January 7, 2025

MEMORANDUM

TO: **Council Members**

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

SUBJECT: **Briefings on the current Columbia River Basin Fish and Wildlife Program: (1) current structure and organization of the Fish and Wildlife Program and (2) Hydropower operations review**

BACKGROUND:

Presenter: Patty O'Toole, Fish and Wildlife Division Director, John Shurts, General Counsel, and Kate Self, Fish and Wildlife Program Scientist

Summary: The January 2025 Council Meeting, in addition to the decision on the letter requesting recommendations, will include two briefings on topics relating to the content and implementation of the Council's Columbia River Basin Fish and Wildlife Program. The first briefing covers the current structure and organization of the Program and the second covers current hydrosystem operations. These are the first in a series of such briefings over the next several months. All of these are background briefings on the program to prepare the members for the upcoming Program amendment process.

Relevance: The Council is initiating the next Fish and Wildlife Program amendment process in January 2025. Council staff provide briefings on foundational elements of the Program to aid that process.

Background: The first of two Program briefings this month will be about the structure and organization of the program. Patty O'Toole will cover that briefing, with assistance from division staff and John Shurts, General Counsel. This topic may seem obvious, but members should be aware there is a history and purpose to this part of the Program.

As the Program has built up and matured over the last 40 years, its organization, the range of strategies, and the specificity of measures has changed. As an example, Programs in the 1980s included lists of measures to be implemented by identified parties on identified timelines. Contemporary Programs include a range of specific measures, general measures, and references to details provided in other documents, like biological opinions or subbasin plans.

Key regional events- like Endangered Species Act listings, and scientific reviews- like the ISG's review of the 1994 Program, played pivotal roles in shaping the evolution of Program structure and content. The 2000 Program reflects that pivot, with the development of a Program framework that connected goals and objectives to the implementation of strategies and measures. Staff will go into this framework in detail, including the scientific critiques of the 1994 Program that led to development of the framework. Lastly, staff will review the structure of the 2014/2020 Program.

The second briefing is a review of current hydropower operations for fish and wildlife, in the context of other system operations. The Council has received several briefings from the staff in the last two years on the implementation and performance of hydropower operations intended to improve conditions for salmon, steelhead and other fish spawning, rearing and migration through the system. This briefing will step back and simply describe what the current set of operations are and some of the issues surrounding operations. This briefing will be by John Shurts and Kate Self of the division. The outline for this briefing is attached below.

More Info: Attachment 1: Hydro primer outline

Links to previous hydrosystem briefings:

- October 2023: Hydrosystem Categorical Assessment: Overview and Examples and video
- September 2024: Fish and Wildlife Program Performance: Hydrosystem Categorical Assessment and video

Attachment 1. Hydro primer

Dams and hydrograph – unregulated/regulated flow profile; storage volumes in relation to runoff

Operations to benefit fish: Sources

- BiOps/CRSO EIS/RODs
- Program
- Accords
- (Court Orders)
- 2023 RCBA settlement
- Annual Water Management and Fish Passage Plans
- In-season Management
- Treaty Operations

Storage reservoir operations

Sources: esp BiOps/CRSO EIS (and Program); not 2023 settlement

Annual rhythm – seasonal characteristics

- Be at but not below early spring flood control minimum – rule curves based on runoff forecast
- Through spring - store + pass inflows
  - Lower river flow objectives – McNary/LG
  - Libby sturgeon pulse releases
- High priority refill by summer target dates
- Draft summer-early fall - change
  - Lower river flow objectives
  - Late summer temperature control (e.g., Dworshak)
  - Limits on releases - steady flows and steady declining elevations (Libby/HH)
- End of summer elevations – e.g., HH and Libby
- Fall/winter drafting mostly for power, but with other considerations, such as…
  - support for Vernita bar operations – fall chinook spawning, emergence, rearing fall into spring

support for chum flow operations

Draft but do not go so deep you won't be able to be … at but no lower than early spring flood control minimum

A word about Grand Coulee operations …

A word about the effect of Columbia River Treaty operations

basic pattern of flood risk management/coordinated power ops – flows across the border

annual non-power use agreement

CRT Agreement in Principle – frm, nonpower 1 to 1.5 MAF; coordinated power ops

effects in US – GC; John Day

Storage operations/flow objectives for fish – seasonal averages only; no daily standards/limits/targets, outside of "minimize ramping" and some minimum flow levels (see below)

Climate change considerations

Run-of-the-river dam operations (lower Columbia and lower Snake + mid-Columbia PUDs)

<u>Sources:</u>

BiOps/CRSO EIS preferred alternative

Program/Accords

2023 RCBA settlement

Juvenile salmon passage and routes – turbines; screens and bypass systems; collection; spill – and adult passage and relationship to operations

Spring Chinook

Other salmon and steelhead

Lamprey/sturgeon?

Spill operations –current sources: mainly 2023 RCBA

Spring

"125 TDG Gas Cap" 24 hours a day

John Day and the Dalles

Transmission support; reserves; reliability

Summer – one spill pattern for June and July; spill reduces August 1

Fall/winter – spillway weir spill for some period every day from Sept thru Nov 15 and in March; purpose, including flows; zero generation issue in Snake

Pool operations – importance

A note about pools and storage – especially John Day

Importance – especially velocity

Lower Snake: 1.5 MOP – within 1.5 feet of minimum operating pool in Snake during juvenile migration

Lower Columbia – wider pool ranges

John Day and FRM: elevation 262.5 to 264.5 (MIP+2 range) spring migration, 262-266.5 (operating range outside of migration), 268 (max), 257 (absolute min – FRM effects)

Flows – in large part determined by storage reservoir operations and base flows; but run-of-the river dam/pool operations effects

Velocities and pool elevations

Minimum generation amounts

Total minimum flow – spill + minimum generation

Daily ramping

Winter in the Snake – zero generation at night

Hanford Reach fall chinook flows – Priest Rapids operations

Chum flows in November – Bonneville operations

Columbia River Basin Fish and Wildlife Program

Organization, structure and framework

Council meeting

January 14, 2025

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

Outline of staff briefing

I. Program Structure and Organization

II. Fish and Wildlife Program Framework

- Origin of the current Framework: The Scientific Critique of the 1994-95 Program
- 2000 Program and the Program Framework: Elements, Geographic Structure, Conceptual Foundation, Basinwide Provisions
- Mainstem (2003) and Subbasin (2004-05) Plans
- Relevance today?

