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

December 3, 2024

MEMORANDUM

TO: **Council Members**

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

SUBJECT: **Staff report on Program Performance: Goals and Objectives**

BACKGROUND:

Presenter: Kris Homel, Kate Self, and Patty O'Toole

Summary: Staff will present on progress toward meeting goals and objectives, as described in the Fish and Wildlife Program 2020 Addendum. This is the first time in the history of the Program that these results have been reported in such a comprehensive way. For each goal and objective, we present a brief summary of background and context, data on progress where available (typically using Strategy Performance Indicators), and identify where edits to the text of the goal or objective could better match existing data sets or be more quantitative or trackable. The full text of goals and objectives, along with citations, embedded targets, or other context appears in the 2020 Addendum. Staff will not have time to review all of the details during the presentation, but we will refer to the sections of interest as we go along.

This evaluation of progress toward Program goals and objectives, along with recent categorical assessments on habitat, 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 amendment process.

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; presentations in September, October, and November 2024), and the third is an evaluation of progress toward reaching Program goals and objectives.

Workplan: Item 2.1 Program Performance: Assess progress toward goals and objectives

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 one-time 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.

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, staff presented a summary of the first three categories. In each assessment, we described (1)

what was called for in the Program, (2) what was implemented, and (3) how implementation compares to available benchmarks. These assessments incorporated content from existing summaries (e.g., the Program Tracker with Strategy Performance Indicators (SPIs), published research or reports, and dashboards on particular topics) and also included new summaries from a variety of information sources. Strategy Performance Indicators are updated annually on Program Tracker (and some SPIs are updated in real-time), 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. In December, staff will present on the status and trends of these goals and objectives. Evaluating progress relies on multiple sources of data, including the SPIs. The Council has invested in expanding the Program Tracker web tool to incorporate information on goals and objectives. Following the December presentation, results will be uploaded into Tracker and made accessible to the region. Goals and objectives will be updated annually on Program Tracker.

The Program framework defines the relationship between the vision, goals, objectives, strategies, and measures. Of particular relevance is the reciprocal relationship between objectives and strategies and measures. Objectives define the conditions the Program seeks to establish as a step toward achieving long-term goals. If measures are already being implemented, associated objectives might contain targets that can be used to measure progress. If implementation has not yet occurred, the objective might be qualitative and point to a need for further implementation and development of quantitative targets. The Program benefits from both kinds of objectives- those pointing toward future implementation and those tracking progress from current implementation.

Program goals and objectives are diverse. They may be quantitative or qualitative. They may define a responsibility toward mitigating for the hydrosystem and fall entirely under a Program obligation. Alternatively, objectives may originate from other regional efforts (such as habitat restoration) and describe how implementation of the Program will "contribute to" achieving those regional targets. This occurs when regional targets seek to address losses that include and extend beyond those attributed to the hydrosystem. In summarizing these diverse goals and objectives, staff relied on information in the SPIs. Some of these SPIs were identical to objectives and were previously described in the categorical assessments. In this presentation, we refer to the results described in those assessments but do not repeat them. It is important to remember that the SPIs were developed through eight regional work sessions with topical experts and relied on existing information that is already collected and reported in some way.

The outcomes from the Fish and Wildlife Program can be described in terms of progress toward meeting quantitative targets. In interpreting this progress, it is critical to keep in mind the information staff presented in the retrospective and categorical assessments. Progress toward Program Goals and Objectives is influenced by when measures appeared in the Program, when planning and implementation began, and when or where physical or biological results may be detectable. As an example, early Program efforts were heavily focused on modifying the structures and operations of the hydrosystem. These modifications dramatically improved fish survival as they navigate the hydrosystem. Subsequently, the Program shifted toward a bigger focus on habitat planning in the mid-2000s, and then implementation of restoration projects. From the point when a restoration project is implemented on the landscape, it may take little time to decades to mature and achieve the physical result- perhaps reduced erosion, increased connectivity, or riparian shading. Fish that are present in the stream may begin to experience improved growth or survival or access to spawning habitat. However, an increase in population abundance may take multiple fish generations as each generation may have slightly higher survival than the previous and contribute more offspring to the next generation (assuming no other significant negative impacts occur). Taken together, this means that restoration work done under the Program is at varying levels of maturity, and fish populations may have only been responding to restoration for a generation or two.

The 2020 addendum contains 5 goals and 37 objectives, along with other relevant information such as citations, embedded targets, and context. Staff will not have time to review all of the details during the presentation, but we will refer to the sections of interest as we go along. Of these goals, the most frequently cited is the **goal for 5 million salmon and steelhead to return to the Basin by 2025**. Council staff have developed robust methods to summarize this data, in collaboration with regional managers. These results will highlight not only the total number of salmon and steelhead returning, but the portion harvested in the ocean, returning to the mouth, and passing Bonneville Dam. Additional details on species composition will also be presented.

The first Program goal for salmon and steelhead is comprised of the following objectives:

1. Contribute to achieving NOAA's Columbia Basin Collaborative targets for stock abundance
2. Contribute to achieving smolt-to-adult return ratios (SARs) in the 2-6 percent range for listed and unlisted populations of salmon and steelhead
3. Contribute to improving survival of juvenile salmon and steelhead through the hydrosystem
4. Achieve annual survival standards for adult salmon and steelhead (details in addendum)
5. Contribute to assessing and, where appropriate, expanding anadromous fish distribution into the blocked areas

6. Hatcheries funded by BPA meet hatchery mitigation goals described in relevant plans
7. Maintain genetic diversity over time

The second Program goal describes **protecting, mitigating, and enhancing other native focal aquatic species** that have been adversely affected by the development and operation of the hydrosystem. This goal is divided into objectives by species (White Sturgeon, Pacific Lamprey, resident salmonids including Bull Trout, Cutthroat Trout, Kokanee Salmon, and Redband Trout, and an "other" category that includes Eulachon, Burbot, Oregon Chub, and freshwater mussels).

For **White Sturgeon**, Program objectives cover the following four areas, with specific geographic and age-based targets covering much of their distribution in the Columbia Basin:

1. Contribute to achieving abundance targets
2. Contribute to achieving distribution targets
3. Contribute to achieving genetic diversity targets
4. Contribute to achieving productivity targets

For **Pacific Lamprey**, the program includes the following objectives:

1. Contribute to an abundance target of 200,000 adults at Bonneville Dam by 2025
2. Contribute to reduced risk of extirpation and improved adult abundance throughout the historical distribution in the Columbia Basin
3. Contribute to improving passage efficiency for adult Pacific Lamprey to at least 80% at mainstem dams on the Columbia and Snake River
4. Contribute to improving passage efficiency and survival for juvenile Pacific Lamprey at mainstem dams on the Columbia and Snake River, using standards for juvenile salmonids

For **resident salmonids**, the program includes the following objectives:

1. Contribute to achieving self-sustaining populations of Bull Trout, which occupy habitat throughout the native range, exhibit genetic diversity, and have stable or increasing abundance that could permit harvest
2. The same objective above as applied to Cutthroat Trout
3. The same objective above, applied to Kokanee Salmon
4. The same objective above, applied to Redband Trout
5. Mitigate for effects of Hungry Horse Dam on resident fish through acquiring habitat in an amount closely equivalent to what was blocked and inundated by Hungry Horse Dam
6. Mitigate for effects of Libby Dam on resident fish through acquiring habitat in an amount closely equivalent to what was blocked and inundated by Libby Dam

The Program also includes an objective covering **other native aquatic focal species** which is expressed in the Goal statement.

The third Program goal describes achieving full mitigation for wildlife losses caused by the construction and operation of the federal hydrosystem. There are four objectives that contribute to this goal:

1. Complete mitigation for construction and inundation losses over the next 5-year period by completing acquisitions or by establishing new settlement agreements
2. Assess and mitigate operational losses over the next 5 years by assessing all losses or by establishing new settlement agreements
3. All acquired land must operate under an approved management plan
4. Maintain existing habitat mitigation values, as described in the approved management plan

The fourth Program goal describes contributing to providing environmental conditions and processes that support the **ecosystem functions** necessary to restore healthy and harvestable populations of resident fish, anadromous fish, and wildlife that have been negatively affected by the hydrosystem. There are six objectives that contribute to this goal:

1. Contribute to maintaining and improving habitat quantity and quality
2. Contribute to maintaining and improving water quantity and quality
3. Provide flows through the hydrosystem that improve production, migration, and survival of fish; these flows are described in the addendum and in other documents such as the 2014 Program or Biological Opinions
4. Contribute to further reducing predation from birds, marine mammals, and fish that negatively affect habitat or survival of focal species
5. Contribute to management, prevention, or eradication of non-native and invasive species to improve abundance and survival of focal species
6. Similar to the Wildlife Goal, contribute to maintaining and improving the quality of land acquired and managed under the Program by developing and using an approved land management plan

The fifth and final Program goal describes the Council's work to **inform the public about the Program and to track and report on progress** along with securing improved access to Program-related information or data. There are five objectives under this goal and these are the responsibility of the Council.

1. Report on progress toward goals, objectives, and strategy performance indicators, along with progress toward addressing research critical uncertainties
2. Review progress toward achieving objectives and SPIs and refine as needed.
3. Improve access to information regarding Program investments, operations and maintenance, and other factors that may affect implementation and success.

4. Track FERC hydroelectric project applications in reference to areas designated as "protected" from future hydroelectric development
5. Advance efforts to complete remaining loss assessments.

Staff will release supplementary documentation on methods and references associated with evaluating progress toward meeting Program goals and objectives. This will be available 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 evaluation wraps up for 2024 in order to start the amendment process. Program performance efforts will continue to build off of the framework developed this year to include additional measures, expanded documentation, and further opportunities for feedback.

Collectively, the retrospective, categorical assessments, and status and trends assessment 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: November 2024 Council presentation on the Habitat categorical assessment available here:

https://www.nwcouncil.org/fs/18967/2024_11_1.pdf
https://vimeo.com/1029755107#t=0m57s

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

Program performance: status of goals and objectives

Kris Homel, Kate Self, Patty O'Toole, John Shurts

Council Meeting
December 2024

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

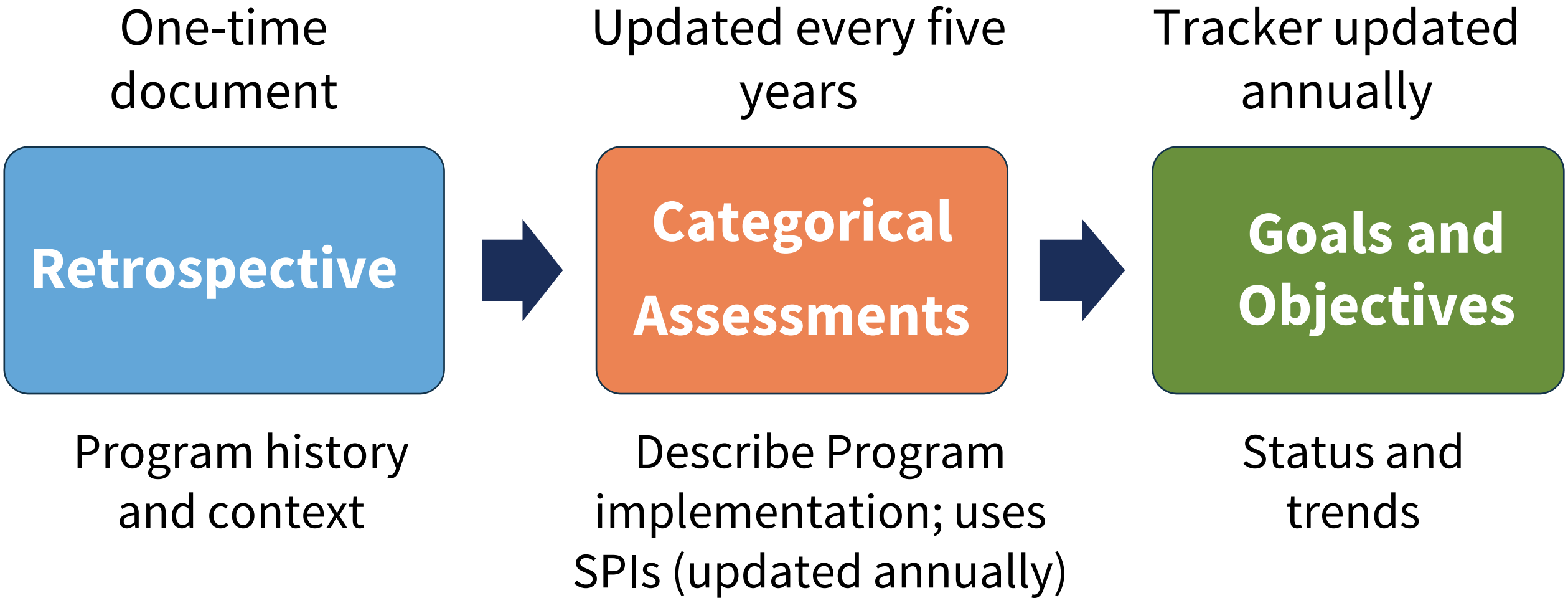
Outline

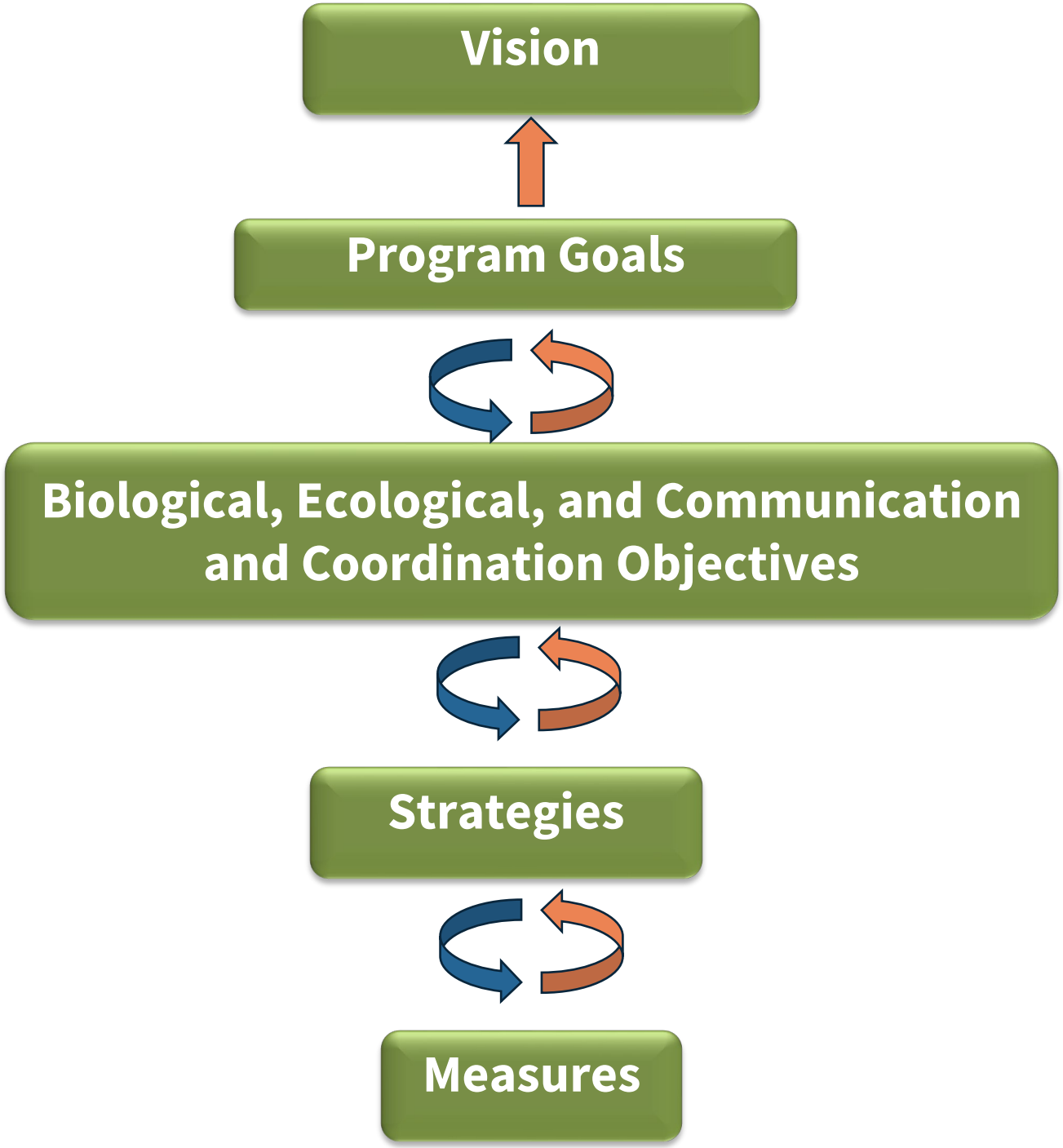
- Status of goals and objectives
- Revised Program Tracker
- Discussion

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

- Approach to performance
- Goals and objectives
  - Communication, assessment, and coordination
  - Anadromous salmon and steelhead
  - Other native aquatic species
  - Wildlife
  - Ecology/ habitat
- Discussion after each goal

Inaugural effort to track performance of 40+ year, basin-scale, multi-disciplinary mitigation Program





Why do we have Program goals and objectives?

- **Track progress on existing implementation**
  - Objectives may provide targets for existing implementation-
  - Reporting on implementation demonstrates progress to objective
- **Guide future work by describing desired outcomes**
  - Objectives may be qualitative and lack targets
  - Strategies or measures might need to be developed to implement

Specific, Measurable, Achievable, Relevant, Time-bound S.M.A.R.T.

- **2020 Addendum contains 5 goals and 37 objectives**
  - Developed through Program amendment process and numerous workshops with region
- Some specify a Program hydro mitigation obligation and others describe "**contributing to**" regional objectives
- Whether a goal or objective can be tracked depends on:
  - If they are quantitative or qualitative
  - If they contain specific targets, are clearly described, or contain timeframes
  - If data exist
- Tracked whatever could be tracked and identified where additional clarity needed for goal or objective to be trackable
- ISAB pointed out the need for further development of S.M.A.R.T. objectives in review of 2014 / 2020 Program

Program goals

1. Salmon and steelhead

2. Other native aquatic species

3. Wildlife

4. Ecology/ habitat

5. Communication, assessment, and coordination

Salmon and steelhead

Goal- 5 million
S1- MAFAC abundance
S2 - SAR 2-6%
S3 - Juvenile passage
S4 – Adult survival
S5 – Blocked areas
S6- Hatchery goals
S7- Genetic diversity

Wildlife

Goal– mitigate losses
W1 – Complete C&I mitigation
W2 – Complete Op mitigation
W3 – Approved management plans
W4 – Maintain mitigation values

Ecology/ habitat

Goal
E1 - Habitat quantity and quality
E2 – Water quantity and quality
E3 – Provide flows
E4 – Reduce predation
E5 – Manage non-native/invasive species
E6 – Management plans for acquired lands

Other native aquatic species

Goal
White Sturgeon
- WS1- Abundance
- WS2- Spatial distribution
- WS3- Genetic diversity
- WS4- Productivity

Lamprey
- L1 – Adult abundance
- L2 – Reduced risk of extirpation
- L3 – Adult passage
- L4 – Juvenile passage

Resident salmonids
- R1 – Bull trout
- R2 – Cutthroat trout
- R3 – Kokanee salmon
- R4 – Redband trout
- R5 – Hungry Horse
- R6 – Libby

Other native aquatic focal species
- NF1 – Includes Eulachon, Burbot, Oregon chub, freshwater mussels

Communication, assessment, and coordination

Goal- Inform public/ track and report on progress/ information available
C1 – Report on objectives
C2 – Review progress
C3 – Improve access to information
C4 – Track protected areas
C5 – Remaining loss assessments

Program goals

Salmon and steelhead

Other native aquatic species

Wildlife

Ecology/ habitat

Communication, assessment, and coordination

Goal 5: Communication, assessment, and coordination

Inform the public about the Fish and Wildlife Program to encourage awareness and involvement, including consideration of the Program within an ecological and social context. Track and report on progress in Program implementation and performance. Secure improved access to all Program-related information and data.

All objectives under the communication, assessment, and coordination goal are achieved through actions implemented by the Council, in coordination with the region.

This goal reflects the Council's responsibility under the Northwest Power Act to: *(1) to develop a program to protect, mitigate and enhance fish and wildlife affected by hydroelectric facilities in the Columbia River Basin, (2) to develop a power plan assuring the Pacific Northwest of an adequate, efficient, economical, and reliable power supply, consistent with the fish and wildlife program, and (3)* ***to inform and involve the public.***

Note: these objectives are generally qualitative, and we report on them by linking to the reporting tool developed to share the referenced information.

Goal 5: Communication, assessment, and coordination

Objective C1: Annually report on progress toward Program objectives, Program strategy performance indicators, and addressing research critical uncertainties

- ✓ Populated Program Tracker with all available data on SPIs
- ✓ Developed new Program Tracker to track progress toward meeting Goals and Objectives
- ✓ Tracker data updated in real time using APIs or annually

Performance indicators by Program goal and objective

View goals, objectives and indicators by Program category below, or jump to specific performance indicators under each category.

GOALS AND OBJECTIVES:	ANADROMOUS SALMON AND STEELHEAD	OTHER NATIVE AQUATIC SPECIES	WILDLIFE	ECOLOGY	COMMUNICATION, ASSESSMENT, COORDINATION
PERFORMANCE INDICATORS:	Mainstem hydrosystem flow and passage Fish propagation and hatchery Wild fish Anadromous fish in blocked areas Plume and nearshore ocean	White sturgeon Pacific lamprey Eulachon Resident fish Predator management Mainstem hydrosystem flow and passage Fish propagation and hatchery	Wildlife mitigation	Habitat Water quality Mainstem hydrosystem flow and passage Predator management Non-native and invasive species Estuary	Public engagement Protected areas and hydroelectric development/licensing Resident fish

✗ Additional reporting needed on addressing research critical uncertainties

Goal 5: Communication, assessment, and coordination

Objective C2: Review progress toward achieving objectives and strategy performance indicators and refine Program objectives and Program strategy performance indicators as needed

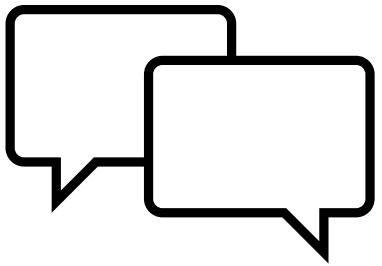
- ✓ Reviewed progress toward goals and objectives in this presentation
- ✓ Reviewed data on Strategy Performance Indicators in Categorical Assessments and this presentation
- ✓ Identified goals and objectives that may need to be refined to be S.M.A.R.T. in this presentation
  - ✓ Refinement of these or any other changes will occur through Program amendment
- ✓ Strategy Performance Indicator workgroup and subgroups refined SPIs prior to data appearing on Program Tracker.

Goal 5: Communication, assessment, and coordination

Objective C3: Improve access to information to inform decisions about Program **investments**, **operation and maintenance**, and factors that affect **Program activities and success**

…about Program investments

- ✓ Governor's report
- ✓ Start of year budget presentation from Bonneville



…O&M

- ✓ BOG- working for improved transparency and tracking of implementation
- ✓ Asset Management plan- contains transparent and public elements
- ✓ Assessing non-recurring maintenance needs associated with Program assets (e.g., hatcheries, screens, lands)

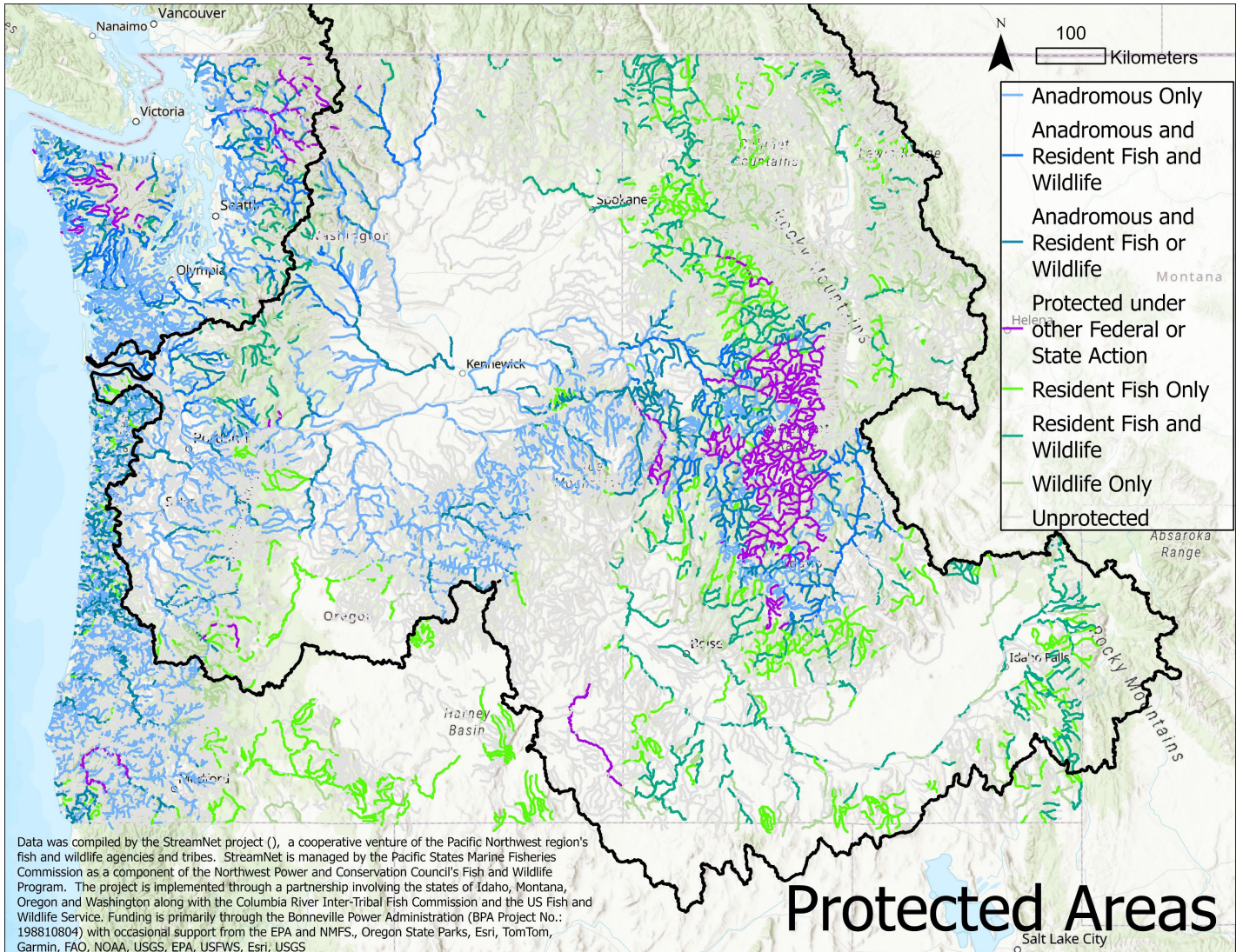
…Program activities and success

- ✓ Project review all done in public
- ✓ Increasing outreach by Public Affairs division, more and better social media, newsletter,
- ✓ Improved website, Program Tracker, other communication tools

Goal 5: Communication, assessment, and coordination

Objective C4: Track FERC hydroelectric project applications with respect to the Program's protected areas

- ✓ Council periodically tracks applications and permits to make sure they are not in protected areas
- X BPA used to employ someone who tracked FERC relicensing but no longer funds that position
- ✓ No Licenses granted by FERC in protected areas since 1988



Goal 5: Communication, assessment, and coordination

Objective C5: Advance efforts to complete remaining loss assessments

Loss assessments form basis for defining targets for hydro share of mitigation

Anadromous

✓ Progress in upper Snake River blocked areas to assess losses

Resident

✓ Only established losses are for Libby and Hungry Horse

X No additional effort on resident fish losses

Wildlife

✓ Operational loss assessments for Libby and Hungry Horse added to 2020 addendum

X Additional operational loss assessments needed.

Questions on Communication, Assessment, and Coordination Goal/ Objectives ?

Goal- Inform public/ track and report on progress/ information available

C1 – Report on objectives

C2 – Review progress

C3 – Improve access to information

C4 – Track protected areas

C5 – Remaining loss assessments

Program goals

Salmon and steelhead

Other native aquatic species

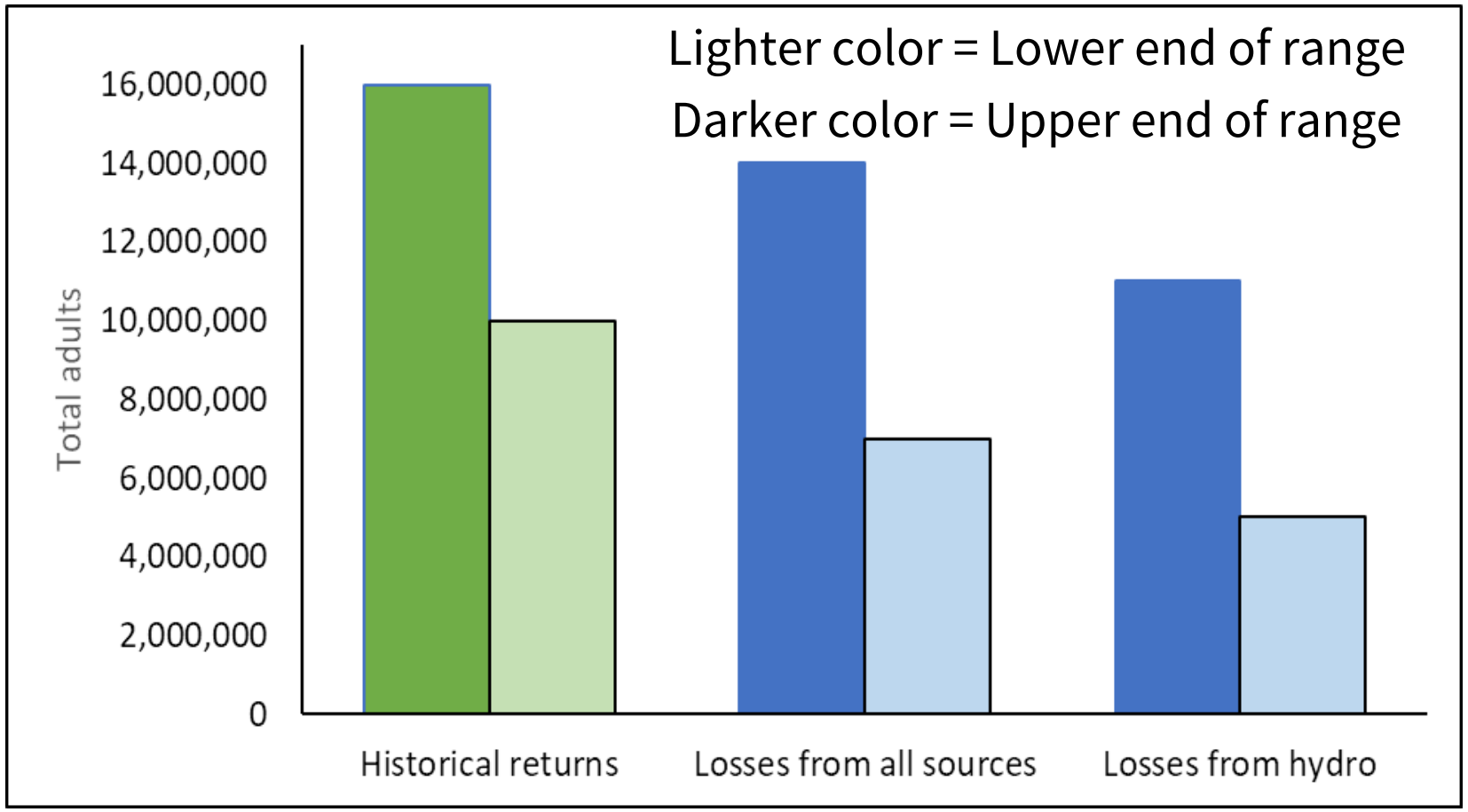
Wildlife

Ecology/ habitat

Communication, assessment, and coordination

Goal 1: Anadromous salmon and steelhead

Increase total adult salmon and steelhead runs of Columbia River origin to a 10-year rolling average of five million annually by 2025 in a manner that emphasizes increases in the abundance of the populations that originate above Bonneville Dam



Estimated range of historical salmon and steelhead returns and losses, NPPC 1986

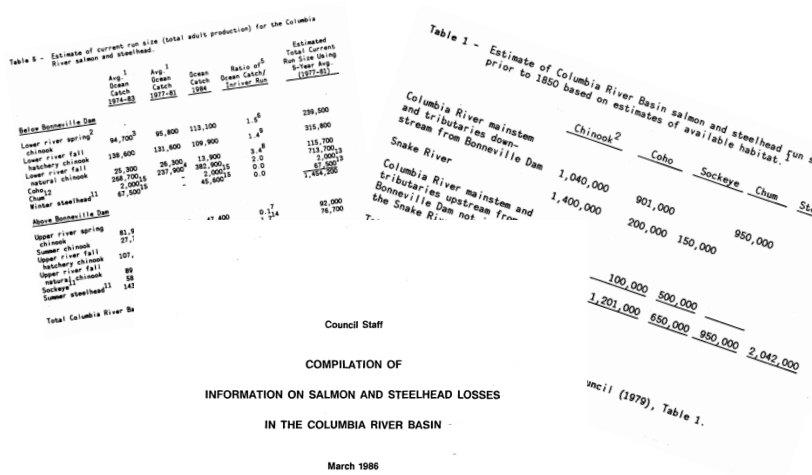


Table 1 - Estimate of Columbia River Basin salmon and steelhead run s prior to 1850 based on estimates of available habitat.

	Chinook[2]	Coho	Sockeye	Chum	St
Columbia River mainstem and tributaries down-stream from Bonneville Dam	1,040,000	901,000	200,000	150,000	950,000
Snake River	1,400,000				
Columbia River mainstem and tributaries upstream from Bonneville Dam not the Snake Ri...			100,000	500,000	
	1,201,000	650,000	950,000		2,042,000

ncil (1979), Table 1.

