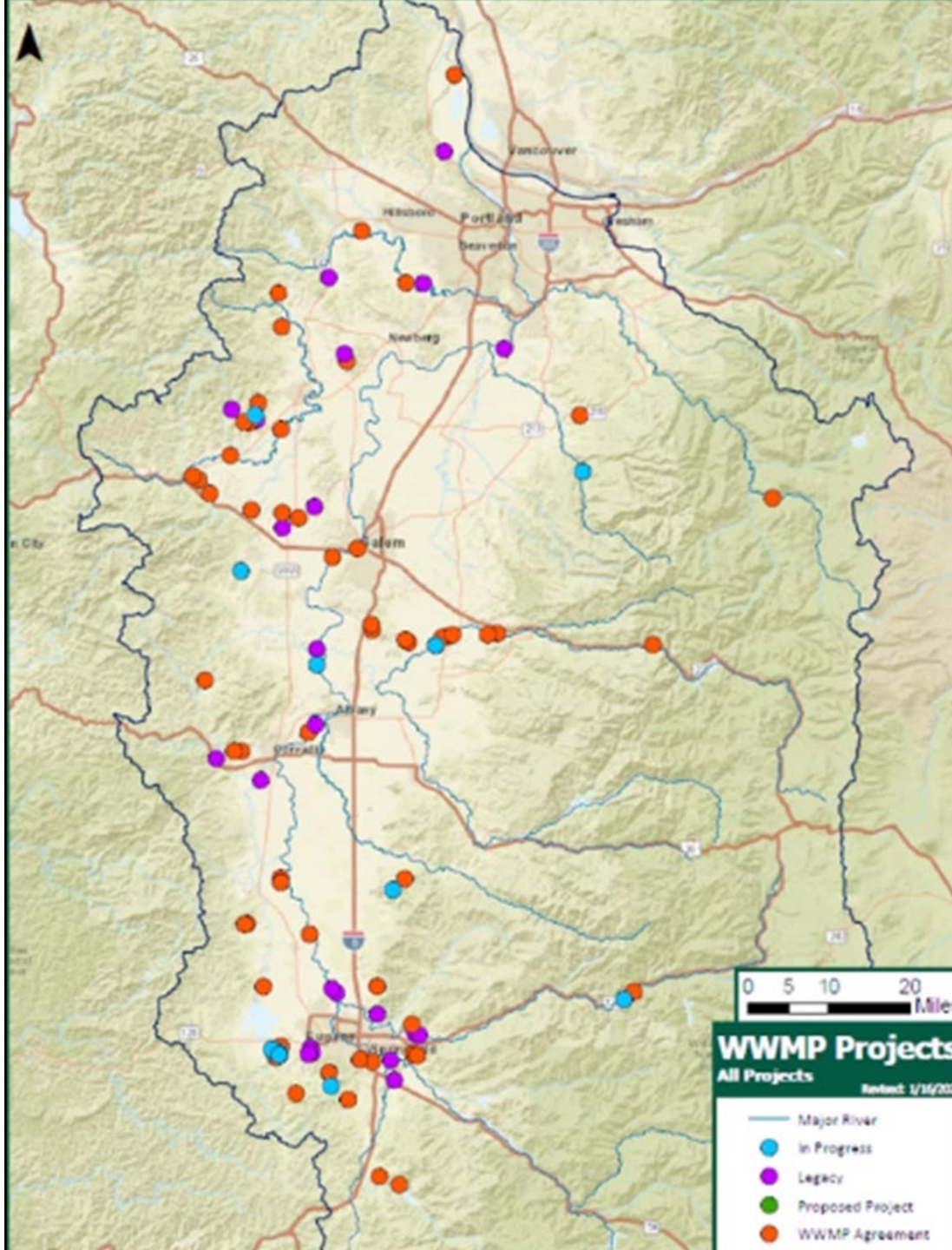
Project	C&I remaining	Op remaining
Willamette Total	0 Ac[1]	0 Ac

[1]Completed acquisitions total **24,756 acres**. FY 2022, 2023, 2024, and 2025 in progress acquisitions total **1,824 acres**.

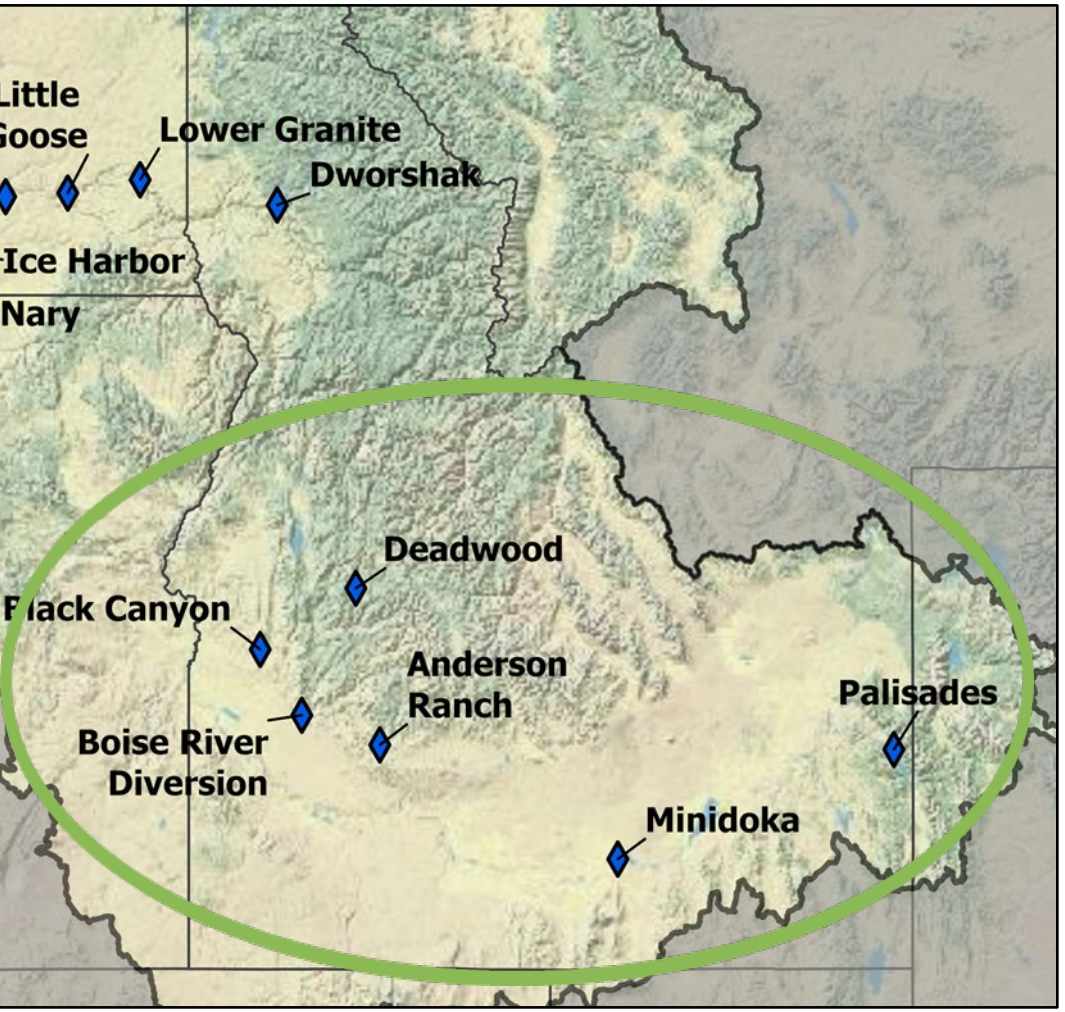
Willamette

General

- After meeting acreage requirements, there was still funds available; these are being used to acquire additional properties through FY 2026.
- Partners working to complete Land Management Plans and make them accessible
- Information needed on whether any conservation issues have been reported and whether mitigation values are being maintained



Upper Snake River basin



- *Calculation of C&I mitigation remaining influenced by 2:1 crediting*
- Data current as of end of 2023

IDFG share of all dams

- C&I mitigation complete; Op mitigation complete

Shoshone-Bannock Tribe share

- C&I mitigation remains; No Op losses assessed

Shoshone-Paiute Tribe share

- C&I remains; No Op losses assessed

Project totals	C&I remaining	Op remaining
IDFG Total	0 Ac	0 Ac
Palisades	*22,840 HU*	Not assessed
Minidoka	*3,845 HU*	Not assessed
Anderson Ranch	*1,924 HU*	Not assessed
Black Canyon	*447.6 HU*	Not assessed
SBT Total	*29,056.6 HU*	
Anderson Ranch	*4,210 HU*	Not assessed
Black Canyon	*1,790.4 HU*	Not assessed
SPT Total	*6,000.4 HU*	

Upper Snake River basin

- C&I losses at Deadwood were assessed but there is disagreement on whether BPA has responsibility to mitigate
  - 1995 Program findings, page 16-201, the Council "*noted that the authorizing legislation and legislative history for Deadwood indicated that the project was authorized in part for power purposes….[which] makes them "power-related facilities within Congress' broad use of the term 'hydropower facilities.The Council also continues to believe that the hydropower share of the expenditures to address these losses will be small.*"
- Operational losses assessed as part of IDFG settlement
  - Accordingly, Tribes entitled to half of losses (665 acres), but Tribes have not indicated whether they accept that loss assessment
- Emerging issue is proposal to raise height of Anderson Ranch Dam by 6 feet
  - Adds 29,000 acre-feet of new storage space for irrigation and increases the area of inundation by 146 acres
  - Shoshone-Bannock and Shoshone-Paiute Tribes have expressed interest in understanding potential affect on wildlife crediting.

Lower Snake River basin

Dworshak

- IDFG- C&I mitigation complete; No Op mitigation
- NPT- C&I mitigation may be complete? No Op mitigation

Lower Snake River

- C&I complete; No Op mitigation

Project	C&I remaining	Op remaining
Dworshak- IDFG	Complete[1]	Not assessed
Dworshak- NPT	2,424 acres[1,2]	Not assessed
Lower Snake River (4 dams)[3]	Complete	Not assessed

[1]Losses mitigated through settlement agreements

[2]Data current as of 2019, additional mitigation may have occurred

[3]Losses mitigated through Lower Snake River Compensation Plan Program

Lower Snake River basin

Discussion topics

- Mitigation settled at Dworshak with IDFG and NPT; do any other parties recognize a role in that mitigation that should be addressed?
- An excess of mitigation in lower Snake River has occurred for C&I
- Operational losses have not been assessed or mitigated at any of these dams
- Location of parcels purchased for Dworshak mitigation? Not in Lands Mapper
- LMPs complete? Where are plans? Conservation values maintained?

Take home points

- Substantial amount of mitigation has occurred through Program
- Significant progress on mitigation for Construction and Inundation losses
- Isolated mitigation for Operational losses
- Settlement agreements provide efficient vehicle for meeting mitigation targets and ensuring sufficient long-term funding for O&M

Discussion- issues across basin

Loss assessments and settlement agreements

- 2014 Program recommended all remaining losses be resolved and funded through long-term settlement agreements,
- Additional settlement agreements may be needed where existing agreements did not include all parties who have an interest in mitigation
- In assessing and settling Operational losses, it may be more efficient to first develop:
  - a process for developing operational settlement agreements
  - an approach to assigning and tracking credits
  - a single database including all relevant information on parcels, land management plans, and continued maintenance of conservation value

Discussion- issues across basin

Funding to mitigate for losses

- Annual O&M budget- Council's Asset Management Strategic Plan
- Rising costs for acquiring or restoring land
- Uneven distribution of funding to entities mitigating for losses
  - Leads to some regions of the basin being under mitigated

Land Management

- Are land management plans complete and approved? Only 55% of parcels have a plan
- Are conservation values being maintained?