III. Current 2014/2020 Program

Adaptive Management / Program Performance, Overview only

I: Program Structure and Organization-bit of history

Year	Description	Program organization
1982	1st Program	List of measures primarily organized by salmonid life stages and with emphasis on the hydrosystem
1984	*Minor amendment*	
1987	2nd Program	List of measures primarily organized by salmonid life stages and with emphasis on the hydrosystem; loss assessments; interim double-the-run goal, simple framework
1988	*Protected Area Rules*	
1989	*Wildlife Rules*	
1991-1993	3rd Program	Four-part amendment
	Part 1: Highest priority production and habitat actions	
	Part 2: Mainstem survival and harvest	Strategy for salmon, simple basinwide & salmon framework
	Part 3: System integration	Strategy for salmon
	Part 4: Resident fish and wildlife	
1994	4th Program	Comprehensive Program; long list of specific measures; subbasin plans used to prioritize and implement habitat restoration; simple basinwide and salmon framework, goals for basinwide, salmon, resident fish, wildlife
1995	*Resident fish and wildlife*	

Year	Description	Program organization
2000	5th Program	Scientific (detailed) framework, basinwide measures, principles, goals, and objectives; intended to be implemented through mainstem and subbasin plans
2003	*Mainstem amendments*	
2004	*Adopt 18 subbasin plans*	
2005	*Adopt 20 subbasin plans*	
2009	6th Program	List of principles, strategies and measures within scientific framework; appendix contains BiOp and subbasin-scale measures, along with goals and objectives
2010	*Adopt 1 subbasin plan*	
2011	*Adopt 1 subbasin plan*	
2014	7th Program	List of principles, strategies and measures within scientific framework; appendix contains BiOp and subbasin-scale measures, along with goals and objectives
2020	Part 1 = Goals, objectives, strategy performance indicators	
2020	Part 2 = near term priorities	

Examples of early program structures/organization - 1987

Program Overview
- Section 100: Introduction

Salmon and Steelhead
- 200: Framework
- 300: Water budget & mainstem flows
- 400: Downstream passage
- 500: Harvest management
- 600: Upstream migration
- 700: Wild, natural & artificial propagation
- 800: Yakima River Basin

Resident Fish and Wildlife
- 900: Resident fish
- 1000: Wildlife

General
- 1100: Future hydroelectric development
- 1400: Five-year action plan 1987-1991

Sections organized by:

- **The problem**
  - Statement of what needs to be addressed
- **The remedy**
  - Approach to address problem – connects all measures to desired outcome
- **Measures**
  - Numbered, specific language on what will be done, who will implement, who will fund, when will it be done, may contain benchmarks or reporting obligations

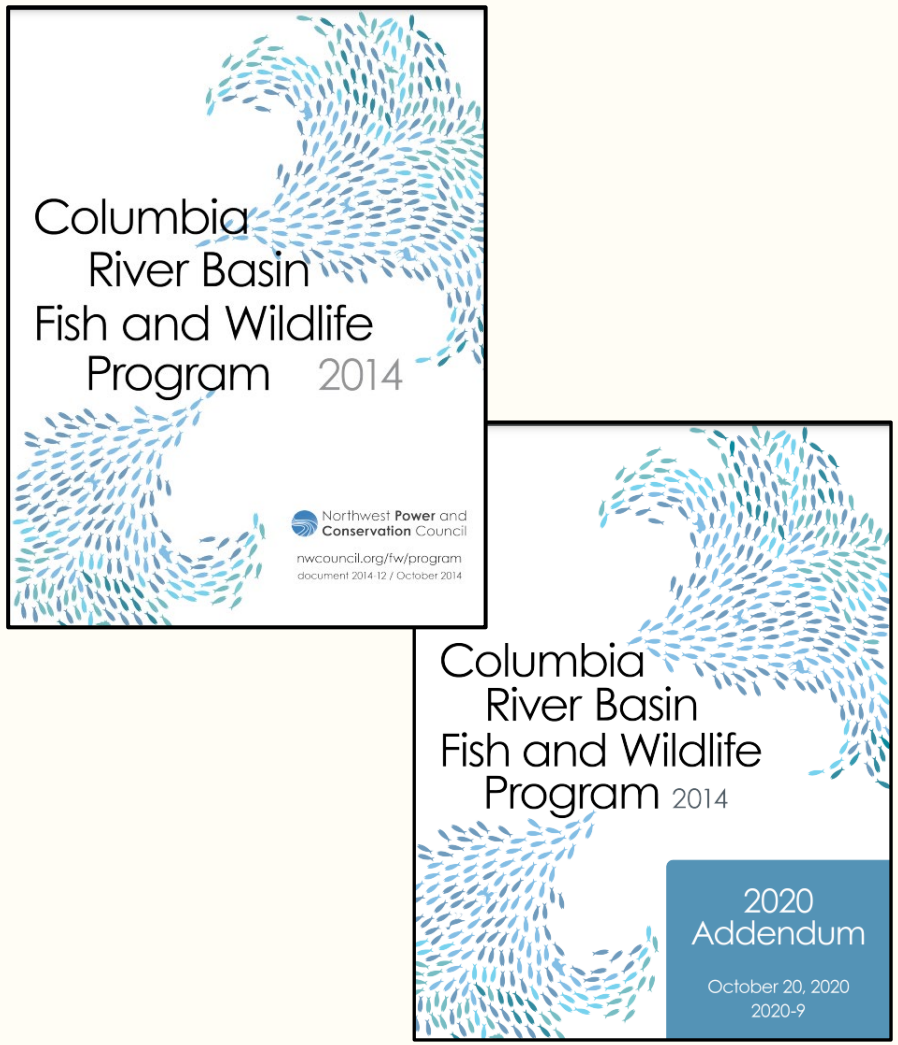
Examples of **early** program structures/organization – 1994

1: Introduction – Columbia River Basin Fish and Wildlife and the Northwest Power Act
2: Systemwide goal and framework
3: Coordinated implementation, RM&E
4: Salmon goal and framework
5: Juvenile salmon migration
6: Adult salmon migration
7: Coordinated salmon production and habitat
8: Salmon harvest
9: Mitigation for adverse effects of salmon and steelhead measures
10: Resident Fish
11: Wildlife
12: Future hydroelectric development
13: Amendment process, etc.

- Program no longer contains action plan, significant expansion since 1987
- Sections begin with background on issue, status of implementation, and overview of key measures
- Subsections ordered by process (e.g., develop harvest goals, adopt exploitation rates, develop alternative harvest opportunities, stock ID, etc.)
- Measures: Numbered, specific language on what will be done, who will implement, who will fund, when will it be done, may contain benchmarks or reporting obligations

II. Fish and Wildlife Program Framework

Fish and Wildlife Program Framework:



- Origin and organizing concepts and components
- Framework elements
- Present/future

Origin of the Program Framework (1)

- *Return to the River* and *Upstream*: Strong scientific critiques of Columbia River fish and wildlife activities.
  - *Return to the River* in particular was a comprehensive critique of the 1994-1995 Fish and Wildlife Program, called for by the Council.
  - Main point: the Fish and Wildlife Program was a collection of good things to do, but lacked an explicit underly foundation linking the actions to the Program goals.
- First ISRP reviews in the late 1990's added weight

Origin of the Program Framework (2)

Scientific critique had two parts:

1. Structure: Need for an explicit program framework that would link actions to immediate objectives, and those objectives to broader and less immediate program goals, a framework replicated in more specificity at smaller geographic levels.

2. Content: A conceptual foundation of substance rooted in scientific principles. Many possible conceptual foundations; scientists recommended a habitat-based foundation rooted in conservation biology principles.