Council Staff

COMPILATION OF

INFORMATION ON SALMON AND STEELHEAD LOSSES

IN THE COLUMBIA RIVER BASIN

March 1986

* Other estimates of historical returns range from ~6 million (ISAB 2015) to 35 million (BPA 1984)

Program	History of the 5 million fish goal
1987	*Interim goal*: **Double salmon and steelhead runs from 2.5 million to 5 million adult fish** in the Basin as a whole, above Bonneville is an added priority.
1992 *Strategy for Salmon*	Maintenance of the interim goal to double the total number of adult salmon and steelhead in the Columbia Basin as fast as possible **without further loss of biological diversity among or within anadromous and resident fish populations**. **Numbers should be obtained by combining:** 1) Number of adult salmon of all species counted at Bonneville Dam. 2) Number of fish spawning below Bonneville Dam. 3) Estimated number of salmon caught in the ocean and in rivers below Bonneville Dam.
1994	Fish and wildlife agencies and tribes consistently recommended the retention of this interim abundance goal as an interim target for overall program efforts.
2000/2009	Target date to reach 5 million salmon and steelhead set as 2025.
2014/2020	Further emphasis on the populations that originate above Bonneville Dam

5 Million Fish by 2025

2014 Program - What
*Increase **total** adult salmon and steelhead runs of Columbia River origin to a 10-year rolling average of five million annually by 2025, in a manner that **emphasizes increases in the abundance of the populations that originate above Bonneville Dam****
2020 Addendum - How
• Harvest in the ocean and river below Bonneville Dam
• The number of fish spawning below Bonneville Dam
• The number of adult salmon of all species counted at Bonneville Dam

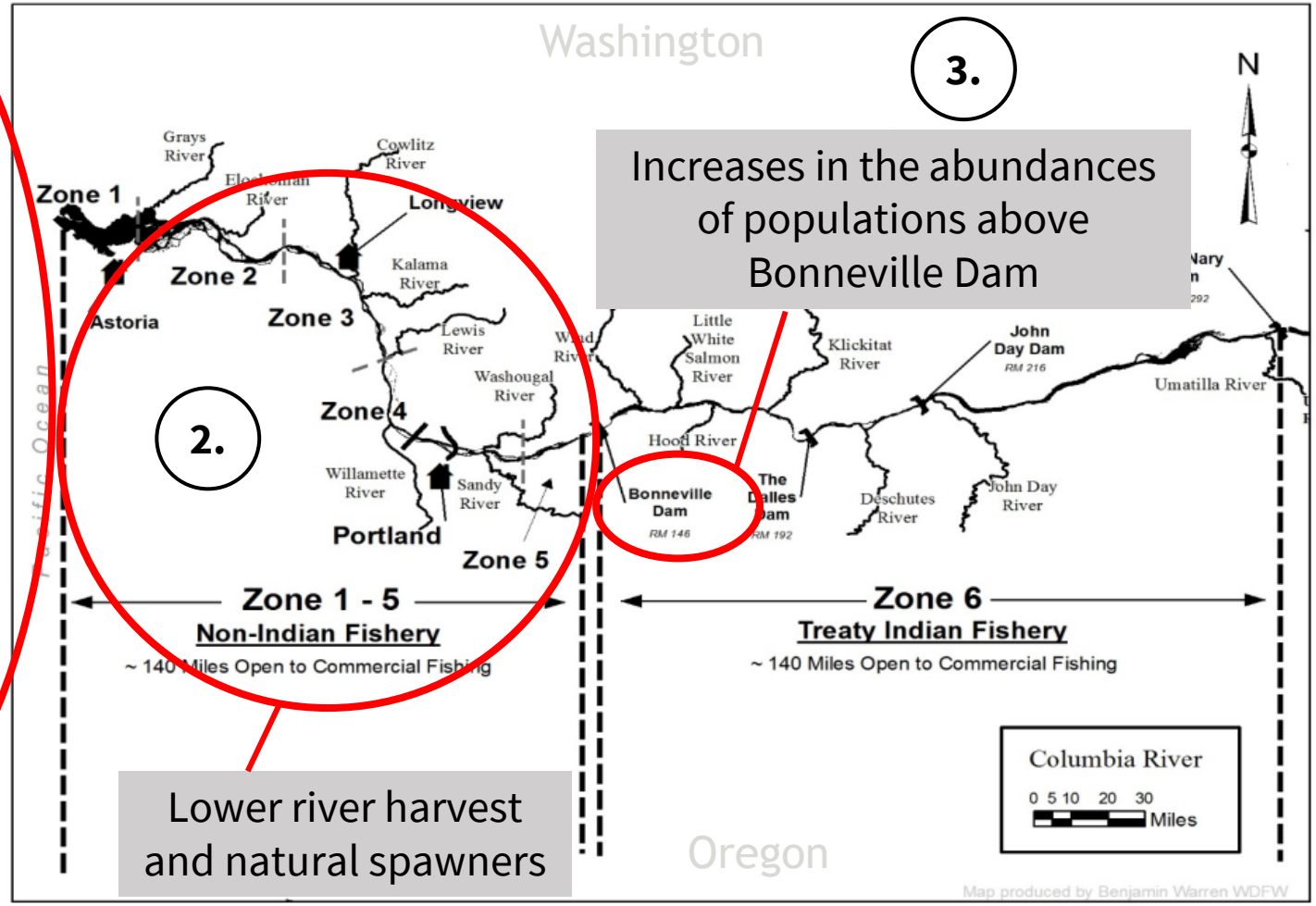
Because most of the loss of salmon and steelhead production as a result of hydroelectric development has occurred above Bonneville Dam, increases in abundance to satisfy this goal must come predominantly from this area.

Remember: This goal is addressing losses due to hydroelectric development, specifically.

5 Million Fish by 2025

1.

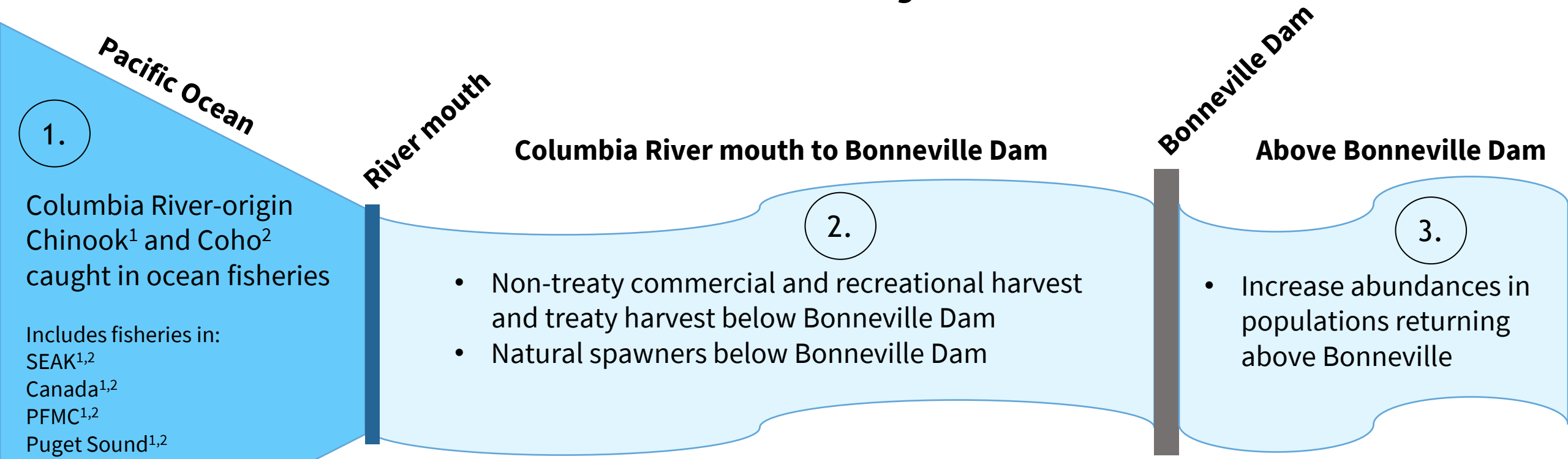
Ocean fisheries of Columbia River origin salmon and steelhead



Information sources:

- NOAA
- USFWS
- CRITFC
- ODFW
- WDFW
- FPC
- *US v OR* Technical Advisory Committee (TAC)
- PFMC Salmon Technical Team (STT)
- Oregon Production Index Technical Team (OPITT)

5 Million Fish by 2025



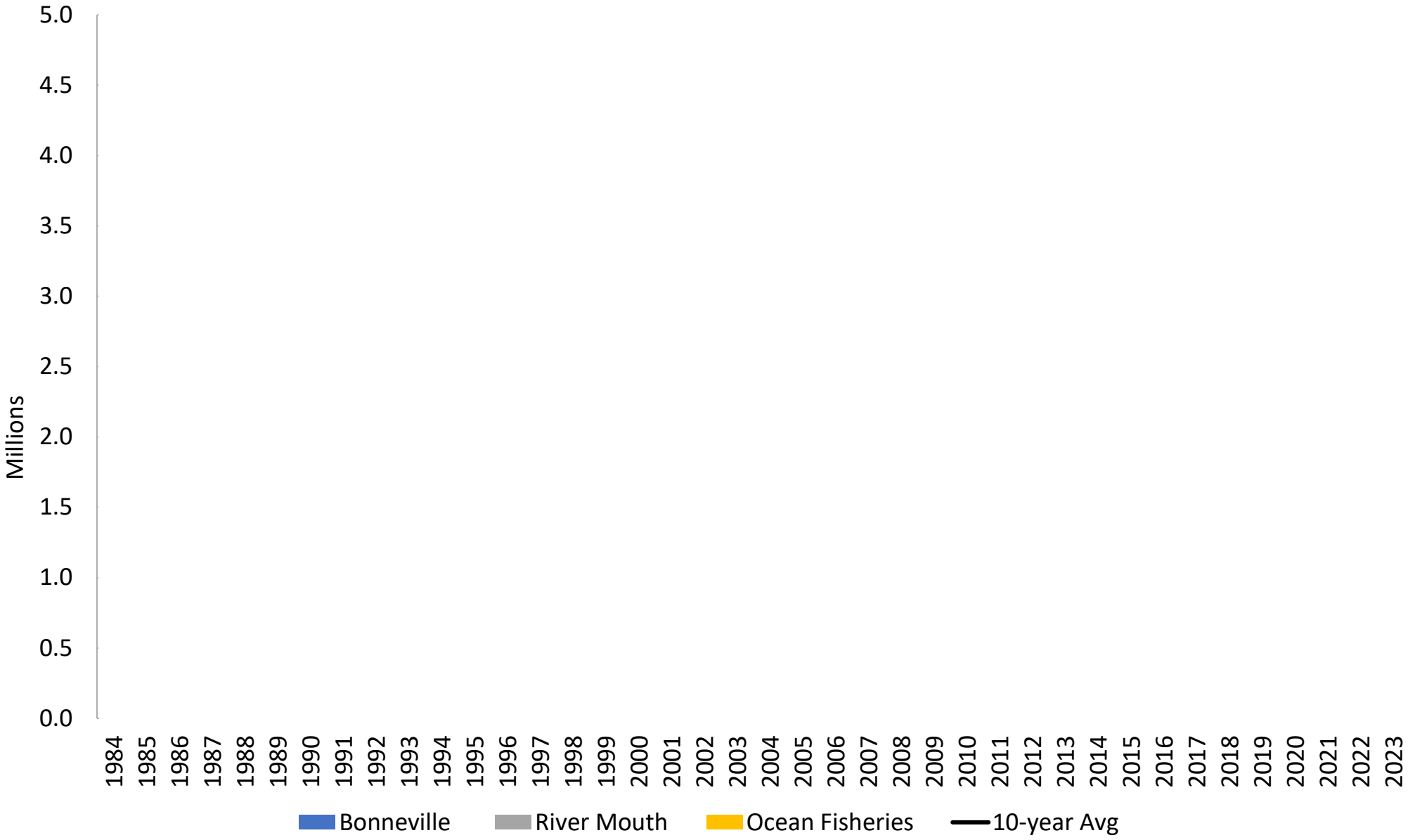
River mouth returns include:

- Mainstem, tributary and hatchery returns in the lower river
- Harvest including catch release mortality rates
- Natural spawner abundances when appropriate

Management groups	
Spring Chinook	Winter steelhead
Summer Chinook	Skamania steelhead
Fall Chinook	A/B steelhead
Sockeye	Coho
Pink at Bonneville	Chum

Adult Salmon and Steelhead Returns to the Columbia River 1984-2023

Total goal = Ocean fisheries + river mouth (harvest below BON and natural spawners) + BON Dam counts



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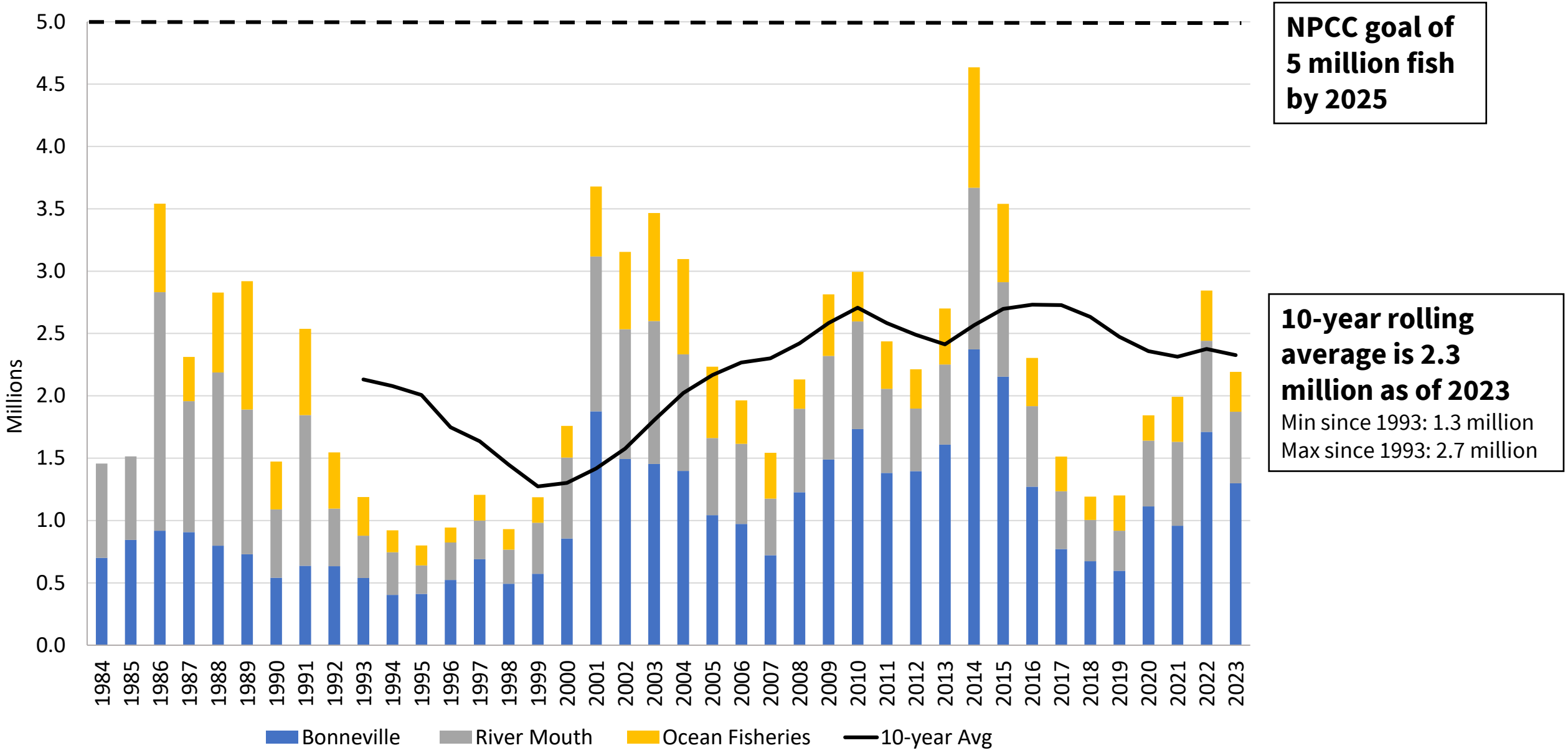


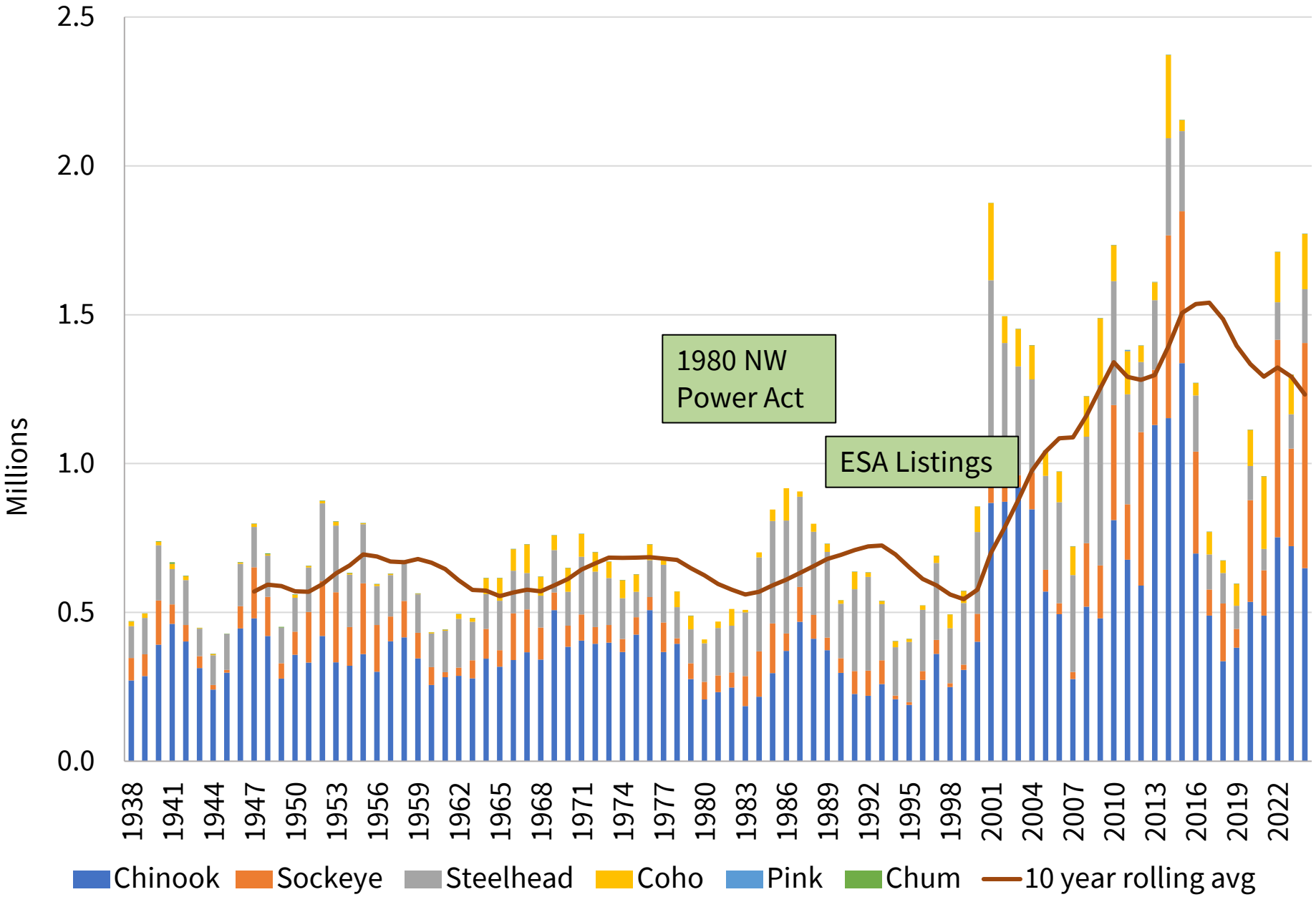
NPCC goal of 5 million fish by 2025

10-year rolling average is 2.3 million as of 2023

Min since 1993: 1.3 million

Max since 1993: 2.7 million

Adult Salmon and Steelhead Returns at Bonneville Dam 1938-2023



Average salmon and steelhead **Bonneville** counts since dam construction:

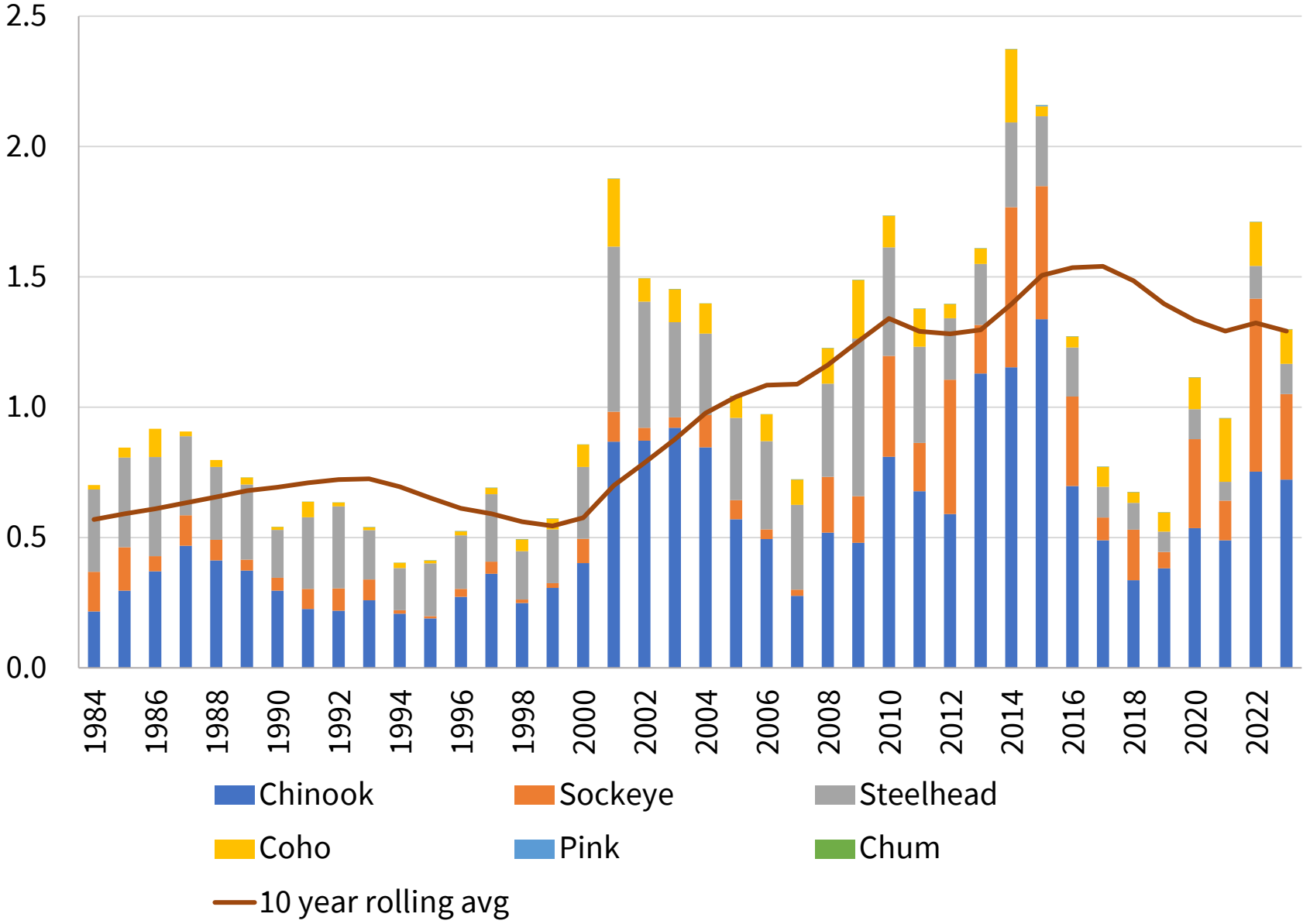
1938-1966: 601,720

1967-1994: 648,095

1995-2023: 1,181,297

2023 rolling 10-yr average: 1,231,865

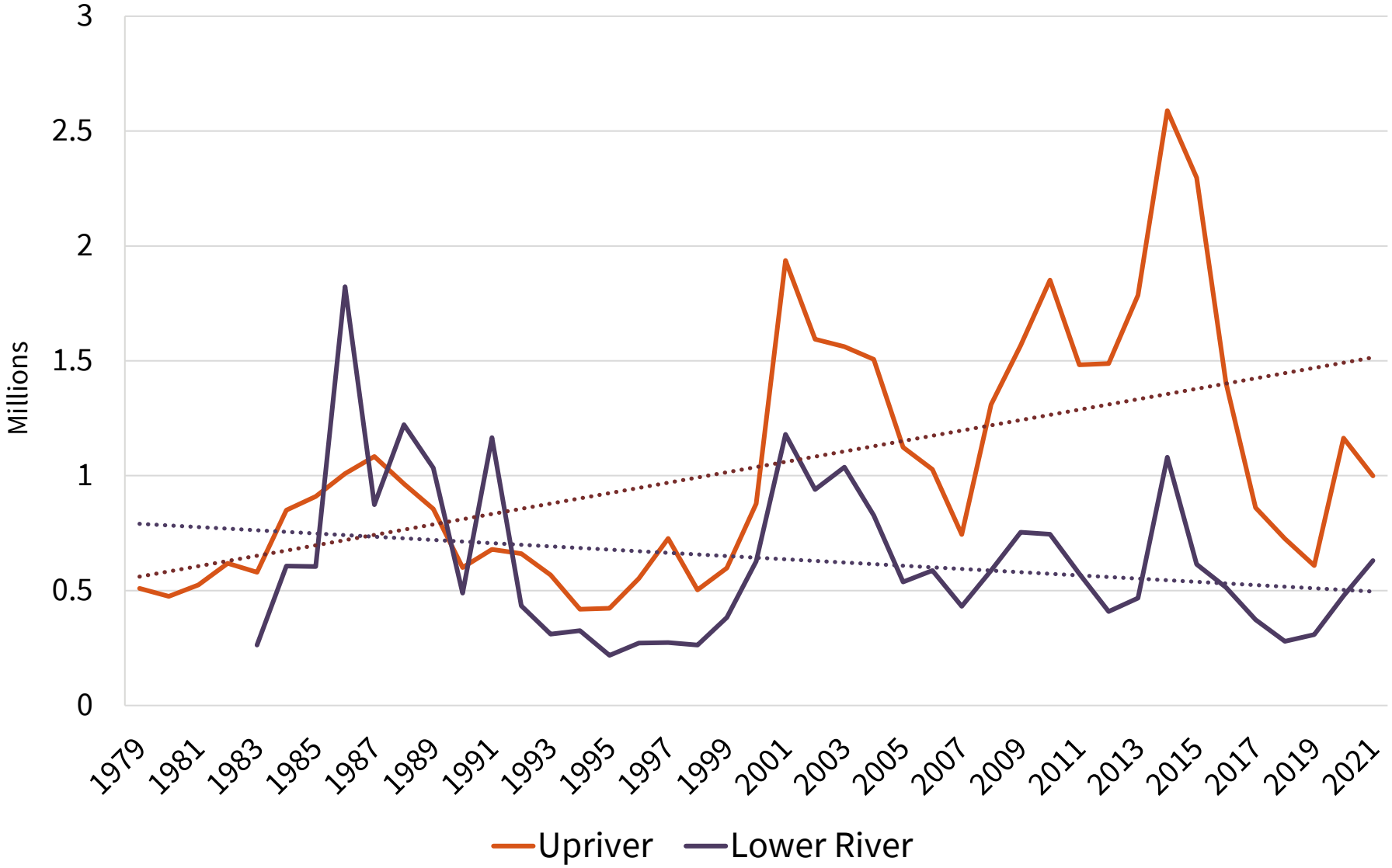
Adult Salmon and Steelhead Returns at Bonneville Dam 1984-2023



1984	48%
1985	55%
1986	32%
1987	46%
1988	36%
1989	39%
1990	50%
1991	34%
1992	58%
1993	61%
1994	54%
1995	64%
1996	63%
1997	69%
1998	64%
1999	58%
2000	57%
2001	61%
2002	60%
2003	57%
2004	61%
2005	64%
2006	62%
2007	63%
2008	65%
2009	65%
2010	68%
2011	69%
2012	75%
2013	72%
2014	66%
2015	75%
2016	69%
2017	63%
2018	68%
2019	67%
2020	70%
2021	60%
2022	59%
2023	56%

The percent of salmon and steelhead over Bonneville Dam has increased relative to annual river mouth returns over time.

Salmon and steelhead estimates at the Columbia River mouth bound for either above Bonneville Dam (upriver fish) or below Bonneville Dam (lower river fish)



- Upriver fish have increased in abundance on average over time.
- Lower river fish have slightly decreased in abundance on average over time.
- This supports the Council's goal of increasing the proportion of fish headed upstream of Bonneville Dam.
- There is work to be done to rebuild certain populations in both areas.

5 Million Fish Discussion

Fish and Wildlife Program mitigation in a dynamic Basin

- Early work under the Program focused on moving production upstream of Bonneville Dam, development and improvement of fish passage structures, and improving flows for ecosystem benefits.
- In the last two decades, substantial investment in restoration, predator management, and other associated research and monitoring, and continued artificial production.

How has the abundance of salmon and steelhead changed over time in relation to this goal?

- Many populations were already depressed or on the decline in the 1990s which led to continued measures in Fish and Wildlife Programs and ESA-listings.
- Overall abundance of populations originating above Bonneville has increased substantially with more work planned on the horizon.
- The contemporary population abundance exceeds 1990s and trend has been positive, although variable.

Goal 1: Anadromous salmon and steelhead

Objective S1: contribute to achieving the targets for salmon and steelhead adult abundance by stock and subregion developed by the NOAA Marine Fisheries Advisory Committee's (MAFAC) Columbia Basin Partnership (CBP) Task Force.

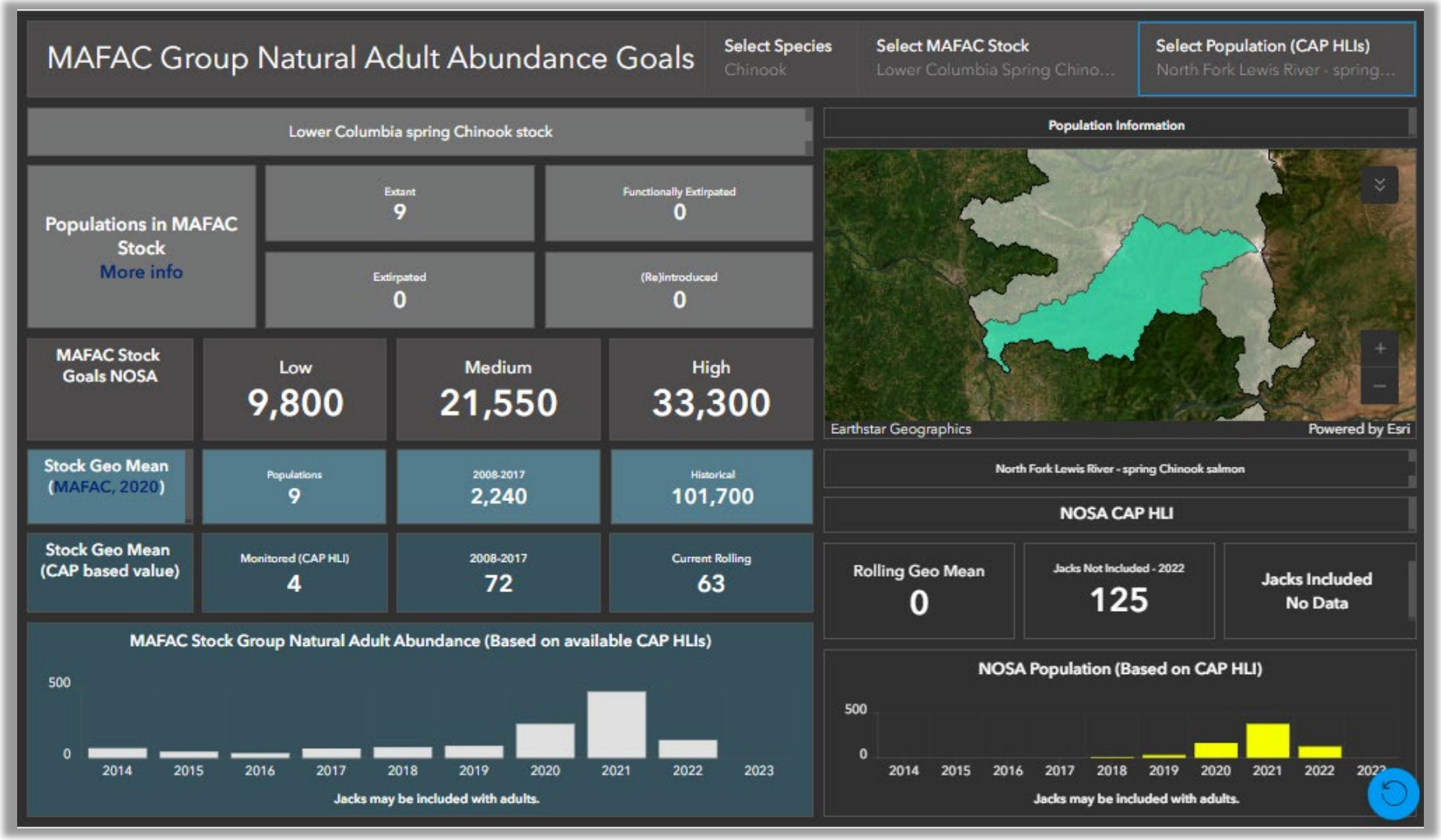
- MAFAC developed estimate of current (~2017) abundance of natural and hatchery origin salmon and steelhead at stock scale
- Established low-med-high goals for natural origin abundance at stock scale
- Summarized hatchery production targets for salmon and steelhead at stock scale
- Natural origin abundance and hatchery production can be summarized at subregion scale (eventually)

Goal 1: Anadromous salmon and steelhead

Objective S1: contribute to achieving the targets for salmon and steelhead adult abundance by **stock** and subregion developed by...CBPTF

StreamNet's MAFAC Dashboard

- **Natural origin**
- CBC: rebuild MAFAC stocks to healthy and harvestable levels, addressing all sources of loss
- NPCC: goal focuses on mitigating for the hydrosystem
  - Mitigation efforts contribute to achieving targets for stocks throughout basin



Goal 1: Anadromous salmon and steelhead

Objective S1: contribute to achieving the targets for salmon and steelhead adult abundance by **stock** and subregion developed by...CBPTF

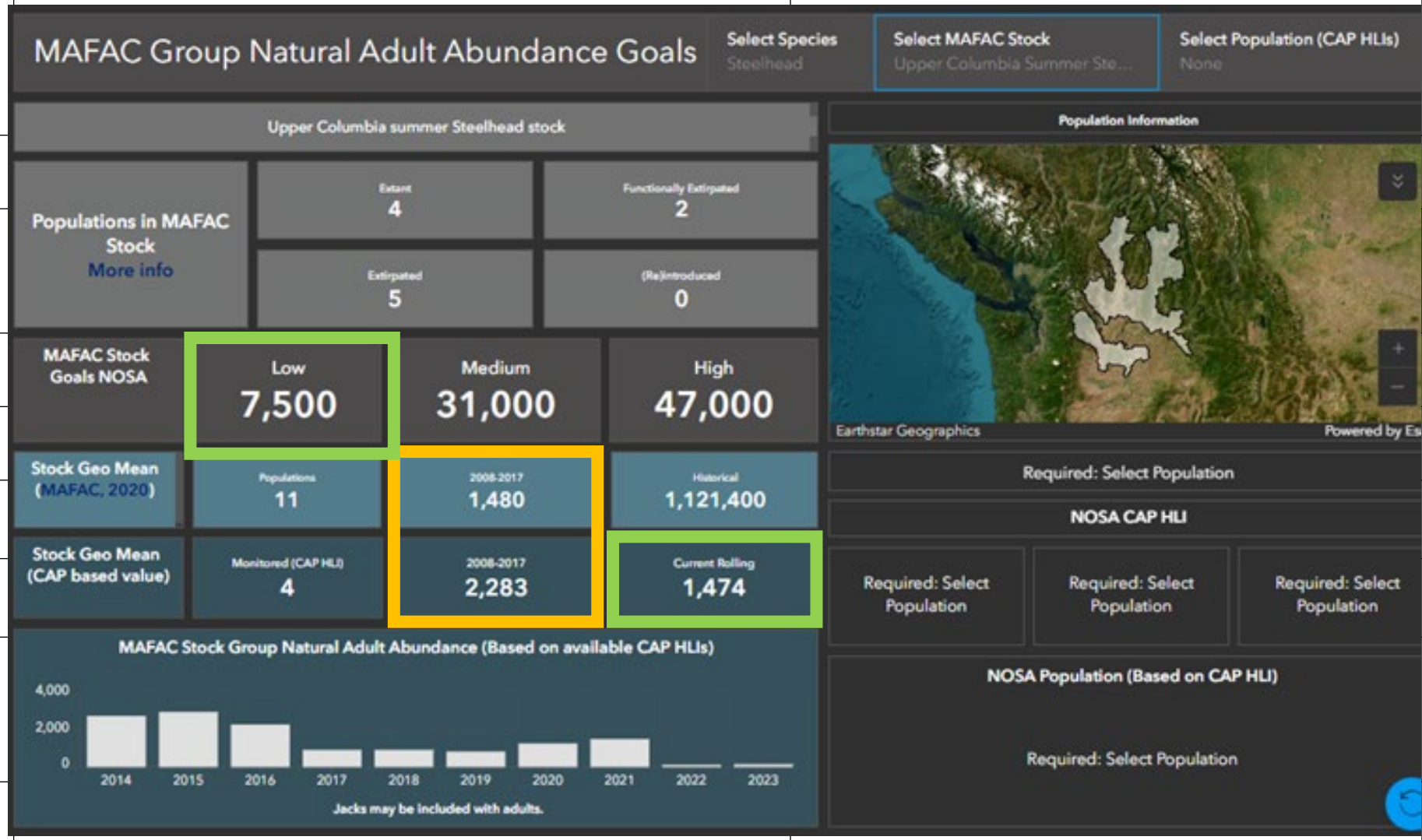
- Looked at percentage of populations within each MAFAC stock with recent population estimates in 6 of last 10 years