Data Management

- Are data in CBFish ledger accurate?
- Is the location of the parcel in the Council’s lands mapper?
- Lingering disagreements on crediting in ledger

Many areas of progress and agreement on wildlife mitigation within region and between Council and BPA

BPA's 2022 Strategic Asset Management Plan (SAMP):

- *The program has been able to significantly improve the tracking … of acquired lands by incorporating it into the Pisces database with readily retrievable metrics… Population influx throughout the region has increased land costs, and market influences continue to affect the project partners' ability to purchase mitigation property at the appraised, fair market value. These are some of the main risks that affect the strategy … Where feasible, BPA is pursuing settlement agreements with stakeholders…to permanently extinguish BPA's mitigation obligations to acquire lands for fish and wildlife mitigation, within defined geographic areas, or pertaining to specific dams, in exchange for the provision of funds to accountable entities."*

BPA describes long term objectives for their lands program:

1. *assess … feasibility of permanently extinguishing BPA O&M expense obligations through the pursuit of settlements by 2027*
2. *improve sponsor compliance to 100% for submitting new and updated land management plans post acquisition or expiration by FY 2027*
3. *develop a system to provide regular reporting on the condition of acquired lands with comprehensive characteristics and ability to measure the status of the program and progress relative to mitigation obligations by 2027*

Outline

- Approach to Categorical Assessments
- Topics in Habitat Categorical Assessment
- Description of strategies and implementation
  - Discussion after each topic

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

- Habitat restoration
- Habitat protection
- Wildlife
- Non-native and invasive species
- Predator management

Non-native and invasive species

Zebra mussels
Quagga mussels
American shad
Brook trout
Eurasian milfoil

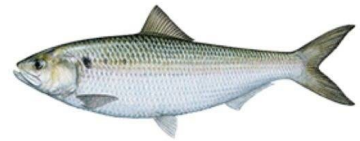
Non-native and invasive species

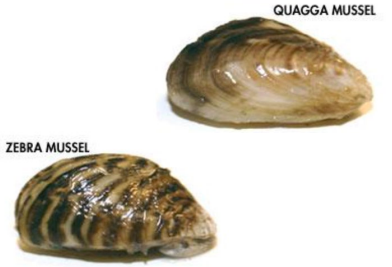
Program strategy

Prevent the introduction of non-native and invasive species in the Columbia River Basin and suppress or eradicate non-native and invasive species.

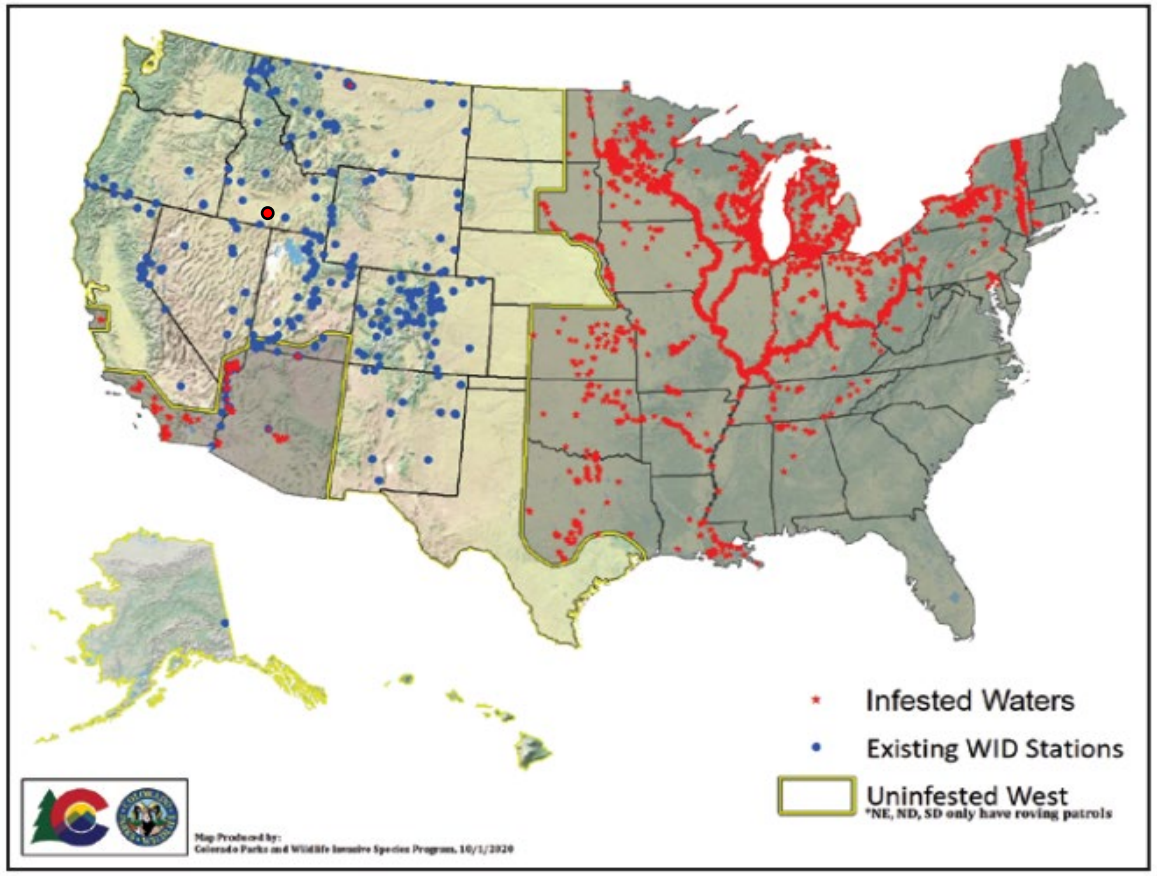
Non-native and invasive species measures over time

Years	Example measures *About 33 measures have appeared since 1991*
1991-1999	• **Evaluate** increasing shad populations • **Remove** brook trout • **Reduce** non-native fish populations where they occur with listed species
2000-2011	• Increased concern about non-native and invasive species • **Suppress** non-native populations that adversely affect salmonids (e.g., shad) • Policies for other invasive species noted (e.g., zebra and quagga Mussels, silver carp, Eurasian milfoil)
2012-2020	• **Eradicate** from strongholds • **Monitor, evaluate, and control** nuisance species • **Prevent establishment** of zebra and quagga mussels • **Assess potential impacts** of using non-native fish species for mitigation • **Develop public outreach tools** to educate the public about regional prevention and management of invasive species



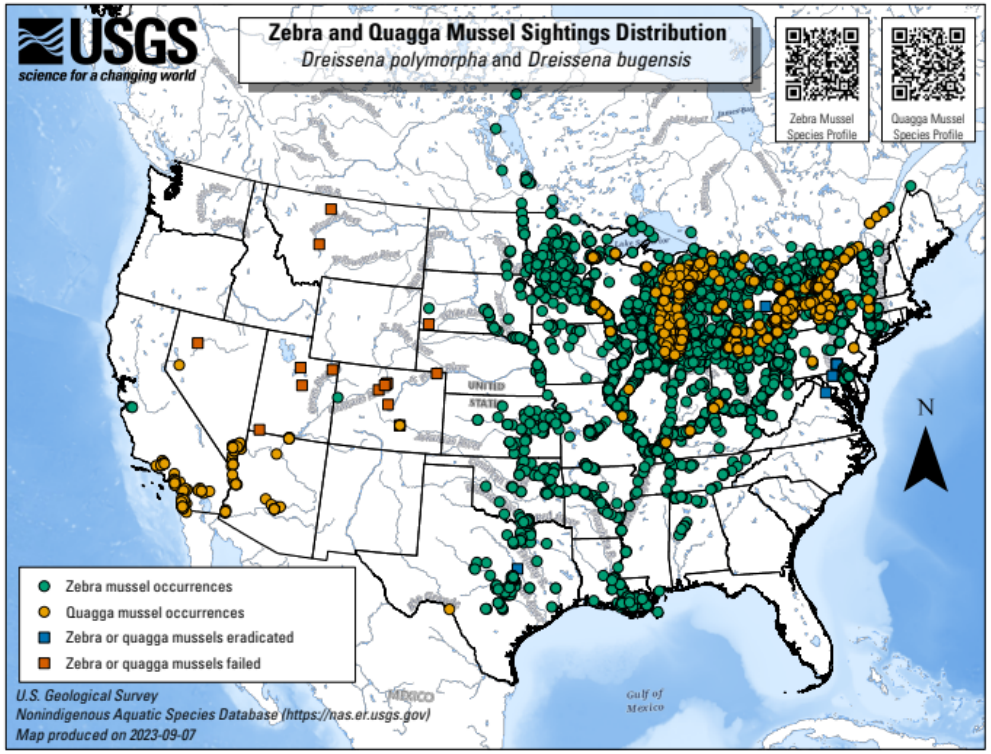


Zebra and Quagga Mussels



The 2014 Program called the introduction of zebra or quagga mussels “the greatest known threat in the Columbia River Basin from aquatic invasive species.”

- Quagga veligers and 1 adult were detected in the Snake River in September 2023 and 2024.
- Rapid response plans were successfully executed and additional resources provided.



Zebra and Quagga Mussels

Environmental Risks

- Competition with native species.
- Water quality changes: reduced oxygen levels, increases in water transparency and aquatic weeds.
- Bioaccumulation of pollutants.
- Severe risk to cultural resources, threatened and endangered species, and human health.

Economic Risks

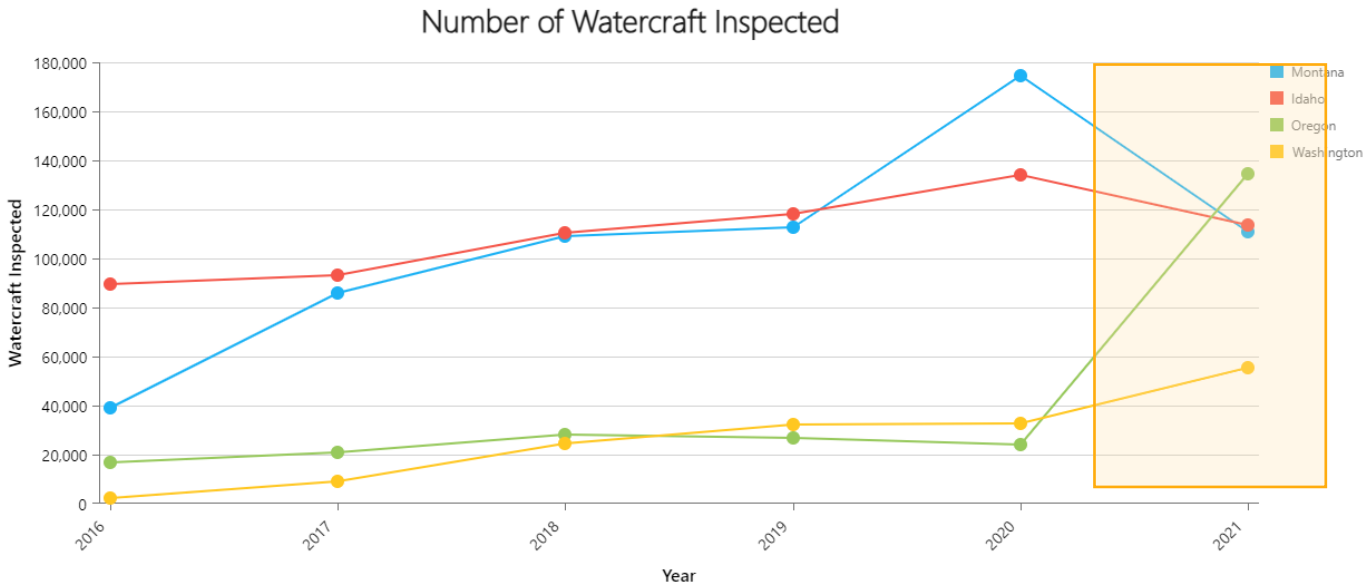
- **$100 million** annual hydroelectric mitigation and maintenance.
  → Similar impacts to fish hatcheries, fish passage infrastructure, irrigation systems, drinking water systems, legacy data centers.
- **$12.8 billion** value of agricultural production (2024).
- **$35.5 million** in state boating related revenue annually (2010).
- **$21.5 billion** annually spent on outdoor recreation (2020).

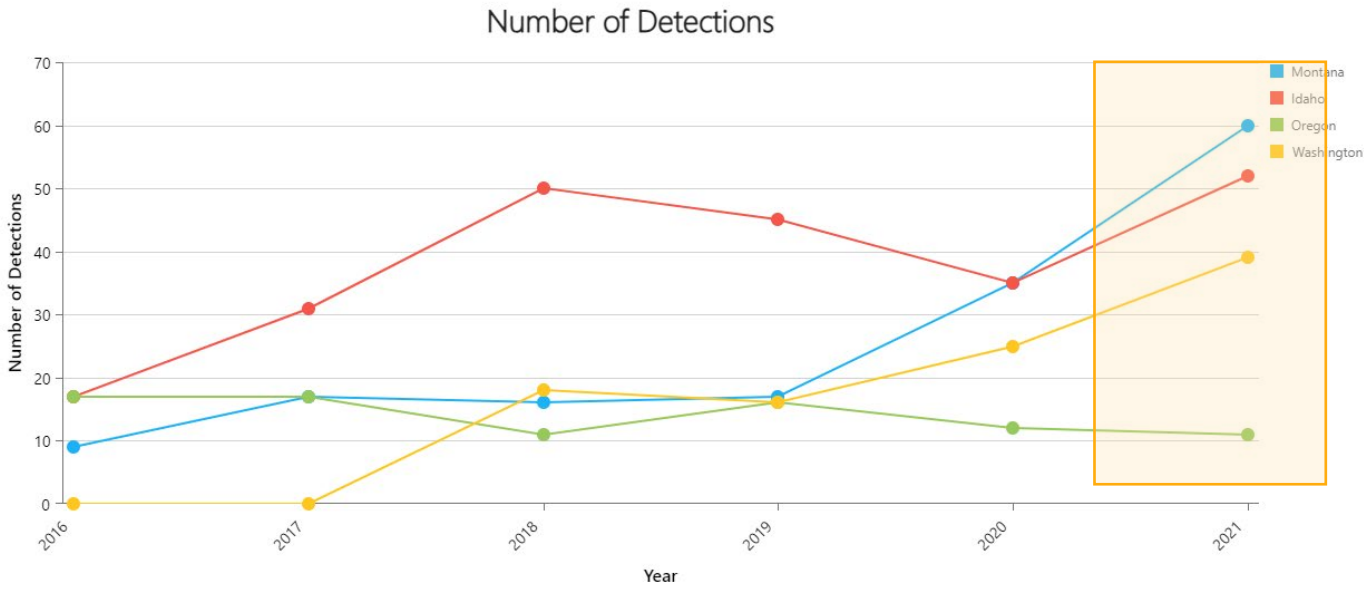
Information provided via August 2024 Council Meeting by WDFW/IDFG

Zebra and Quagga Mussels

- Through 2021, as watercraft inspections plateaued or decreased in all states except Oregon, the number of detections increased.
- Continued need for thorough inspection protocols to be observed.