How the critique was addressed:

- From 1996-1999 the Council worked with regional partners to develop a new program framework (staff issue paper, Ecological Working Group, the "Multi-species framework process")
- Used in the 2000 Fish and Wildlife Program to incorporate the new framework and begin a comprehensive revision of the Fish and Wildlife Program (completed in 2005)

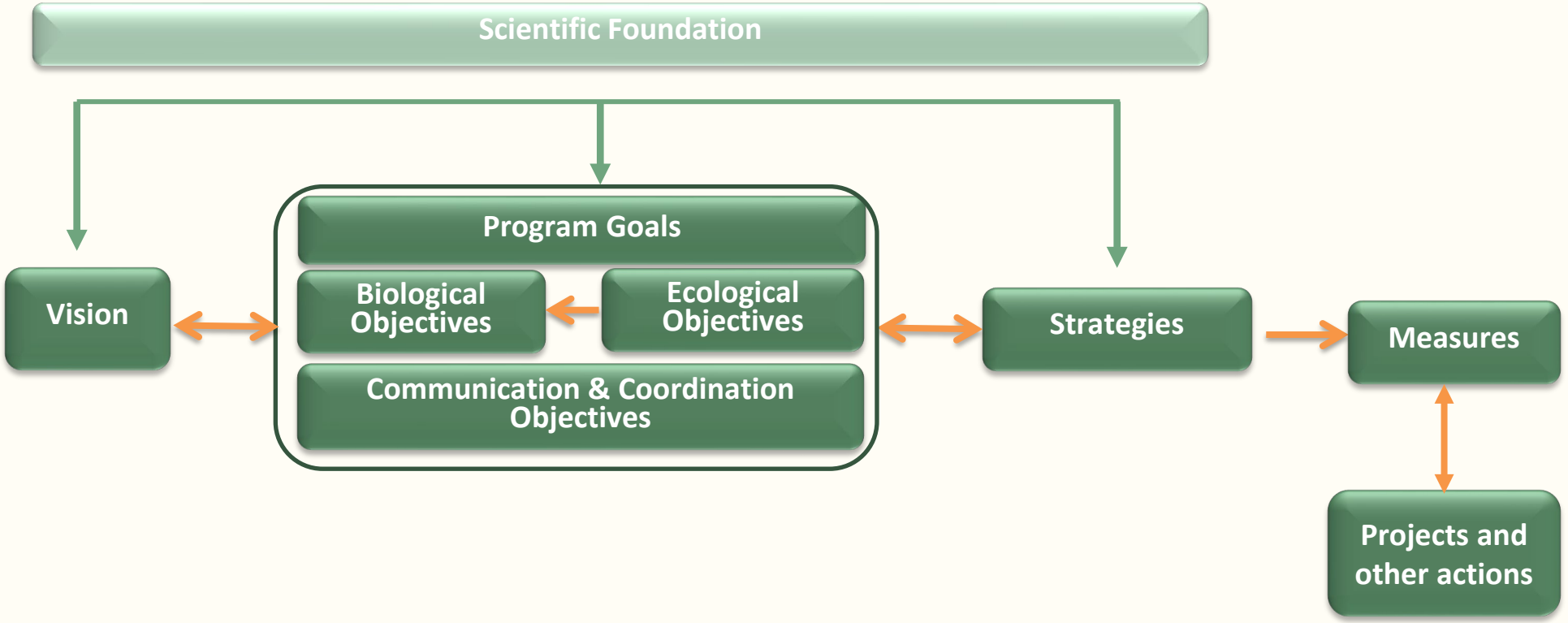
Fish and Wildlife Program Framework (1): Elements

- **Vision:** What does the region want from the Program and the Columbia River Basin?
- **Biological performance (goals and objectives):** What fish and wildlife performance do we need to get us to our vision?
- **Environmental characteristics (objectives):** What environmental characteristics do we need to get that biological performance?

Fish and Wildlife Program Framework (2): Elements

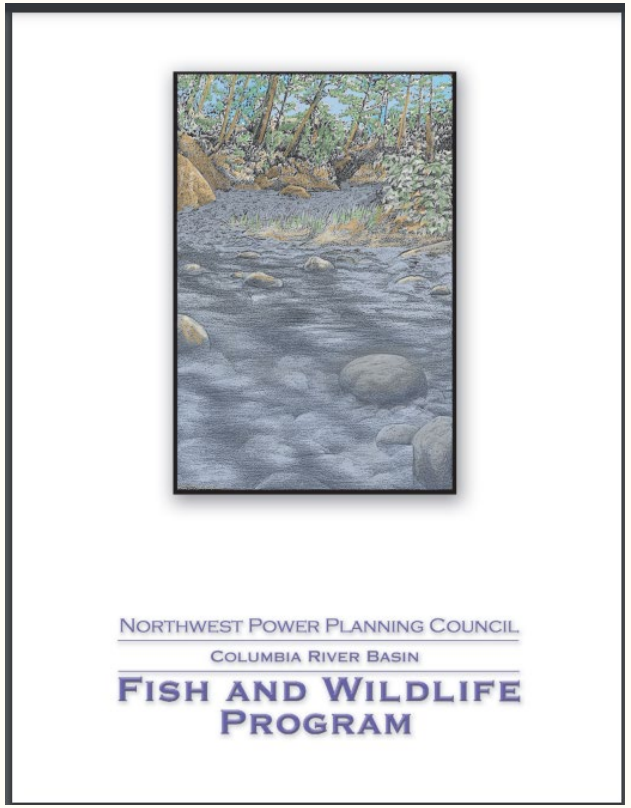
- **Strategies:** What types of action should we take to achieve those characteristics?
- **Scientific Foundation:** The science principles that support the relationships between actions, environmental characteristics and biological performance.
- **Geographic structure:** Basin, Eco-province, Subbasin, Population

Fish and Wildlife Program Framework



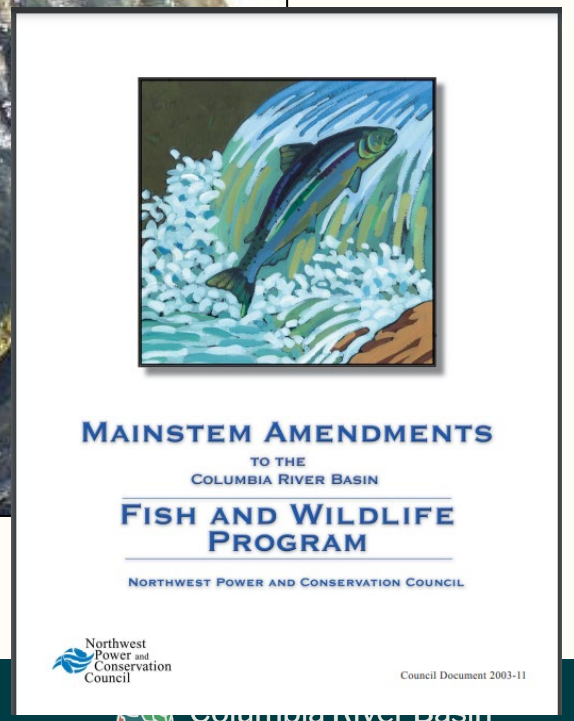
F&W Program Framework (3)
Comprehensive revision of the F&W Program

- **2000 Program:** New Program Framework, including geographic structure; basinwide provisions embedding a habitat-based conceptual foundation



F&W Program Framework (4)