> 80% of populations	→ **33% of stocks**
60-79% of populations	→ **19% of stocks**
< 60% of populations	→ **48% of stocks**

- Some population estimates or other abundance data not yet available in StreamNet
  - Could be remedied through additional support of data stewards
- Additional monitoring data also needed to track every MAFAC stock

MAFAC Stock	Historical # pops	Current # pops	Percent of current pops with 6 + years of pop estimates in last decade
LCR / SW WA Winter Steelhead	7	7	85.7
LCR Chum	18	16	25.0
LCR Coho	25	25	96.0
LCR Fall Chinook (bright)	1	1	0.0
LCR Fall Chinook (late bright)	2	2	100.0
LCR Fall Chinook (tules)	21	21	81.0
LCR Spring Chinook	9	8	62.5
LCR Summer Steelhead	6	6	83.3
LCR Winter Steelhead	17	17	70.6
Mid-C Coho	5	3	0.0
Mid-C Sockeye	2	2	0.0
Mid-C Spring Chinook	15	15	20.0
Mid-C Summer Steelhead	20	18	94.4
Mid-C Summer/Fall Chinook	1	1	0.0
SR Coho	5	2	0.0
SR Fall Chinook	2	1	0.0
SR Sockeye	9	1	100.0
SR Spring/Summer Chinook	68	38	81.6
SR Summer Steelhead	40	24	66.7
UCR Coho	5	2	0.0
UCR Fall Chinook	5	4	0.0
UCR Sockeye	5	2	0.0
UCR Spring Chinook	10	4	75.0
UCR Summer Chinook	14	7	42.9
UCR Summer Steelhead	11	5	80.0
Willamette Spring Chinook	7	7	71.4
Willamette Winter Steelhead	4	4	0.0

> 80% of populations	Comparing abundance estimates in SN and in MAFAC report, 2008 – 2017 **If < 100%, SN data may underestimate abundance**	Comparing contemporary SN data to MAFAC Low Goal **If > 100%, Low Goal exceeded**
MAFAC Stock		
LCR / SW WA Winter Steelhead		
LCR Coho		
LCR Fall Chinook (late bright)		
LCR Fall Chinook (tules)		
LCR Summer Steelhead		
Mid-C Summer Steelhead		
SR Sockeye		
SR Spring/Summer Chinook		
UCR Summer Steelhead		



> 80% of populations MAFAC Stock	Comparing abundance estimates in SN and in MAFAC report, 2008 – 2017 **If < 100%, SN data may underestimate abundance**	Comparing contemporary SN data to MAFAC Low Goal **If > 100%, Low Goal exceeded**
LCR / SW WA Winter Steelhead	20.5%	3.6%
LCR Coho	24.8%	13.1%
LCR Fall Chinook (late bright)	130.6%	169.8% also exceeds medium goal
LCR Fall Chinook (tules)	135.8%	74.1%
LCR Summer Steelhead	87%	46.1%
Mid-C Summer Steelhead	108%	61.6%
SR Sockeye	14%	0%
SR Spring/Summer Chinook	127.8%	15.9%
UCR Summer Steelhead	154.3%	19.7%

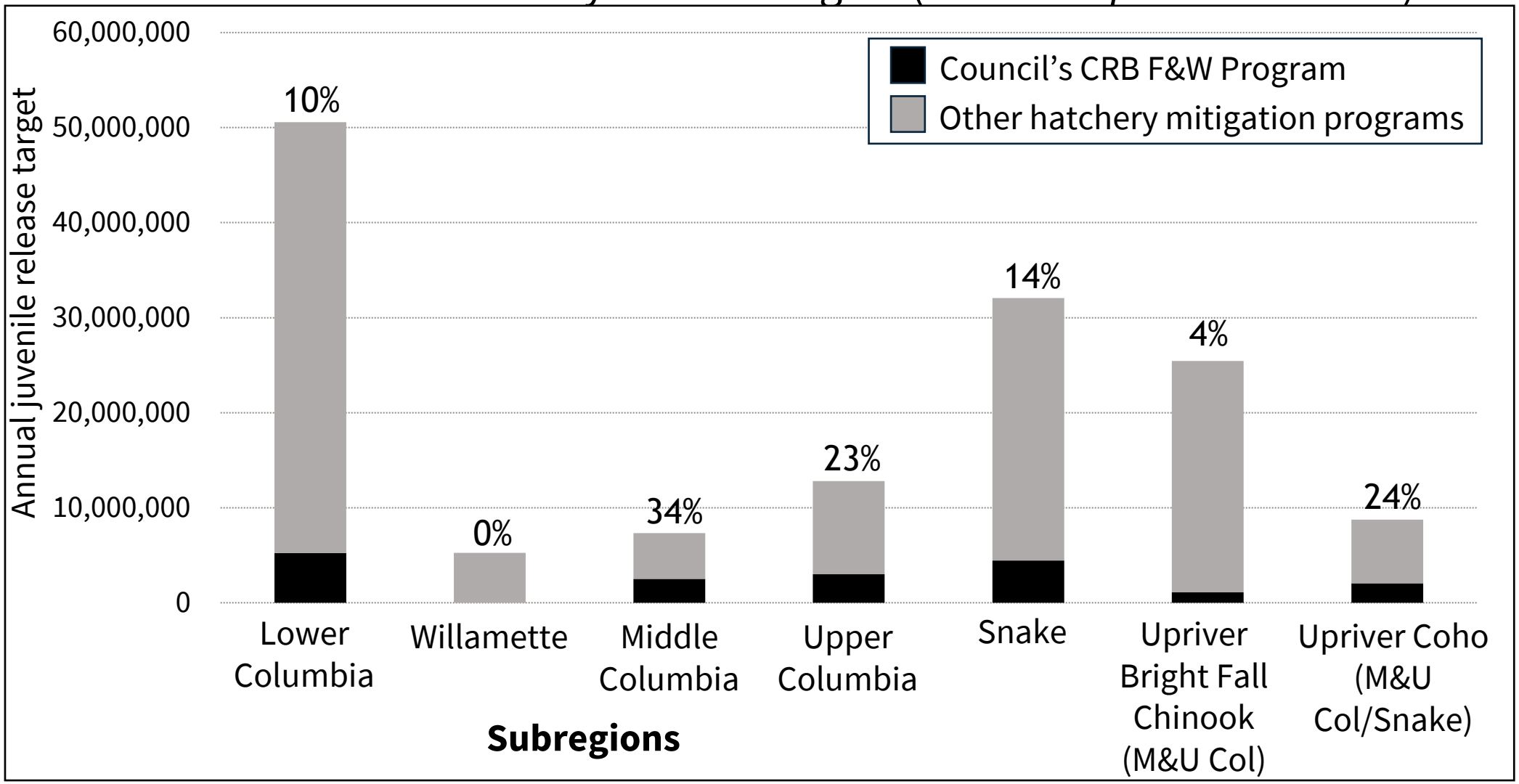
Goal 1: Objective S1: contribute to achieving the targets for salmon and steelhead adult abundance by stock and subregion developed by…CBPTF

Progress toward regionally agreed-upon targets for salmon and steelhead hatchery production.

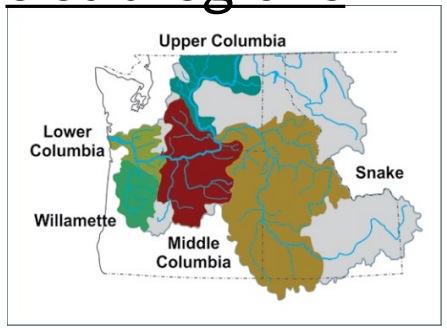
Information compilation steps		Sources
Hatchery program information (NW Power Act associated production only)	✓	Program Tracker hatchery tool (compiled with F&W managers)
Identify how hatchery program fits within context of Columbia Basin Partnership (MAFAC) stocks	✓	Reference Tables 5 and 11 – CBP phase 1 report Table A-5 – CBP phase 2 report
Identify hatchery release targets: individual program-specific & total stock-specific	✓	*US v. Oregon* Management Agreement; F&W managers Table A-5 – CBP phase 2 report
Estimate BPA-funded portion for jointly-funded hatchery programs	✓	F&W managers
Summarize compiled information showing contribution of the F&WP hatchery production to total releases by stock	✓	Above steps
Review preliminary/draft compiled information with F&W managers to finalize	TBD	

Goal 1: Objective S1: contribute to achieving the targets for salmon and steelhead adult abundance by stock and **subregion** developed by...CBPTF

Contribution of the Council's Columbia River Basin Fish & Wildlife Program to annual juvenile hatchery release targets (*Draft compilation of data*)



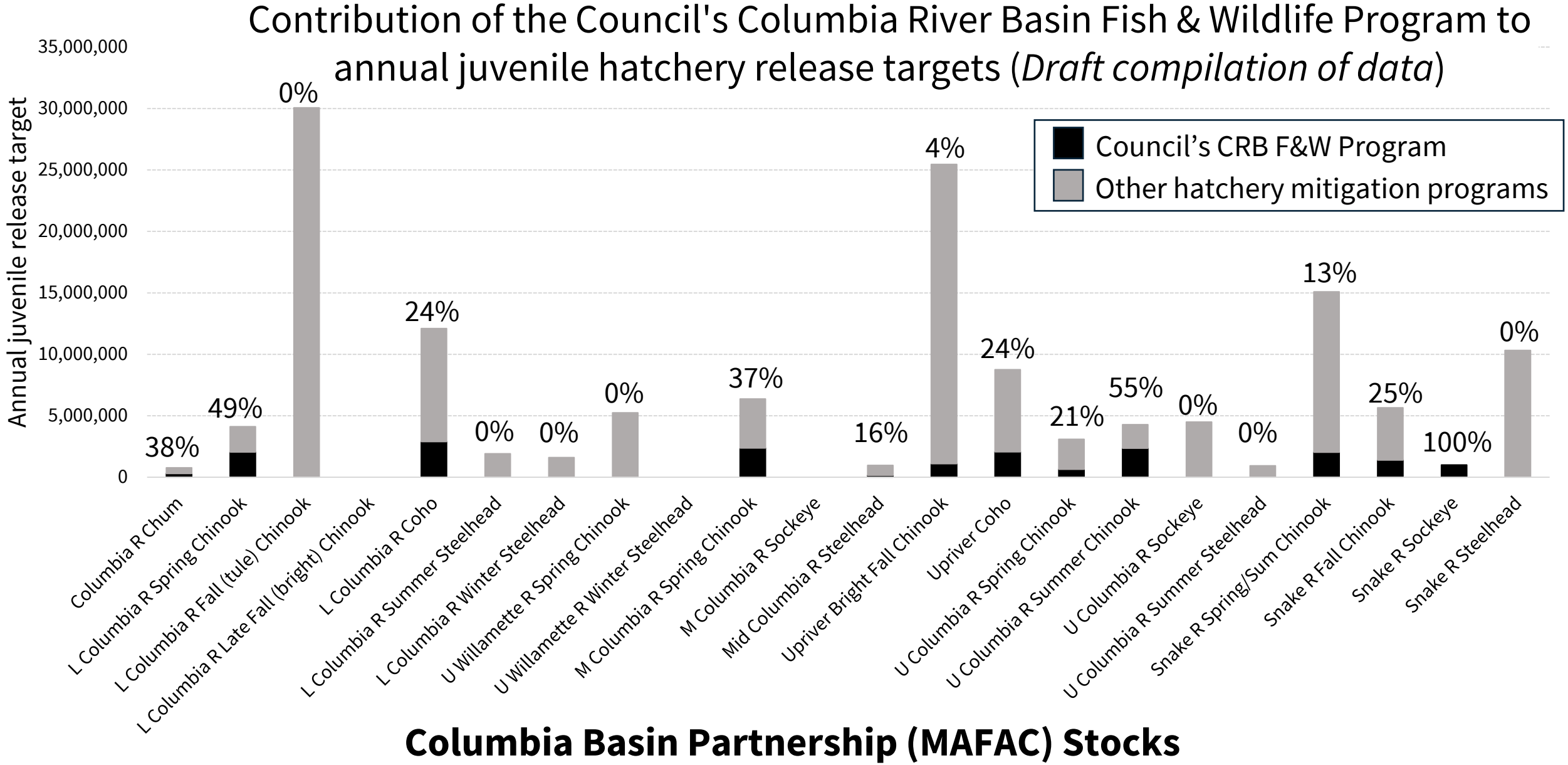
5 subregions



Source: CBP phase 1, Figure 6.

- Council's program represents ~13% of total juvenile release targets CRB-wide.

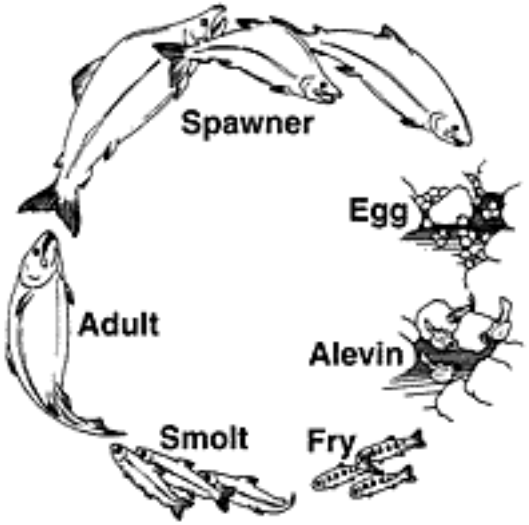
Goal 1: Objective S1: contribute to achieving the targets for salmon and steelhead adult abundance by **stock** and subregion developed by…CBPTF



Goal 1: Anadromous salmon and steelhead

Objective S2: contribute to achieving a smolt-to-adult return ratio (SAR) in the **2 - 6 %** range for listed Snake River and upper Columbia salmon and steelhead, as well as for non-listed populations

- SAR = number of smolts leaving the basin / number of adults returning
- Many factors involved in calculating and interpreting SAR:
  - Starting location and ending location for different species/ runs
  - Whether jacks included in calculation
  - Migration distance
  - Life histories/ natural vs hatchery origin
  - Variation in mortality while navigating hydrosystem
  - Susceptibility to predation
  - Migration patterns in ocean, etc.
- ISAB finalizing report on use and calculation of SAR/ SAS



Goal 1: Anadromous salmon and steelhead:

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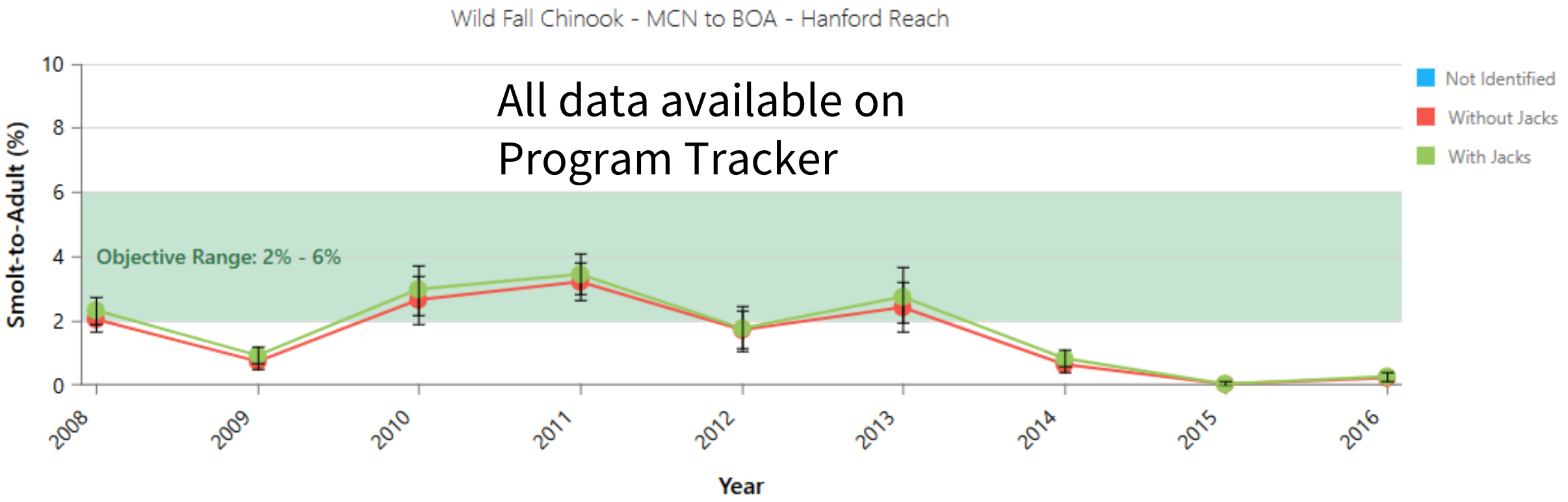


Objective: range = 2 – 6%, average = 4%

Stock	# brood years with SAR data	Avg SAR (# years > 2%)
SR Spring/ Summer Chinook	11	0.84 (1)
SR Steelhead- A	10	1.62 (3)
SR Steelhead- B	10	1.44 (2)
SR Fall Chinook	4	0.77 (0)
SR Sockeye- Sawtooth	7	0.35 (0)
SR Sockeye- Oxbow	3	1.57 (2)
SR Sockeye- Springfield	4	0.0025 (0)
UCR Spring Chinook	11	0.64 (0)
UCR Summer Chinook	7	0.39 (0)
UCR Steelhead	10	1.724 (3)
UCR Sockeye	5	1.64 (1)

Natural origin

Hatchery origin

- Different starting and ending points for SAR among stocks
- No jacks
- Data summarized for ~ 2007 – 2018 brood years
- Focusing on ESA-listed stocks

Goal 1: Anadromous salmon and steelhead

Objective S3: continue to improve juvenile passage survival through the hydrosystem

- 1986 Council report stated passage mortality over 9 dams was estimated at:
  - **15 to 30% per dam** for downstream juvenile migrants.
  - **77-96% cumulative mortality** for downstream juvenile migrants.
- Current estimates in the range:
  - **1-33% per reach** for downstream juvenile migrants.
  - **48-50% cumulative mortality** from the Snake River to Bonneville Dam.

Table E1. Average survival estimates by reach for combined hatchery and wild yearling Chinook salmon and steelhead during 2022. Standard errors in parentheses.

	Yearling Chinook salmon	Steelhead
Snake River Smolt Trap to Lower Granite Dam	0.963 (0.072)	0.940 (0.023)
Lower Granite to Little Goose Dam	0.823 (0.035)	0.881 (0.027)
Little Goose to Lower Monumental Dam	1.014 (0.059)	0.992 (0.043)
Lower Monumental to McNary Dam[a]	0.869 (0.138)	0.681 (0.043)
Lower Monumental to Ice Harbor Dam	0.921 (0.104)	1.036 (0.078)
Ice Harbor to McNary Dam	0.929 (0.172)	0.672 (0.052)
McNary to John Day Dam	0.806 (0.087)	1.265 (0.198)
John Day to Bonneville Dam[b]	0.892 (0.077)	0.737 (0.091)
Snake River Smolt Trap to Bonneville Dam[c]	0.508 (0.044)	0.520 (0.038)

[a] Two-project reach, including Ice Harbor Dam and reservoir.
[b] Two-project reach, including The Dalles Dam and reservoir.
[c] Entire hydropower system, including eight dams and reservoirs.

Survival Estimates for the Passage of Springmigrating Juvenile Salmonids Through Snake and Columbia River Dams and Reservoirs, 2023, NOAA Fisheries

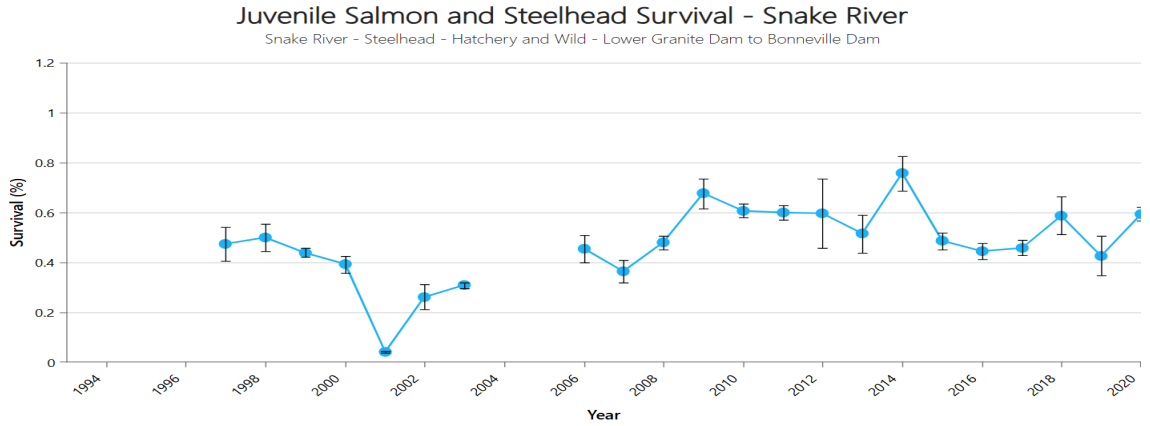
Goal 1: Anadromous salmon and steelhead

Objective S3: continue to improve juvenile passage survival through the hydrosystem

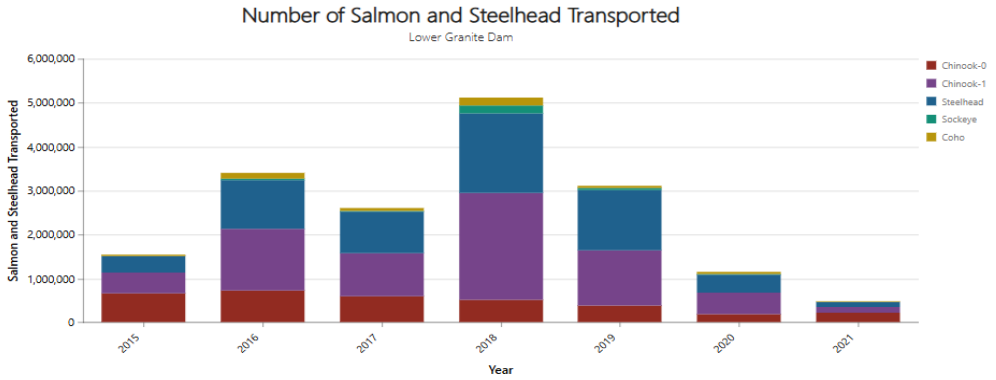
- Survival and travel times reported annually via regional partners including the FPC, NOAA, USGS, and others.
- Infrastructure upgrades such as juvenile bypass structures, screens, attractant flows, and other methods used throughout Basin.
- Transportation used in some cases.

SPIs on Program Tracker:

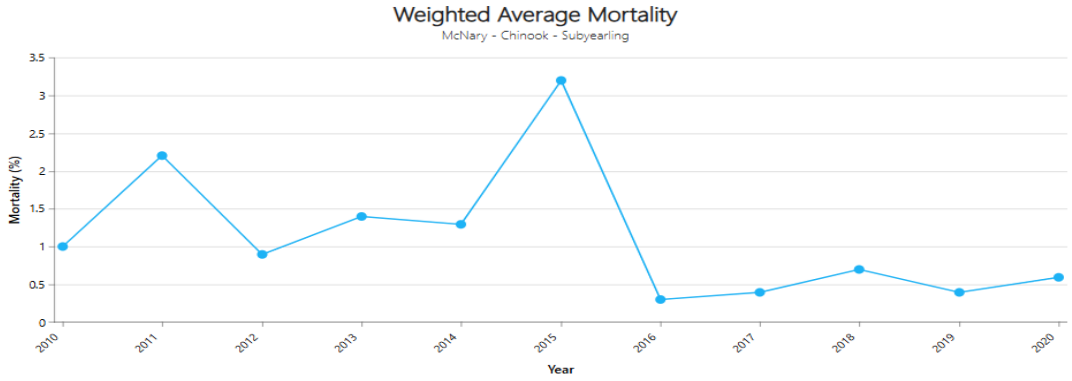
→ Juvenile salmon and steelhead reach survival by year, S3-2



→ Number of salmon and steelhead transported in the Snake River, S3-3

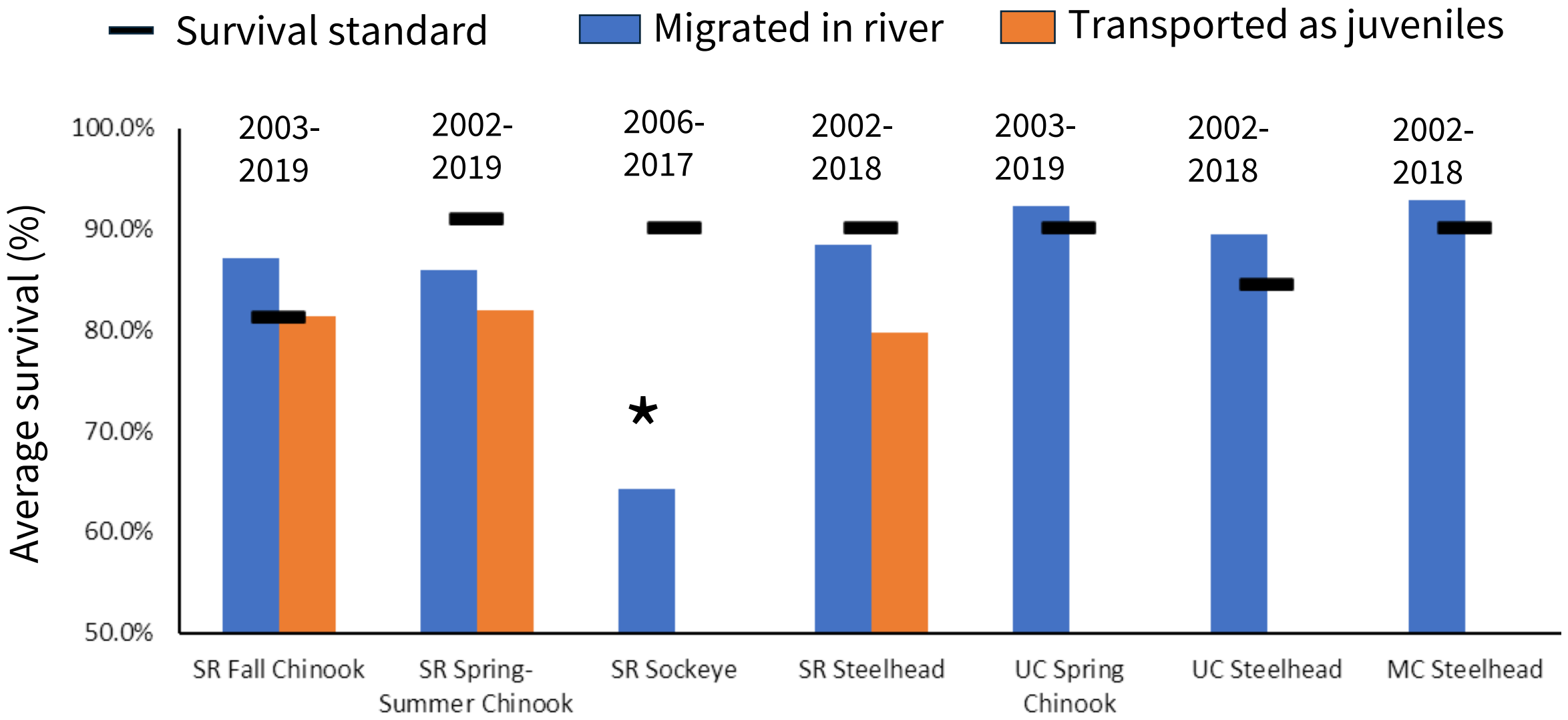


→ Average mortality (%) of juvenile salmon and steelhead at Columbia and Snake River dams, S3-4



Goal 1: Anadromous salmon and steelhead

Objective S4: Achieve annual adult salmon and steelhead survival standards for the BON to LGR reach and the BON to MCN reach (listed in Program)



Goal 1: Anadromous salmon and steelhead

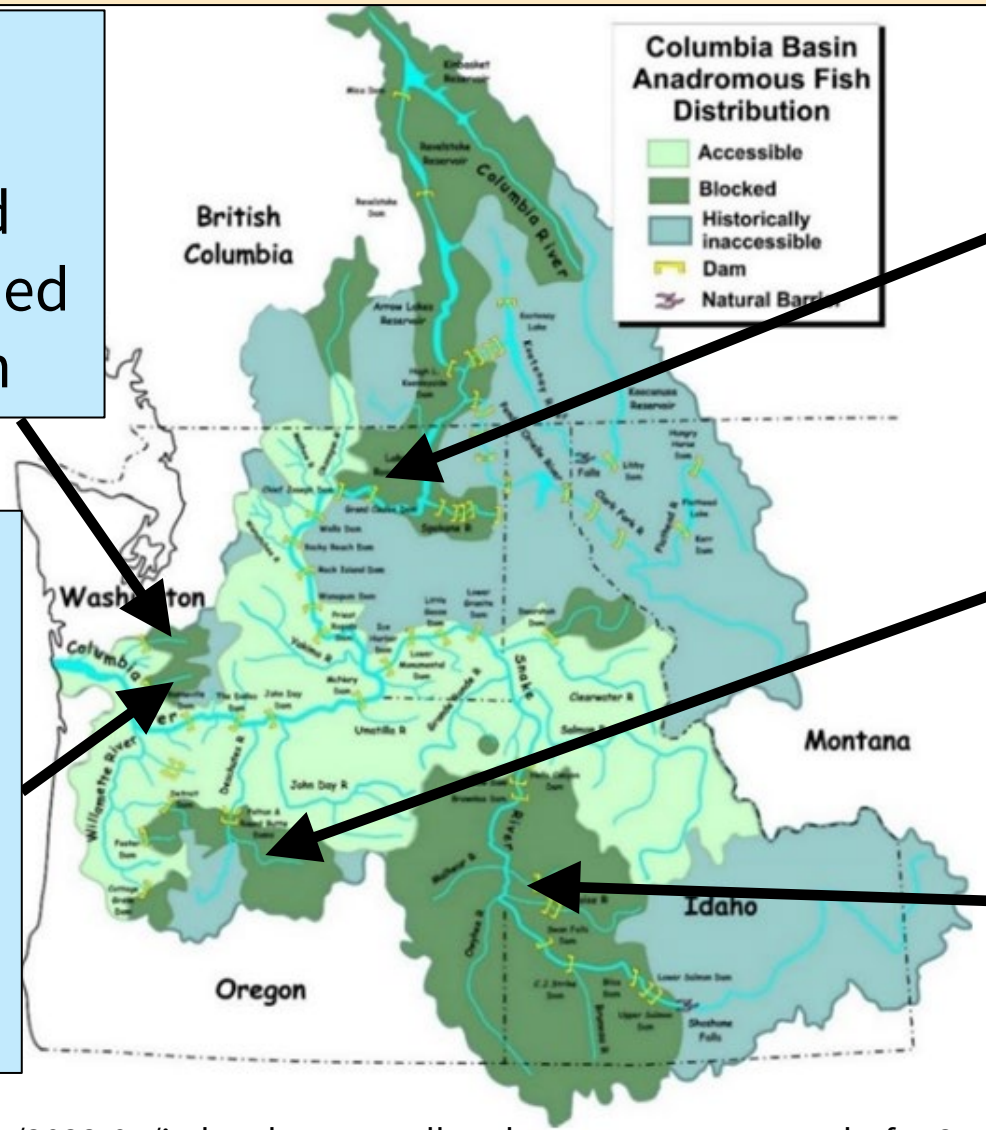
Objective S5: …contribute to assessing and, where appropriate, expanding anadromous fish distribution into historical habitat above blocked areas

Cowlitz River

- FERC license requires trap and haul and continued passage research

Lewis River

- Ongoing discussions between utilities, managers, FERC on constructing fish passage at Yale and Merwin Dams



Upper Columbia River

- UCUT- Phase II Implementation Plan

Deschutes River

- Passage at Pelton/ round butte; reintroduction

Upper Snake River

- USRTF- Draft loss assessment

Map from: https://media.fisheries.noaa.gov/2022-07/icrb-salmon-steelhead-recovery-summary-draft-v2.5.pdf?mc_cid=f2efda109a&mc_eid=8218407c8f

Goal 1: Anadromous salmon and steelhead

Objective S6: Bonneville-funded hatcheries must meet hatchery mitigation goals as described in the management plans or HGMPs

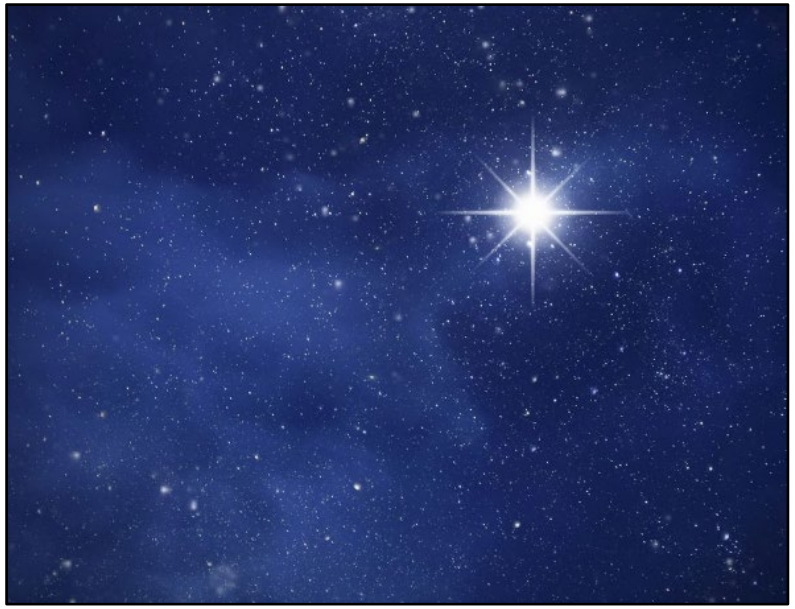
Two strategy performance indicators:

- All program-funded hatcheries have a final management plan and a reviewed and approved master plan, with specific objectives to track performance.
  - ➢ Status: Available - documentation in Program Tracker hatchery tool
- Salmon and steelhead indicators for Bonneville-funded hatcheries tracked and compared to management goals as described in hatchery management plans and HGMPs.
  - ➢ Status: Developing
    - Annual juvenile hatchery release data relative to established target – Program Tracker hatchery tool
    - Additional SPIs need to be developed and then tracked

Goal 1: Anadromous salmon and steelhead

Objective S7: maintain genetic diversity over time

- Genetic diversity was researched in the 1980s and maintaining genetic diversity first appeared as a measure in 1991.
- No basin-scale or stock-scale data to establish baseline diversity or contemporary diversity.
- Objective remains a good north star and statement of priority.
- To track further would require development of new monitoring and a determination of diversity levels to be maintained.