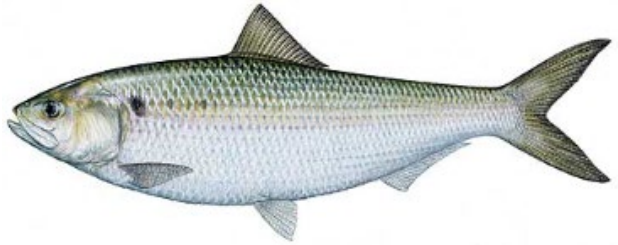

Credit: Center for Invasive Species Research UC Riverside



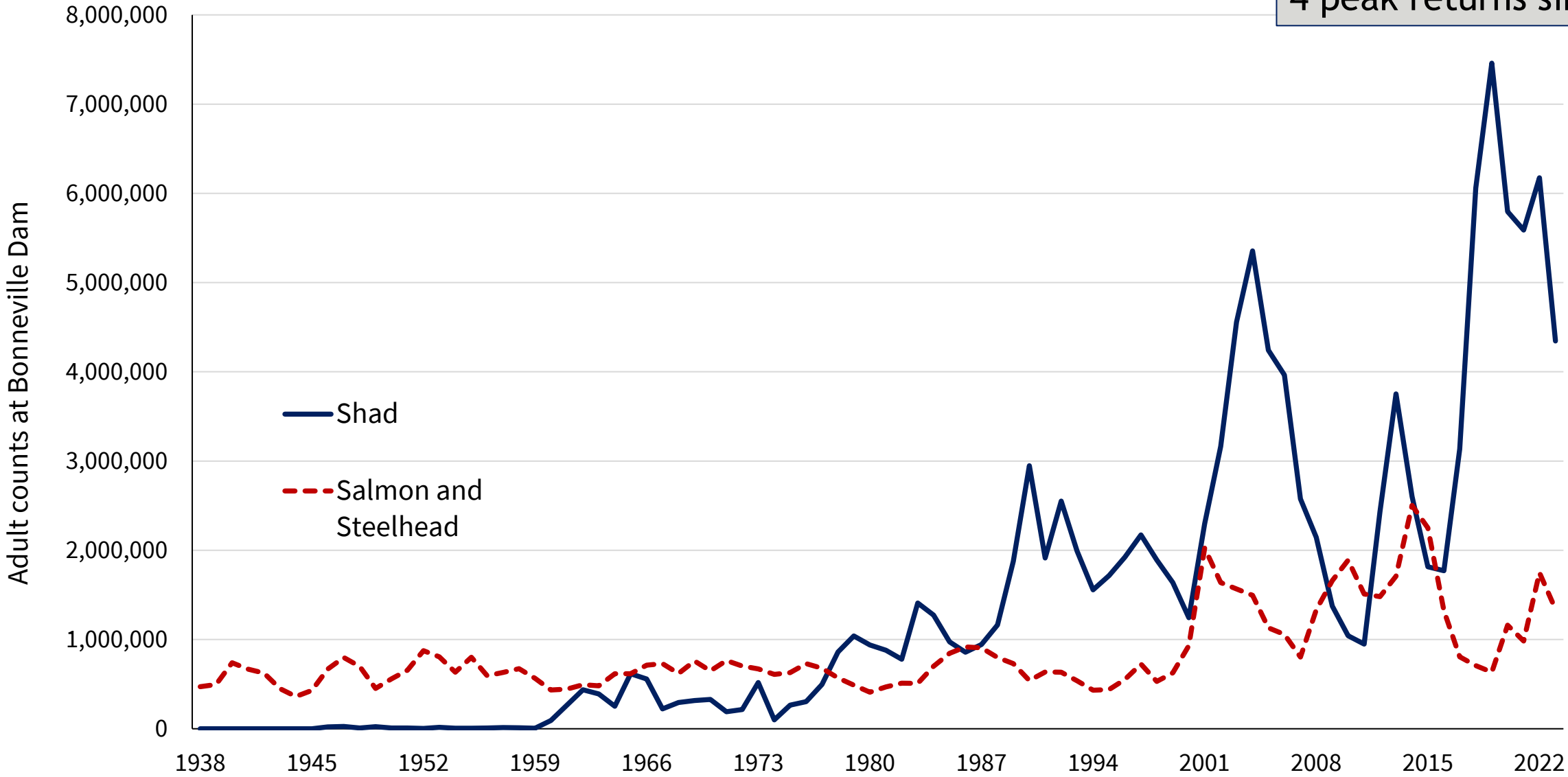


Strategy Performance Indicator E5-1

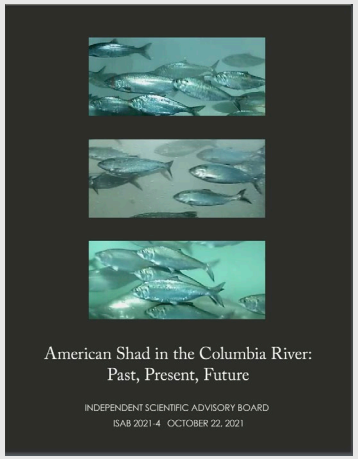
American Shad



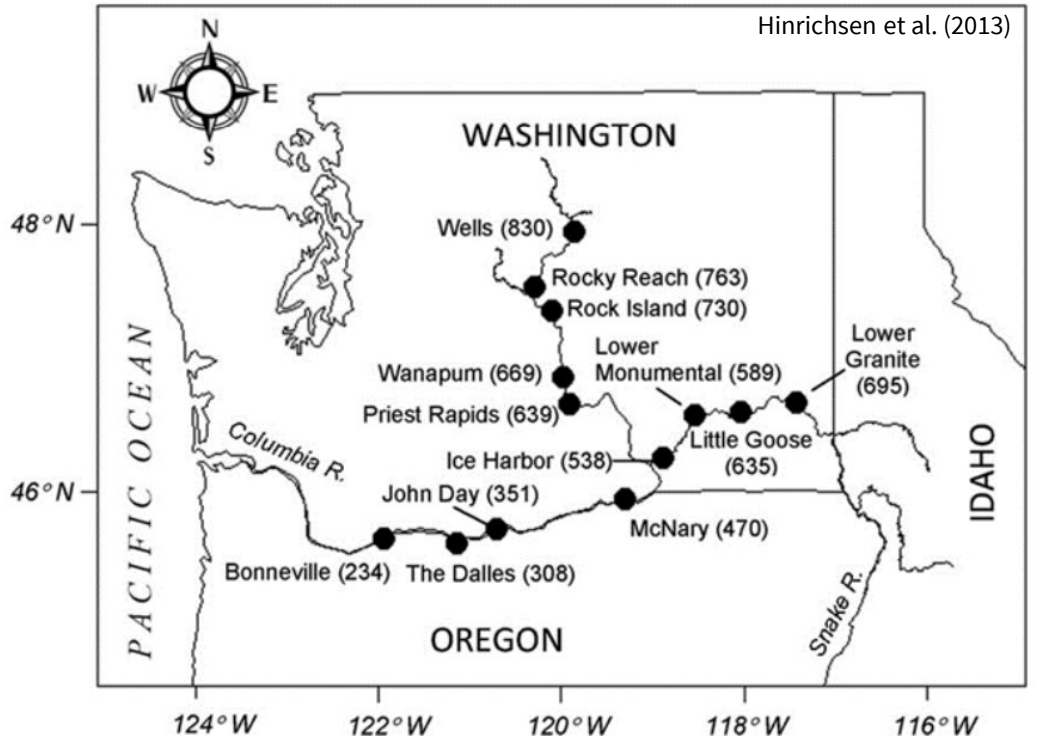
4 peak returns since 2019



American Shad

1994 Program	Control and eliminate shad above Bonneville and reduce below Bonneville.
2004 Program	Reduce shad abundance
2021 ISAB Report 	Answering questions about the impact of increasing shad on salmon is an important challenge. *How?* - Focused research and monitoring. - Better describe life history patterns of the CR population. - Model interactions between shad and native species in a variety of scenarios to inform future on-the-ground research.

- Anadromous but can spawn multiple times.
- There are likely ecological connections between shad and salmonids.
- Peak of return in June overlaps with spring + summer salmon.



Passable dams on the mainstem Columbia and Snake rivers along the migratory route of American shad. Numbers show distance in river kilometers (km) from the mouth.

Take home points

Non-native and invasive species measures have increased in recent Programs.

Zebra and quagga mussels

- The FW Program has consistently called upon action agencies to step up with regards to management actions over time.
- Extensive early detection and treatment programs are in place across the Columbia Basin.
- Additional resources and attention have been provided in response to the detection of quagga mussels in the Snake River.

Shad

- More research and coordination are needed if active population management is to occur.

What about species that aren't managed?

- Carp
- Spotted Lanternfly
- Invasive vegetation species
- Non-native clams and snails
- Tiger muskie
- Red-eared slider turtles
- European green crab
- Other species whose invasions threaten existing Program investments (e.g. in restoration, reintroduction, etc.)?

Credit: USDA

Credit: iNaturalist

Credit: UW

Credit: ODFW

Credit: WDFW

Credit: WDFW

Discussion

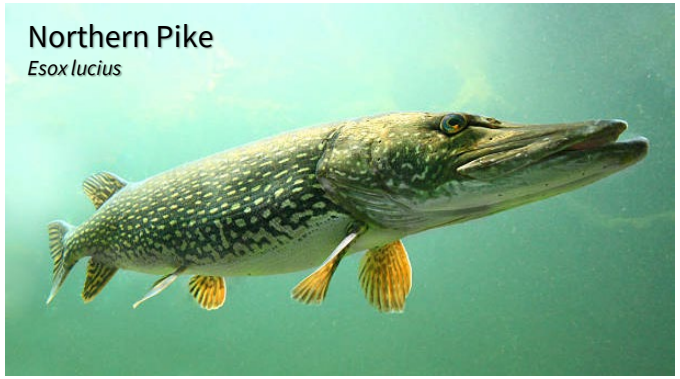
- Continued prioritization of non-native and invasive species research, monitoring, and evaluation is imperative in a dynamic system like the Columbia River.
  - Climate change
  - Human demands
  - Operational changes
- The Columbia River Basin is highly modified and complicated.
  - Opportunities for adaptive management?
  - What kind of future planning might be needed?