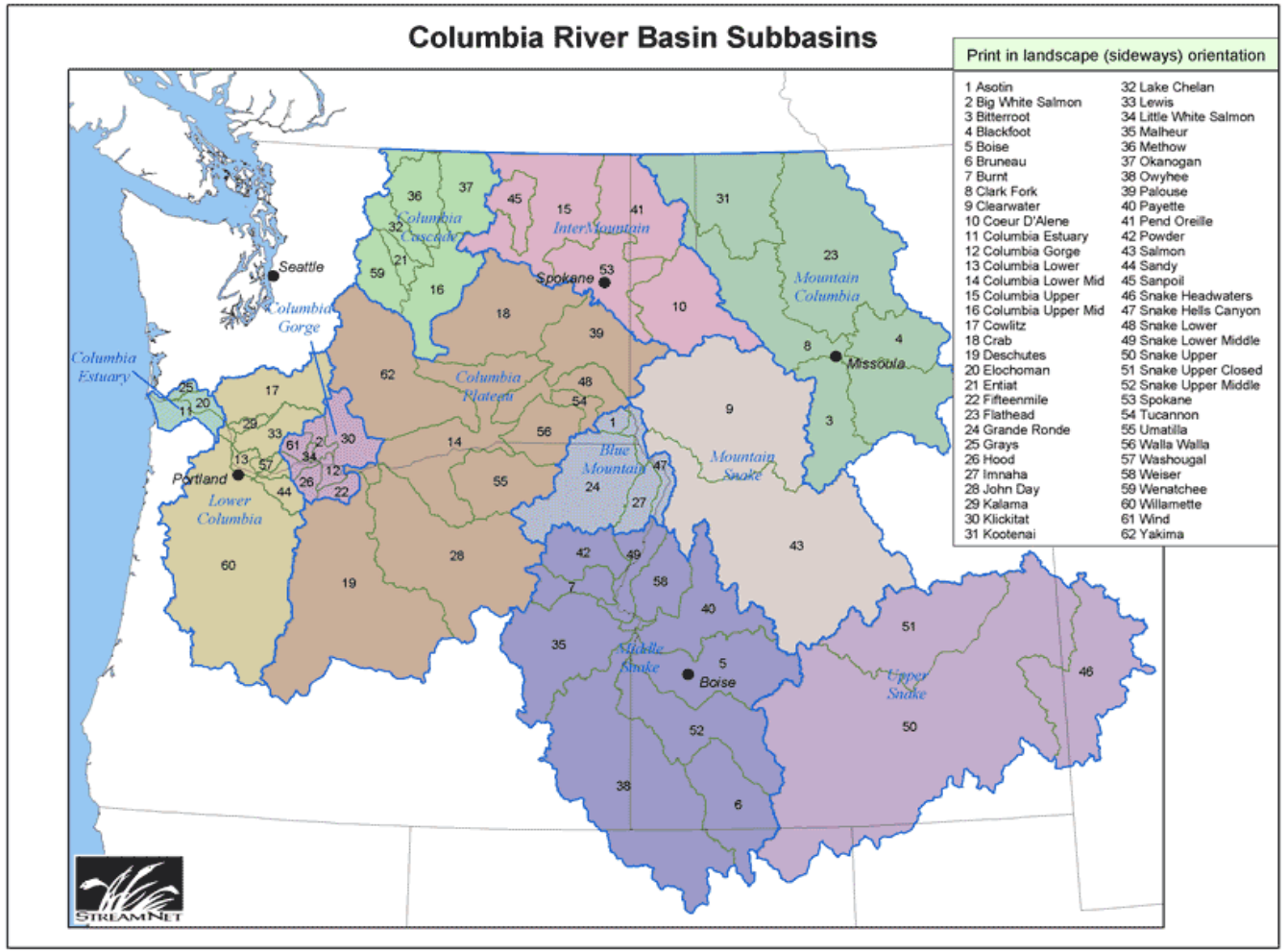
- Comprehensive revision of the F&W Program:
  - 2000 Program
  - 2003 Mainstem Plan: specific objectives and measures for mainstem operations tied to new Program framework



F&W Program Framework

- Comprehensive revision of the Fish and Wildlife Program
- 2000 Program
- 2003 Mainstem Plan
- 2004-2005 Subbasin Plans
  - Specific objectives and measures for tributaries, estuary and mainstem reaches tied to new Program Framework

- Missing piece? Ecological Province objectives?



Program Framework: present/future

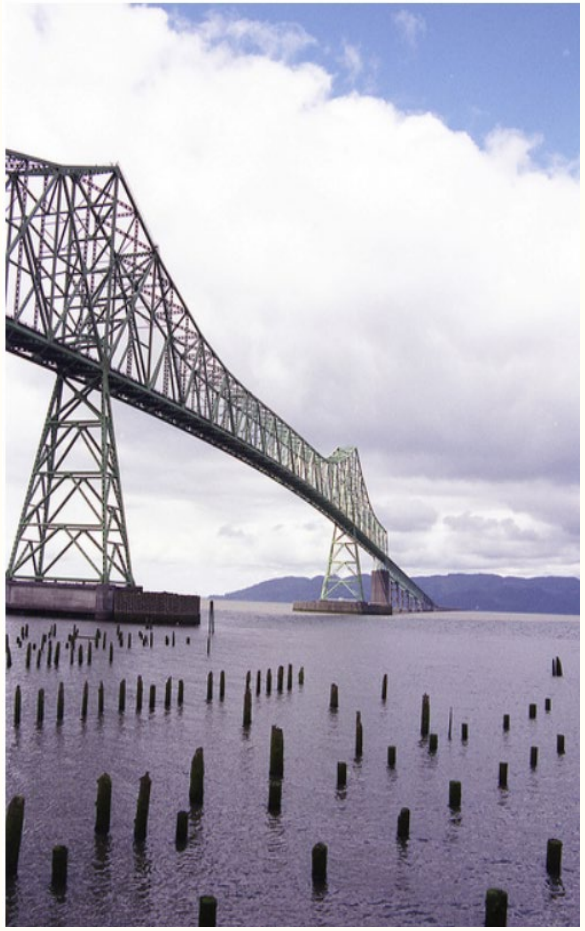
- Framework defines relationships among program elements (objectives, strategies, measures)
- Program framework remains sound, both in elements/structure and in basic conceptual foundation rooted in conservation biology principles.
- Program biological objectives at the basin level were refined in 2020 and reported in 2024.
- ISAB suggested revisions to vision, science principles, continued development of SMART objectives, but noted framework remains “critical”.

Additional considerations

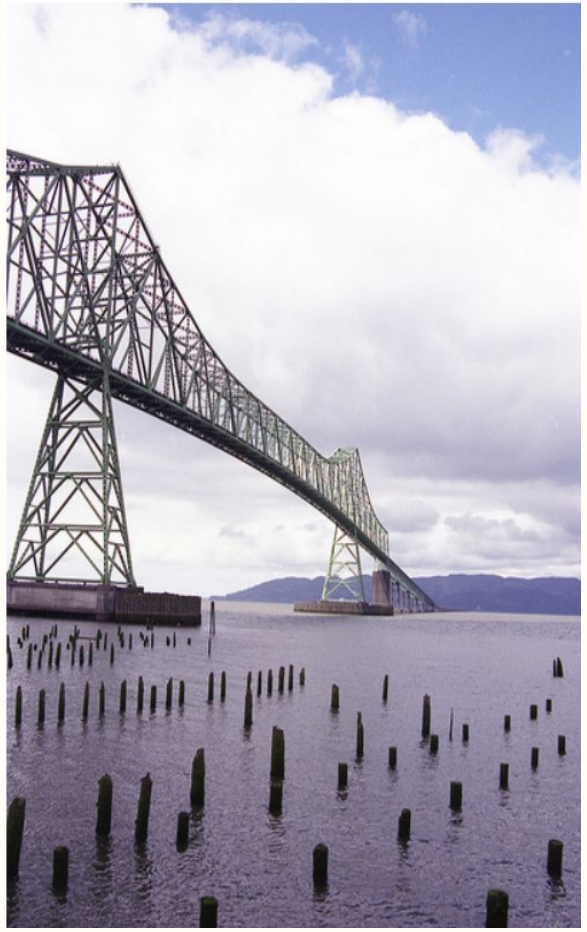
- Program goals and objectives are basin wide
  - Program biological objectives at *ecological province level* remain a gap.
- Program is designed to be implemented through mainstem plans and subbasin plans, while meeting scientific principles. Also relies on externally developed measures in BiOps
  - Subbasin plans 20 years old
  - Does implementation sync up with measures in the Program? How can this be improved?
- We observe a disconnect of scale of objectives and scale of implementation. This makes it hard to know how much to implement to reach the broad objectives.
- Should we find opportunities to explicitly connect implementation to objectives?
- Adding specificity to the Program would allow to track implementation and progress.