Questions on Salmon and Steelhead Goal/ Objectives?

Goal- 5 million

- S1- MAFAC abundance
- S2 - SAR 2-6%
- S3 - Juvenile passage
- S4 – Adult survival
- S5 – Blocked areas
- S6- Hatchery goals
- S7- Genetic diversity

Program goals

Salmon and steelhead

Other native aquatic species

Wildlife

Ecology/ habitat

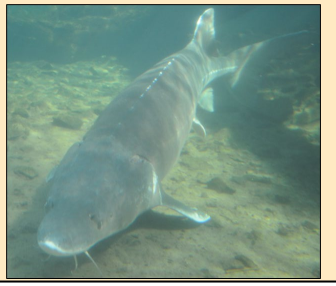
Communication, assessment, and coordination

Goal 2: Other native aquatic focal species

Protect, mitigate, and enhance these other native focal aquatic species adversely affected by the development and operation of the Columbia River hydrosystem, including related spawning grounds and habitat

- "**These other**" focal species? Does this refer to species with associated objectives or is this a more extensive list?
- Most objectives under this goal are described as "**contributing to**" other regional targets
  - Hydrosystem portion of losses has not been assessed with exception of resident fish at Libby and Hungry Horse Dams
- Diverse group of fish under this Goal
  - Migratory and resident; some broadly distributed, unique conditions affecting fish throughout range, different management targets geographically, different size categories monitored against different criteria

Goal 2: Other native aquatic focal species



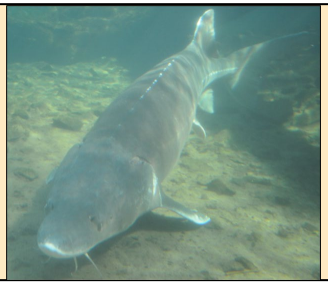
White Sturgeon Objective WS1: Contribute to abundance

- White Sturgeon
  - Long-lived (can live to 100 years old) anadromous species distributed throughout Basin
  - Spawning age ~10-15 years (males) or 15 – 25+ years (females); females might spawn every five years
  - Spawning success heavily dependent on flow, temperature, and habitat conditions
- Sturgeon severely impacted by construction and operation of hydrosystem
  - Migration almost entirely blocked- no passage constructed
  - Populations and habitat fragmented
  - Habitat degraded, lack of suitable flows

Figure from ODFW White Sturgeon Conservation Plan 2011

Goal 2: Other native aquatic focal species

White Sturgeon Objective WS1: Contribute to abundance

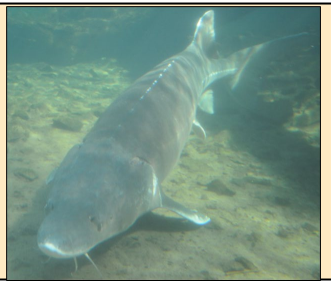


Techniques employed to support populations and rebuilding

- Active management of harvest
  - Slot limit allows for harvest within the size range specified
  - Can protect reproductive-aged fish and maintain pool of fish that can grow and recruit into harvest range
  - Can reduce abundance of over-represented age classes (e.g., Lake Roosevelt)
- Flow management at Libby
- Habitat restoration
- Improved research on life history, habitat needs, demographics
- New models to support future management
- Hatchery production to support lack of productivity
- Collaborations between Tribal, state, federal, and private entities on management and monitoring

Goal 2: Other native aquatic focal species

White Sturgeon Objective WS1: Contribute to abundance



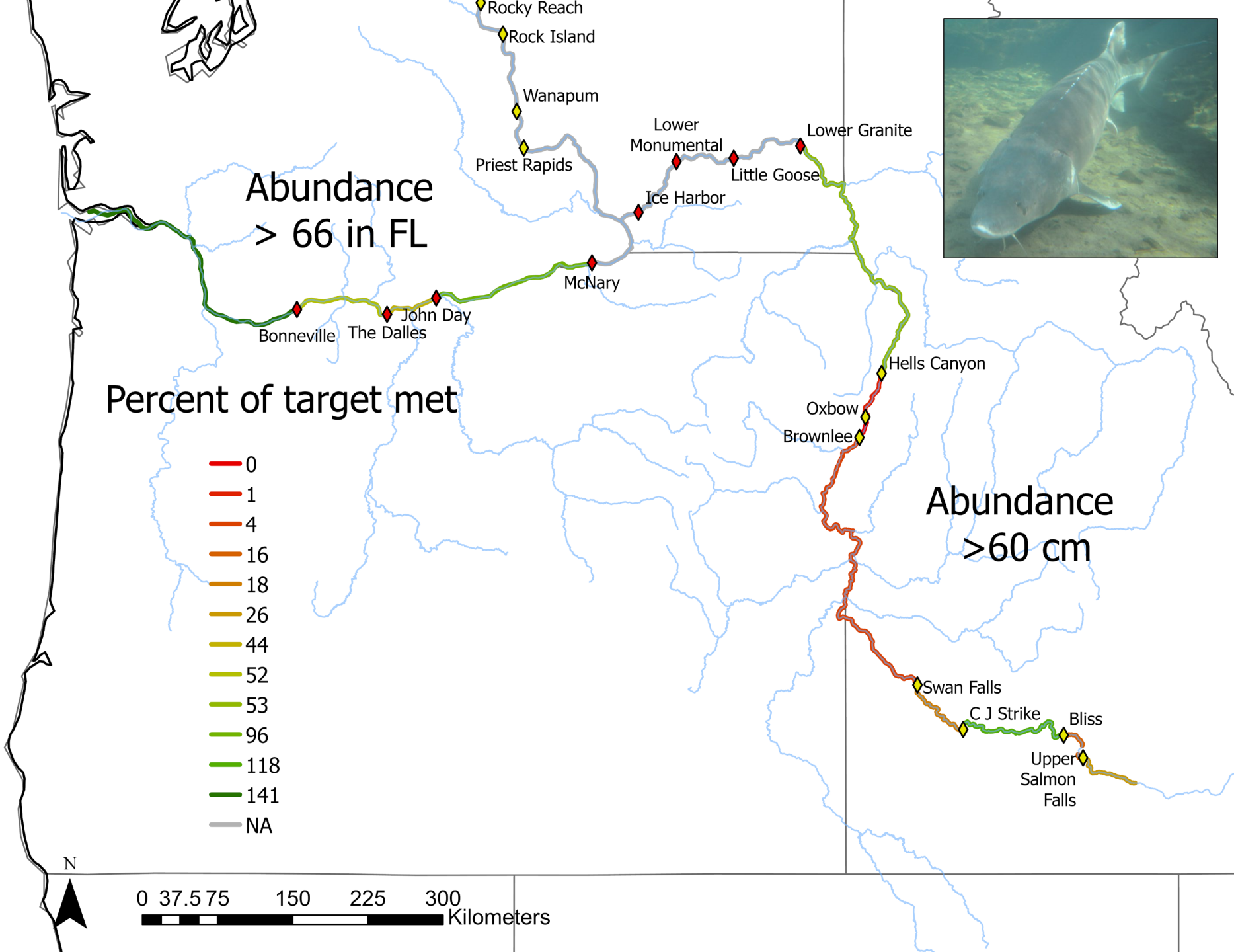
Sturgeon objectives derived from management plans throughout region. Since 2020 addendum, revised objectives exist. **Consider revising addendum objectives to match?**

- Lower Columbia- adult and subadult objectives
- Lower Snake- targets listed as "when available based on population viability analysis"
- Middle Snake- adult target
- Upper Snake- addendum does not describe life stages contributing to "abundance" Notes from workshops call for > 60 cm; updated management plan describes adult targets.
- Transboundary Upper Columbia- U.S. reach = adults; Canadian reach = adults; harvest objective
- Kootenai River – adult objective will be developed; currently tracking against recovery goal

Goal 2: Other native aquatic focal species

White Sturgeon Objective WS1: Contribute to abundance

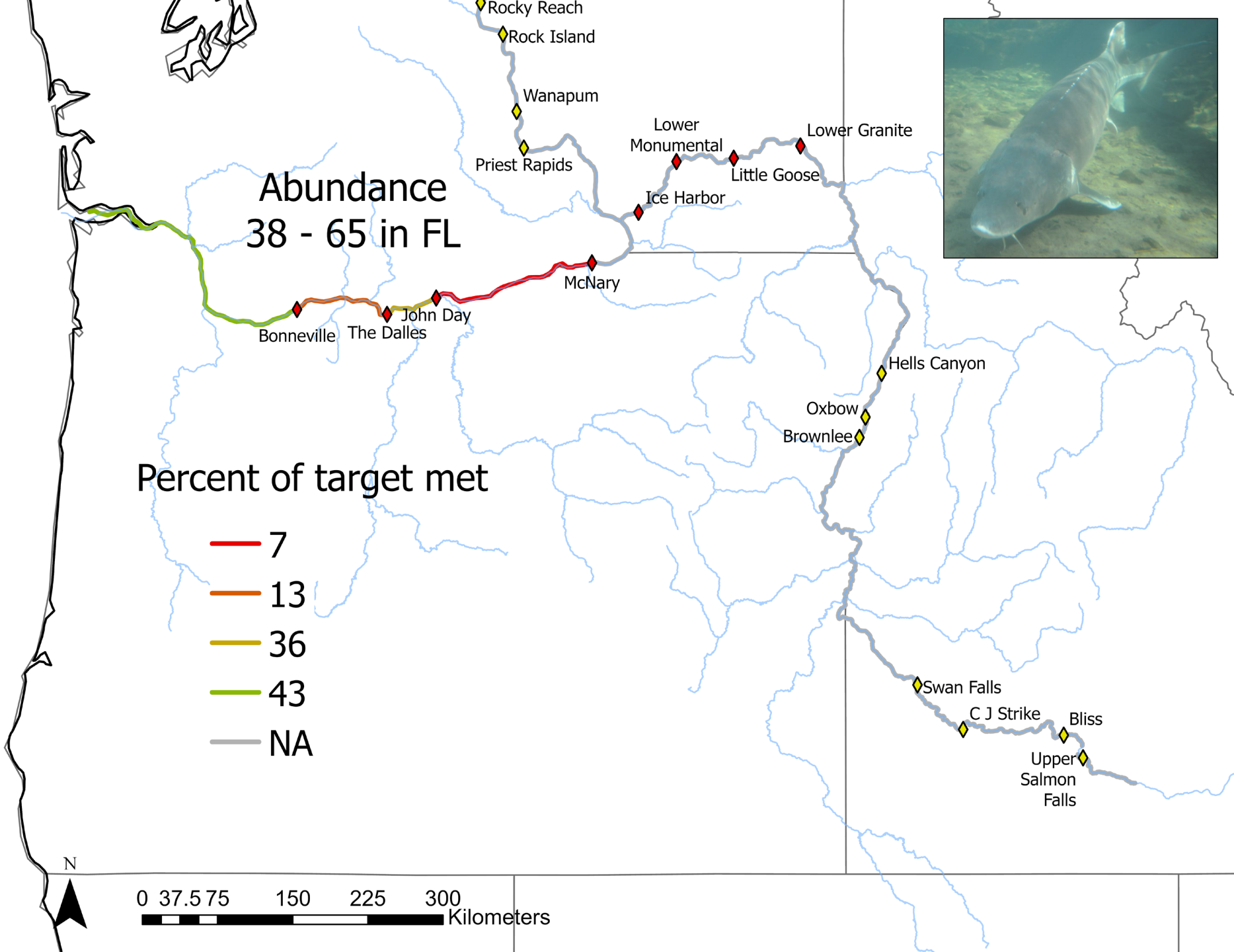
- Lower Columbia = sturgeon > 66 in FL
- Lower Snake = **NA**
- Middle Snake = adult
- Upper Snake **target doesn't define size class;** notes from workshop = sturgeon > 60 cm



Goal 2: Other native aquatic focal species

White Sturgeon Objective WS1: Contribute to abundance

- Lower Columbia = sturgeon 38 -65 in FL

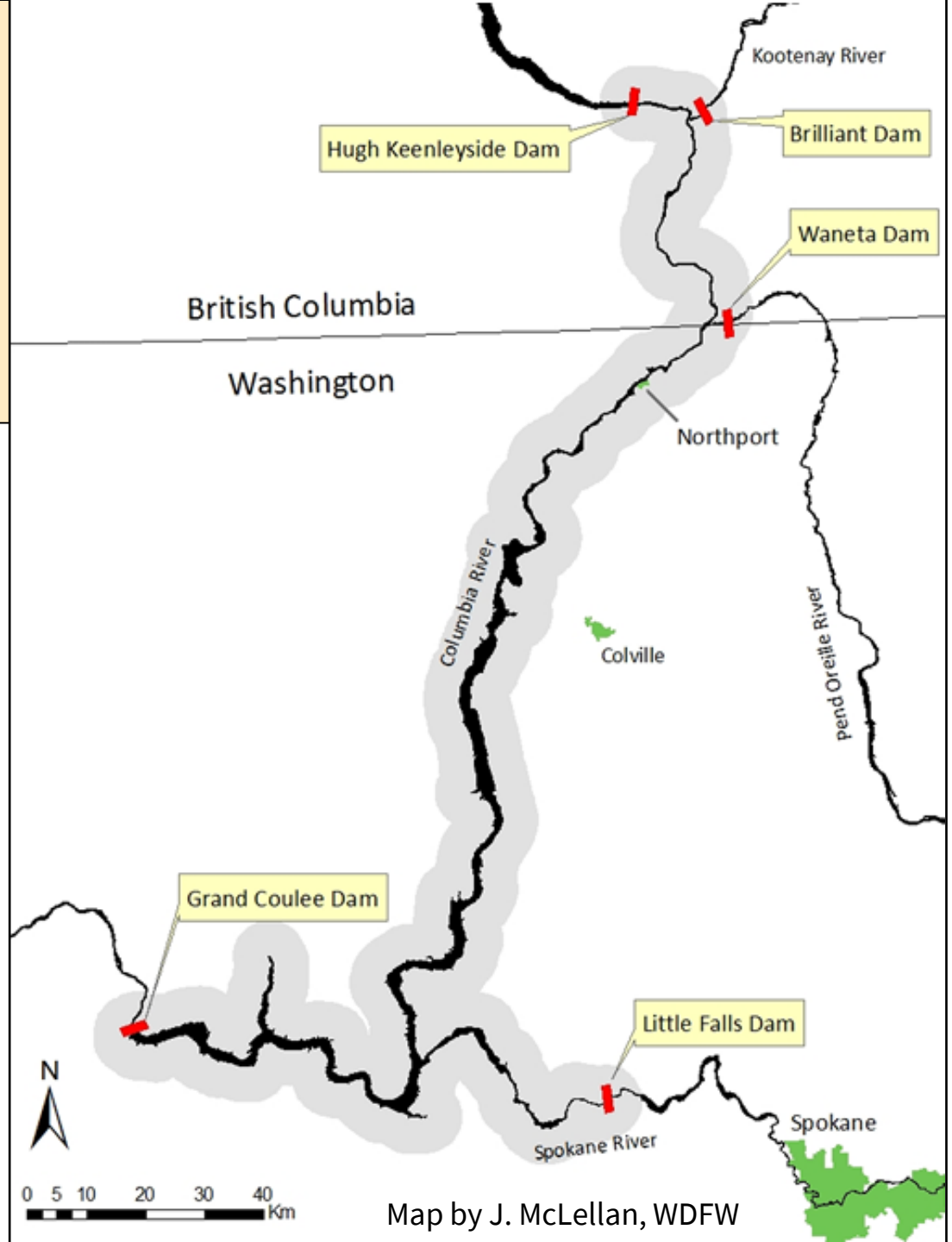


Goal 2: Other native aquatic focal species

White Sturgeon Objective WS1: Contribute to abundance

- Transboundary- U.S.
  - 5,000 adults
- Transboundary- Canada
  - 2,000 adults
- Subsistence and recreational harvest
  - 2,000 fish/yr

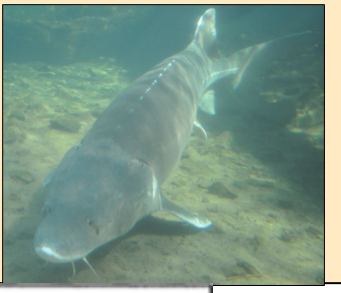
Note: white sturgeon recovery plan target date is **2080**



- Looking for current data on abundance and harvest- will add to Program Tracker
- Recreational and subsistence fishery since 2017
  - Slot limit to decrease over abundant size classes produced from previous hatchery releases
- Contemporary hatchery production uses wild caught larvae; more diversity

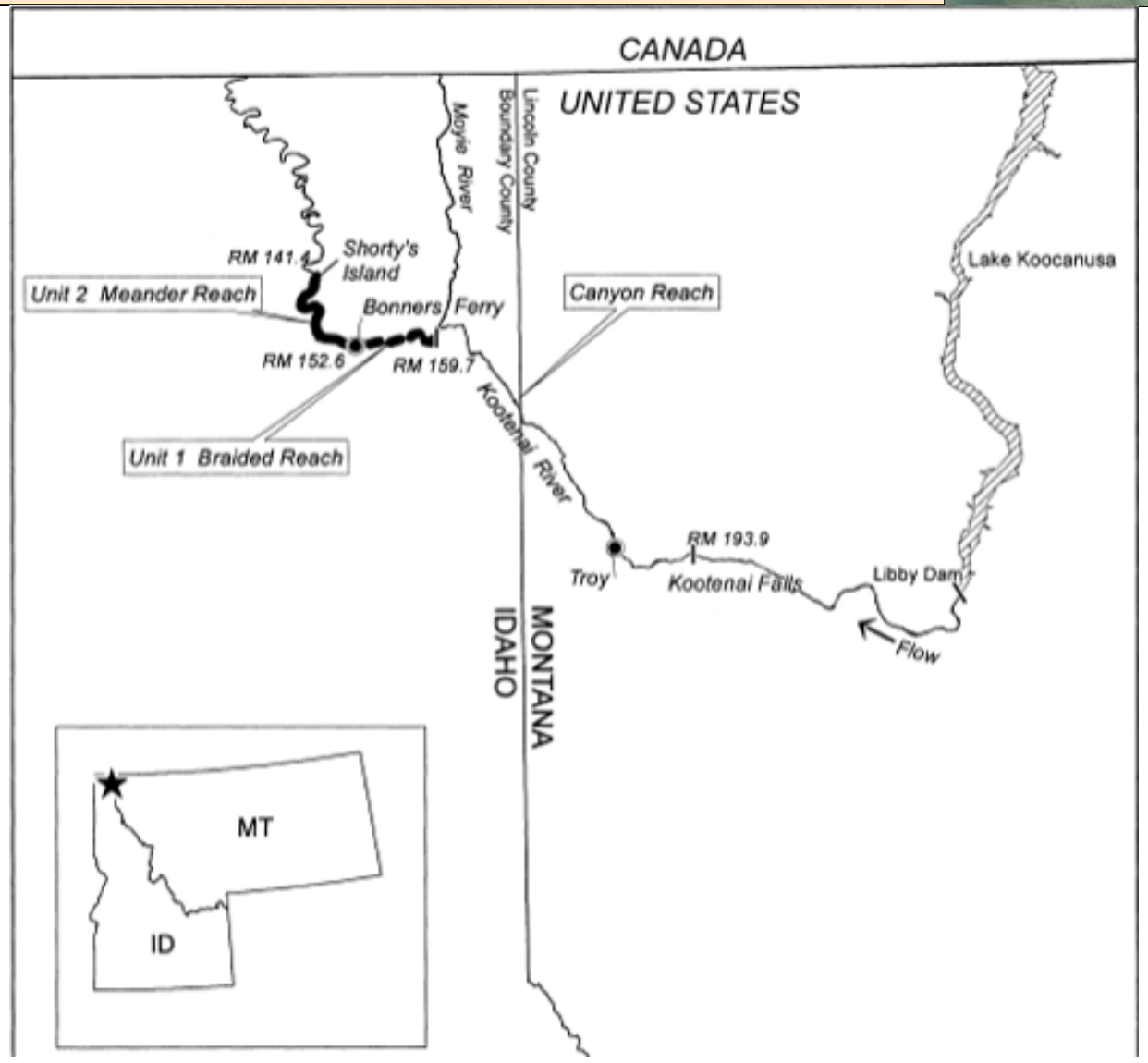
Goal 2: Other native aquatic focal species

White Sturgeon Objective WS1: Contribute to abundance
WS4: Contribute to productivity



Kootenai River

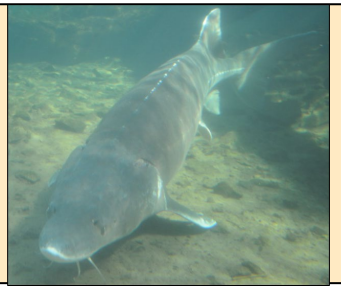
- Program objective = stable, self-sustaining, healthy population; **Targets TBD**
- USFWS recovery goal:
  - Avg of 250 adults added to population annually
  - >10,000 wild juveniles (age 3 – 24)
  - Natural production ≥ 700 age-3 fish in 30% of years



Goal 2: Other native aquatic focal species

White Sturgeon Objective WS1: Contribute to abundance

WS4: Contribute to productivity



Kootenai River

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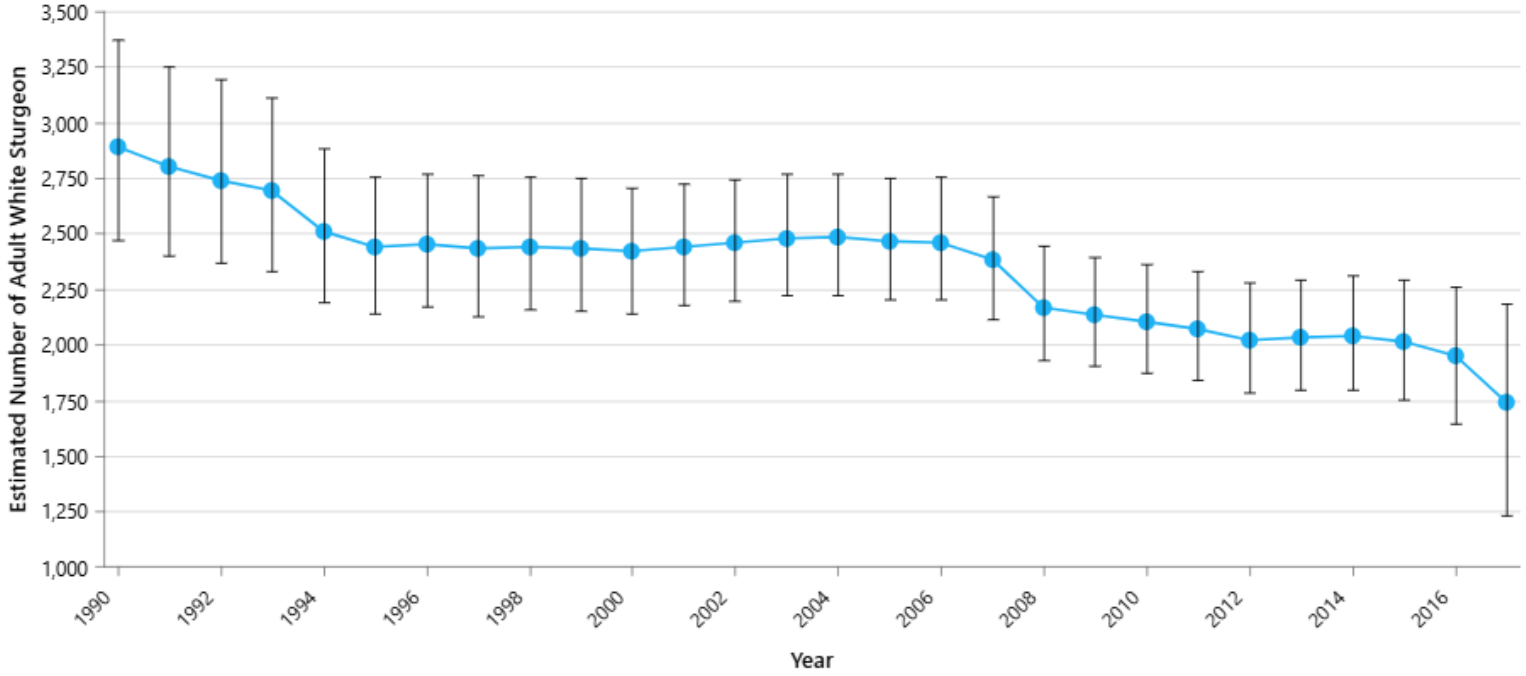
Kootenai River- adult abundance

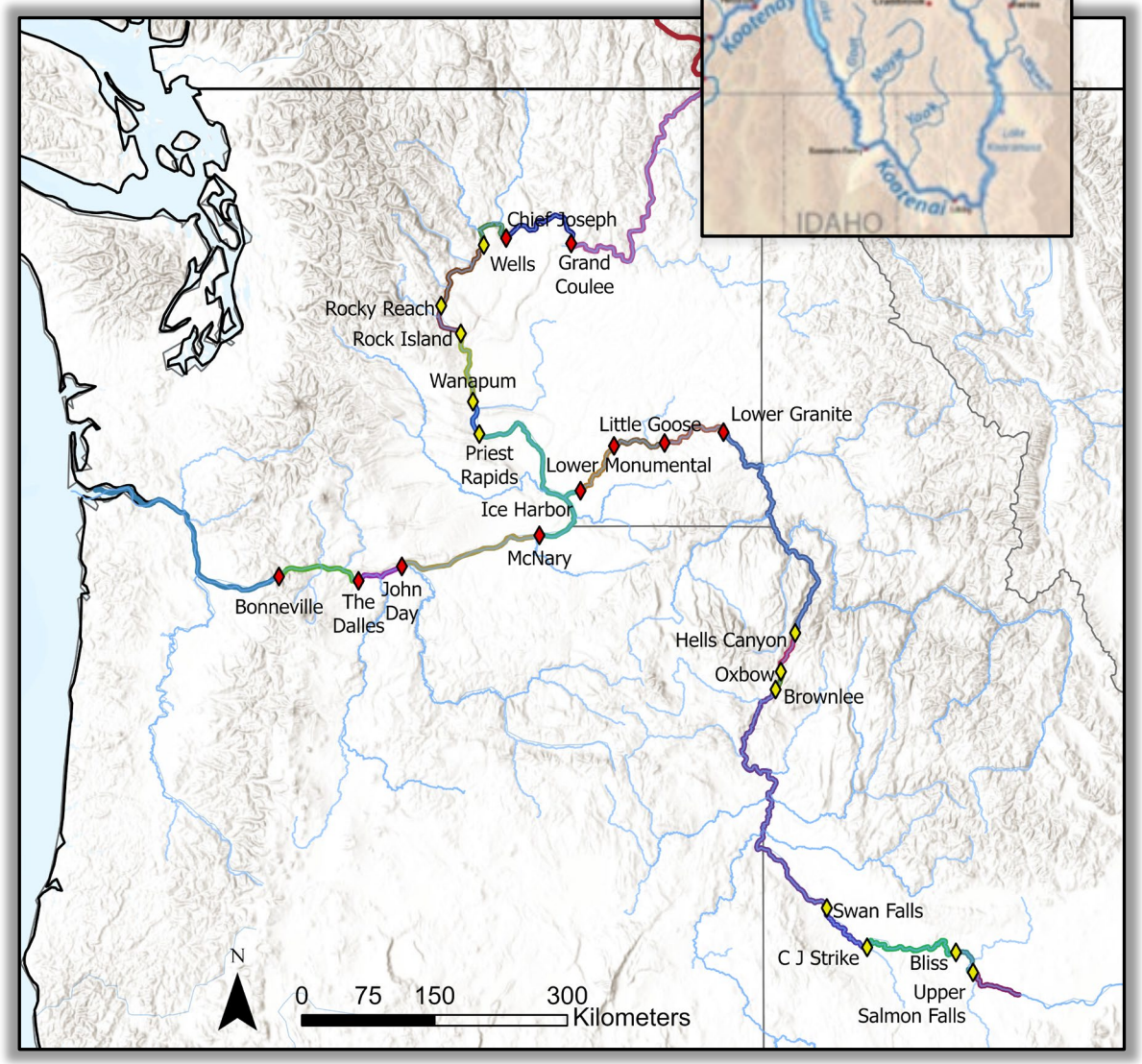


Hardy *et al.* 2020 report (1) an estimated 85 wild juveniles produced annually and (2) recruitment rate does not replace aging out population or promote natural recovery

Goal 2: Other native aquatic focal species

White Sturgeon Objective WS2: Contribute to spatial distribution- stable, healthy populations within all available historical habitats

- Objective WS2 builds off WS1 (abundance) and WS4 (productivity)
  - Objectives exist for many of the populations within the historically available habitat
  - **Objectives still needed for Priest Rapids to Grand Coulee, and the lower Snake River**
- Objective also references Coastal rivers, bays and estuaries in Oregon and Washington
  - Aside from Columbia estuary- these other estuaries are outside basin
  - Is there a need to define relationship to hydrosystem impacts?



Goal 2: White Sturgeon Objective WS3: Contribute to genetic diversity

Columbia River populations

- Genetic baseline = 14 microsat loci, ≥ 235 alleles

Snake River Lower Granite to Brownlee

- Genetic baseline = 13 microsat loci, 184 alleles

Snake River Brownlee to Shoshone Falls and Hells Canyon

- Genetic baseline = 13 microsat, 184 and 121 alleles

Kootenai River

- Genetic baseline = 14 microsat loci, 97 alleles

- Contemporary genetic monitoring uses different techniques than those used to establish the baseline for genetic diversity in the Program.
- These objectives and baseline for genetic diversity need to be updated to reflect how it is currently assessed.

Open Access Article

Population Structure of White Sturgeon (*Acipenser transmontanus*) in the Columbia River Inferred from Single-Nucleotide Polymorphisms

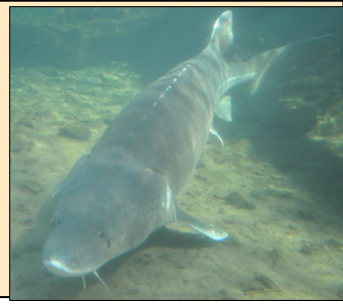
by Stuart C. Willis [1,*], Blaine Parker [2], Andrea D. Schreier [3], Ray Beamesderfer [4], Donella Miller [5], Shawn Young [6] and Shawn R. Narum [1]

Diversity **2022**, *14*(12), 1045

- Samples not currently processed.
- New monitoring (and possibly new technique) will initiate when hatchery fish recruit to spawning age.