Predator management

Avian
- Double-crested cormorants
- Terns

Marine mammals
- California sea lions
- Stellar sea lions
- Seals

Fish
- Northern Pike
- Northern Pikeminnow
- Lake Trout



Predator management

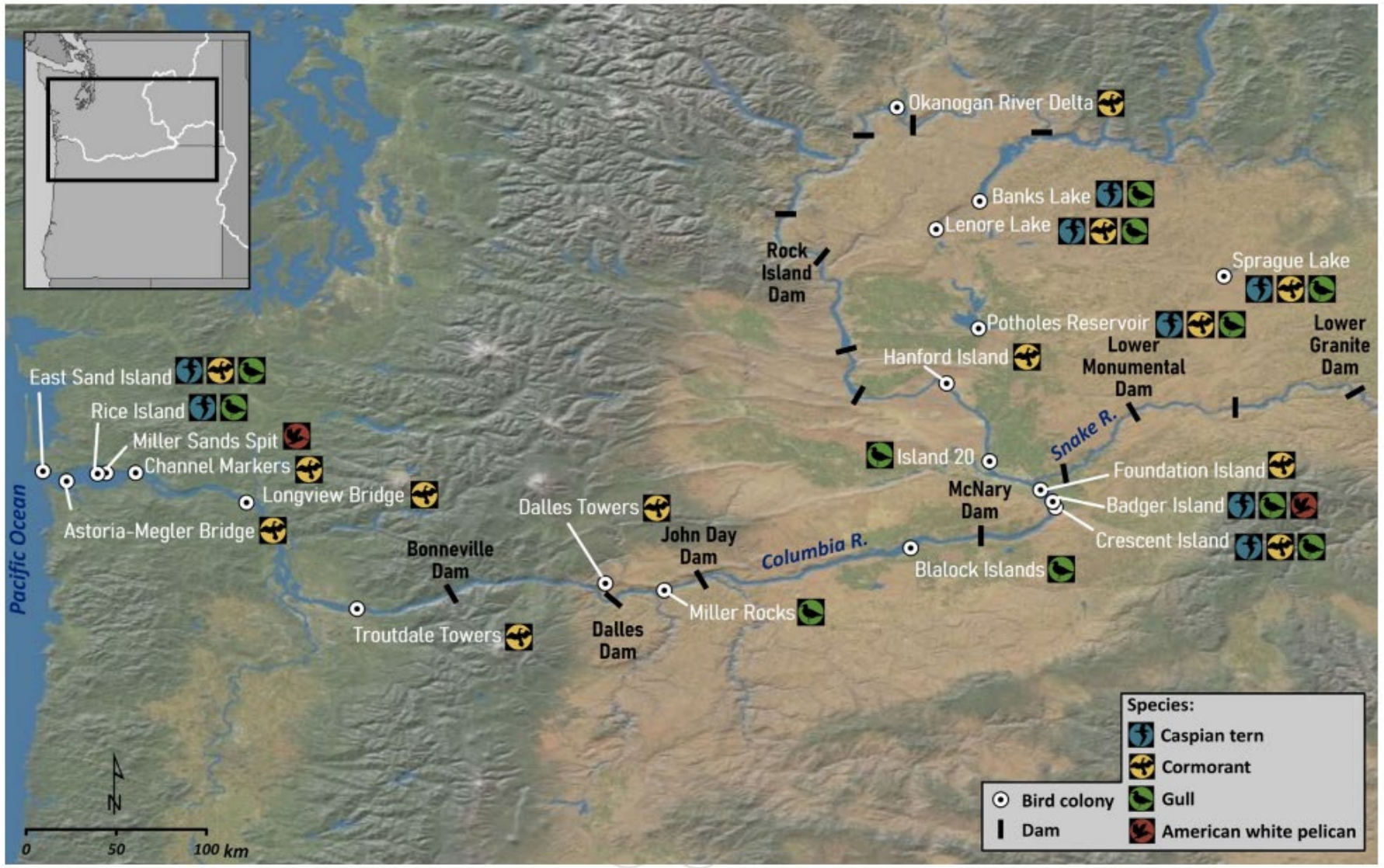
Program strategy

Improve the survival of salmon and steelhead and other native focal fish species by managing and controlling predation rates.

Predator management measures over time

Years		Example measures *About 45 measures have appeared since 1991*
1991-2011	Birds	• **Monitor predation** in reservoirs - examine stomach contents. • **Identify non-lethal methods of control**. • Comprehensively study salmonid consumption in the estuary.
	Mammals	• Collect data on distribution, abundance, and interaction with salmonids on a year-round basis. • Seek to allow the **lethal removal once all reasonable non-lethal means exhausted**. • **Model the effects** of removing non-breeding male sea lions.
	Fish	• **Reduce smolt mortality** due to fish and avian predation at bypass system release sites. • **Expand monitoring** of pikeminnow control, identify non-lethal methods of control. • **Reduce the population** of pikeminnow by more than 20 percent.
2012-2020 *(ISAB predation reports: 2016, 2019, 2021)*	Birds	• **Reduce the number** of Caspian terns on East Sand Island and in the estuary. • Develop a double-crested cormorant **management plan**. • Encourage more aggressive efforts to remove or **manage avian predation impacting wild fish.**
	Mammals	• Continue land- and water-based harassment efforts below Bonneville Dam as well as lethal take. • Improve **exclusion of sea lions at all adult fish ladder entrances and navigation locks** at BON.
	Fish	• Bonneville shall **support/ evaluate/ implement predator management** programs where appropriate in the Columbia Basin, for example Lake Roosevelt. • Sustain and support ongoing efforts to **reduce predation** by northern pike

Avian predation in the Columbia Basin



35 active breeding colonies of piscivorous waterbirds detected:

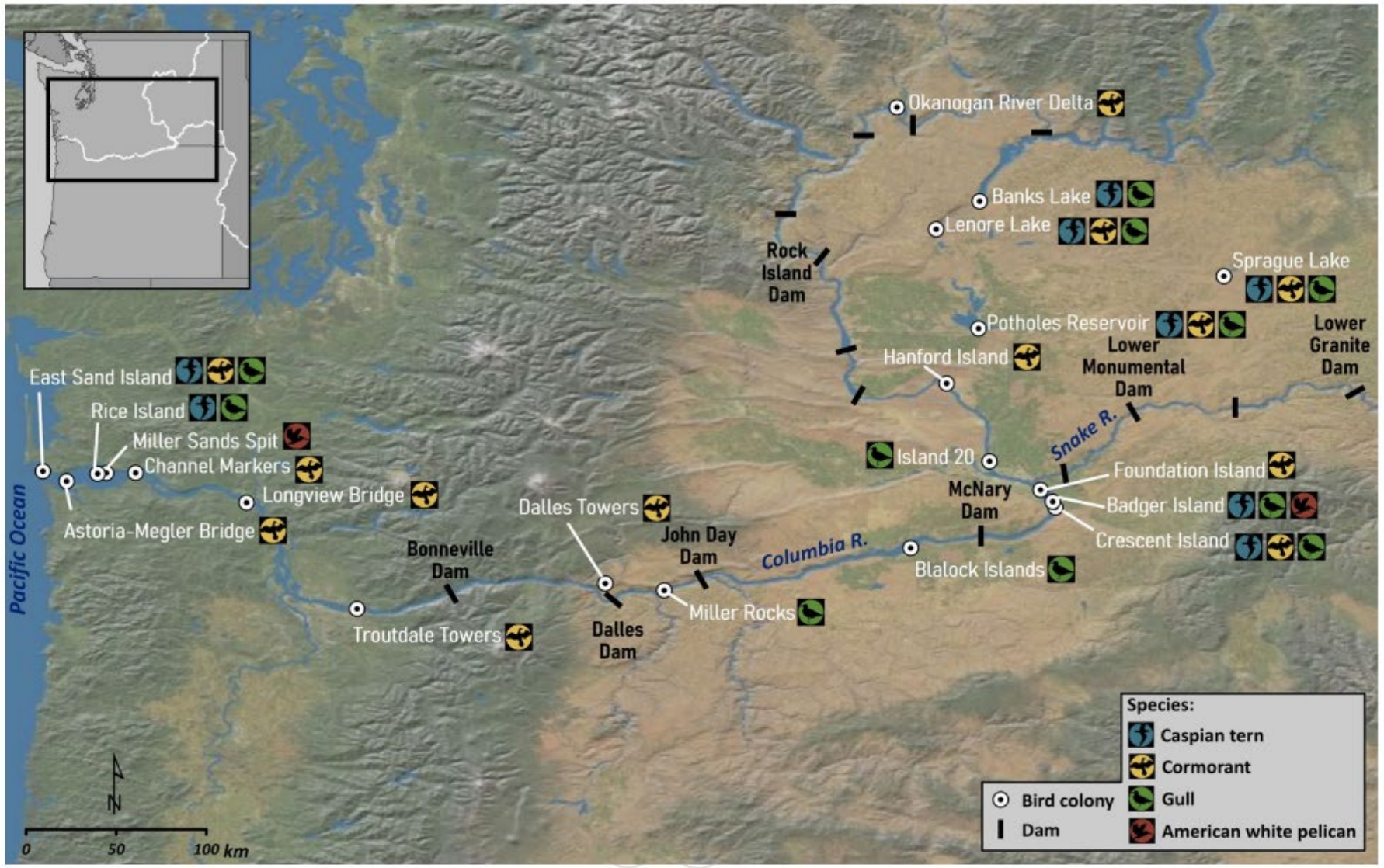
- -14 cormorant
- -11 gull
- -8 tern
- -2 pelican

23 in the Columbia River Plateau, 3 in the lower river, 8 in the estuary.

3 adaptive management plans respond to shifts in nesting distributions of terns and cormorants.

Credit: Allen Evans, RTR, presentation to Council August 2024
Bird Research Northwest, 2023 Annual Report

Avian predation in the Columbia Basin

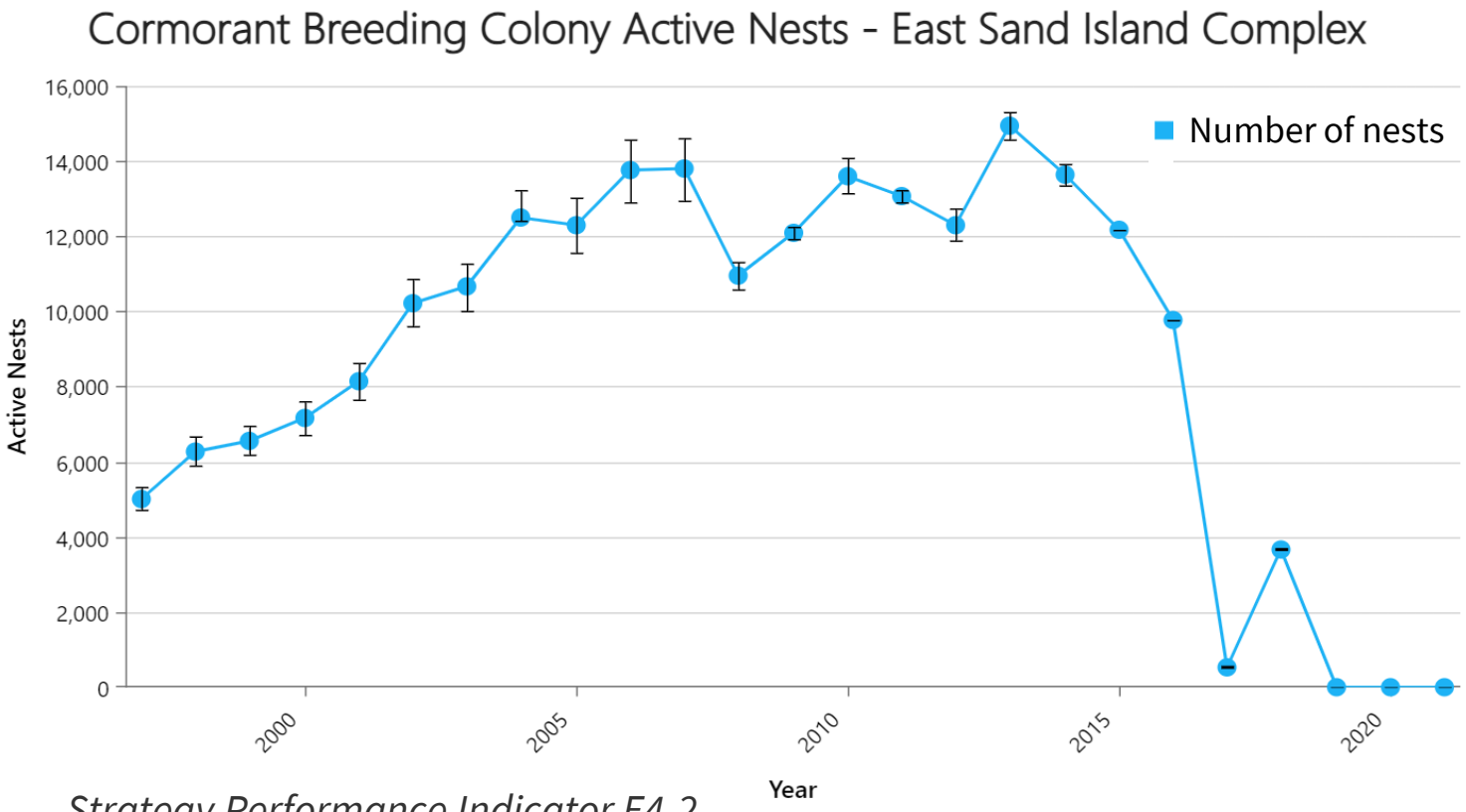


The arc of management:

- DCCO and CT nesting in the Columbia River Basin have declined (management objective met).
- This means declines in the Pacific Flyway breeding populations.
- Concerns about the conservation status of these populations, especially Caspian terns.