III. Current Program 2014/2020

High level view- 2014



- Part One: Overview
- Part Two: Introduction
- Part Three: Basinwide Vision, Scientific Foundation, Goals, Objectives, and Strategies
- Part Four: Adaptive Management
- Part Five: Subbasin Plans
- Part Six: How the Program is Implemented
- Part Seven: Appendices



Part One: Overview

I. The Columbia River Basin

II. The Northwest Power and Conservation Council and the Columbia River Basin Fish and Wildlife Program

Part Two: Introduction

I. The program framework

A. Geographic structure

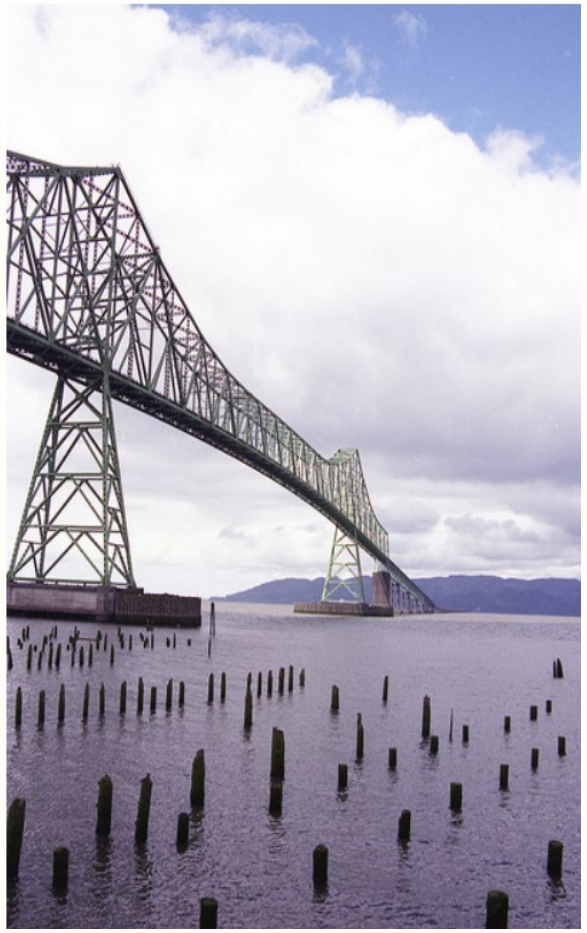
II. Legal and social context of the program

III. Assuring the Pacific Northwest an adequate, efficient, economic and reliable power supply

IV. Program progress

A. Program successes

B. Program challenges



Part Three: Basinwide Vision, Scientific Foundation, Goals, Objectives, and Strategies

I. Vision for the Columbia River Basin

II. Scientific foundation and principles of the program

III. Goals and Objectives - the changes we want to achieve

A. Program goals and quantitative objectives

1. Refining program goals and quantitative objectives

IV. Strategies - how the program will achieve the changes

A. Ecosystem function

1. Habitat
2. Strongholds
3. Non-native and invasive species
4. Predator management
5. Protected areas and hydroelectric development and licensing
6. Water quality
7. Climate change
8. Mainstem hydrosystem flow and passage operations
9. Estuary
10. Plume and nearshore ocean
11. Wildlife mitigation

B. Fish Propagation Including Hatchery Programs

C. Other strategies

1. Wild fish
2. The use of hatcheries for reintroduction
3. Anadromous fish mitigation in blocked areas
4. Resident fish mitigation
5. Sturgeon
6. Lamprey
7. Eulachon
8. Public engagement