Goal 2: Other native aquatic focal species

White Sturgeon Objective WS4: Contribute to productivity

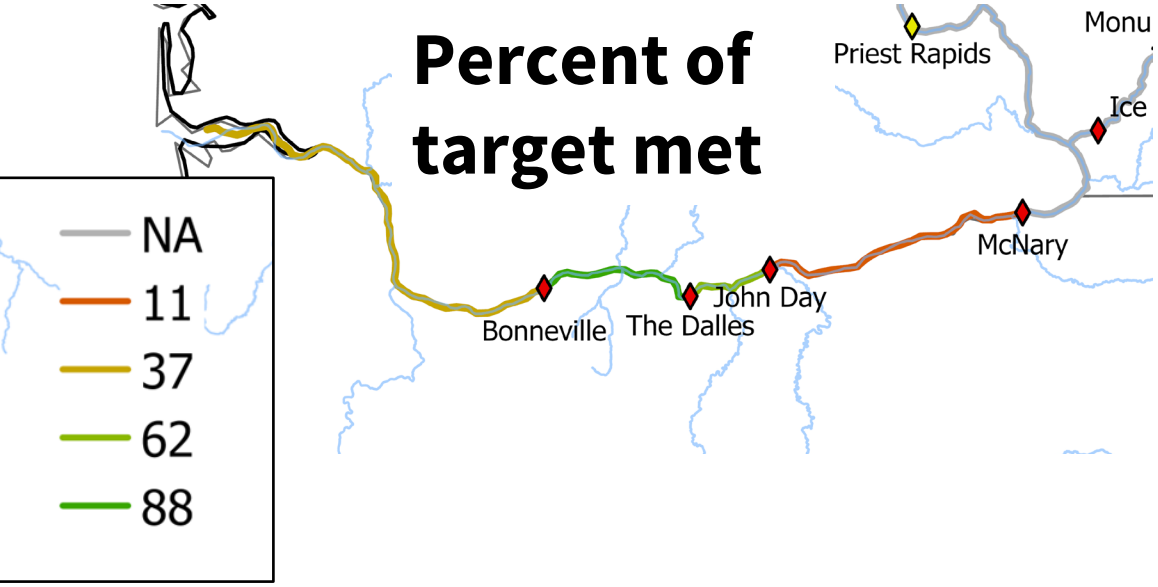


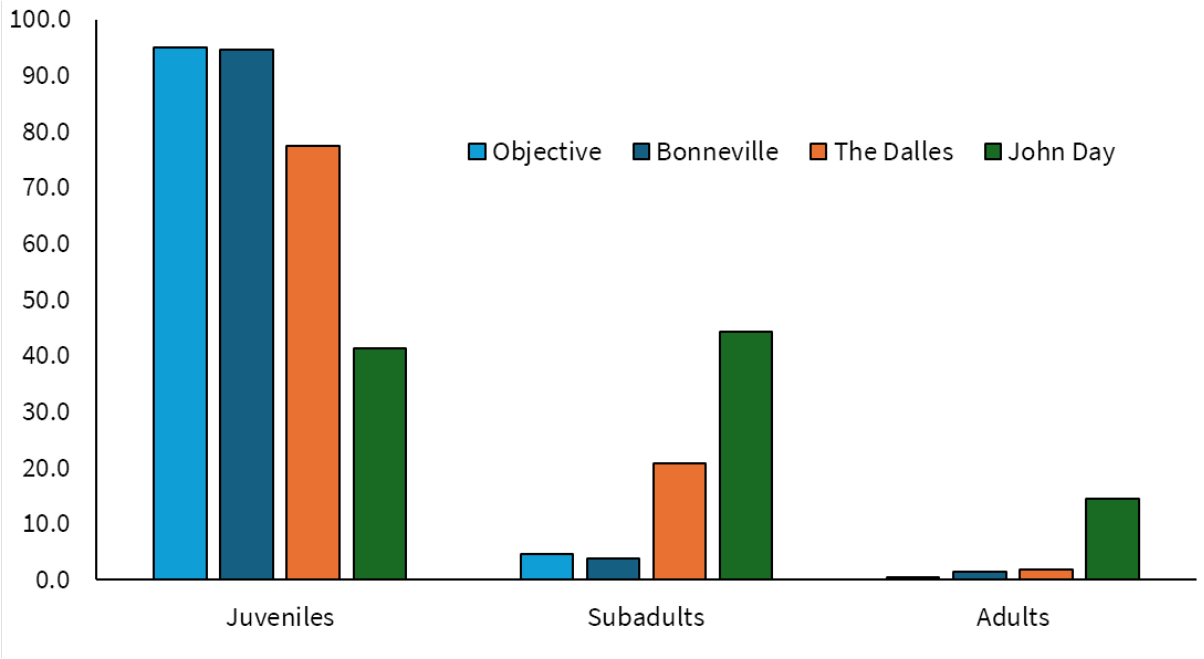
Lower Columbia and Lower Snake

- Positive set = young-of-year (YOY) captured in net
- Program targets for proportion of positive sets vary among reservoirs

Length frequency distribution conforming to approximate percentages:

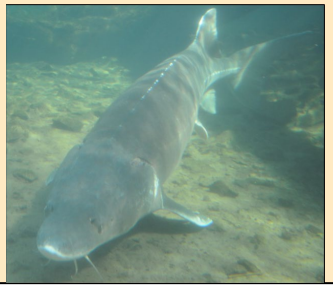
- 95% juveniles
- 4.5% subadults
- 0.5% adults





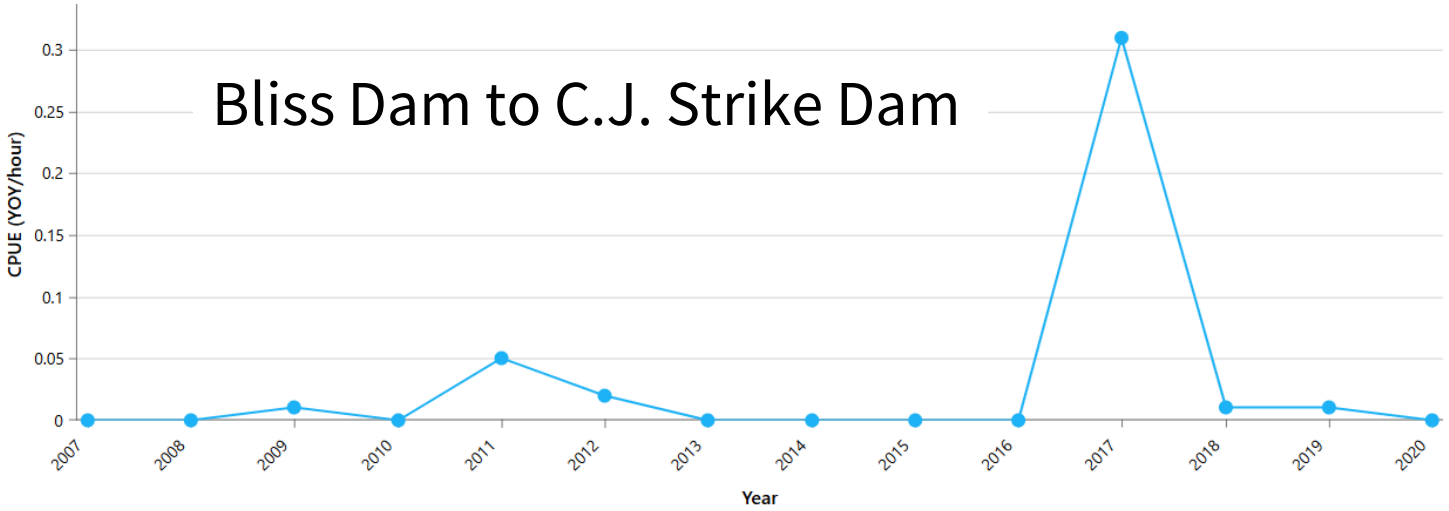
Goal 2: Other native aquatic focal species

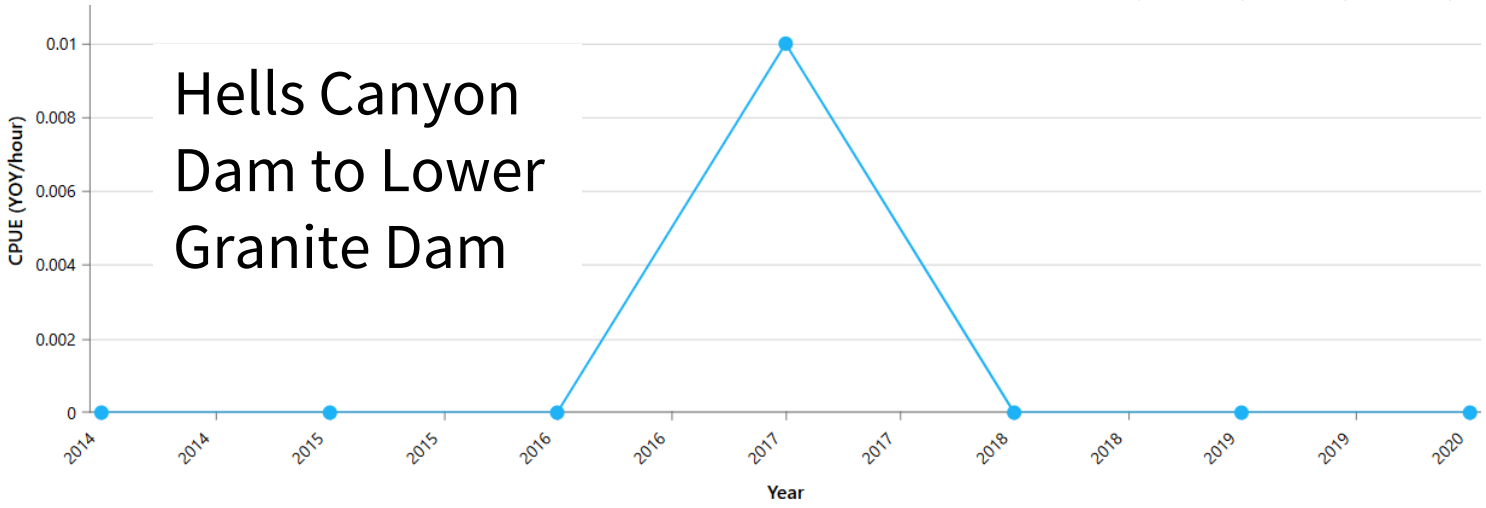
White Sturgeon Objective WS4: Contribute to productivity



Snake River

- Young –of-year (YOY) sampling annually in core conservation populations, **when available**
- Catch-per-unit-effort (CPUE) = YOY/hour

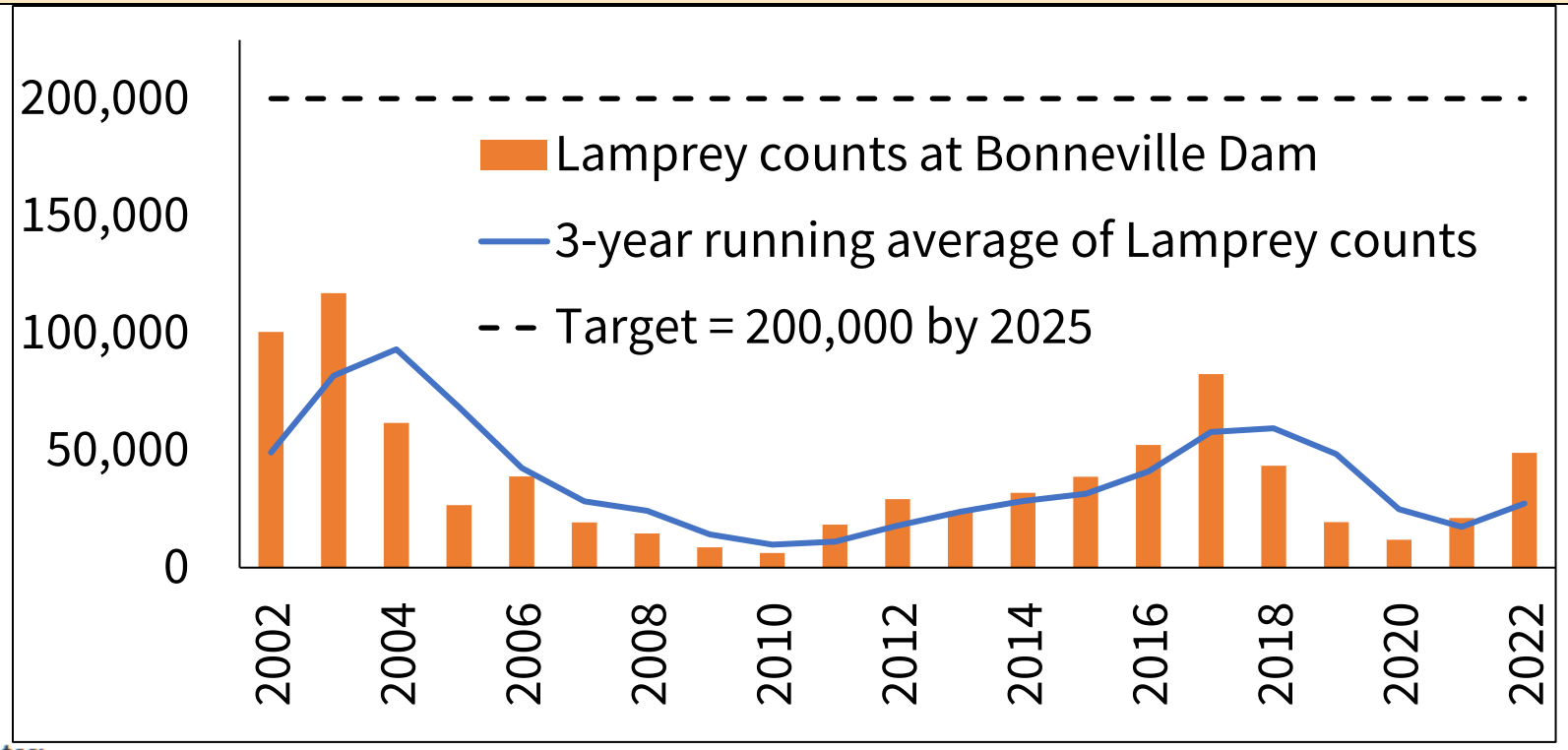


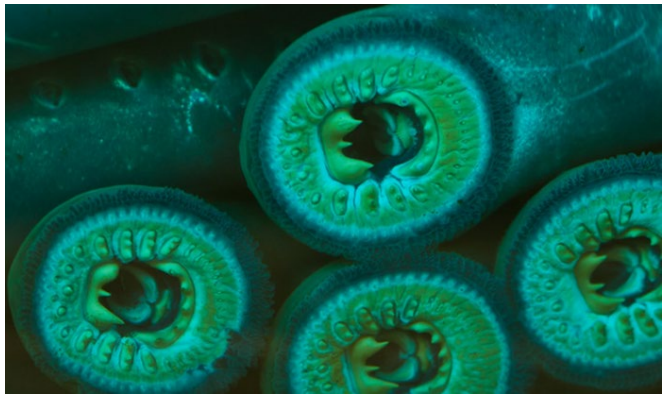


No catch per unit effort target listed in Program

Goal 2: Other native aquatic focal species

Pacific Lamprey Objective L1: Contribute to adult Pacific lamprey abundance target of a three-year rolling average of 200,000 at Bonneville Dam by 2025, progressing toward 1,000,000 by 2035





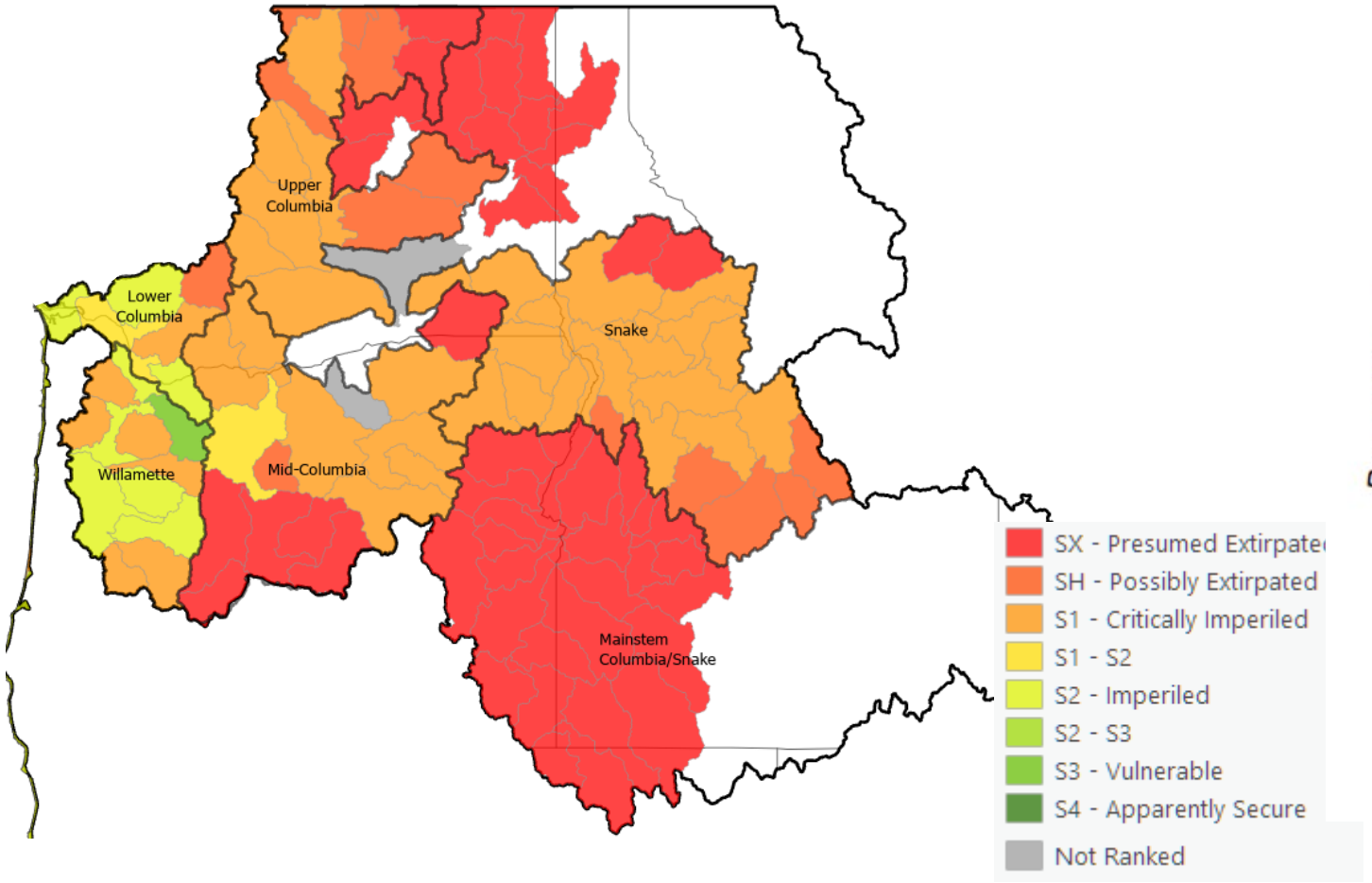
Notes:

1. During the fish passage season (April through October) the USACOE uses visual counting from 0400-2000 PST, during periods with daylight savings time this time is actually 0500 to 2100. The COEs QA/QC program involves a one hour test each month for all fish counters. During this test, both the tested fish counter and the fish count supervisor each count each species passing for one hour. The tested fish counter must score within 95% of the counts recorded by the fish count supervisor for all species other than shad which is within 85%. During visual counting, fish counters typically get a 10 min break every hour; therefore, counts over a 50 minute period are multiplied by a factor of 1.2 to obtain an estimate of a full hours counts.
2. Lamprey counts at Lower Columbia River and Snake River facilities occurs during the day, while counts at Upper Columbia River facilities represent an entire 24-hour period.

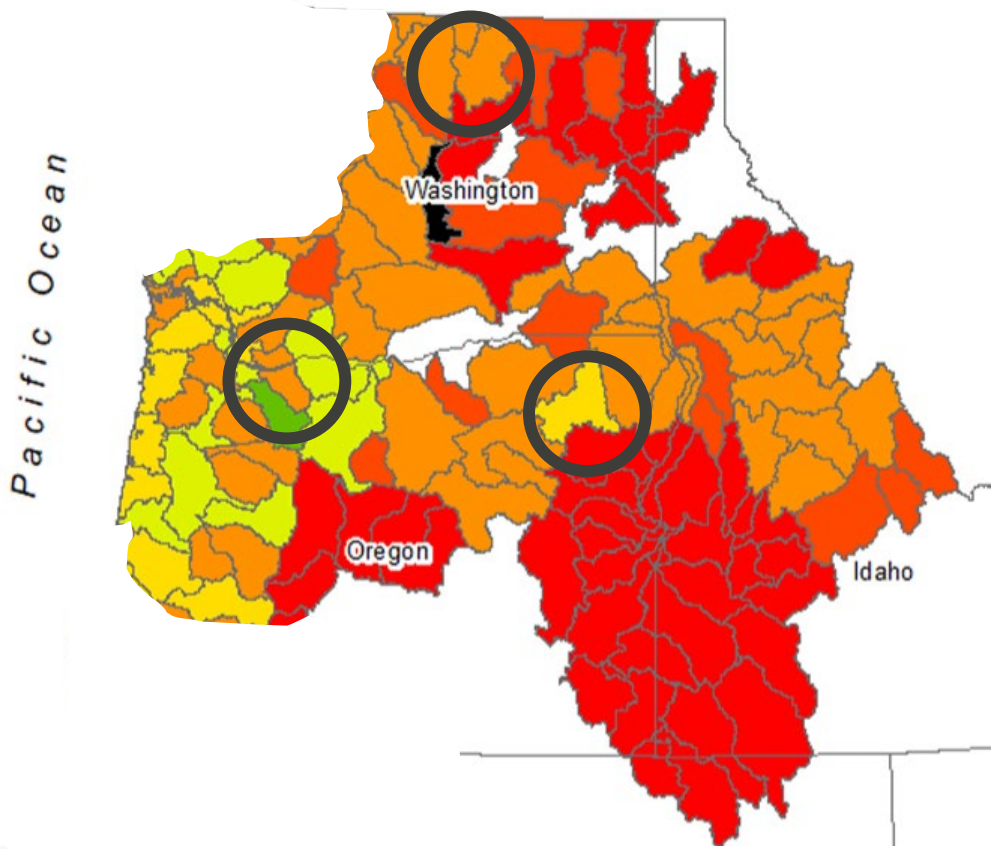
Goal 2: Other native aquatic focal species

Pacific Lamprey Objective L2: Contribute to **reduce the risk of extirpation** and improve adult abundance toward sustainable harvestable levels across the historical distribution and range of Pacific lamprey in the Columbia basin, including across all six Pacific Lamprey Regional Management Units (RMU), measured every five years.

NatureServe ranking 2017



NatureServe ranking 2022



Goal 2: Other native aquatic focal species

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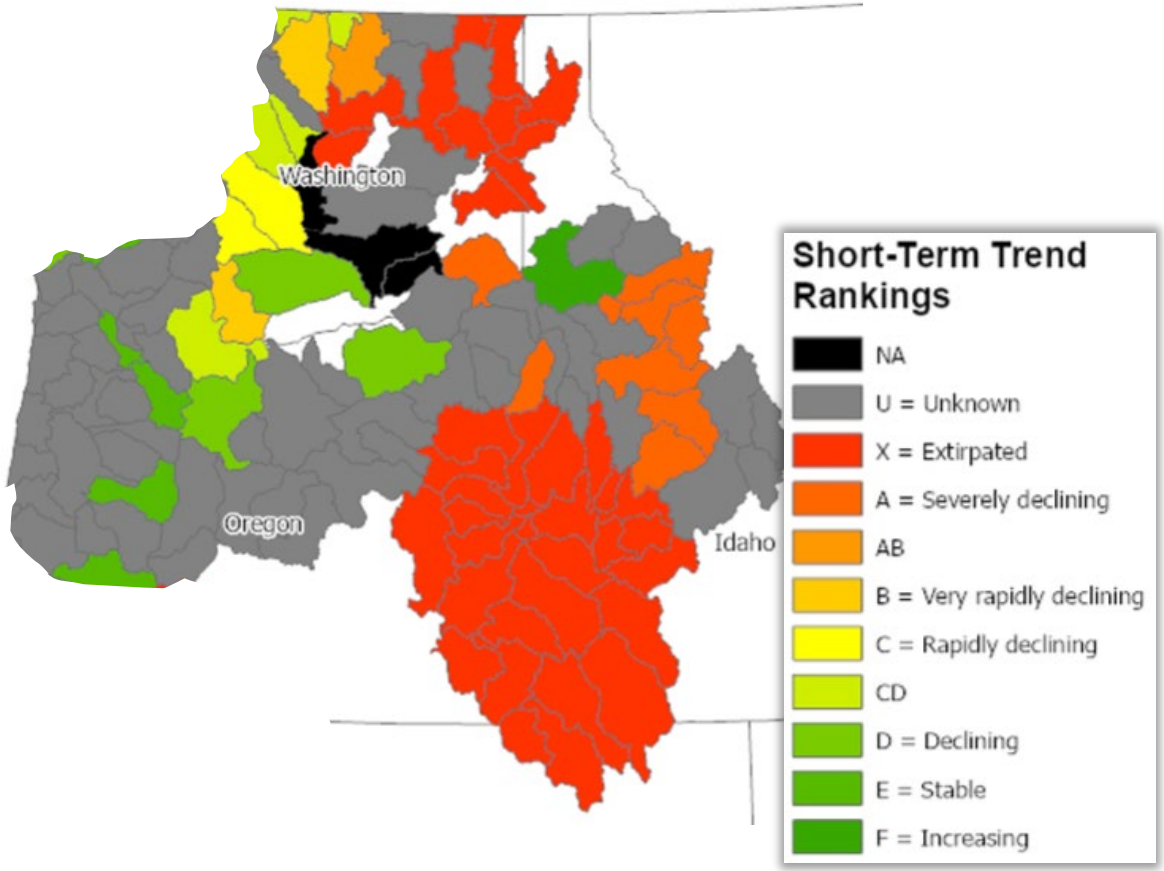
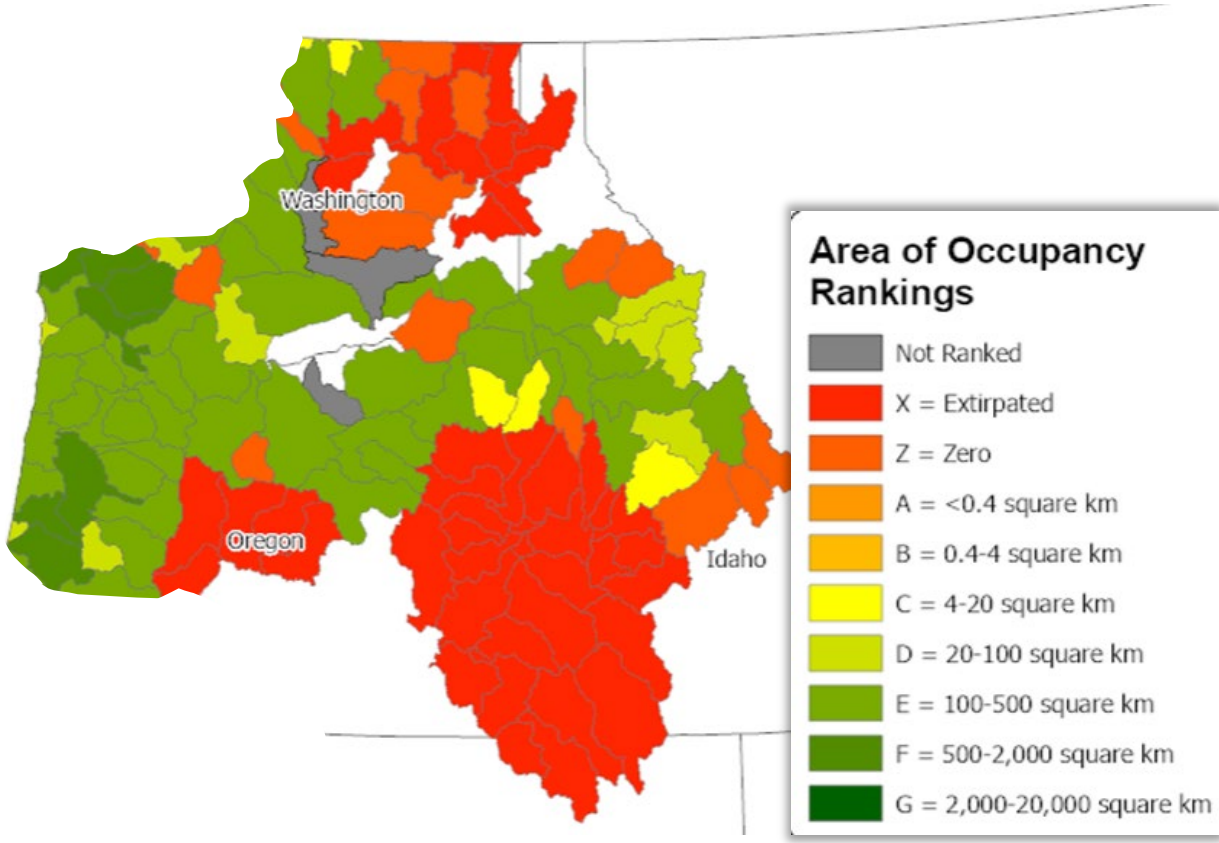
2022 Short-term trends in abundance



2022 Current area of occupancy



Goal 2: Other native aquatic focal species

Pacific Lamprey Objective L3: Contribute to improving passage efficiency for adult Pacific Lamprey to an interim standard of at least 80 percent at each dam on the mainstem Columbia and Snake rivers

- A diversity of routes is key to lamprey passage success.
- Bonneville, The Dalles, and John Day Dams offer a mix of volitional passage, lamprey passage structures/traps, and transportation options.
- The ability to consistently and accurately enumerate lamprey is needed to evaluate passage efficiency.

Lamprey Passage at Bonneville Dam

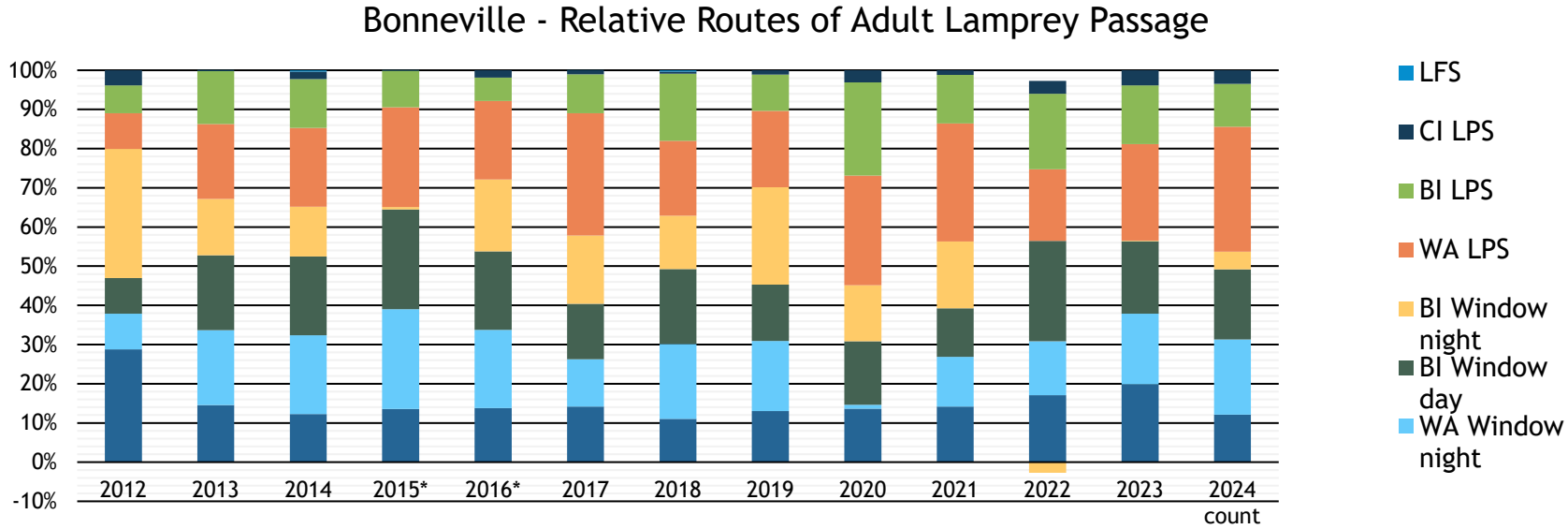
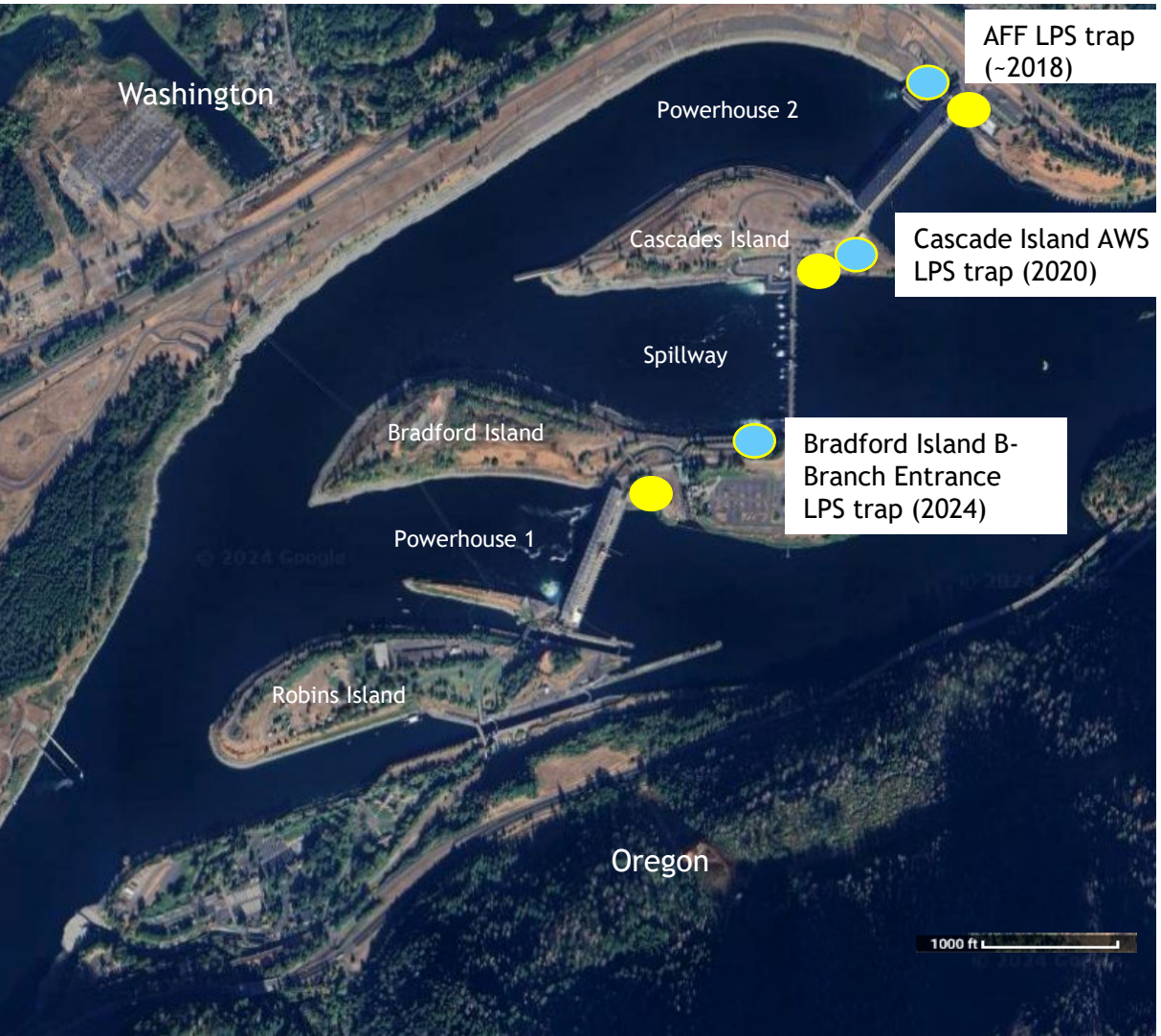


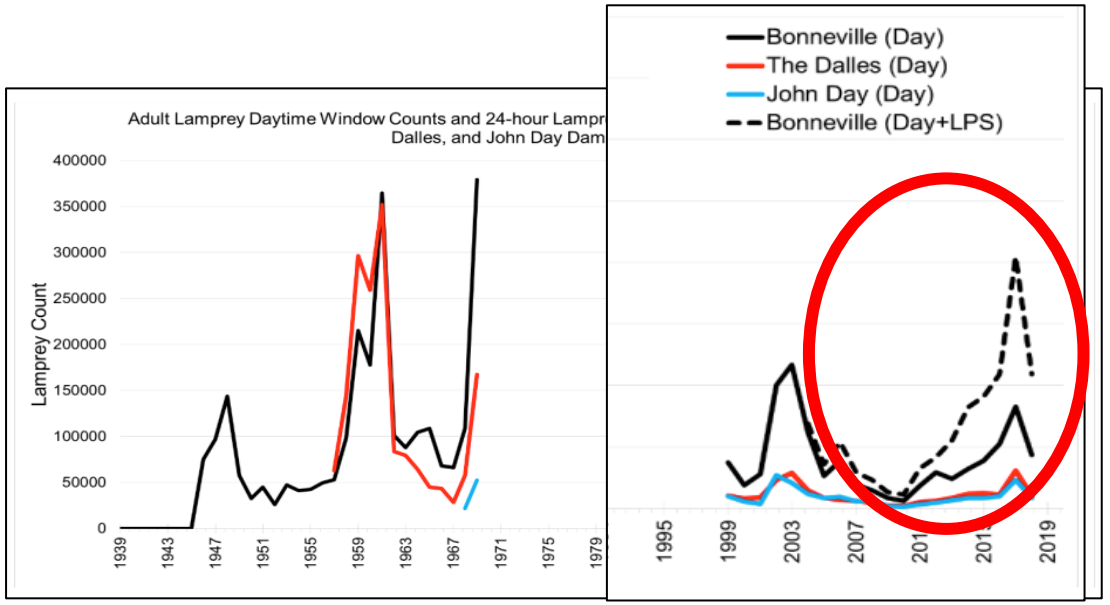
Figure 2. Proportional routes of passage for adult Pacific lamprey at Bonneville Dam. These can differ from PIT tagged or radio tagged fish. Data from table 2 above.
I've omitted negative WA night counts here for convenience in all years to allow comparison of trends. Just realize that LPS & LFS counts are 24 hours / day, Window Day for 16 hours/day.
The LFS was not operated in 2016 after an access hatch was discovered missing at low tailwater ~9 feet
The LFS was operated in 2017 collecting 51 lamprey. However, we were not able to actuate the lower entrance pickets suggesting it is plugged with sediment or other debris. An ROV inspection in 2018 did not see any debris. Lower picket gears are rusting.
* In 2015, 2016, and 2022 massive negative night counts, likely due to recycling at BI & WA shore makes those data difficult to interpret.