Credit: Allen Evans, RTR, presentation to Council August 2024
Bird Research Northwest, 2023 Annual Report

Predator management-
Double-crested Cormorants

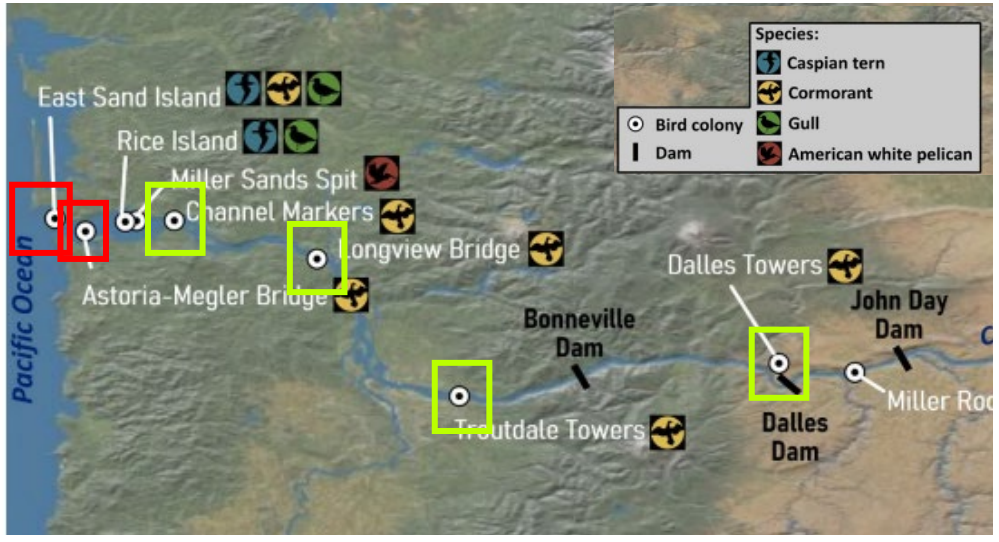


Strategy Performance Indicator E4-2

Credit: Friends of Ridgefield National Wildlife Refuge

- Cormorants are managed as a western population, not individual colonies.
- Following control measures, the population collapsed at East Sand Island.
- Many of these birds now nest on the Astoria-Megler Bridge.

Predator management-
Double-crested Cormorants

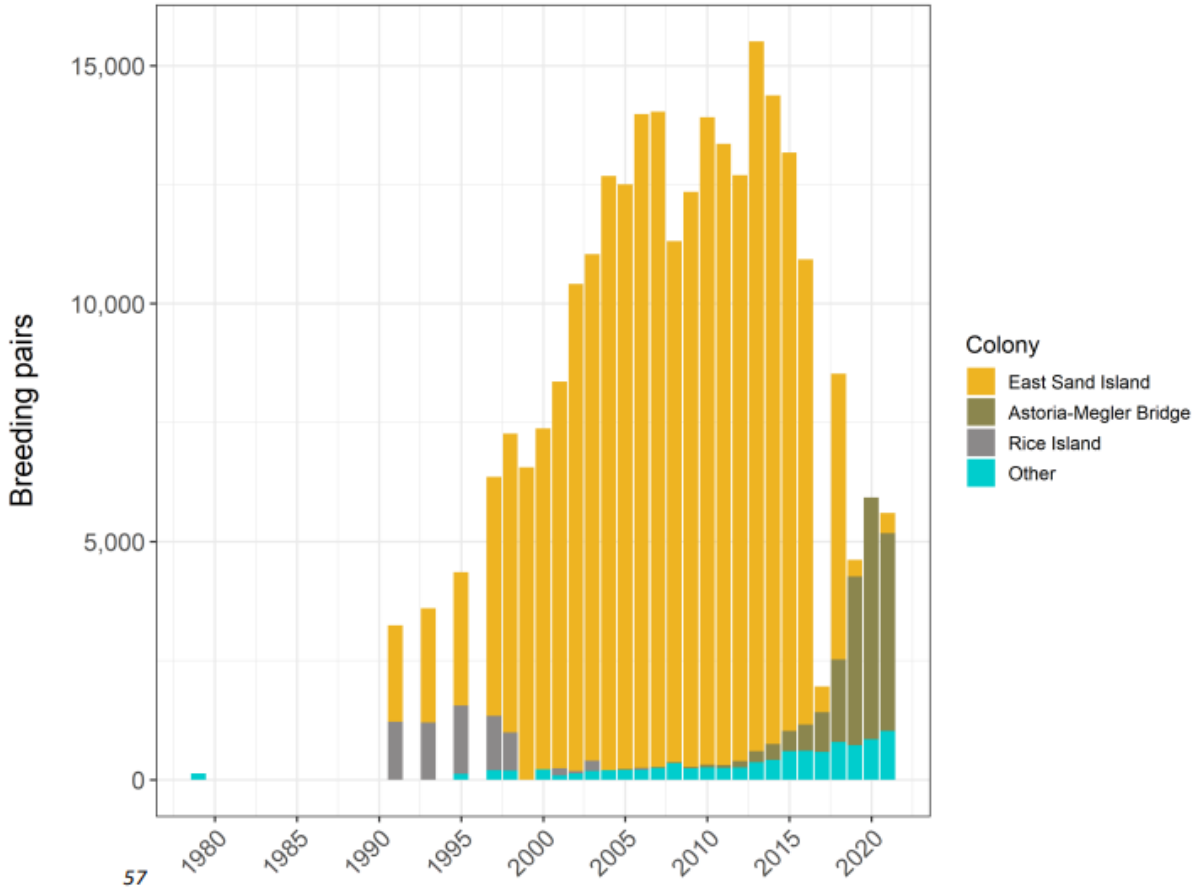


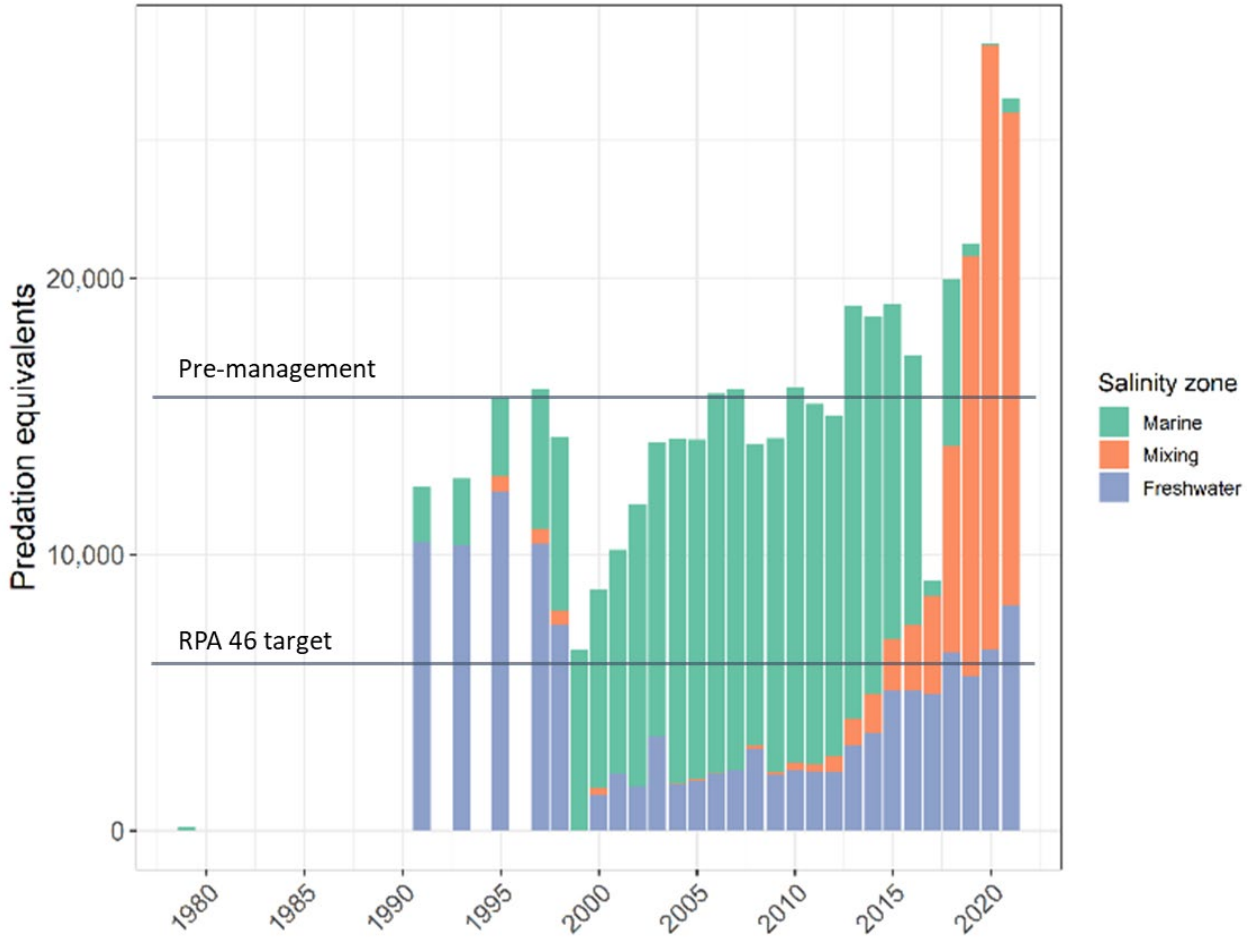

DCCO nests on the Astoria-Megler Bridge
Photo: ODOT


DCCO on East Sand Island prior to removal
Photo: Willamette Riverkeeper

- Estuary-wide predation on ESA-listed juvenile salmonids is estimated to have been about 12-14% in recent years, post East Sand Island vacancy (ODFW).
- Human health and safety concerns have been identified on the Astoria-Megler bridge due to the current DCCO colony.
- If birds can be lured back to East Sand Island, there would be less predation concern than if the birds move upstream to one of the 4 highlighted colonies (for example).

Predator management-
Double-crested Cormorants





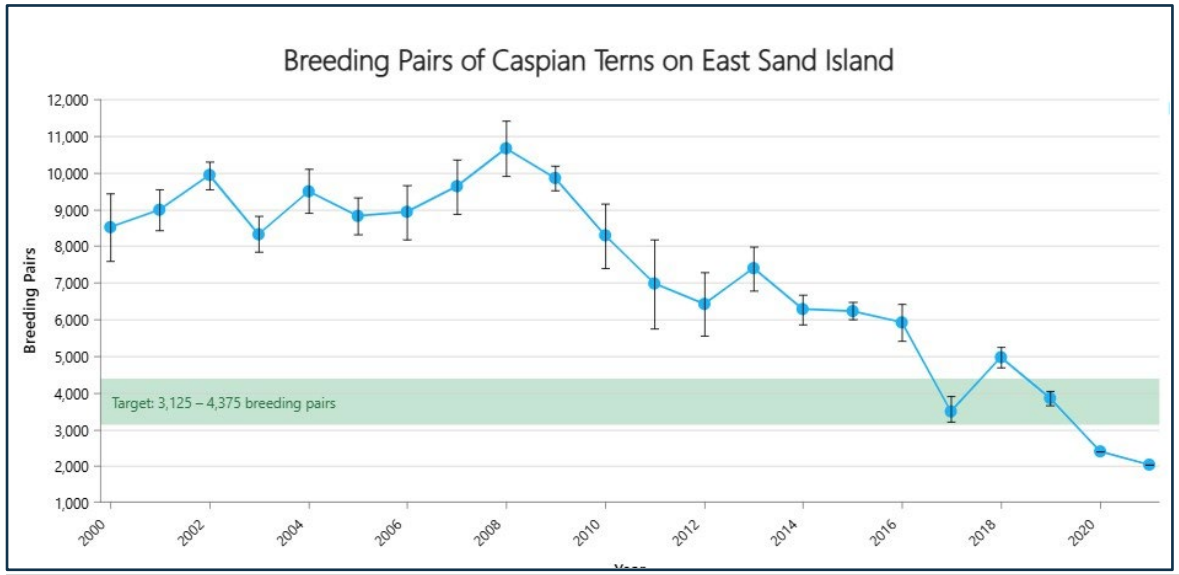
Data from Lawonn 2023a, 2023b; Evans et al. 2023, 2024