Part Four: Adaptive Management

Part Five: Subbasin Plans

Part Six: How the Program is Implemented

I. Program measures

II. Investment strategy (inc. priorities)

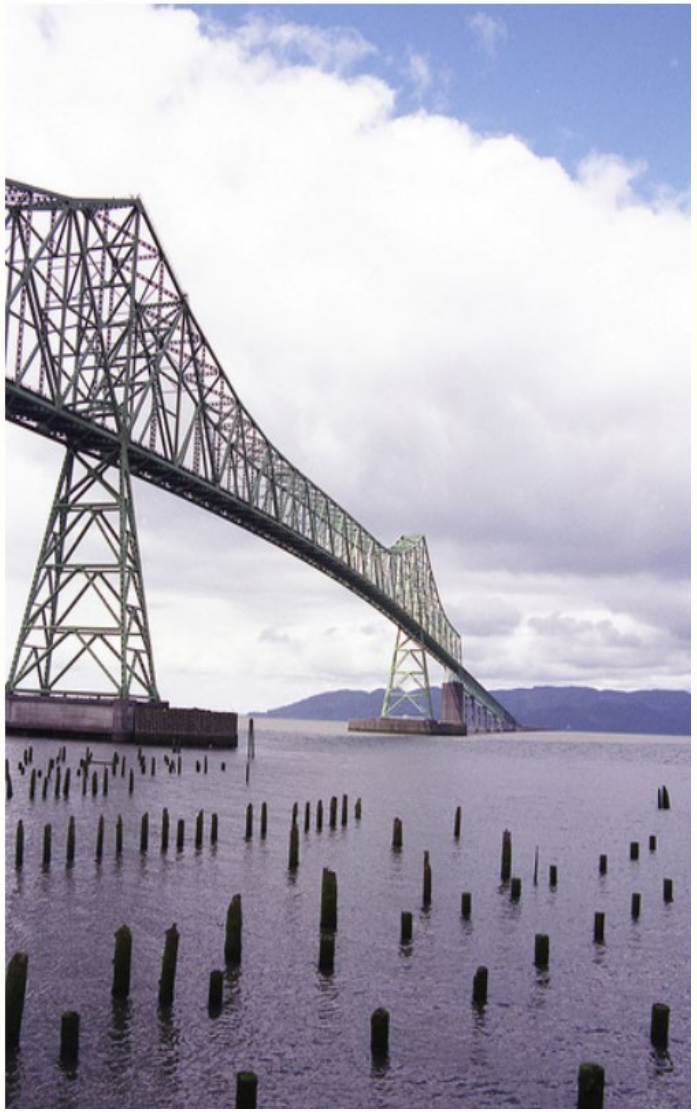
III. Implementation procedures

A. Project review process

1. Elements of project review
2. Step review process

B. Program coordination

C. Independent scientific and economic review



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1. Elements of project review
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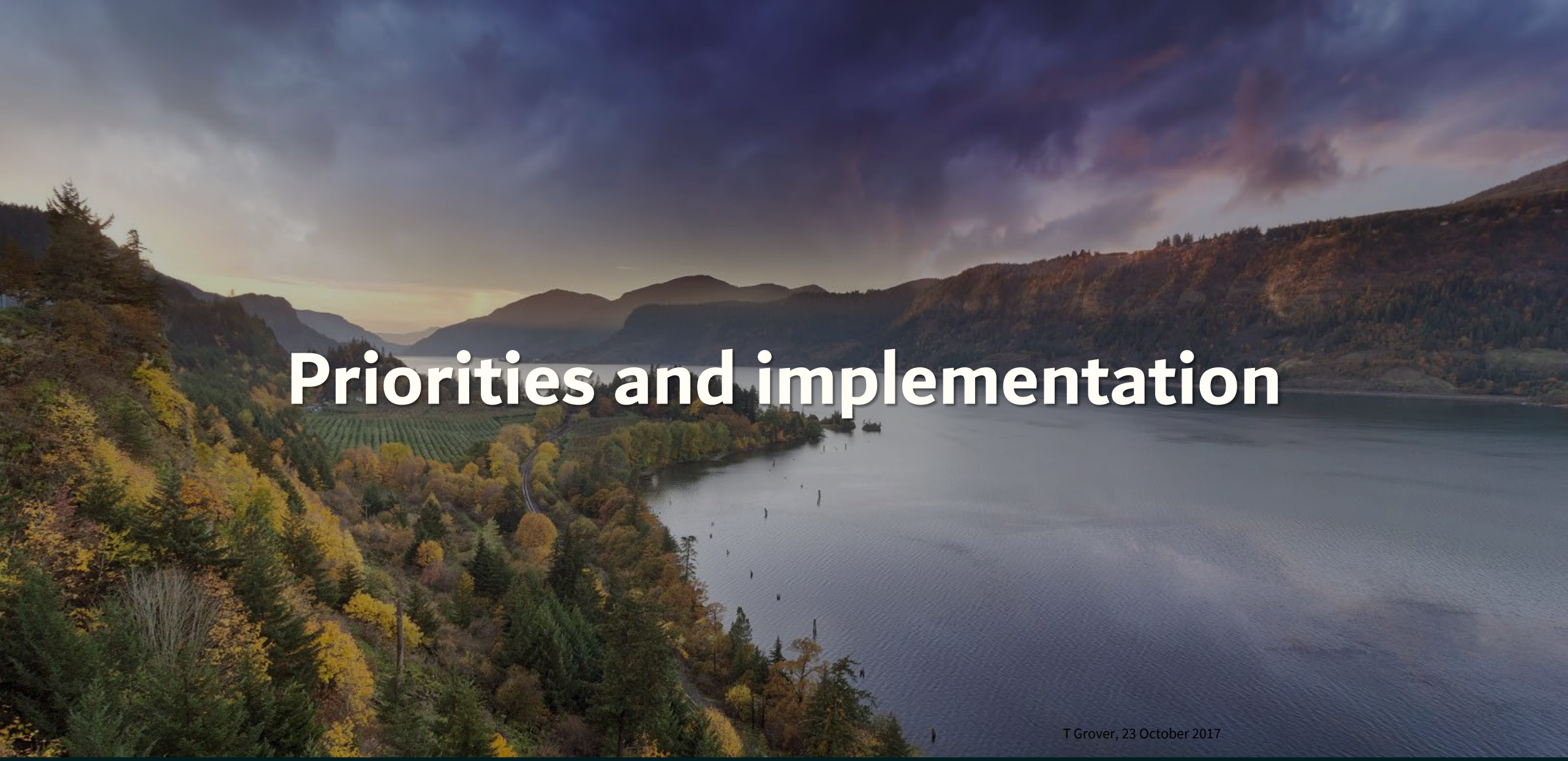
2020 Addendum to the 2014 Program

- Part I. Program performance and adaptive management
  - Goals, objectives and performance indicators, organized by biological category
  - Assessing, monitoring and reporting

- Part II. Program Implementation
  - Near term priorities
  - How the Program is implemented



Priorities and implementation

T Grover, 23 October 2017

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

How to prioritize?

- **Past programs: Action Plans: Example 1987 Five-Year Action Plan:**
  - Measures to be implemented within the next five years
  - Provide a more solid and focused basis for budgeting and planning
  - Clear way to judge success of program implementation
  - Improve reporting to the region and congress

- **Current Program: Emerging and near-term priorities**
  - Many of the program's current measures represent ongoing activities that already have multi-year funding and implementation commitments from Bonneville and the other federal agencies for the foreseeable future. These ongoing activities and existing program areas represent a set of priorities from earlier programs and largely continue into the new program
  - Priorities provide guidance to Bonneville and other federal agencies that these new measures are to be implemented in next five years.

The Council identified seven emerging priority areas in its 2014 Program

1. Support long-term maintenance of program assets
2. adaptive management (including prioritized research on critical uncertainties) throughout the program by assessing the effectiveness of ongoing projects, developing program objectives when appropriate and taking into account the effects of climate change
3. (1) expanded management of predators; (2) mapping and determining hotspots for toxic contaminants; and (3) aggressively addressing non-native and invasive species
4. Investigate blocked area mitigation options through reintroduction, passage and habitat improvement, and implement if warranted
5. Additional sturgeon and lamprey measures (passage and research)
6. Update the subbasin plans most in need of updates
7. Improve floodplain habitats

2020 Addendum: Near-term priorities

1. Climate change: Consider the implications of climate change
2. Mitigation in blocked areas: …above Grand Coulee and Chief Joseph dams, as well as ongoing operational impacts.
3. Ocean: Restore and sustain the funding and implementation of ocean research at the level recommended by the Council
4. Estuary: Repeat research implemented in 2016 and 2017 to assess benefits of estuarine use by interior salmon stocks.
5. Mainstem hydrosystem flow and passage operations: Implement the refinements in operations at Libby and Hungry Horse dams
6. Predator management: Adequately sustain and support ongoing efforts to reduce predation and, as described below
7. Sturgeon: Continue to make progress in developing and implementing the program's comprehensive approach to White Sturgeon