This chart highlights that lamprey use a wide variety of passage routes even at just one location like Bonneville Dam.

Goal 2: Other native aquatic focal species

Pacific Lamprey Objective L3: Contribute to improving passage efficiency for adult Pacific Lamprey to an interim standard of at least 80 percent at each dam on the mainstem Columbia and Snake rivers





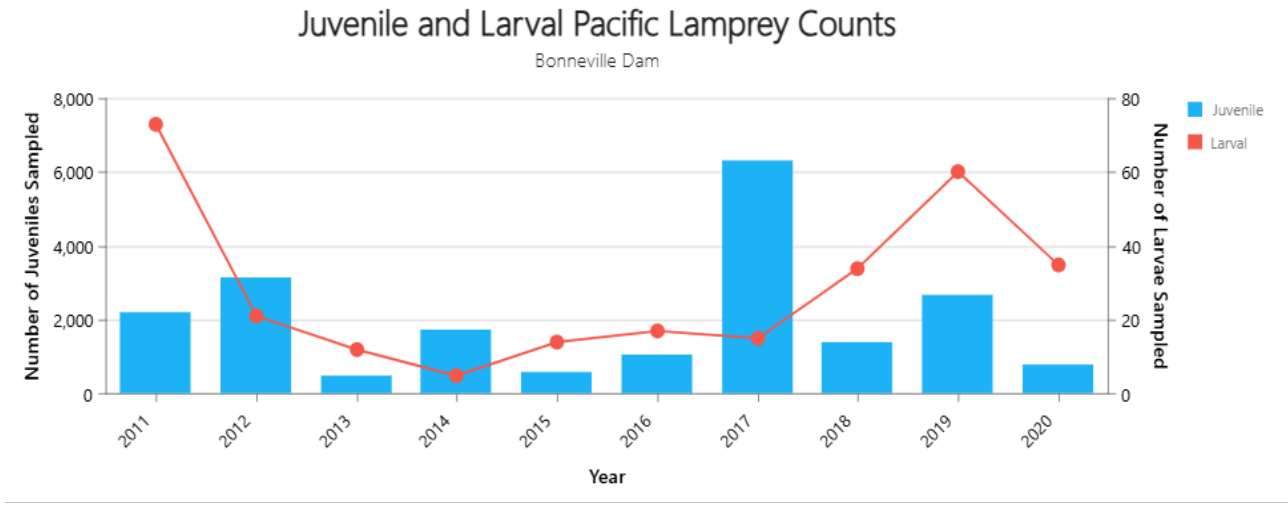
- Lamprey-specific passage is still a relatively new concept but has already shown improved numbers.
- Lamprey have different needs than salmonids.
  - Infrastructure
  - Run timing with spring flows
- Counting is still very complicated --> Potential for new SPI?

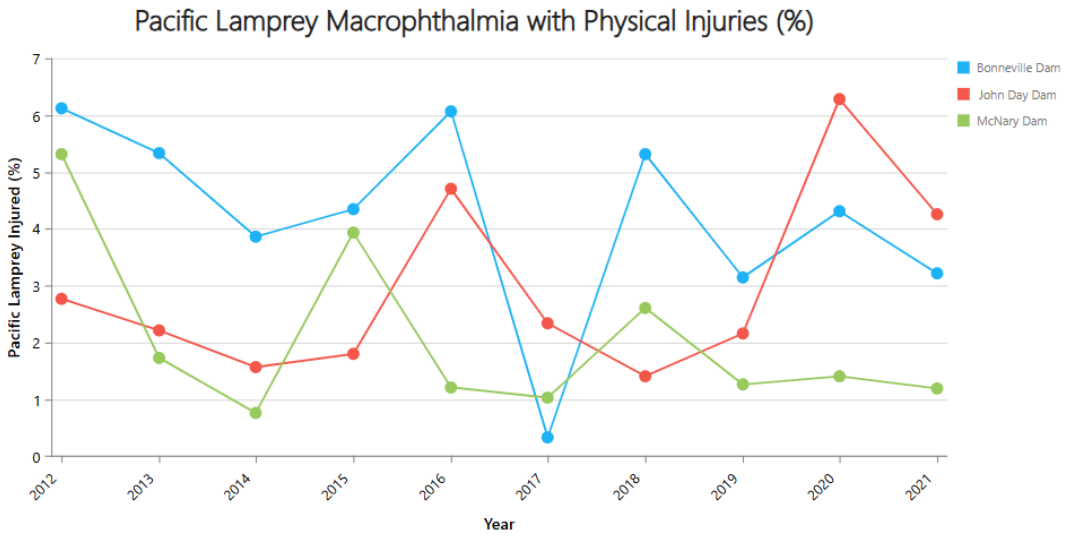
Goal 2: Other native aquatic focal species

Pacific Lamprey Objective L4: For lamprey, contribute to improving passage efficiency and survival progressing toward standards used to measure juvenile salmonid survival

So far, the Program has worked to document:

- Abundance of juvenile and larval outmigration tracked at certain dams.
- Annual weighted average injury rates for Pacific Lamprey macrophthalmia at Bonneville, McNary and John Day dams.
- Improved enumeration of juveniles is needed to calculate passage efficiency and survival.





Goal 2: Other native aquatic focal species

Resident salmonids- Bull Trout Objective R1: For Bull Trout, contribute to achieving **self-sustaining** populations **geographically widespread** across their native range, providing for **genetic integrity** and exchange and with **stable and/or increasing fish populations** capable of sustaining **harvest** across that range

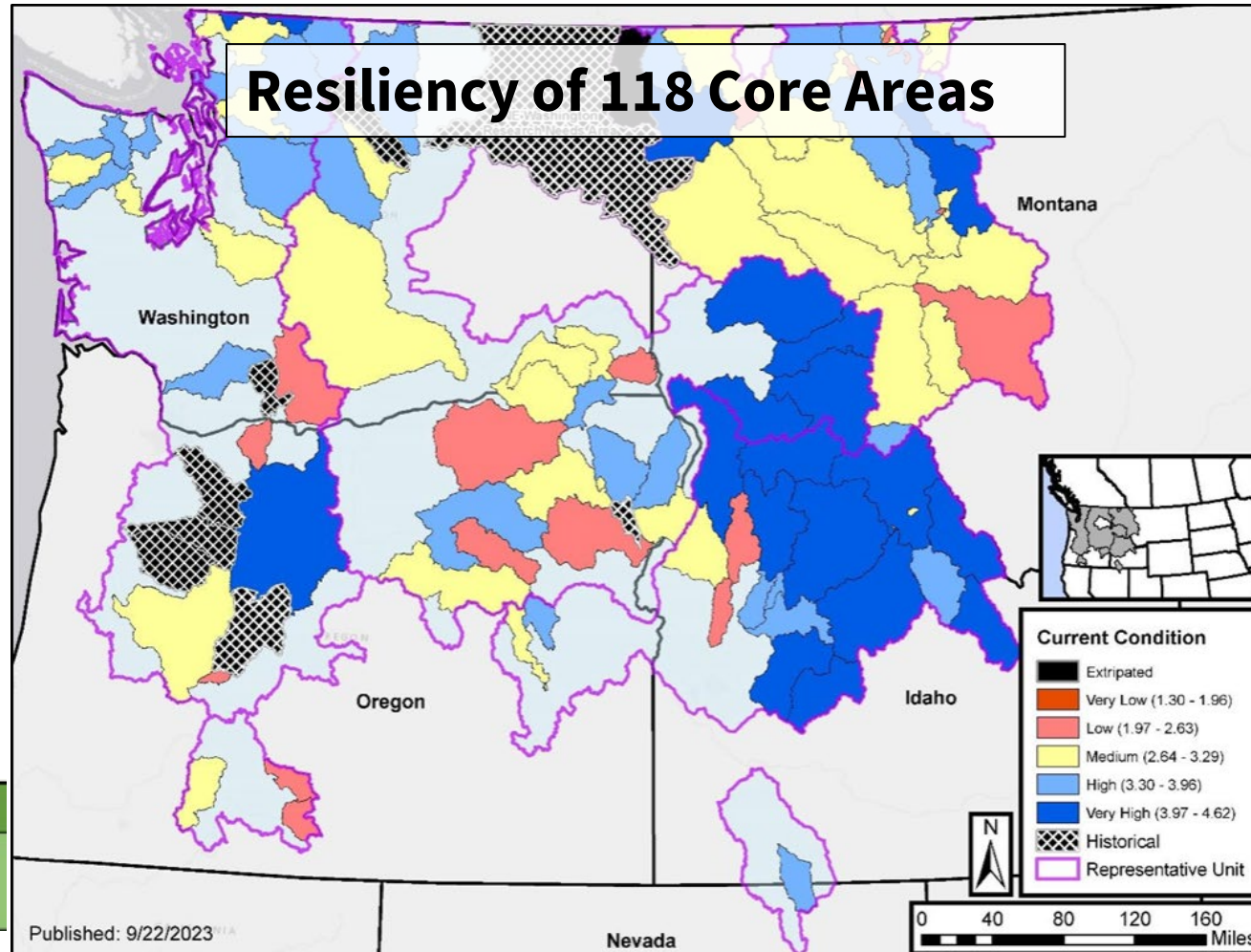
Photo by Trout Unlimited

USFWS released 5-year status update in 2024- recommended no change in status

Resiliency scores developed from factors:

DEMOGRAPHIC FACTORS				
Growth Rate: Population Trend	Life History Diversity	Number of occupied local populations	Connectivity	Abundance

HABITAT FACTORS					
Water Quality	Access to FMO	Fish Community Quality	Instream Quality	Riparian Quality	Habitat Quantity



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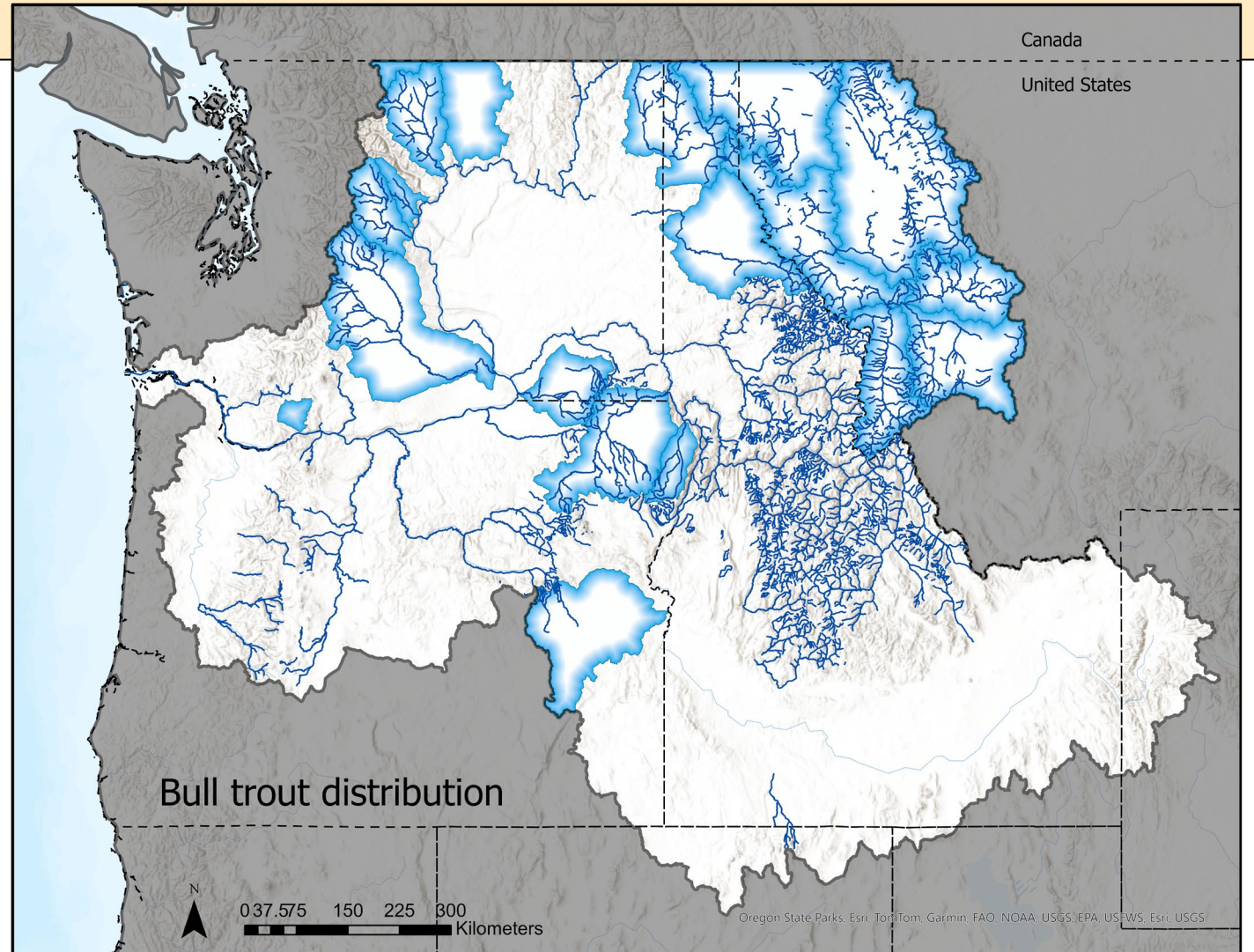
- Currently tracking abundance through redd counts within highlighted subbasins
  - Distribution = blue lines
- Is 5-year status assessment sufficient for tracking other elements?
- Can **bold** terms in objective be expressed quantitatively?
  - What information exists?
  - What can be tracked?

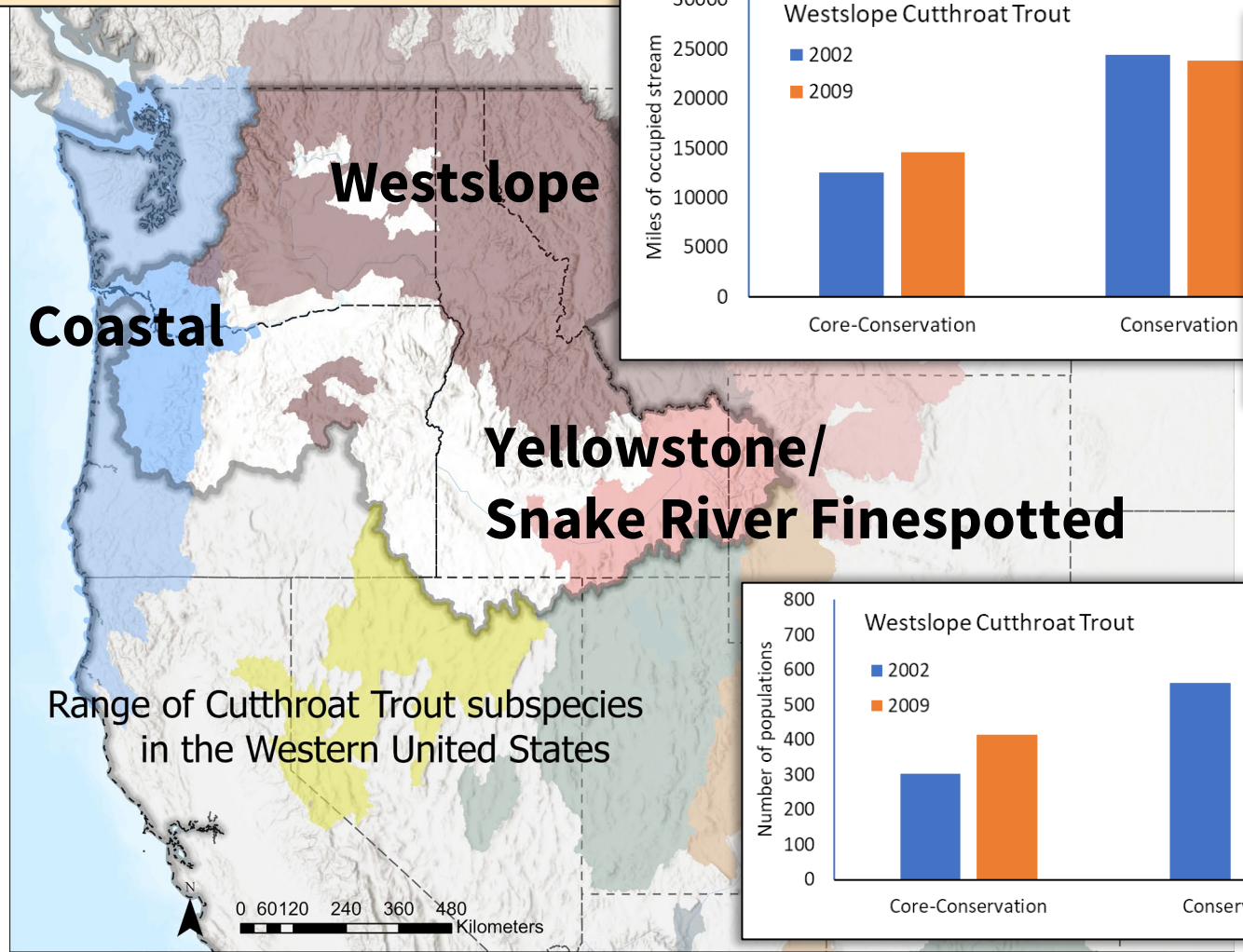


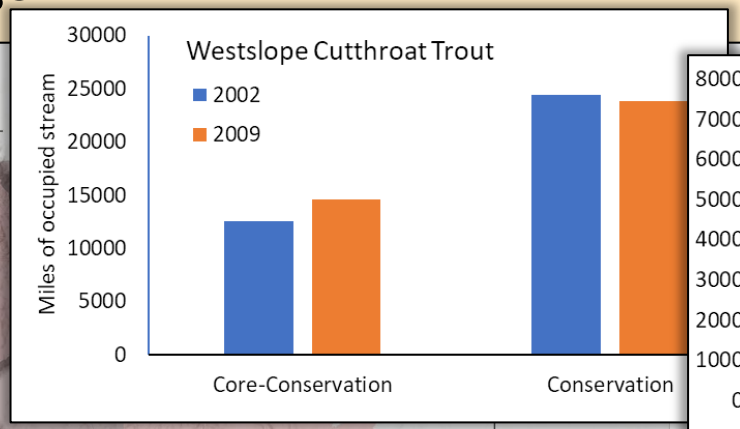
Goal 2: Other native aquatic focal species

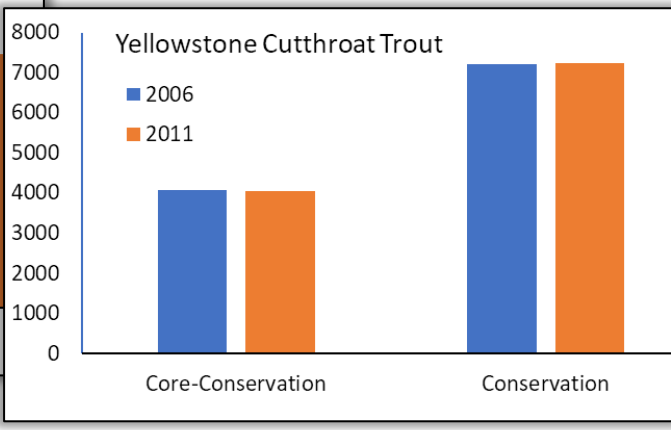
Resident salmonids- Cutthroat Trout Objective R2: For Cutthroat Trout, contribute to achieving self-sustaining populations of geographically widespread across their native range, providing for genetic integrity and exchange and with stable and/or increasing fish populations capable of sustaining harvest across that range

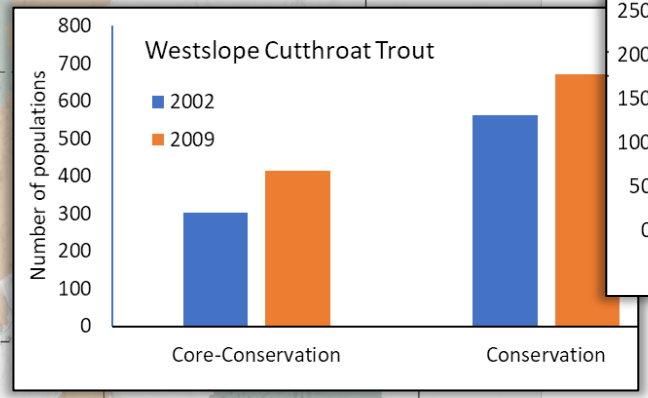
SPI data for Westslope and Yellowstone

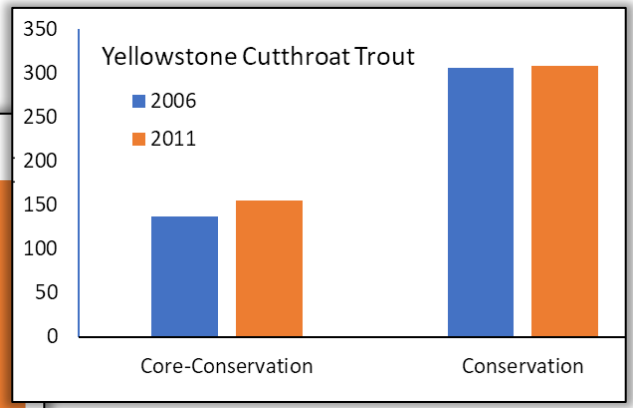
- Hatchery Mitigation
- Miles of occupied stream
- Number of core-conservation and conservation populations





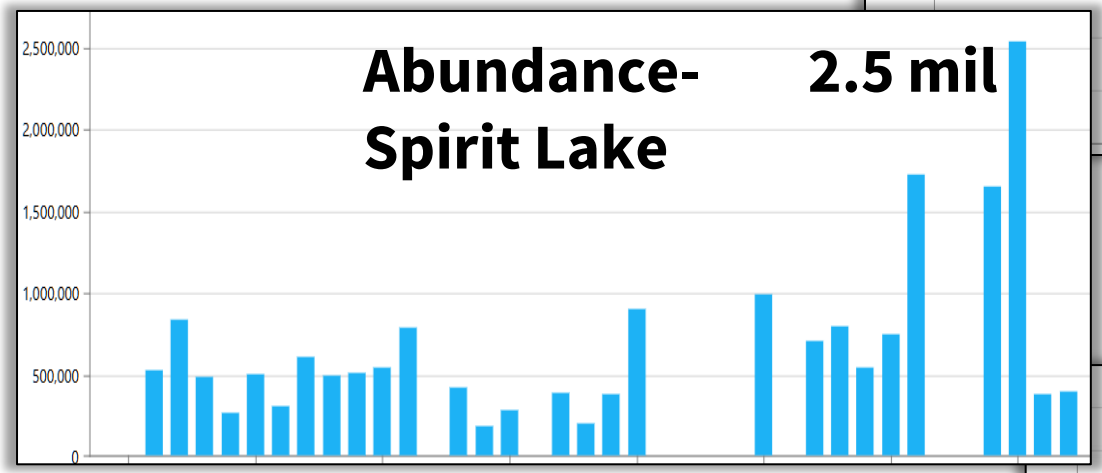


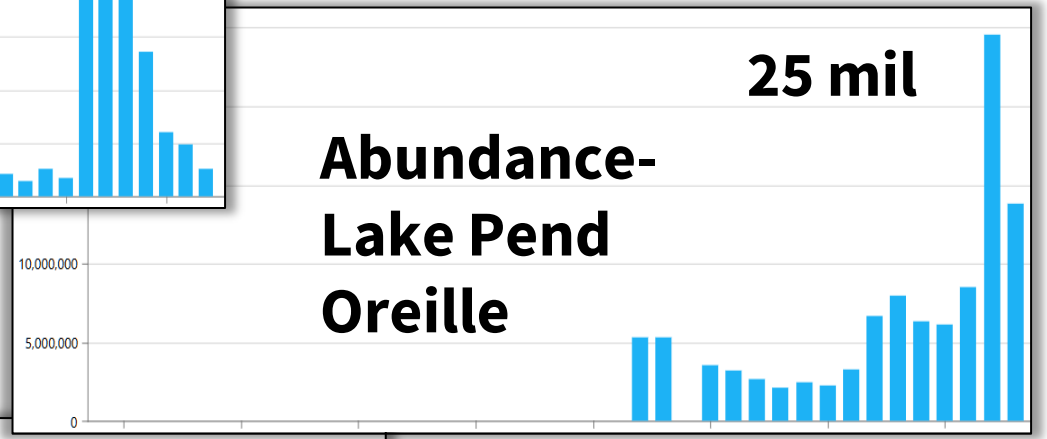


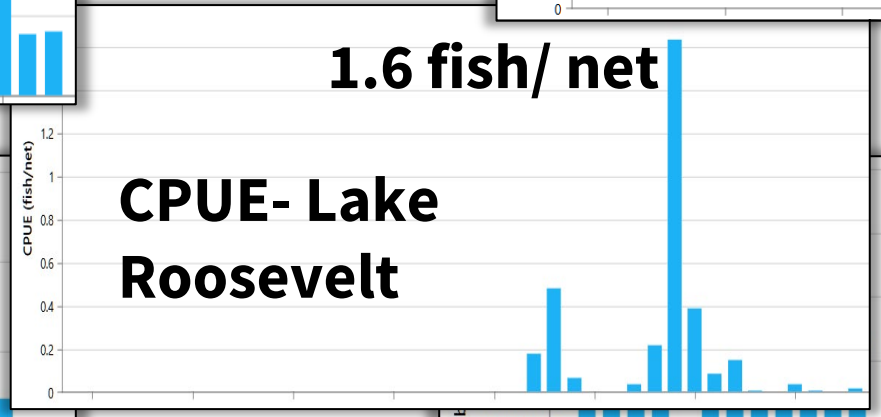


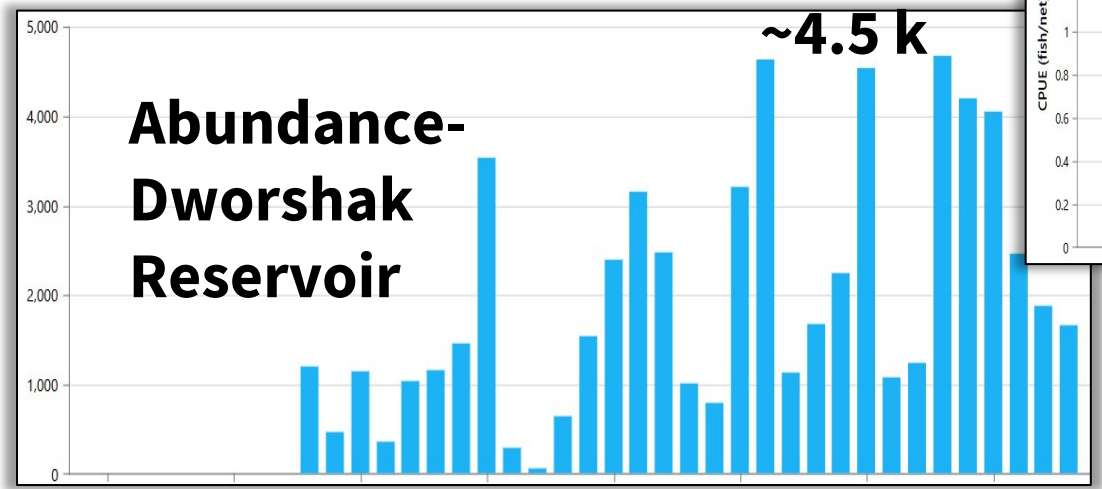
Goal 2: Resident salmonids- Kokanee Salmon Objective R3: For Kokanee, contribute to achieving self-sustaining, broadly distributed populations in the 11 subbasins in which they are present, with stable and/or increasing populations capable of sustaining harvest where they are identified as a focal species.

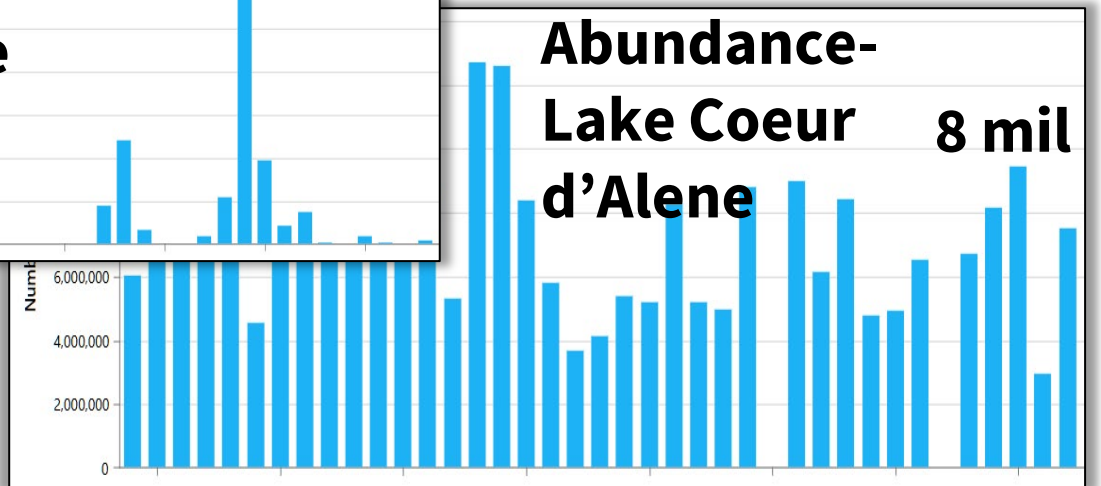
All graphs 1980 - ~2020









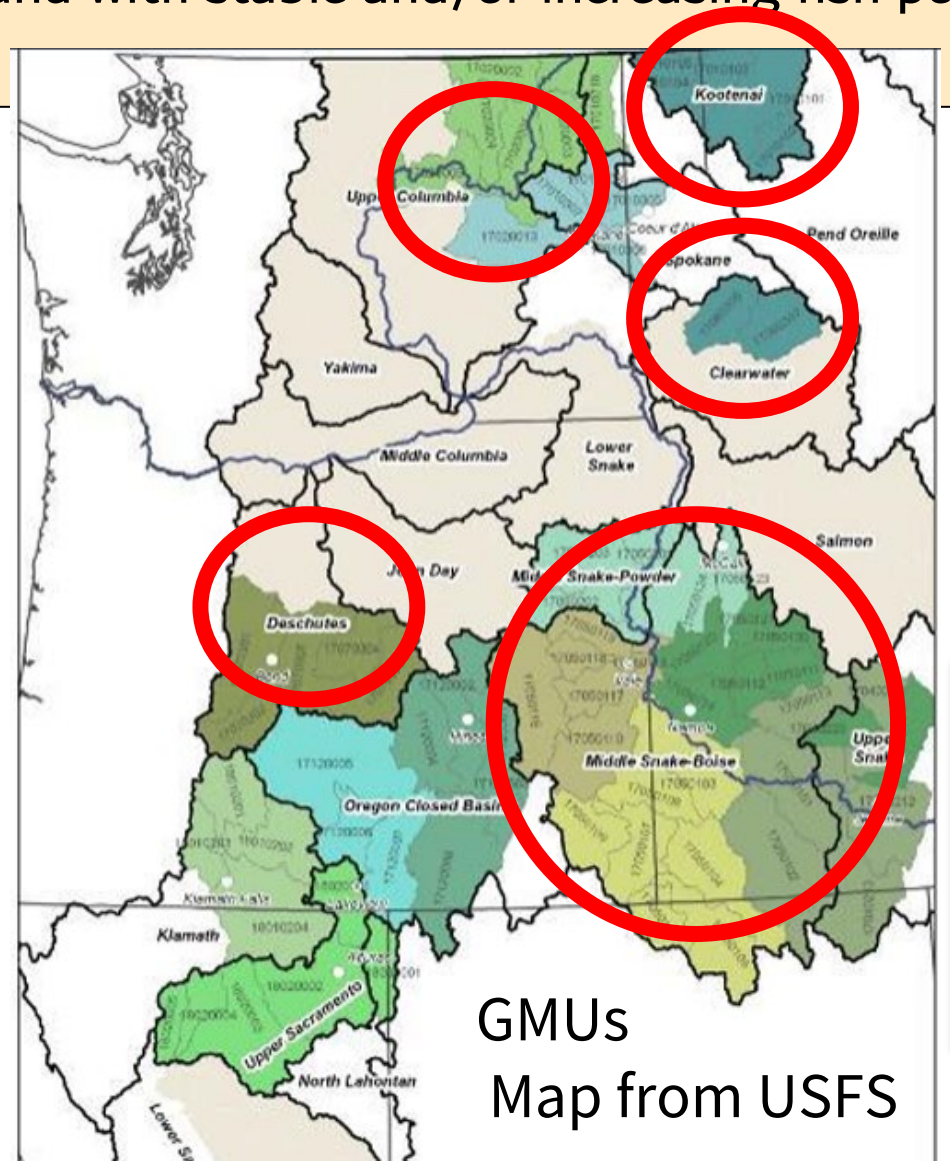


Goal 2: Other native aquatic focal species

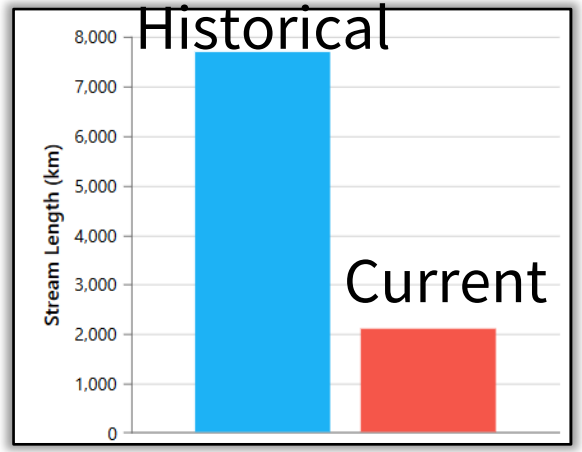
Resident salmonids- Redband Trout Objective R4: For Redband Trout, contribute to achieving self-sustaining populations of geographically widespread across their native range, providing for genetic integrity and exchange and with stable and/or increasing fish populations capable of sustaining harvest across that range.