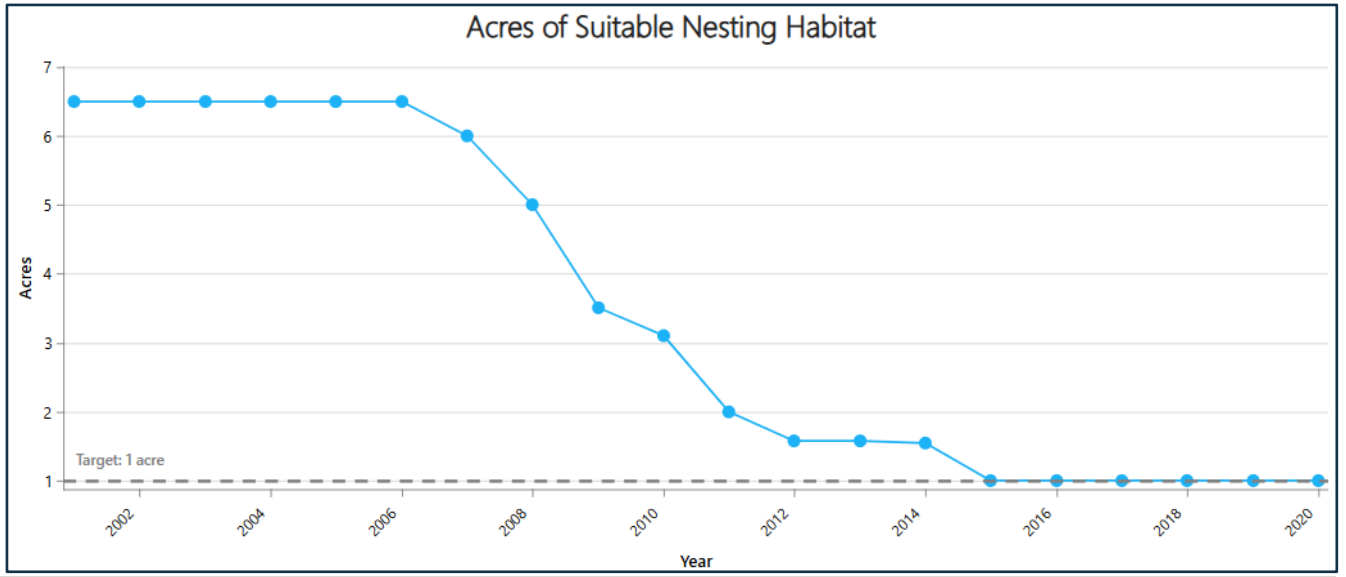
Predator management- Caspian Terns

East Sand Island

East Sand Island

Strategy Performance Indicator E4-1





The number of breeding pairs of Caspian Terns and availability of suitable nesting habitat on East Sand Island

Following management, the number of breeding pairs on East Sand Island dipped below the target number of 3,125-4,375.

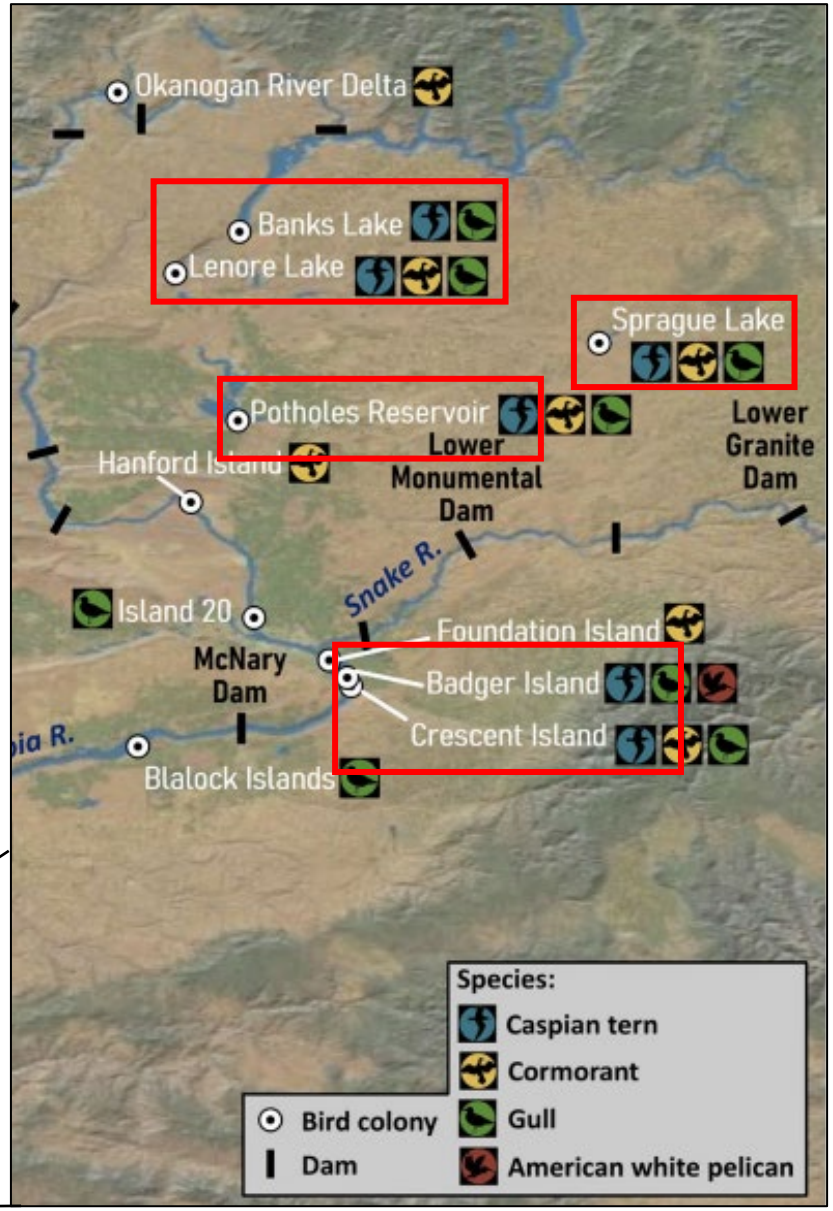
The target of one suitable acre of habitat was achieved in and has been maintained since 2015. The target

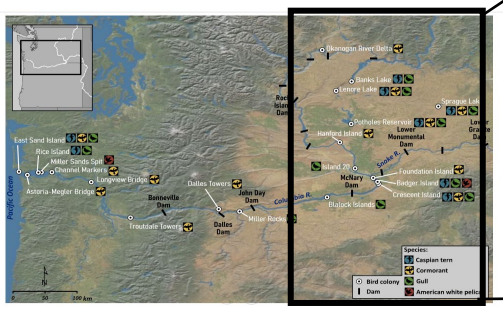
Predator management- Caspian Terns

Predation

Columbia River Plateau

Caspian terns are found across the Columbia River Plateau.





Annual Caspian tern predation rates on ESA-listed salmonids		
	Snake River	Upper Columbia
Chinook	0.1-1.6	0.2-5.5
Sockeye	0.1-2.4	
Steelhead	0.4-8.0	1.5-22.5

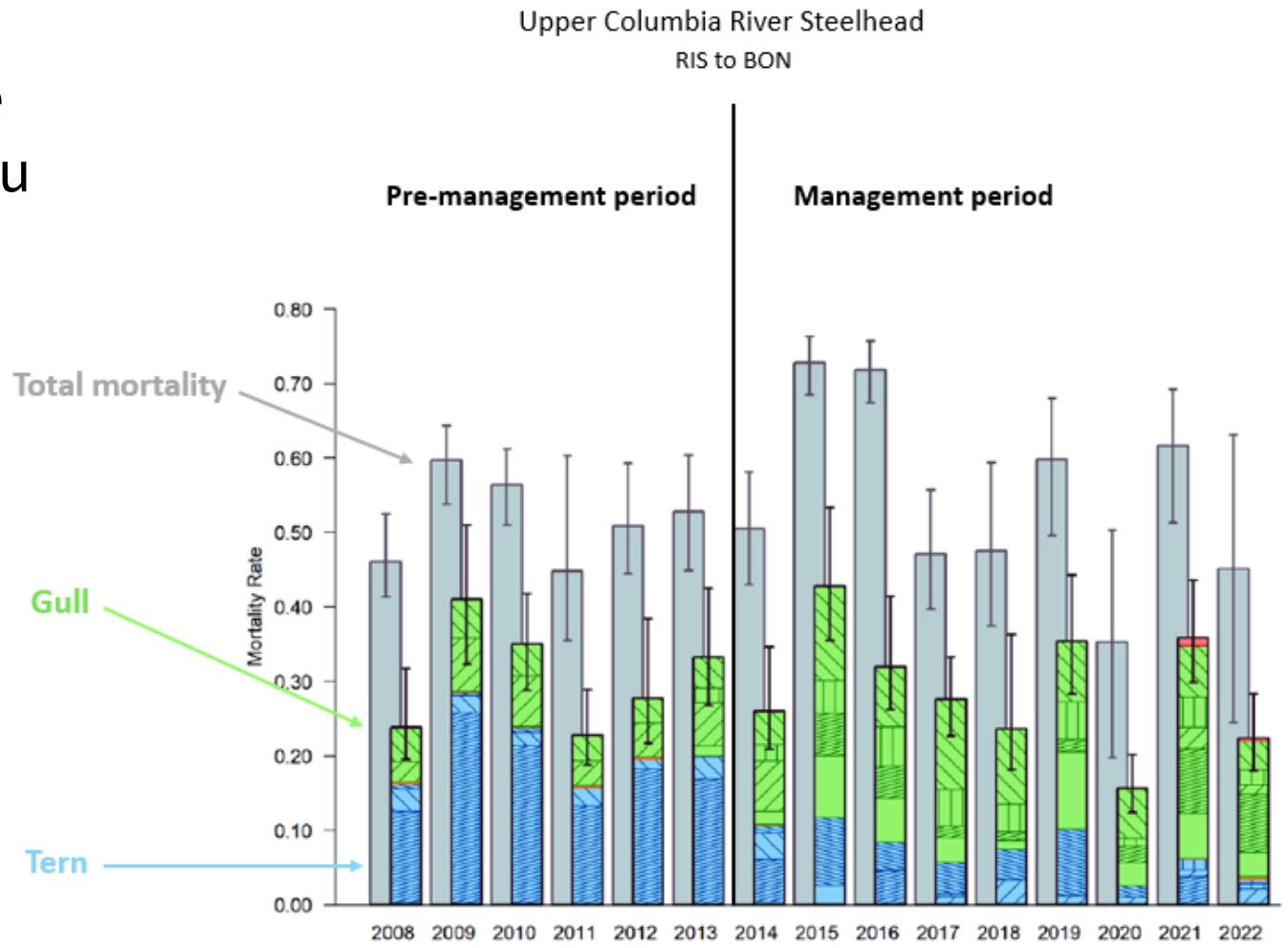
Strategy Performance Indicator: E4-3

Predator management- Caspian Terns

Columbia River Plateau

Caspian tern predation on the Columbia Plateau

Other predation pressure



Modified from Evans et al. 2023

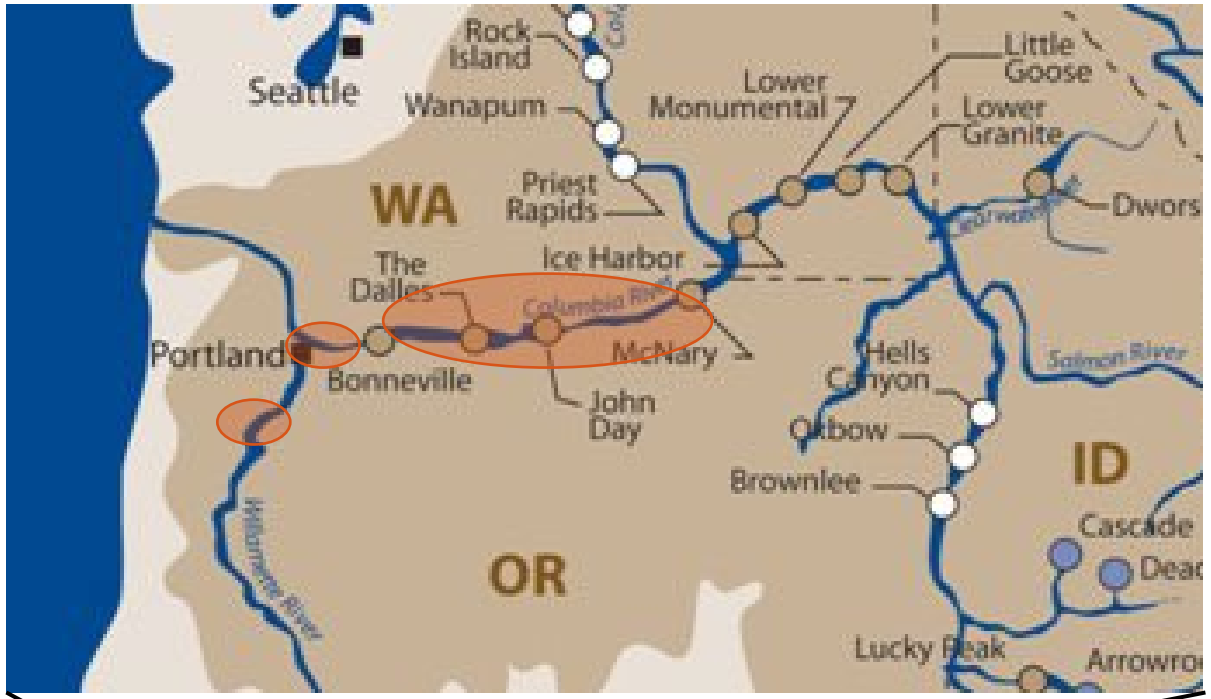
Goals

- ~<200 pairs in plateau
- <5% predation on ESA-listed runs

Outcomes

- Dispersal and subsequent “whack-a-mole”
- ~900 → ~400 pairs
- ~20% → <5% tern predation on ESA-listed steelhead
- Unclear if survival improvement to Bonneville Dam