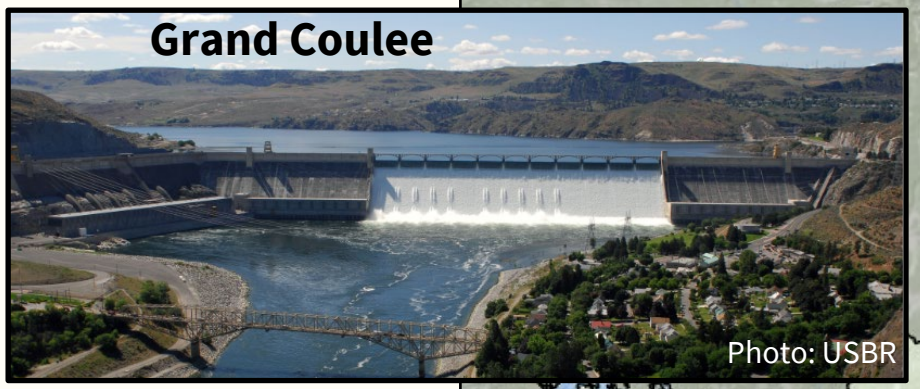
Hydropower system operations

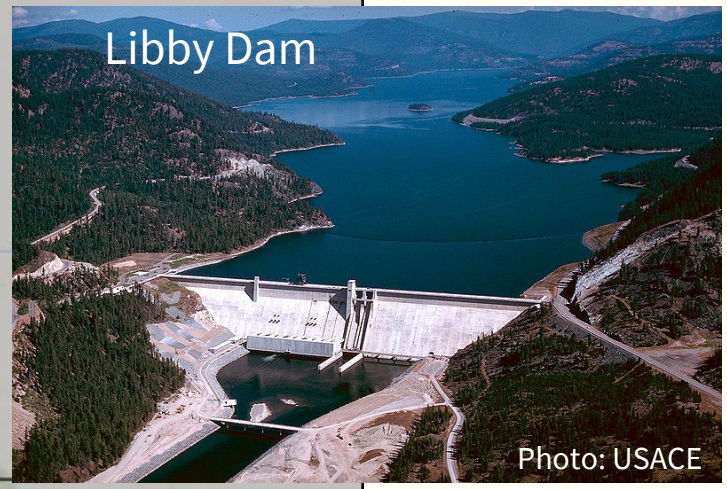
John Shurts
Kate Self
January 2025

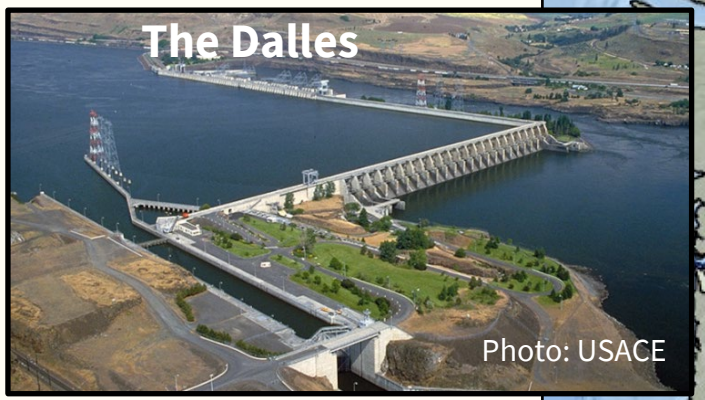
Northwest **Power** and **Conservation** Council

Hydropower System Operations

- **Dams/Hydrograph**
- **Operations to Benefit Fish**
- **Storage Reservoir Operations**
- **Run-of-the-River Project Operations**