SPIs for Redband

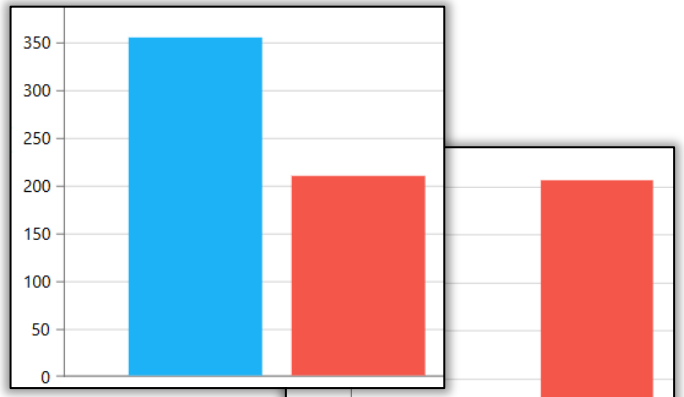
- Stream length and lake area occupancy within each of the five geographic management units
- Reference to other genetic data in literature

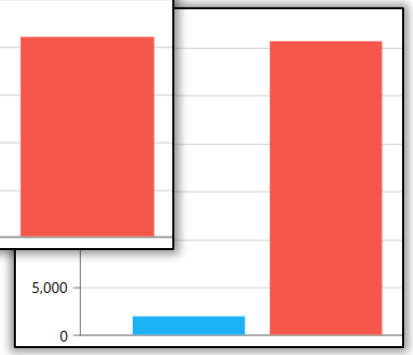


GMUs
Map from USFS



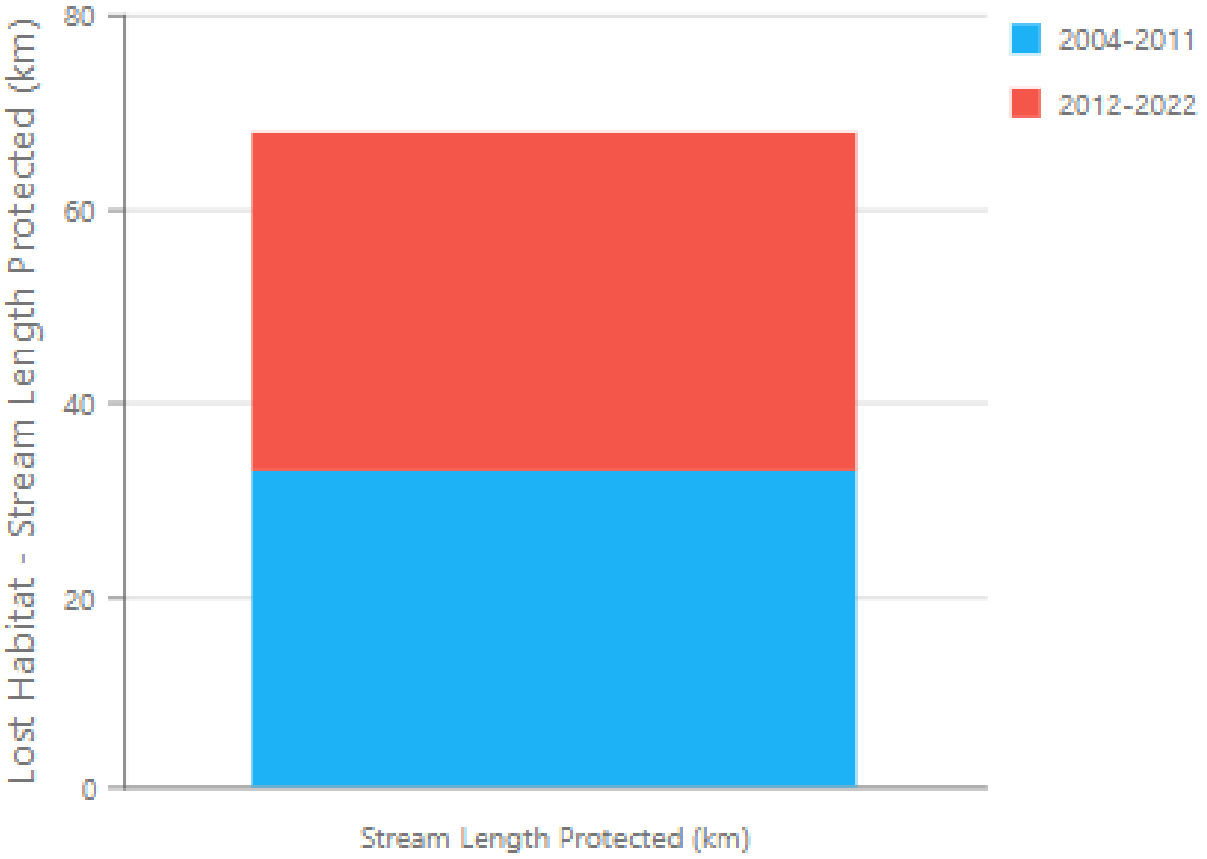
Stream length occupied decreasing in all 5 GMUs





Lake area occupied varies across GMUs

<u>Goal 2:</u> Resident salmonids- Hungry Horse Dam Objective R5: <u>Hungry Horse Dam</u> impacts on Westslope Cutthroat and Bull Trout have been assessed and partially mitigated. Mitigation for these losses has been expressed and implemented under the program primarily in terms of **operations** and **habitat protection targets** and not species numbers. A current mitigation target for these salmonids is **by 2024 to restore and protect 448 miles (721 km) of suitable stream habitat within the Flathead River watershed** that is closely equivalent to the habitat blocked and inundated by Hungry Horse Dam.



- Target originated in 1991 Mitigation Plan (Montana Fish, Wildlife, and Parks, and Confederated Salish and Kootenai Tribes)
- Mitigation for resident fish losses occurs through habitat restoration and protection, and reducing non-native species interactions, and more
- Figure shows habitat protection as of 2022

<u>Goal 2:</u> Resident salmonids- Libby Dam Objective R6: Libby Dam impacts on Westslope Cutthroat and Bull Trout have been assessed and partially mitigated. Mitigation for these losses has been expressed and implemented under the program primarily in terms of **operations and habitat protection targets** and not species numbers. Current mitigation targets for these salmonids is **by 2028 to protect or restore 109 miles (175.42 km) of Kootenai River and 40 miles (64.37 km) of tributary stream** that were inundated by Libby Dam and make accessible 60 miles or more of previously blocked suitable streams.

- Substantial restoration has occurred in Kootenai River above and below Libby Dam through multiple partners
- No specific habitat restoration program exists to implement this objective
- Restoration benefits resident fish and wildlife
- Data not currently in Program Tracker while we determine how restoration credits against target

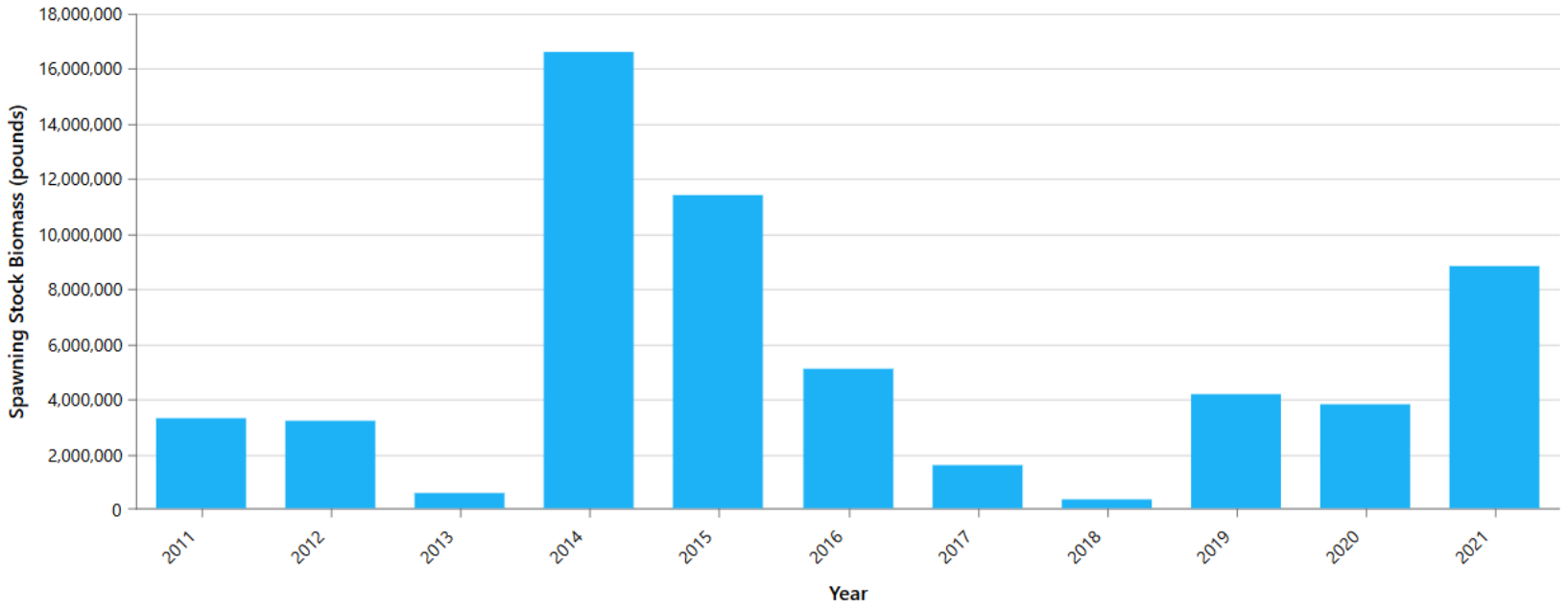
Map from Kootenai River Network

Goal 2: Other native aquatic focal species

Protect, mitigate, and enhance …aquatic species adversely affected by the development and operation of the …hydrosystem, including related spawning grounds and habitat

All other native aquatic focal species- Objective NF1: The program's biological objectives for other native aquatic focal species, including **Eulachon**, Burbot, Oregon Chub and freshwater mussels, are expressed in the goal statement.

Eulachon spawning stock biomass- Lower Columbia River



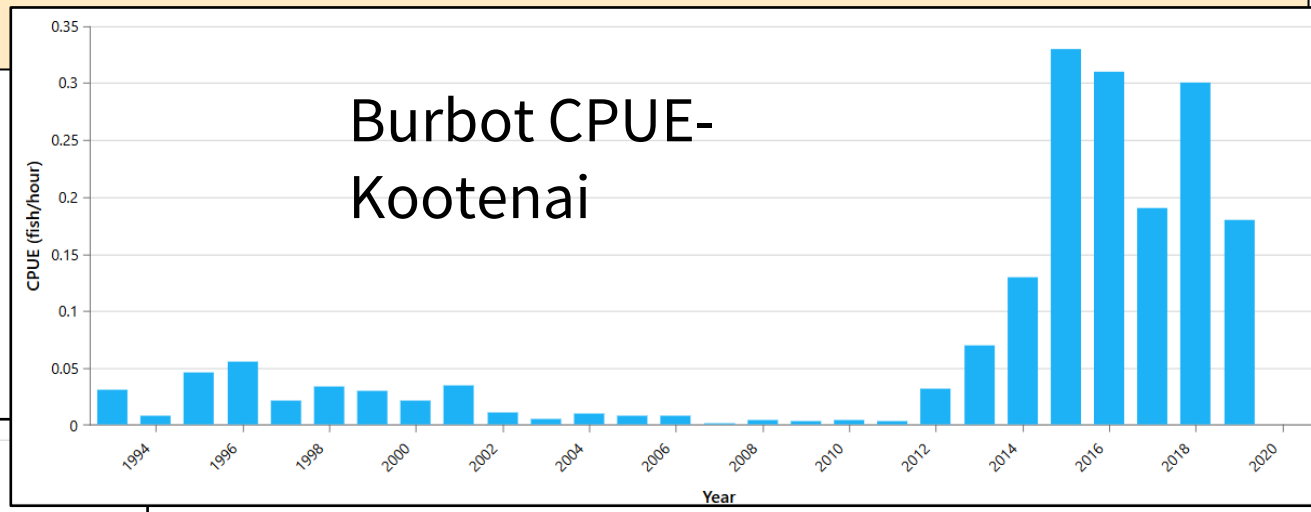
What is the target? More specific details are needed.

Goal 2: Other native aquatic focal species

Protect, mitigate, and enhance …aquatic species adversely affected by the development and operation of the …hydrosystem, including related spawning grounds and habitat

All other native aquatic focal species- Objective NF1: The program's biological objectives for other native aquatic focal species, including Eulachon, **Burbot**, Oregon Chub and freshwater mussels, are expressed in the goal statement.

What is the target? More specific details are needed.



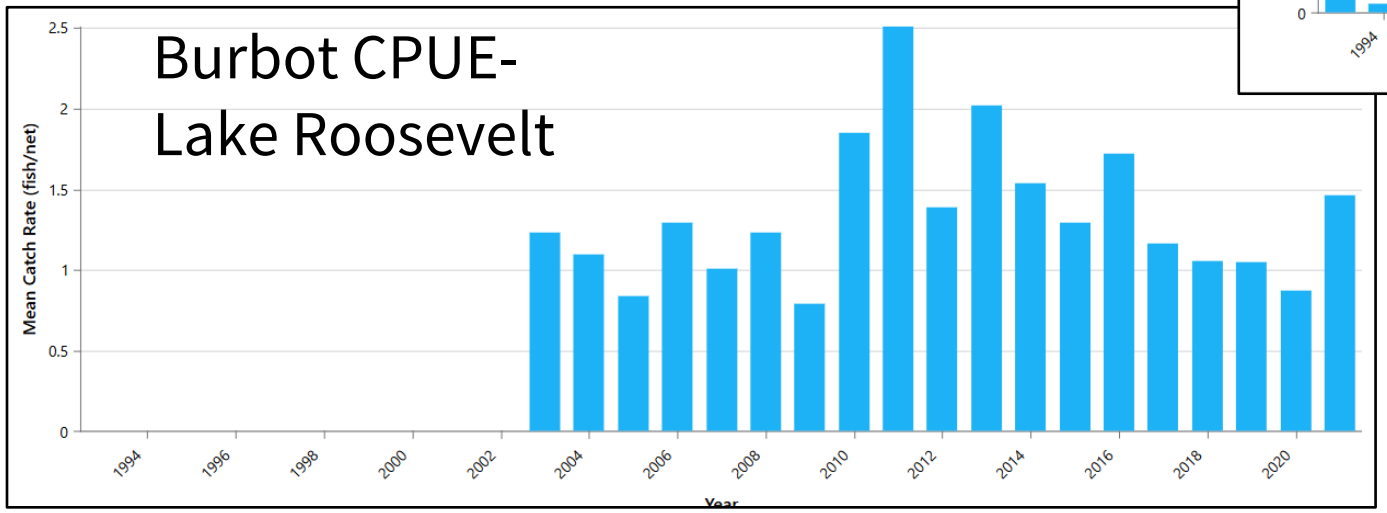


Photo: National Park Service

Goal 2: Other native aquatic focal species

Protect, mitigate, and enhance …aquatic species adversely affected by the development and operation of the …hydrosystem, including related spawning grounds and habitat

All other native aquatic focal species- Objective NF1: The program's biological objectives for other native aquatic focal species, including Eulachon, Burbot, **Oregon Chub** and freshwater mussels, are **expressed in the goal statement.**

What is the target? More specific details are needed.

- Oregon Chub:
  - Listed in 1983
  - Delisted in 2015
- **First fish species to be recovered under ESA**

Goal 2: Other native aquatic focal species

Protect, mitigate, and enhance …aquatic species adversely affected by the development and operation of the …hydrosystem, including related spawning grounds and habitat

All other native aquatic focal species- Objective NF1: The program's biological objectives for other native aquatic focal species, including Eulachon, Burbot, Oregon Chub and **freshwater mussels**, are **expressed in the goal statement.**

What are the targets? More specific details are needed.

Freshwater Mussels

- Current SPI points to project in CBFish
- What data should we track? What data are available? Which species?
- More work needs to be done by Council on developing SPIs, in collaboration with managers

Winged Floater Freshwater Mussel

Western Ridged Mussel

Photos: OR conservation strategy

Questions on Other Native Aquatic Species Goal/ Objectives?

White Sturgeon

- WS1- Abundance
- WS2- Spatial distribution
- WS3- Genetic diversity
- WS4- Productivity

Lamprey

- L1 – Adult abundance
- L2 – Reduced risk of extirpation
- L3 – Adult passage
- L4 – Juvenile passage

Resident salmonids

- R1 – Bull trout
- R2 – Cutthroat trout
- R3 – Kokanee salmon
- R4 – Redband trout
- R5 – Hungry Horse
- R6 – Libby

Other native aquatic focal species

- NF1 – Includes Eulachon, Burbot, Oregon chub, freshwater mussels

Program goals

Salmon and steelhead

Other native aquatic species

Wildlife

Ecology/ habitat

Communication, assessment, and coordination

Goal 3: Wildlife

Mitigate for wildlife losses caused by the development and operation of hydropower dams.

FCRPS mitigation

30 dams/ related facilities in Basin

- **27% (8) fully mitigated for C&I and Op**
- 33% (10) fully mitigated for C&I only
- 30% (9) with C&I mitigation remaining
- 10% (3) where mitigation was not called for

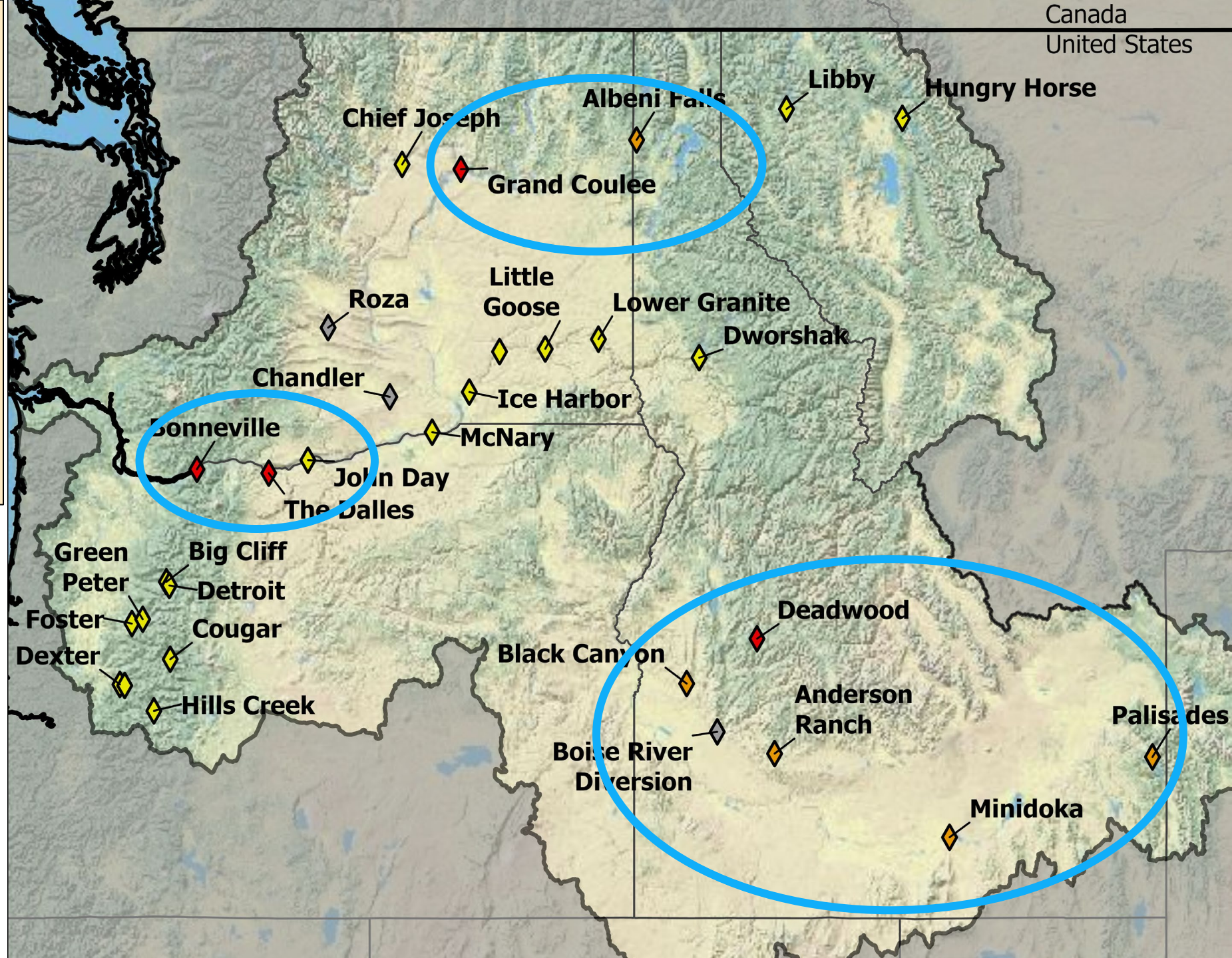
Non-federal hydro mitigation

- Wildlife mitigation occurs through FERC relicensing and HCPs.
- X This has not been tracked

2014 Program and 2020 Addendum continue to call for settlement of remaining C&I and Operational losses

Goal 3: Wildlife

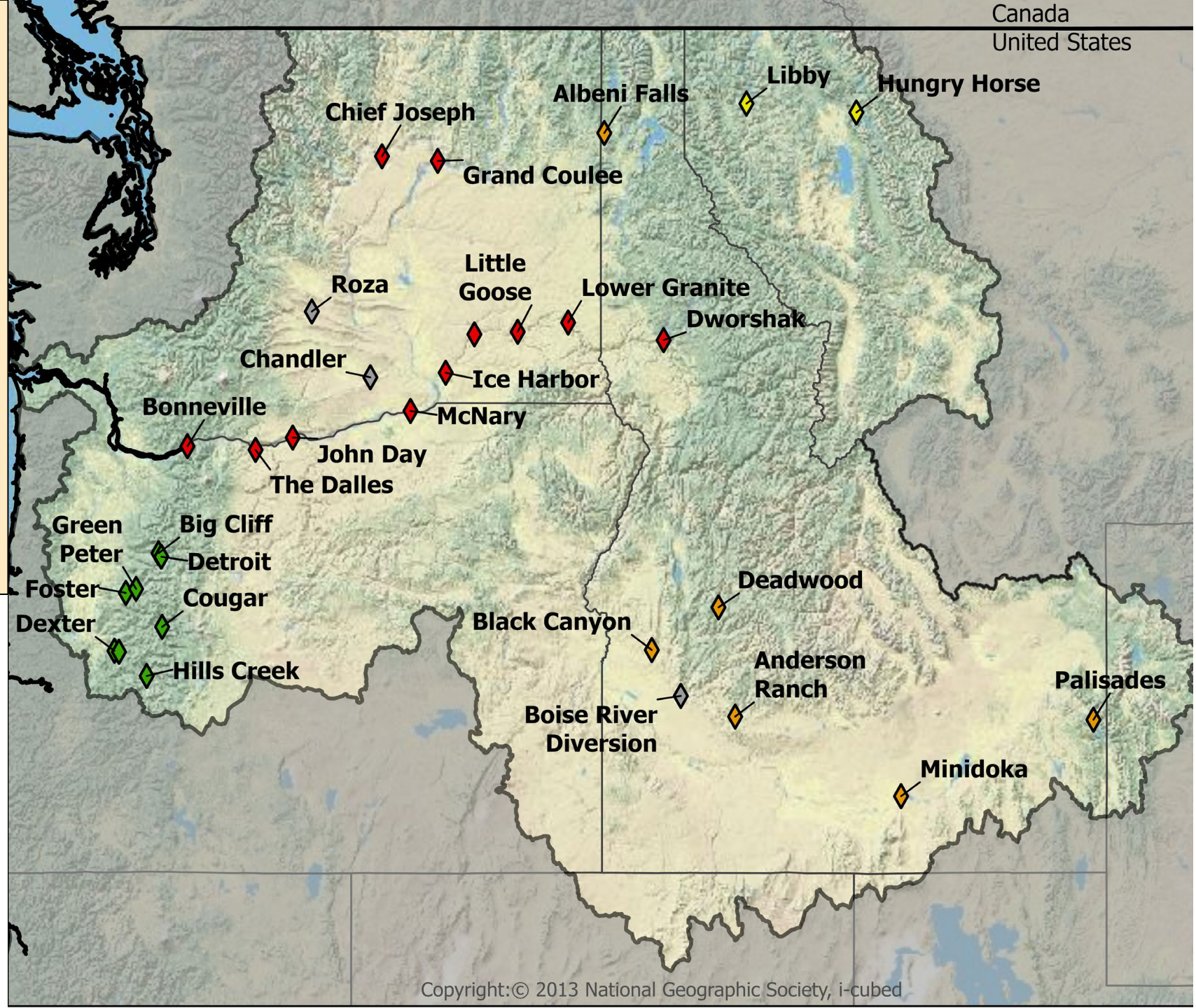
Objective W1: Complete mitigation for **construction and inundation losses over the next five-year** period by acquiring lands or through settlement agreements.



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

Goal 3: Wildlife

Objective W2: The objective for the next five-year period will be for operational losses to be assessed where it is determined by the relevant parties to be necessary **and for mitigation actions or mitigation agreements to be in place in all areas**.



- Losses mitigated
- Assessed
- Partially assessed or settled
- Not assessed
- NA

Goal 3: Wildlife

Objective W3: All parcels and/or management units operate under an approved management plan.

55% of parcels in CBFish operate under approved management plan

- Unclear if remaining parcels lack management plan or it is just not available.

Goal 3: Wildlife

Objective W4: Maintain existing habitat mitigation values on the parcels and/or management units as described in their individual management plans.

- BPA evaluates 10% of parcels for compliance using remote sensing and conducts on-the-ground surveys when potential issues exist
- Sponsors report annually on mitigation values and any land management issues
- No public database on condition of these parcels or management units- would need to work with individual managers
- With only 55% of parcels in CBFish with approved management plans, more work needed to meet this objective

Questions on Wildlife Goal/ Objectives?

Goal– mitigate losses

W1 – Complete C&I mitigation
W2 – Complete Op mitigation
W3 – Approved management plans
W4 – Maintain mitigation values

Program goals

Salmon and steelhead

Other native aquatic species

Wildlife

Ecology/ habitat

Communication, assessment, and coordination

Goal 4: Ecology/ habitat: Contribute to providing environmental conditions and processes that support the ecosystem functions necessary to restore healthy, self-sustaining and harvestable populations of native anadromous and resident fish and wildlife adversely affected by the hydroelectric power system, including related spawning grounds and habitat

- Objectives are qualitative statements of program priorities
- Most are written using "contribute to" with the exception of flow objectives
- Implementation of associated measures was thoroughly reviewed in the **Hydrosystem Assessment** and the **Habitat assessment**

Juvenile migration-Salmon/ Steelhead
- Water budget and seasonal flows
- Upper Snake R. flow augmentation
- Passage/ Spill /
- Transportation

Adult migration-Salmon/Steelhead
- Summer flows
- Temperature
- Passage structures and operations

Migration-Lamprey
- Passage
- General measures

Resident fish measures, by location
- Columbia/ Snake River Sturgeon
- Libby and Hungry Horse-downstream
- Libby and Hungry Horse- reservoir
- Grand Coulee
- Albeni Falls/ Pend Oreille

Mainstem spawning and rearing
- Hanford Reach Fall Chinook
- Chum Salmon below Bonneville

Restoration
- Habitat quantity/ quality
- Water quantity/ quality
- Climate adaptation

Protection
- Screens
- Fish lands
- Protected areas

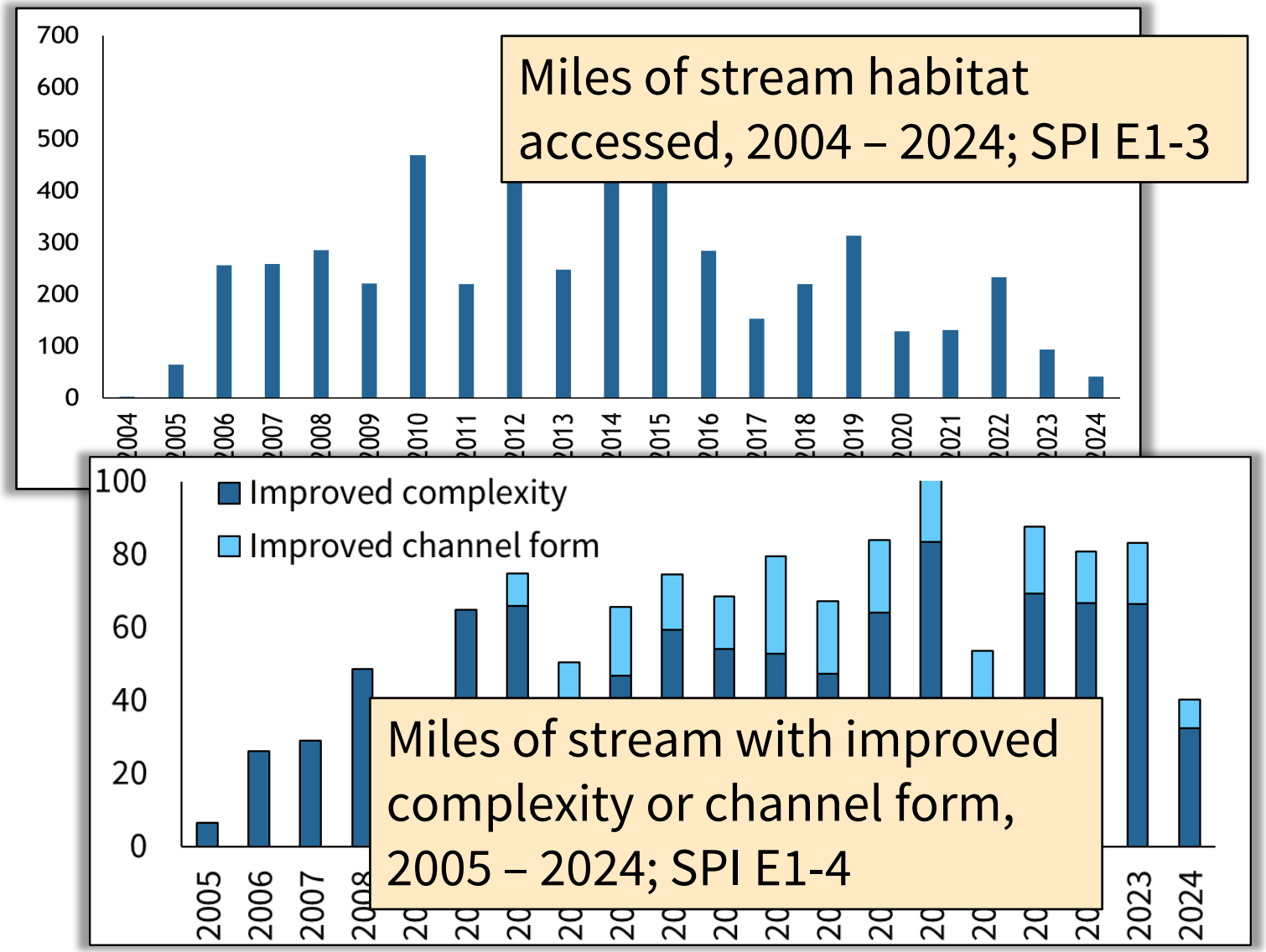
Non-native / invasive spp:
- Zebra/ Quagga mussels
- Shad
- Vegetation

Predator management:
- Avian
- Marine mammals
- Fish

Goal 4: Ecology/ habitat

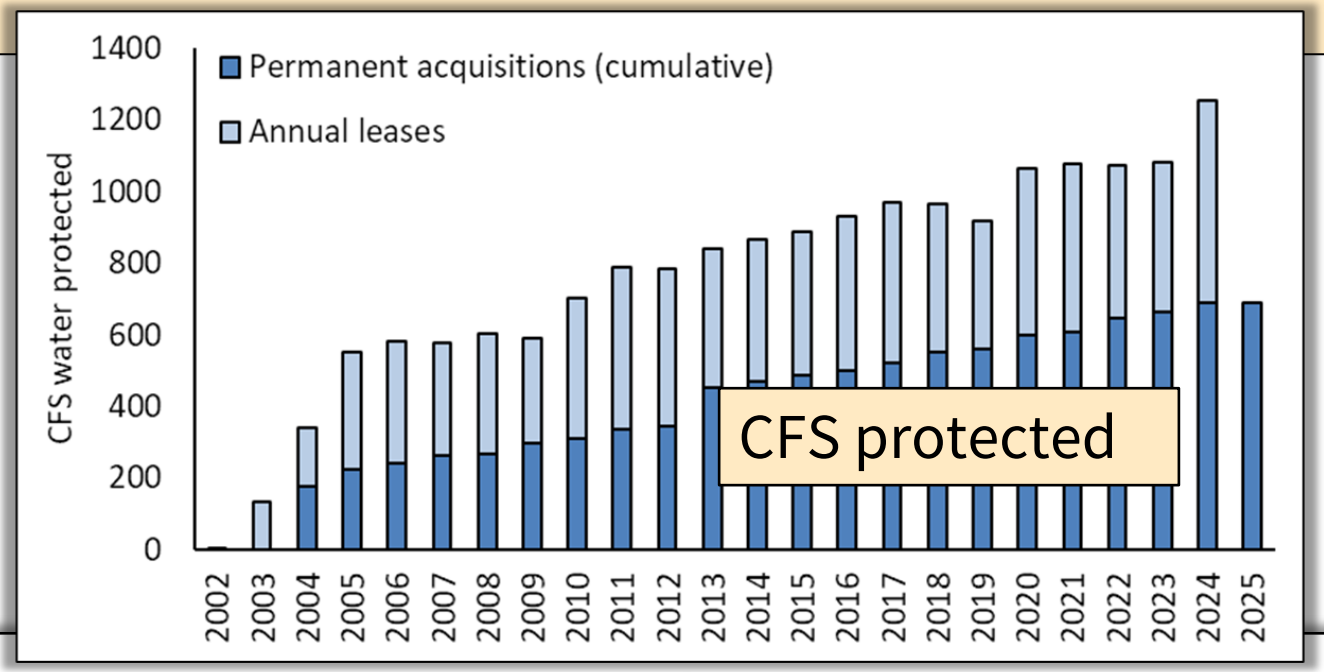
Objective E1: Contribute to maintaining and improving **habitat quantity, quality**, connectivity, and functions while taking into account **climate change**.