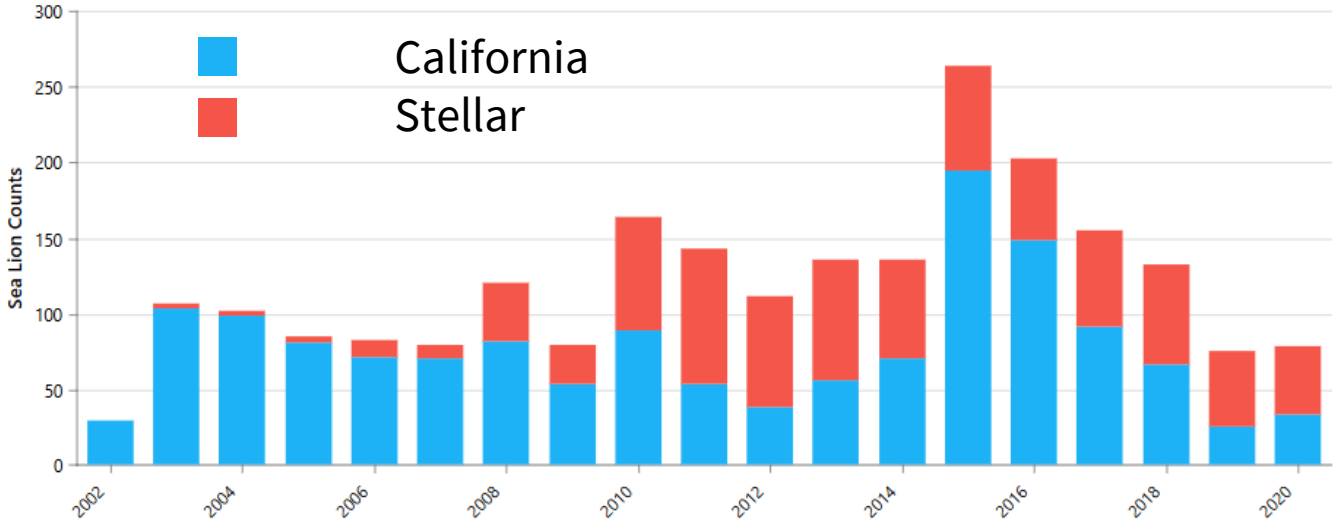
Current marine mammal management



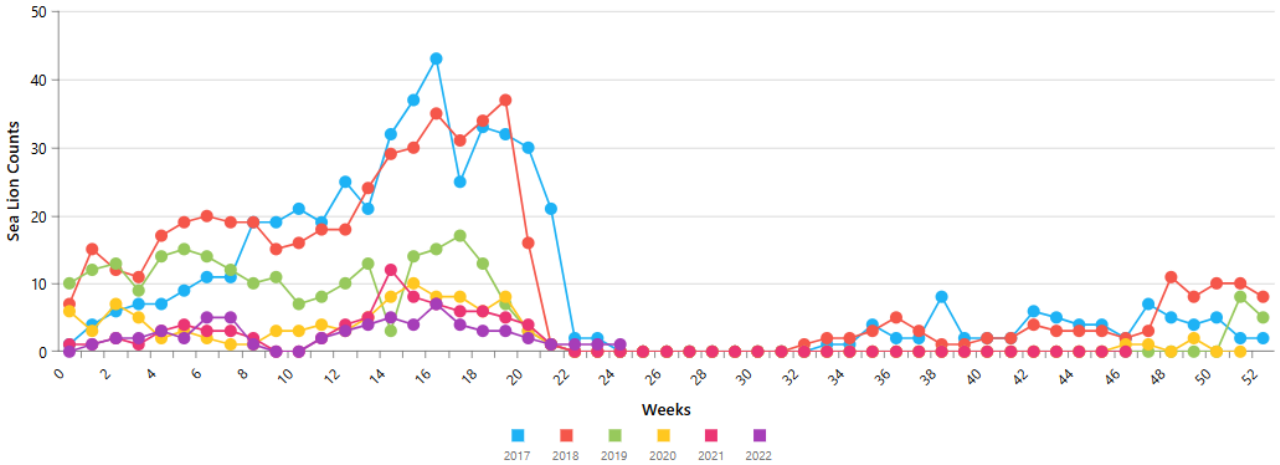
Current permitting allows removal of sea lions in <u>any Columbia River tributary that is salmon bearing</u>.

- Willamette Falls
- I-205 Bridge to Bonneville Dam
- Above Bonneville Dam to McNary Dam <u>but</u> a sea lion has never been confirmed upstream of The Dalles Dam.

Predator management-
California and Stellar Sea Lions



Below Bonneville

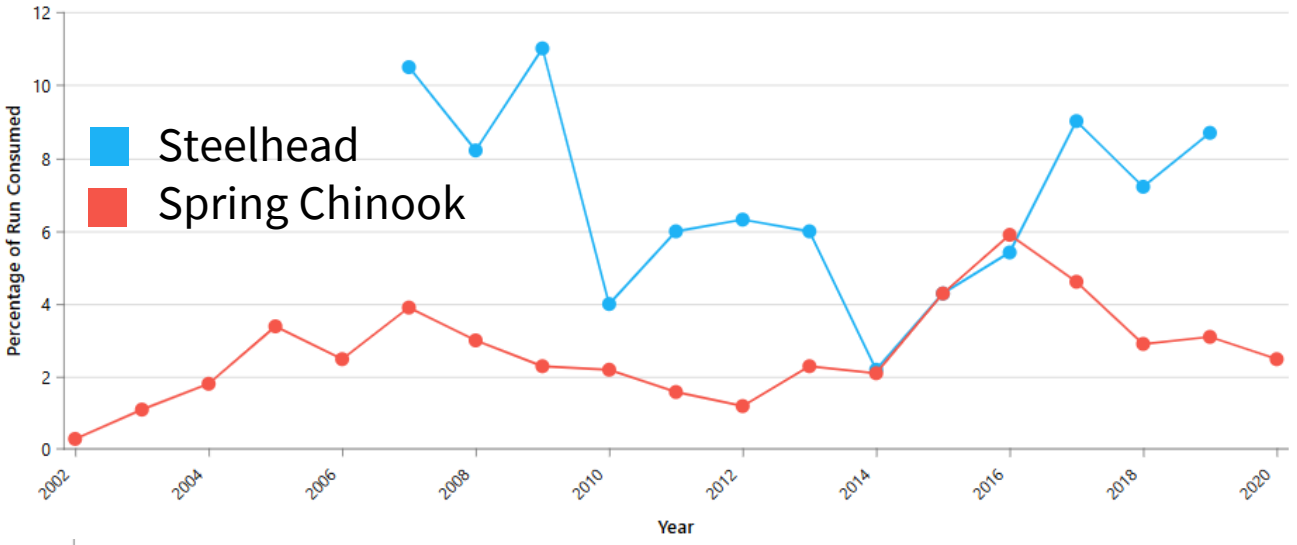


Willamette Falls

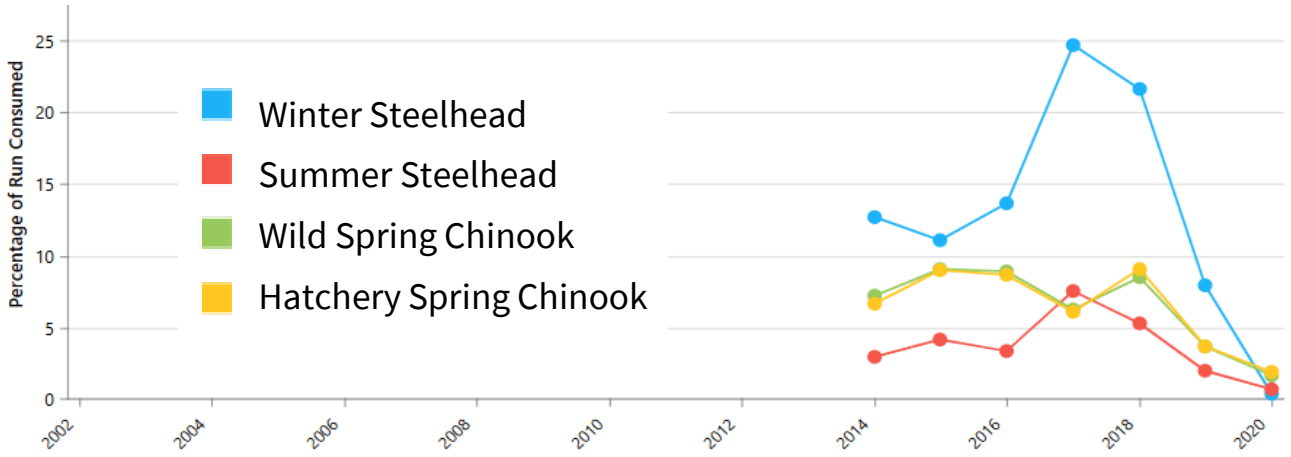
Counts of sea lions observed below Bonneville Dam, in the lower Columbia River/Estuary, and at Willamette Falls.

Strategy Performance Indicator: E4-6

Predator management-
California and Stellar Sea Lions



Below Bonneville



Willamette Falls

Percentage of the adult spring Chinook salmon and winter steelhead runs consumed by sea lions below Bonneville Dam and at Willamette Falls.

Strategy Performance Indicator: E4-7

Predator management- Harbor Seals


Credit: Lewis and Clark NP

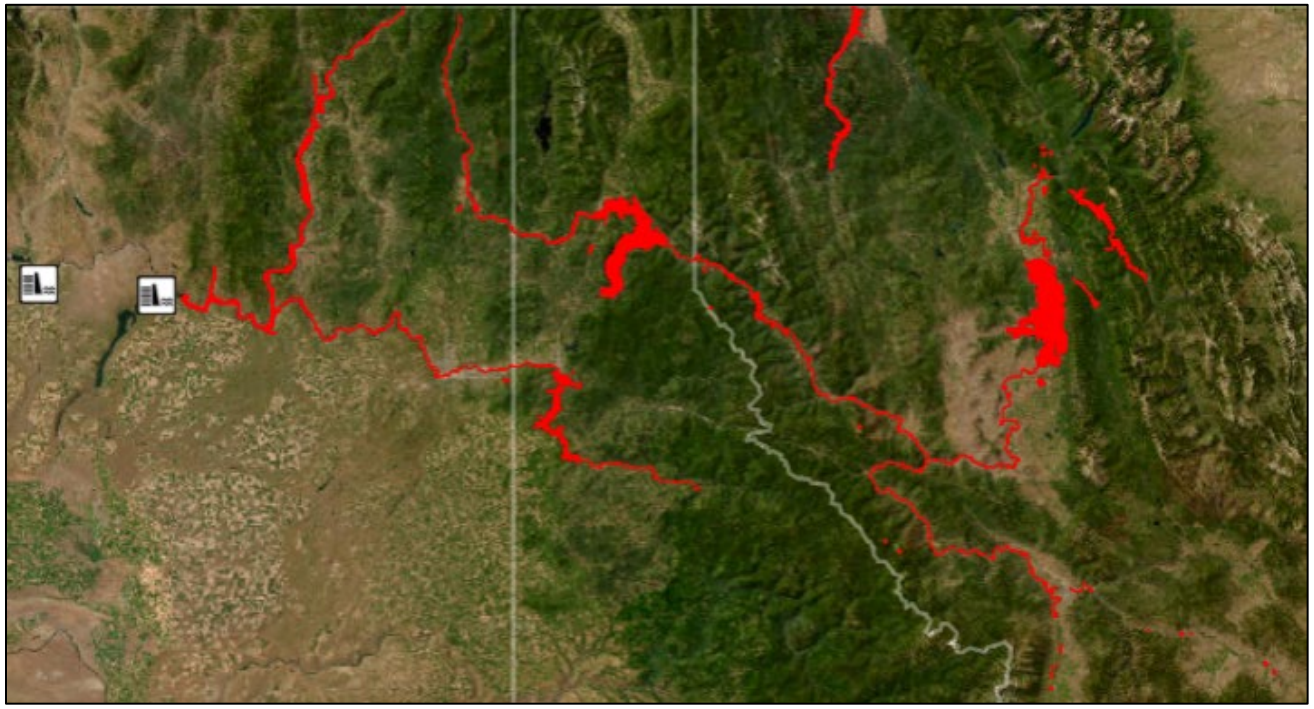
Pinniped measures including but not implemented for seals in 1994 and 2014 Programs related to:

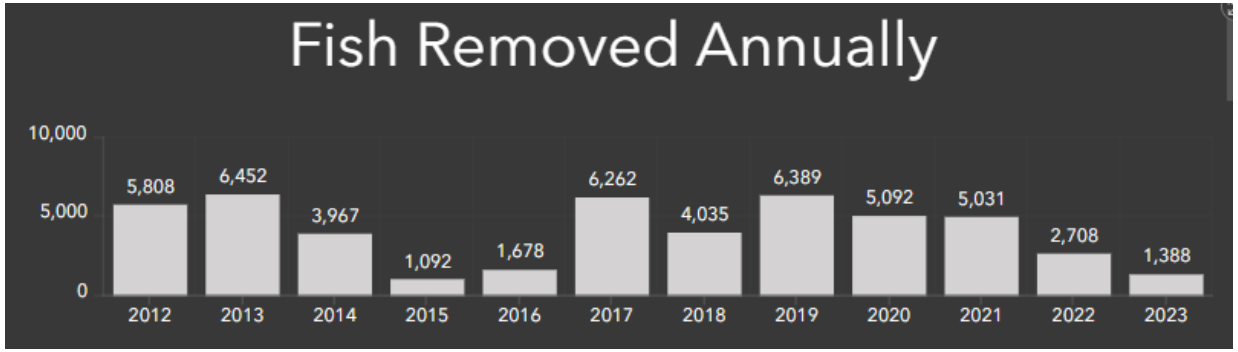
- Radio tagging
- Stomach content research
- Evaluation of impact of predation
- Lethal and non-lethal control methods

- Very rare sightings at Bonneville Dam
- Mostly reside in the estuary
- Large assemblages observed at the mouth of the Cowlitz River with the smelt run


Thaleichthys pacificus

Predator management-
Northern Pike (non-native)





Range expansion, spatial distribution, and number of non-native Northern Pike removed in the Columbia River Basin.

Strategy Performance Indicator: E4-5

Predator management-
Northern Pikeminnow


Northern Pikeminnow Credit: pikeminnow.org

Exploitation rate on Northern Pikeminnow measuring 200 mm (~8 inches) or greater in fork length

The sport reward fishery has successfully reached the 10-20% exploitation objective each year since 1997.

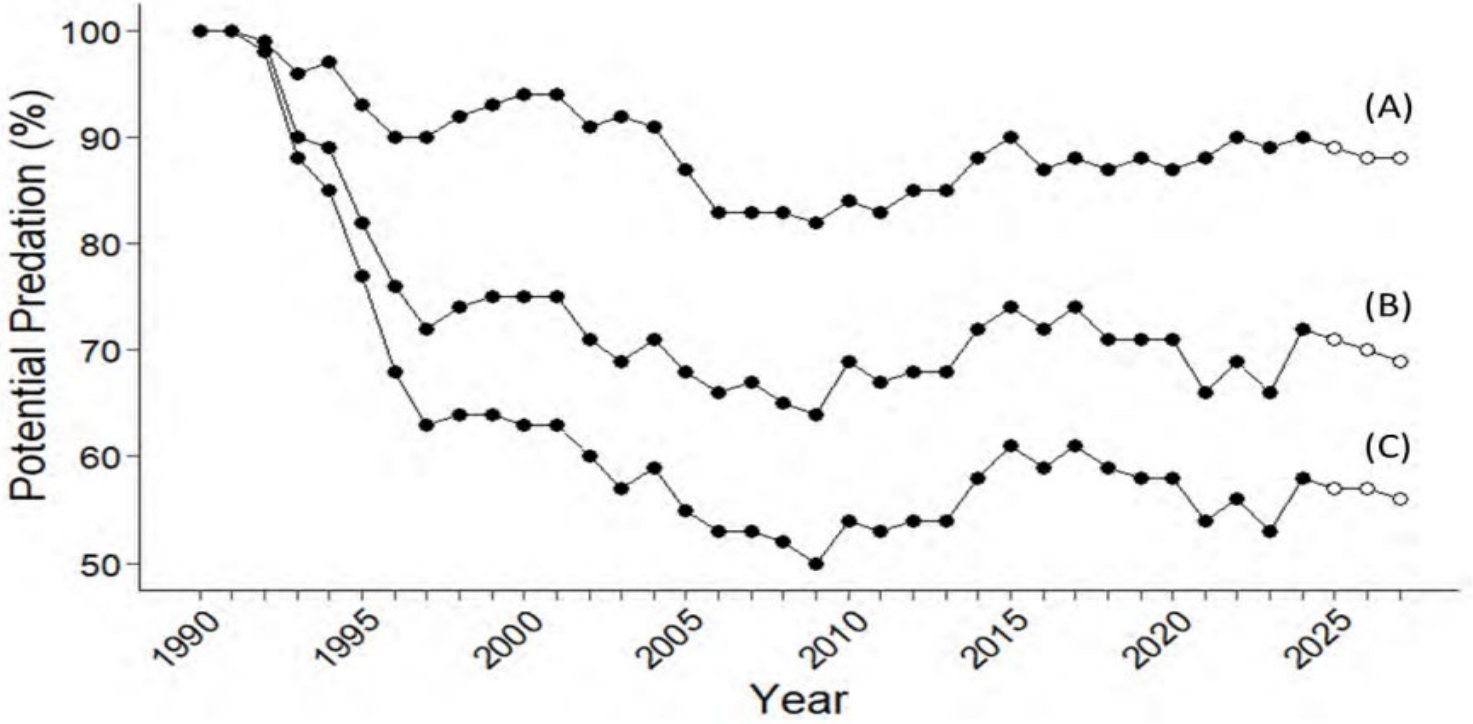
- Pikeminnow control has been called for since the Program's inception.
- One of the most intensively managed predator populations in the Columbia via actions including a sport reward fishery, dam angling and commercial harvest.
- Pikeminnow population monitoring also allows for some tracking of bass and walleye in certain areas.

Strategy Performance Indicator: E4-4

Predator management-
Northern Pikeminnow


Northern Pikeminnow Credit: pikeminnow.org

Since 1990, potential predation on juvenile salmonids has decreased by approximately 10-50%.



Estimates of (A) maximum, (B) median, and (C) minimum annual levels of potential predation by Northern Pikeminnow on juvenile salmon relative to predation levels before implementation of the Northern Pikeminnow Management Program. 2023 Annual Report

- Pikeminnow control has been called for since the Program's inception.
- One of the most intensively managed predator populations in the Columbia via actions including a sport reward fishery, dam angling and commercial harvest.
- Pikeminnow population monitoring also allows for some tracking of bass and walleye in certain areas.

Predator management-
Lake Trout

Strategy Performance Indicators: R1-1, R3-1	Juveniles	Adults
Priest Lake	Decreasing	Decreasing
Lake Pend Oreille	Decreasing	Decreasing
Flathead Lake	Data not Available	Data not Available
Cle Elum Lake	Data not Available	Data not Available

Status of current-year juvenile and adult Lake Trout abundances (increasing, decreasing, or stable) relative to the most recent 5-year average at each site listed

Main impacts are on kokanee, bull trout, and cutthroat trout.

Management considerations:

-Feasibility and cost of suppression increases with the size of the lake.
-Combination of efforts directed at both juveniles and adults needed.
-Public support is important.
-Ongoing monitoring and suppression efforts may be needed.

2019 ISAB Predation Review

What other species aren't managed?

- Pelicans
- Walleye (non-native)
- Bass (non-native)
- Channel catfish (non-native)


Credit: Encyclopedia of Puget Sound


Credit: Columbia Insight

Summary of Predator Management

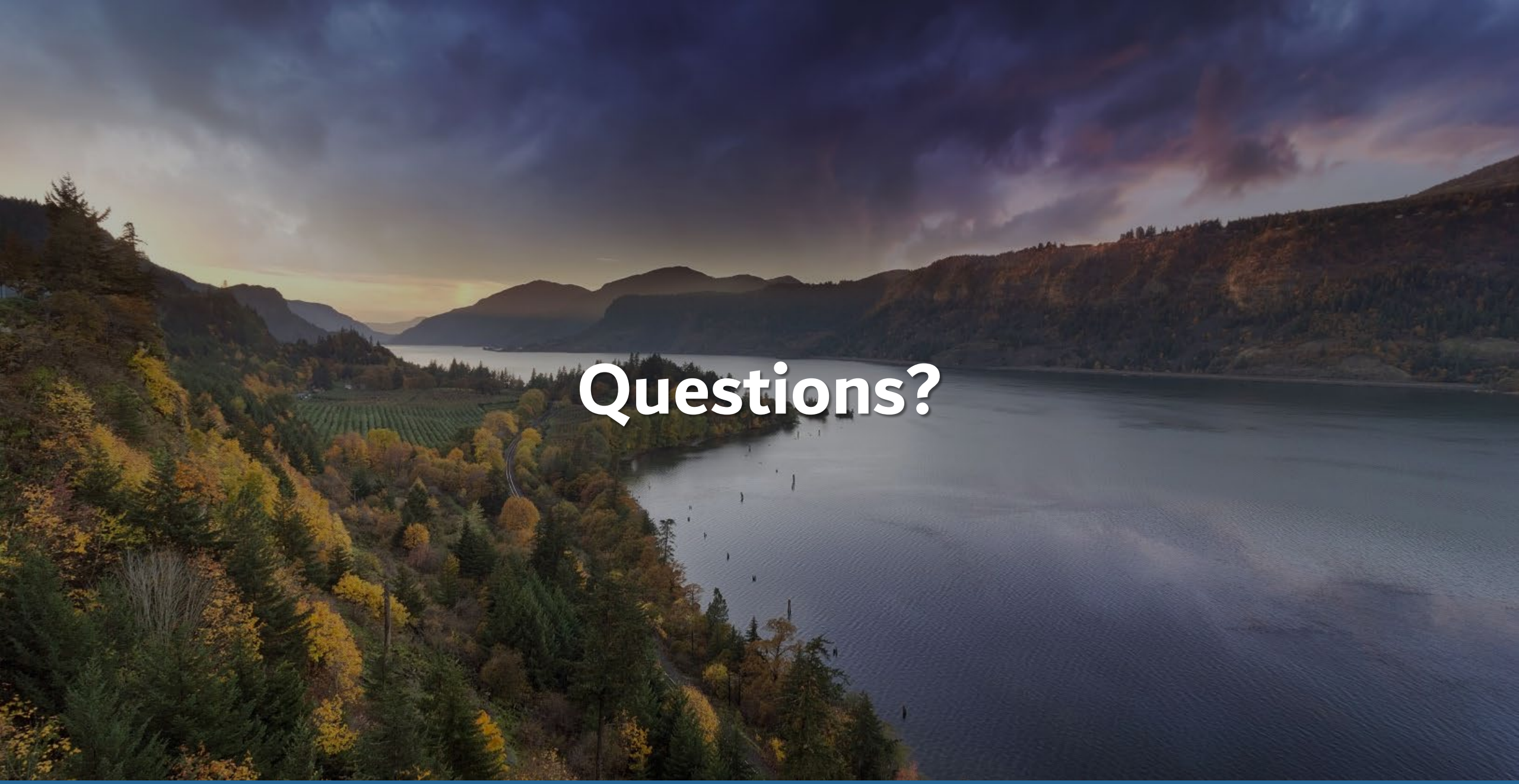
- Predator management techniques and implementation in the Columbia Basin vary widely based on the species.
- Priorities tend to shift with ESA listings, regional focus, and funding opportunities.
- Incentive programs can be useful to engage the public and ensure continued monitoring.
- Relieving the pressure of one type of predation can invite other types to fill that niche.

Discussion of Predator Management

- Is the current monitoring on predator species sufficient?
- Which predator species may be able to capitalize on climate change impacts? How can the region prepare?
- Other predator species like bass and walleye also exist and may influence the survival of focal species…
  - Is there a need to more fully assess the impacts of these species?
  - Does predation of these species offset gains made by other predator management actions?

Discussion topics

- What do we need to think about leading up to the next amendment?
- As the priorities or conditions of the Basin change, are actions or strategies adaptable?
- How are measures/goals incorporating or planning for future change or flexibility


Questions?