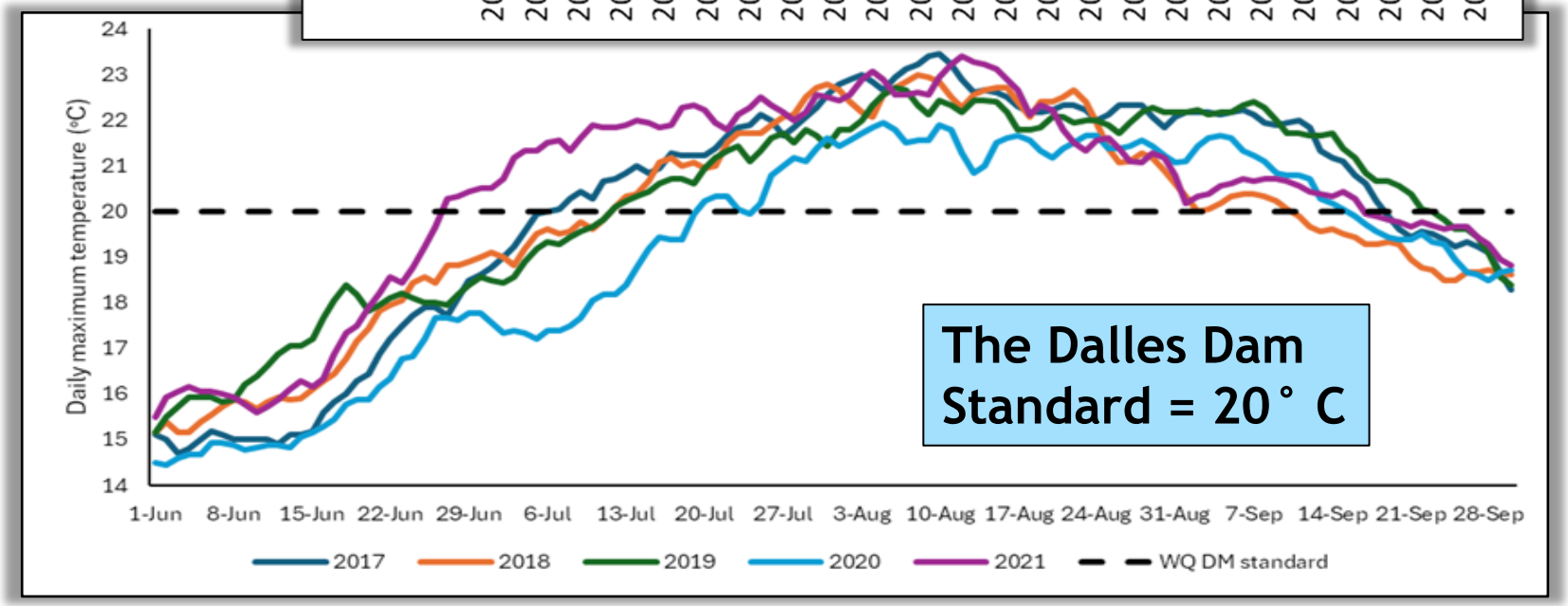
- Program efforts are part of tapestry of habitat restoration in basin
- November presentation on Habitat Categorical Assessment included examples of:
  - Restoration to improve habitat quantity, quality, and connectivity
  - How project sponsors are adapting project work in a changing climate



Goal 4: Ecology/ habitat- quantity and quality. **Objective E2:** Contribute to maintaining and improving **water**

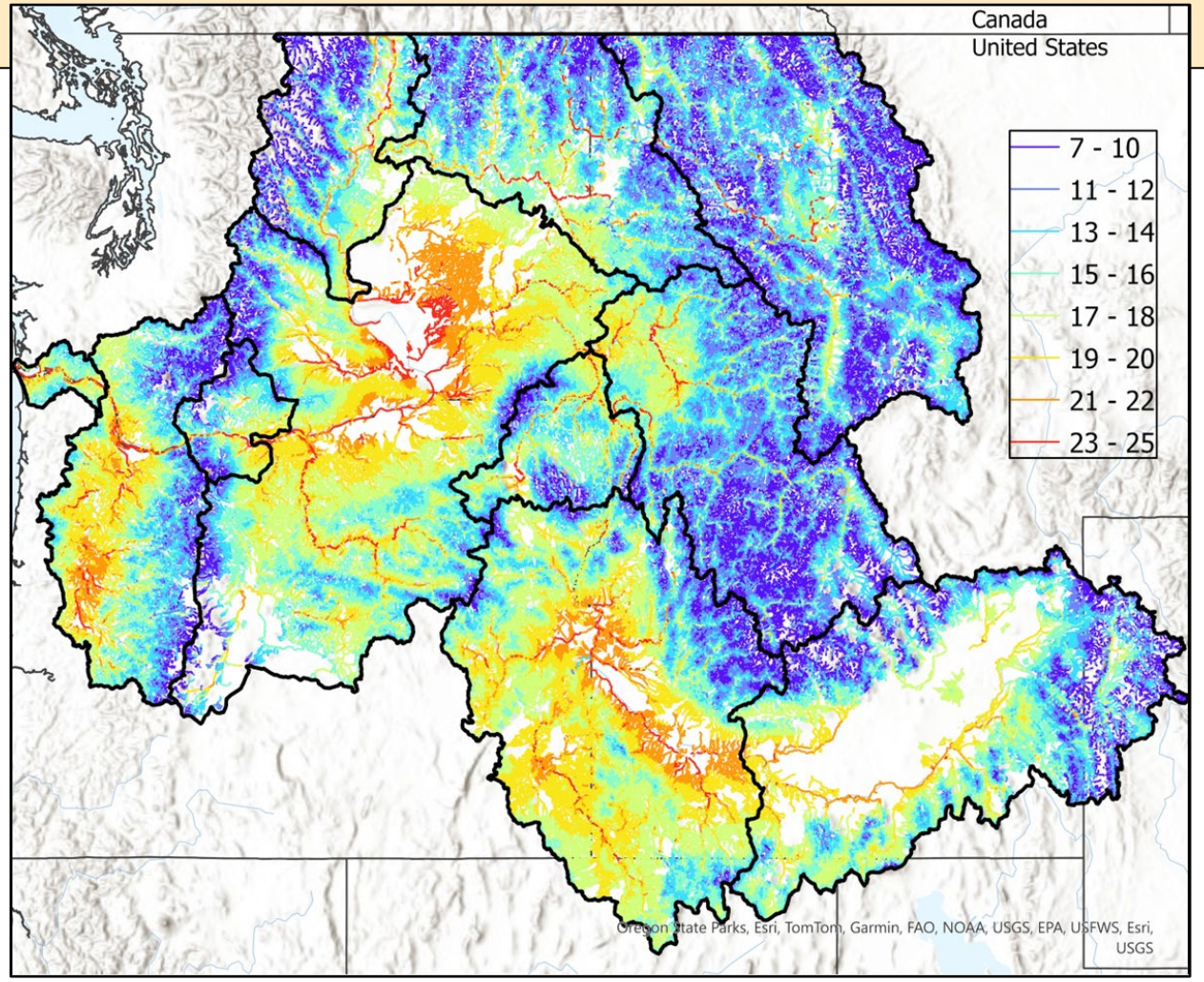
- November presentation on Habitat Categorical Assessment included examples of:
  - **Improving water quantity through acquisitions and leases** under the Columbia Basin Water Transactions Program
  - Water quality (temperature) conditions in the **mainstem** and tributaries now and under future climate conditions





<u>Goal 4: Ecology/ habitat- quantity and quality.</u> **Objective E2:** <u>Contribute to</u> maintaining and improving **water**

- November presentation on Habitat Categorical Assessment included examples of:
  - Improving water quantity through acquisitions and leases under the Columbia Basin Water Transactions Program
  - Water quality (temperature) conditions in the mainstem and **tributaries** now and **under future climate conditions**



- USFS RMRS NorWeST stream temperatures
  - Mean August temperatures (°C)
  - **Forecast = 2040**

Goal 4: Ecology/ habitat- **Objective E3:** Provide flows through the hydrosystem of sufficient quality and quantity to improve production, migration, and survival of both listed and key unlisted populations of anadromous and resident fish. … the Program's objectives include flow objectives and reservoir elevation targets recognized in the Program and in most cases embedded in the federal system operating plans.

- Power Act allows for modifying operations and structures of hydrosystem
- Flows around basin apply to different species or seasons
- Reviewed in great detail in Hydro assessment
  - Identified general constraints around flow management and prioritization and who and how flows implemented/ decisions made
  - *Generally* implemented as described

Identified key points to consider

- How to address cases of incomplete implementation? Are there missed opportunities to increase survival through existing operations?
- How to incorporate changing demands and operation of system now and into future?
  → Columbia River Treaty, ramp rates, spill, BiOPs, climate change, population growth
- Are operations adaptable? Flexible? Do they support system resilience?

Goal 4: Ecology/ habitat

Objective E4: Contribute to further reducing avian, pinniped and fish predators that negatively impact the habitat and populations of focal fish species in order to improve abundance and survival of these fish species.

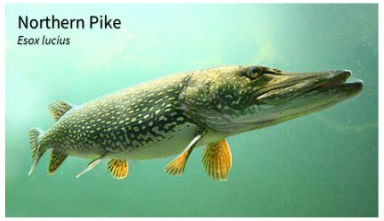
Covered in habitat categorical assessment in November

Avian
- Double-crested cormorants
- Terns

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

Fish
- Northern Pike
- Northern Pikeminnow
- Lake Trout

Predator management

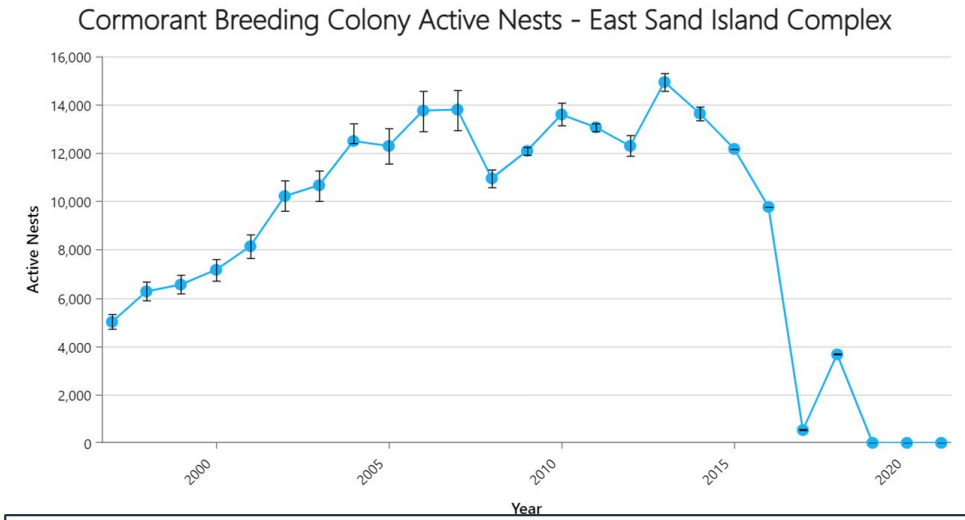


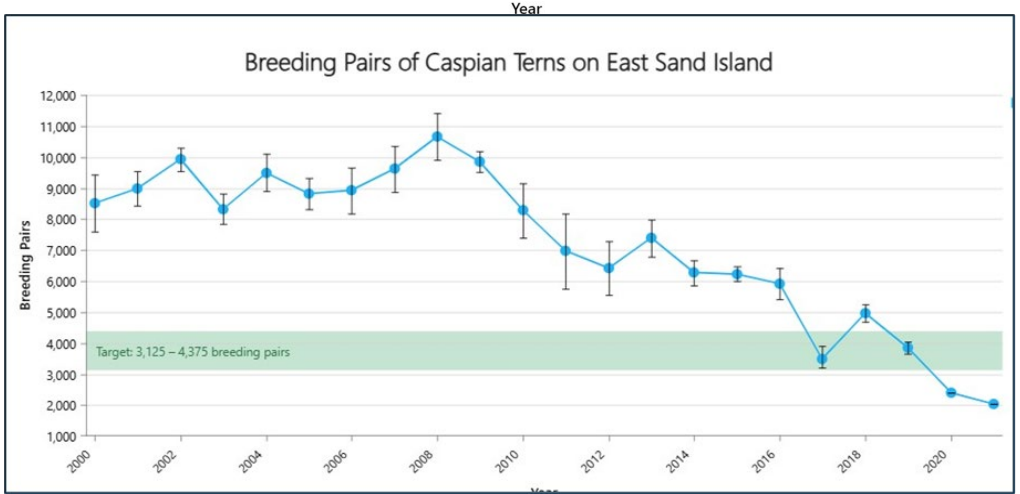
Current Strategy Performance Indicators
Caspian Tern (predation, breeding pairs)
Double-Crested Cormorant (colony size)
Northern Pikeminnow (exploitation rate)
Northern Pike (range, population)
Sea lions (population, consumption)
Lake Trout (abundance)

Predator species not currently managed
Walleye (non-native)
Bass
Pelicans

Goal 4: Ecology/ habitat

Objective E4: Contribute to further **reducing avian**, pinniped and fish predators that negatively impact the habitat and populations of focal fish species in order to improve abundance and survival of these fish species.





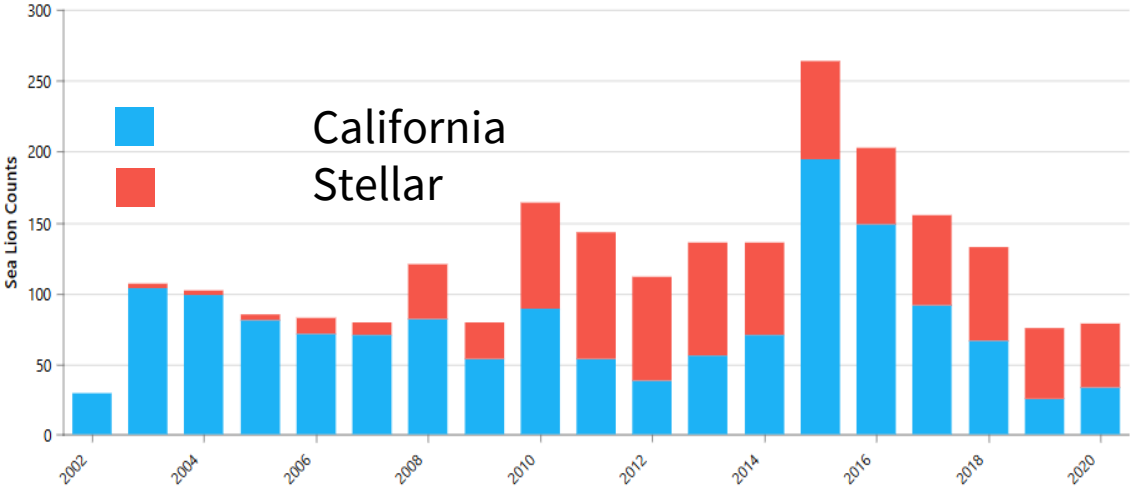
November presentation on Habitat Categorical Assessment included examples of:

- Population decline as a response to management in specific areas for both double-crested cormorants and Caspian terns.
- Actions meeting current management goals.
- Concerns remaining about the conservation status of these populations, especially Caspian terns.

Goal 4: Ecology/ habitat

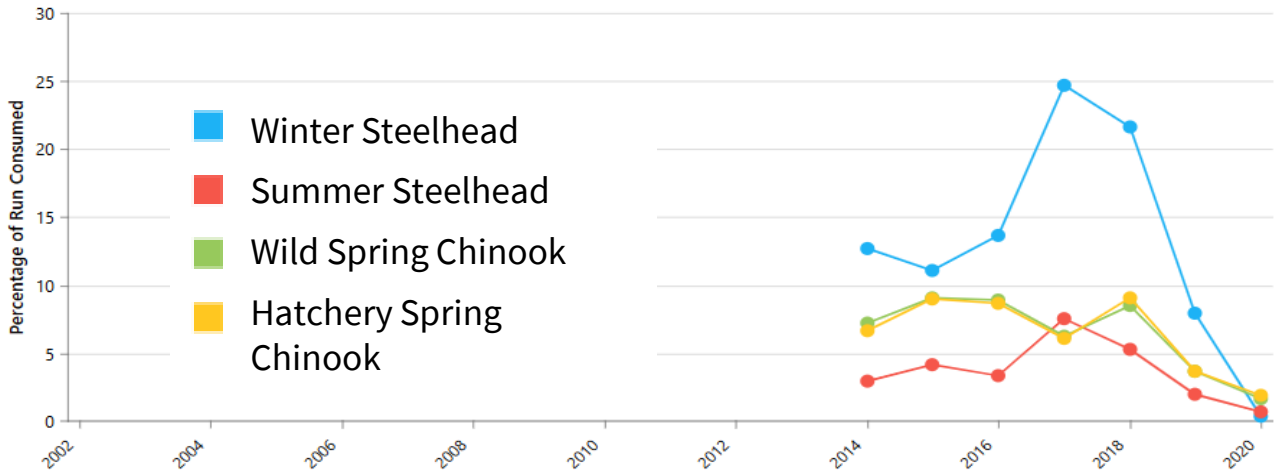
Objective E4: Contribute to further **reducing** avian, **pinniped** and fish predators that negatively impact the habitat and populations of focal fish species in order to improve abundance and survival of these fish species.

California and Stellar sea lion counts below Bonneville Dam 2002-2020



November presentation on Habitat Categorical Assessment included examples of:

- A population decline following management of California sea lions below Bonneville Dam while Stellar sea lions have maintained a more steady population.
- Direct reduction in predation rates on salmonids at Willamette Falls following pinniped management.



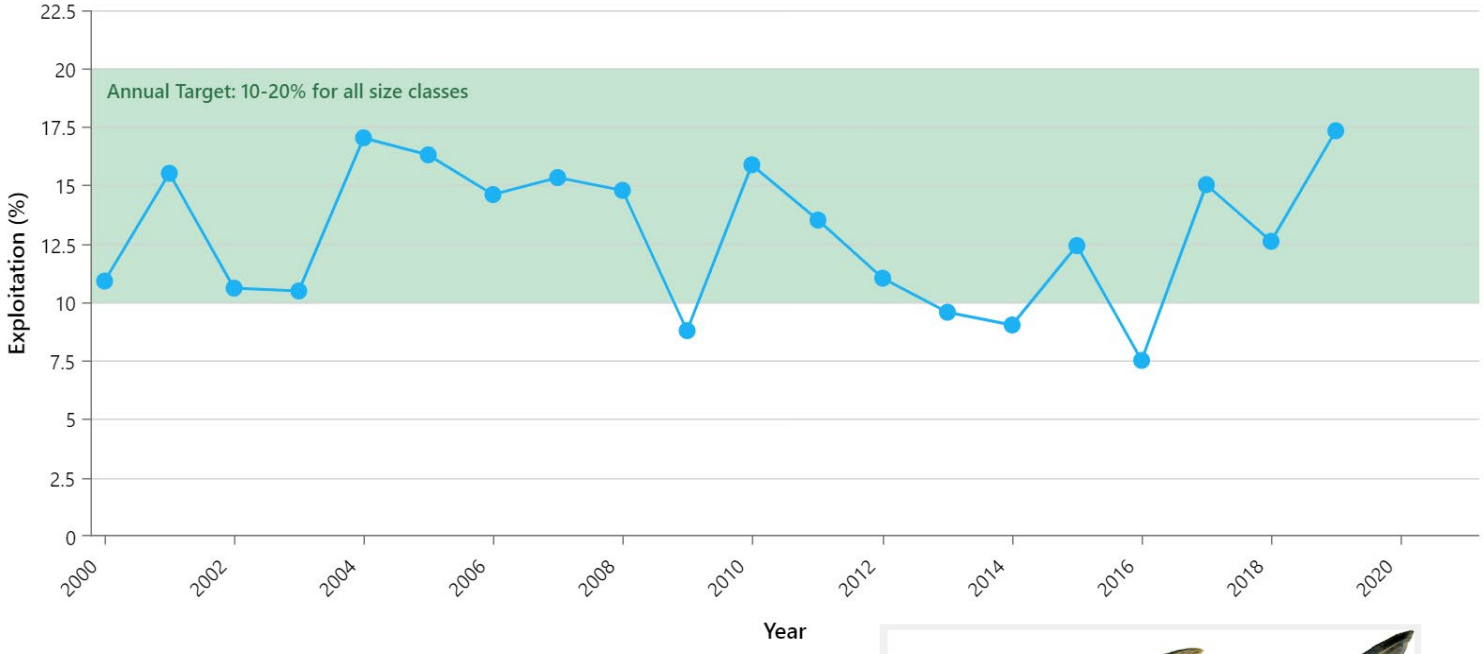
Goal 4: Ecology/ habitat

Objective E4: Contribute to further **reducing** avian, pinniped and **fish** predators that negatively impact the habitat and populations of focal fish species in order to improve abundance and survival of these fish species.

November presentation on Habitat Categorical Assessment included examples of:

- The annual target exploitation rate on Northern Pikeminnow has been met since 1997.
- Considered successful at meeting the management goal not to *eliminate* a native species, but to **reduce** the number of fish considered to have the heaviest impact on actively migrating juvenile salmon and steelhead.

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



Northern Pikeminnow

Goal 4: Ecology/ habitat

Objective E5: Contribute to management, prevention or eradication of non-native and invasive species in order to improve abundance and survival of focal fish and wildlife species

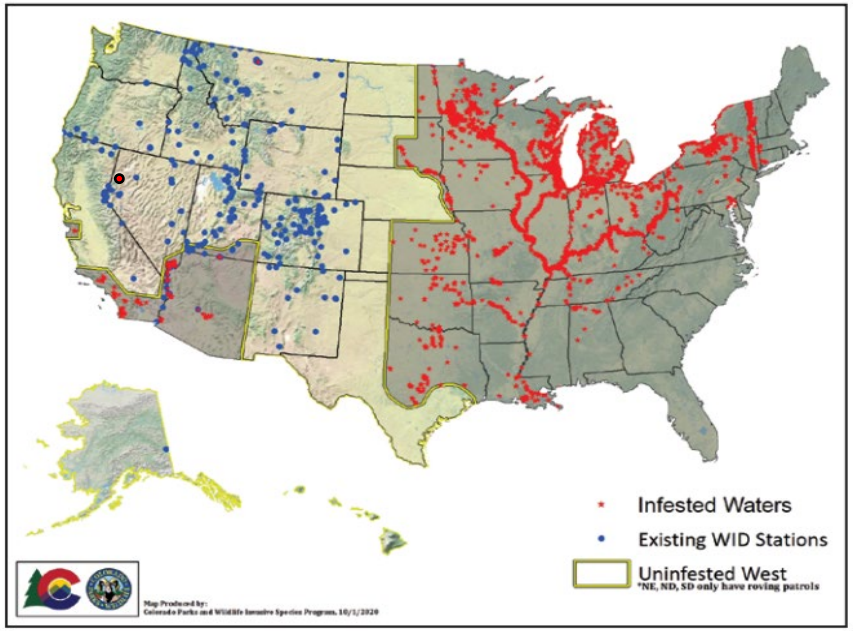
Covered in habitat categorical assessment in Nov

Extensive zebra and quagga monitoring programs exist and data are available in Strategy Performance Indicators.

Example non-native and invasive species **not** currently managed
Carp
Spotted Lanternfly
Invasive vegetation species
Non-native clams and snails
Tiger muskie
Red-eared slider turtles
European green crab

Goal 4: Ecology/ habitat

Objective E5: Contribute to **management, prevention or eradication of non-native and invasive species** in order to improve abundance and survival of focal fish and wildlife species



Zebra and Quagga Mussels

Economic Risks total a minimum of $34.5 billion

- Annual hydroelectric mitigation and maintenance
- Other infrastructure (hatcheries, irrigation, etc.)
- Agricultural production
- State boating related revenue annually
- Outdoor recreation

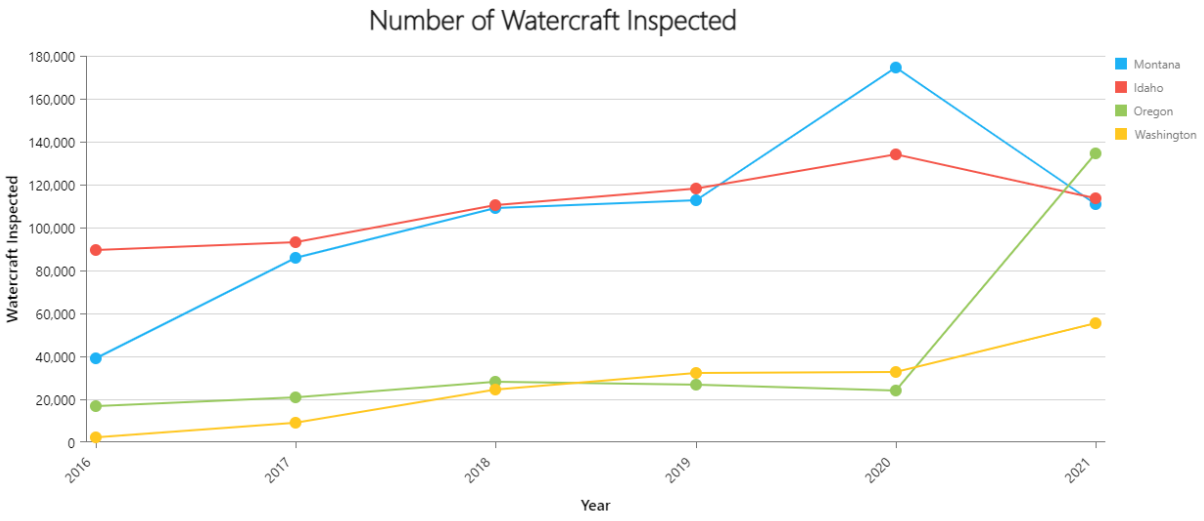
Information provided via August 2024 Council Meeting by WDFW/IDFG

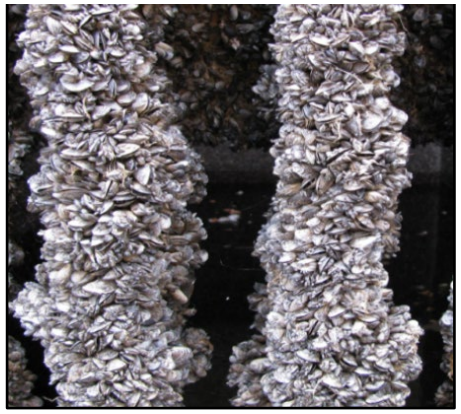
Environmental Risks

- Competition with native species
- Water quality changes
- Bioaccumulation of pollutants
- Severe risk to cultural resources, threatened and endangered species, and human health

Goal 4: Ecology/ habitat

Objective E5: Contribute to **management, prevention or eradication of non-native and invasive species** in order to improve abundance and survival of focal fish and wildlife species





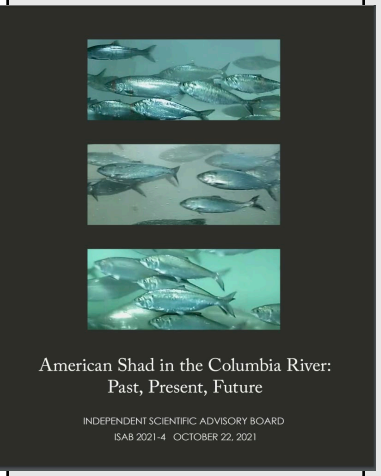
November presentation on Habitat Categorical Assessment included examples of:

- Intensive zebra and quagga mussel monitoring programs throughout the Basin, also coordination between states and tribes.
- Examples of current protocols implemented swiftly and effectively in real-time.

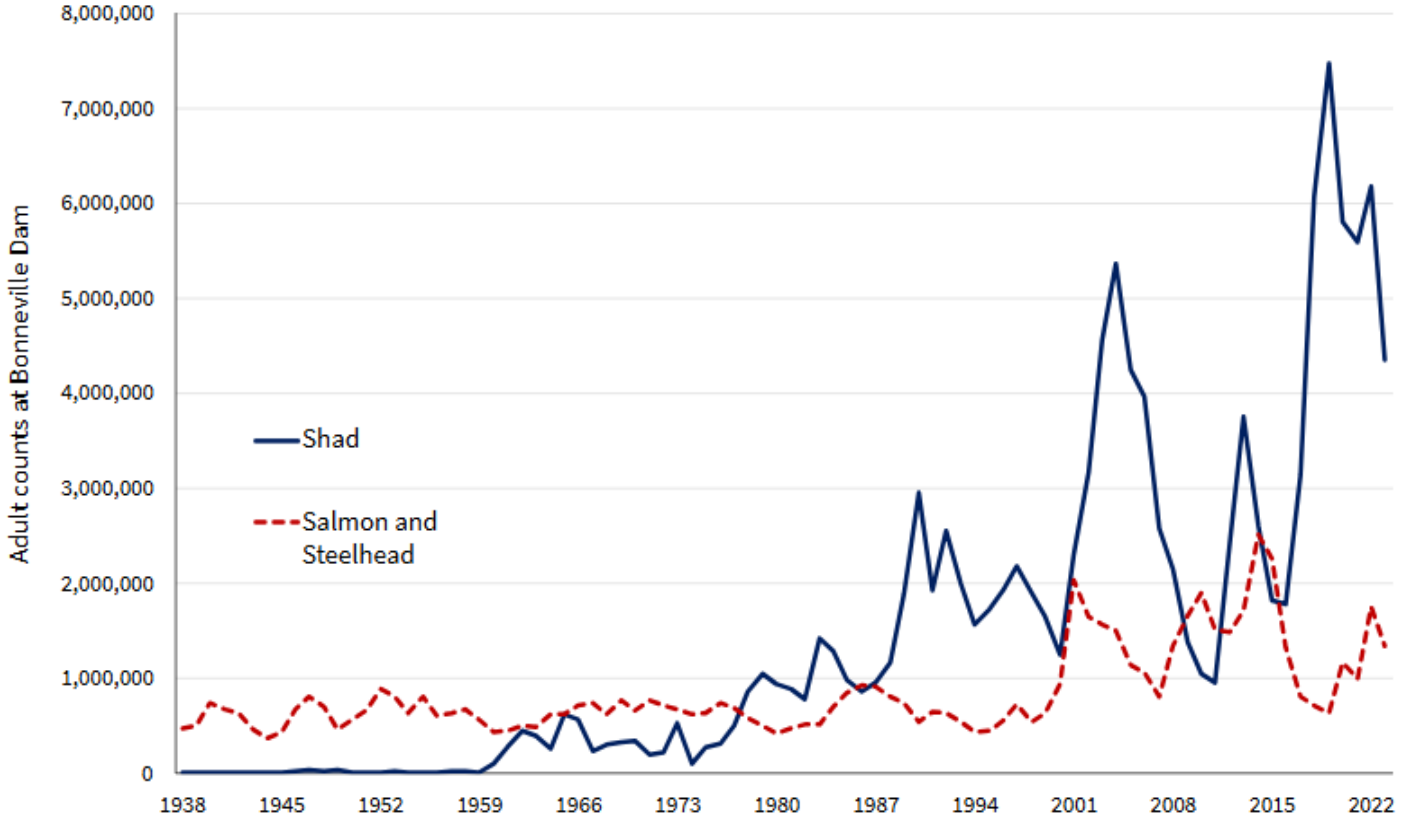
The 2014 Program called the introduction of zebra or quagga mussels “the greatest known threat in the Columbia River Basin from aquatic invasive species.”

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.



- **Example of a non-native species that is not currently being managed.**
- Known habitat and run-timing overlap between shad and salmonids.
- Long-running call for better understanding of the potential effects in FW Program.



Goal 4: Ecology/ habitat

Objective E6: Contribute to maintaining and improving habitat quality on land purchased or managed to mitigate for hydrosystem impacts on wildlife, resident fish, and/or anadromous fish by developing and using approved land management plans for all parcels purchased under the Program

- Land management plans required for all parcels purchased under Program
- Approximately 55% of parcels currently have approved plans in CBFish; additional plans exist elsewhere (e.g., within agencies)
  - Continued need to bring full set of plans into one location
- Plans form basis for tracking conservation value of parcels over time
  - Value is tracked by entities managing the land and reported through annual reports on CBFish
  - BPA also uses remote sensing to track implementation of agreed upon objectives in plans
- Difficult to compile information on conservation value of parcels- would benefit from centralized database

Questions on Ecology/ Habitat Goal/ Objectives?

Goal

E1 - Habitat quantity and quality
E2 – Water quantity and quality
E3 – Provide flows
E4 – Reduce predation
E5 – Manage non-native/invasive species
E6 – Management plans for acquired lands

Outline

- Status of goals and objectives
- Revised Program Tracker
- Discussion

- https://projects.nwcouncil.org/programtracker/modules/assessments/indicators?indicatorId=1

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

Goals and objectives

Performance indicators by Program goal

ANADROMOUS SALMON AND STEELHEAD

Mainstem hydrosystem flow and passage

Fish propagation and hatchery

Wild fish

Anadromous fish in blocked

OTHER NATIVE AQUATIC SPECIES

White sturgeon

Pacific lamprey

Eulachon

Resident fish

Predator management

WILDLIFE

Wildlife mitigation

ECOLOGY/HABITAT

Habitat

Water quality

Mainstem hydrosystem flow and passage

Predator management

OUTREACH, COORDINATION, ASSESSMENT

Public engagement

Protected areas and hydroelectric development/licensing

- Revised Program Tracker to include goals and objectives
- Will be updating visuals over next few months to include information from this presentation
- Tracker includes:
  - High level visual summary, link to associated SPIs, notes on data sources, context

Outline

- Status of goals and objectives
- Revised Program Tracker
- Discussion

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

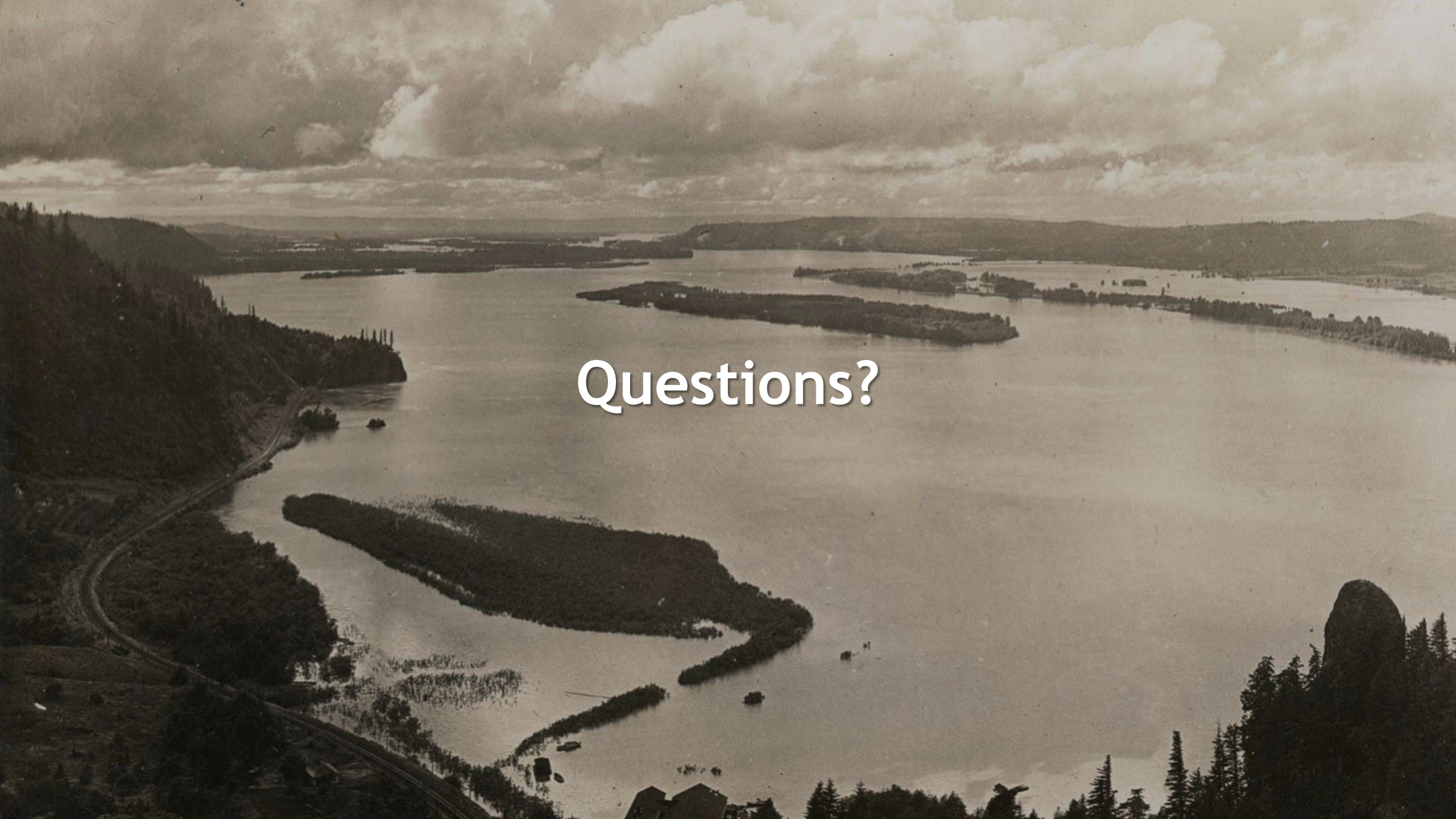
Discussion topics

What do we need to think about leading up to the next amendment?

- Some goals / objectives not trackable because data not available
  - Some qualitative objectives could be refined to become trackable
- Is there language describing goals or objectives that needs to be updated?
- Are additional goals or objectives needed?

As the priorities or conditions of the Basin change, are goals and objectives still appropriate? adaptable?

- How are measures/goals incorporating or planning for future change or flexibility/ supporting system resilience?


Questions?