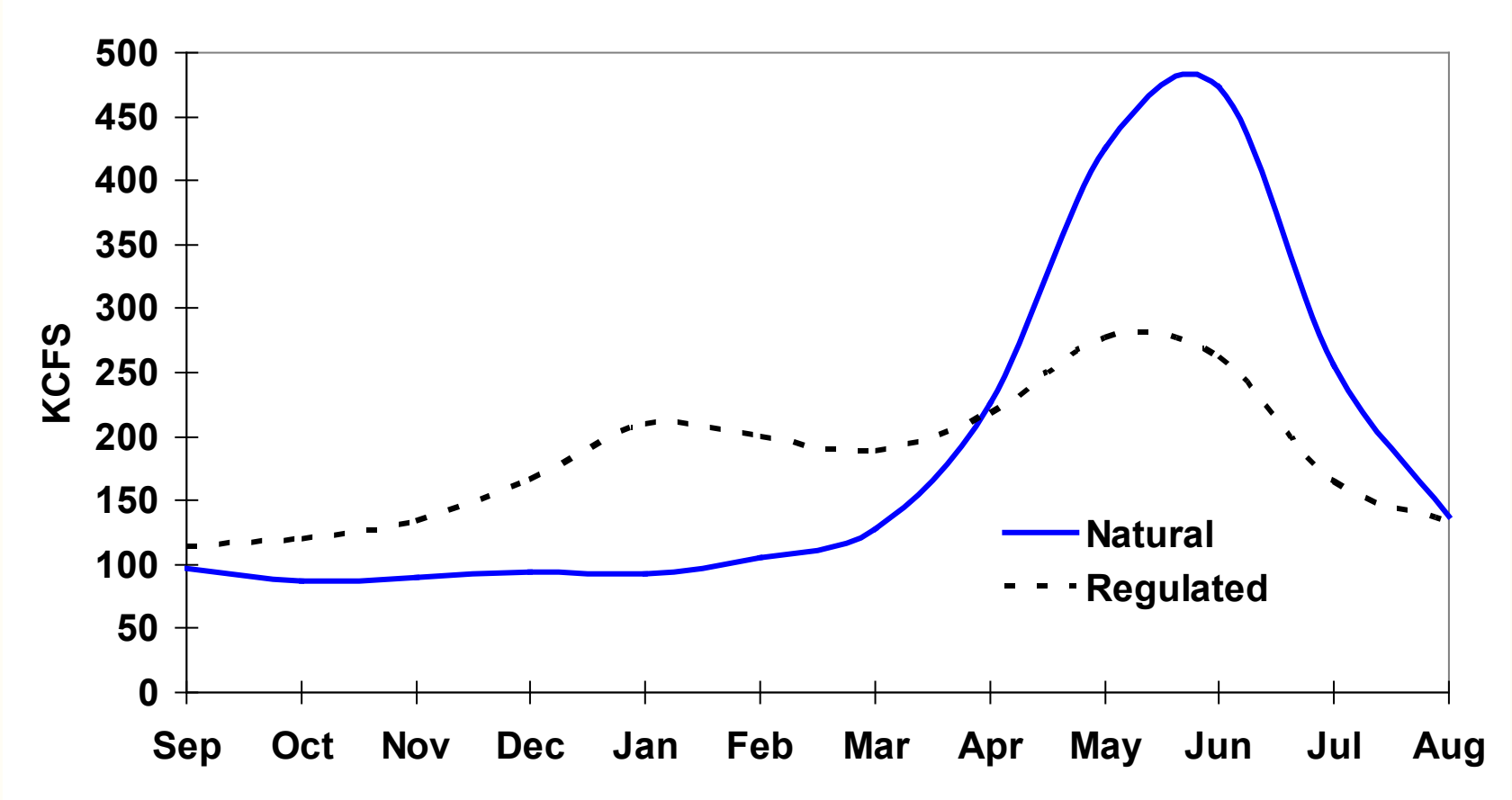




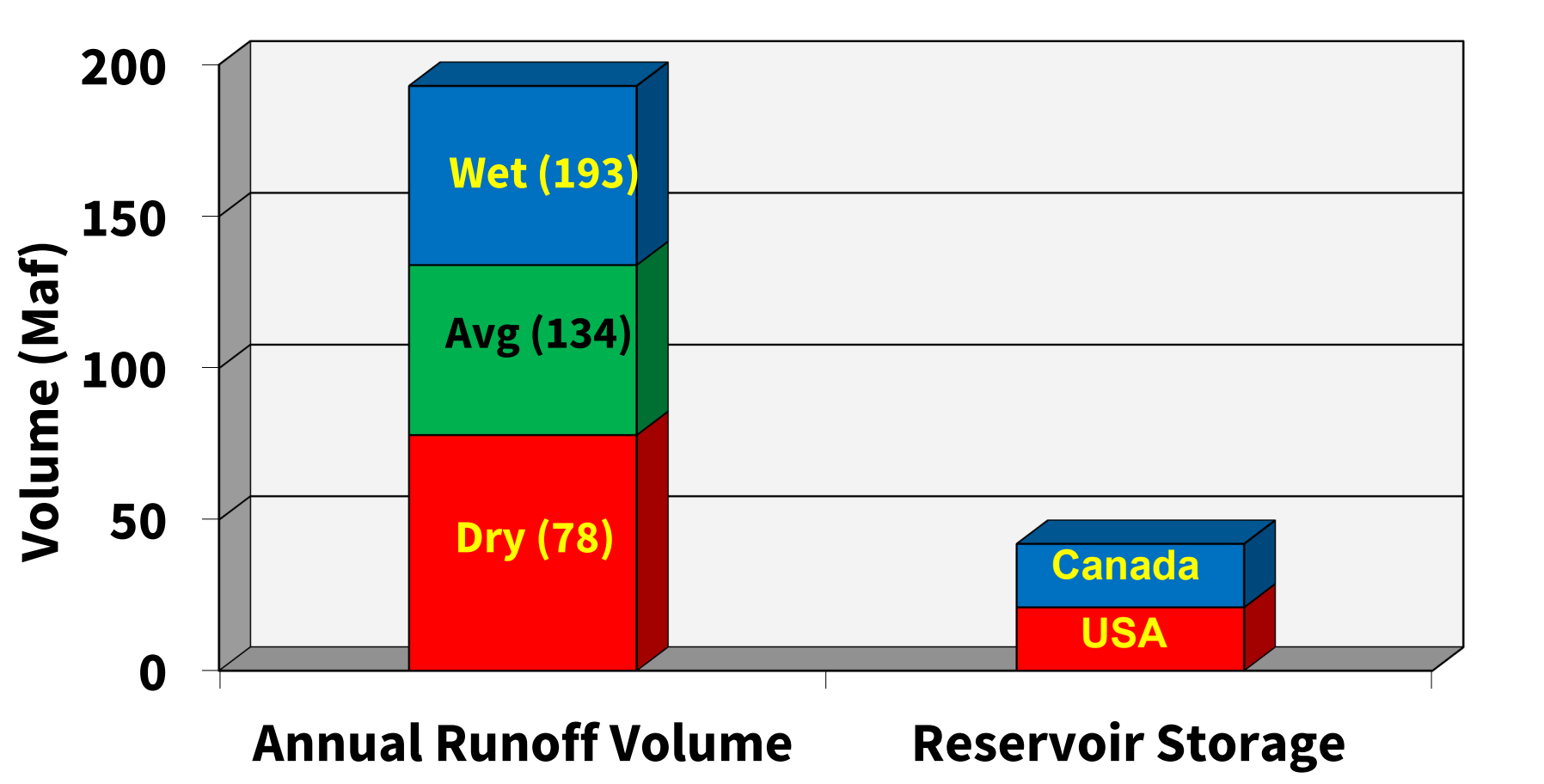


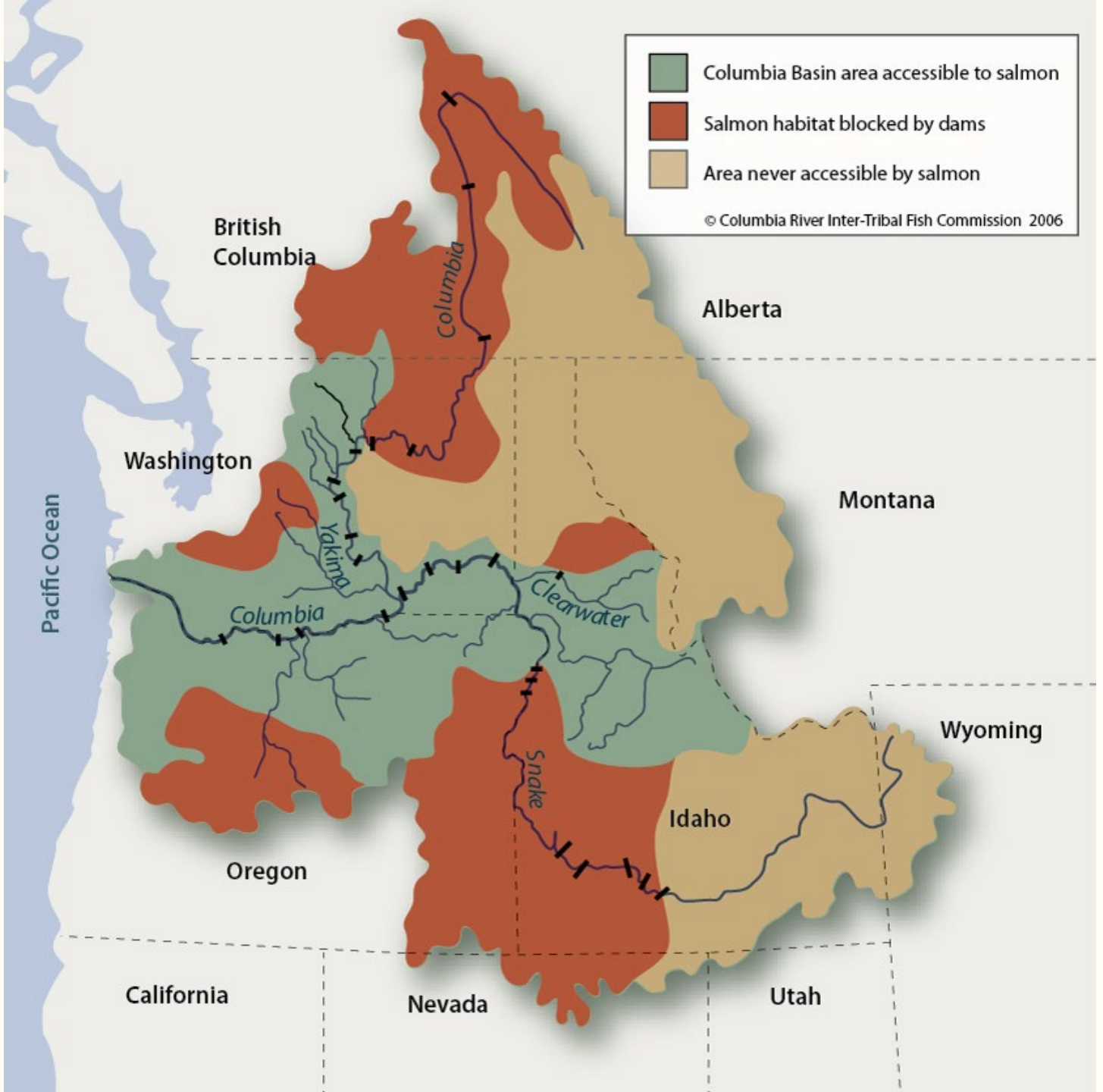
Anderson Ranch

Average Natural and Regulated (pre-1980) Columbia River Flows at The Dalles



Reservoir Storage & Runoff Volumes




Columbia Basin area accessible to salmon
Salmon habitat blocked by dams
Area never accessible by salmon
© Columbia River Inter-Tribal Fish Commission 2006
British Columbia
Alberta
Columbia
Washington
Montana
Pacific Ocean
Yakima
Columbia
Clearwater
Wyoming
Snake
Idaho
Oregon
California
Nevada
Utah

Operations to Benefit Fish – Sources

- Biological Opinions/CRSO EIS/RODs
- Program
- Accords
- (Court Orders)
- 2023 RCBA Settlement
- Annual Water Management and Fish Passage Plans
- In-season Management
- Treaty Operations

Storage Reservoir Operations

Sources:

- In particular, BiOps/CRSO EIS preferred alternative
- Program
- not 2023 settlement

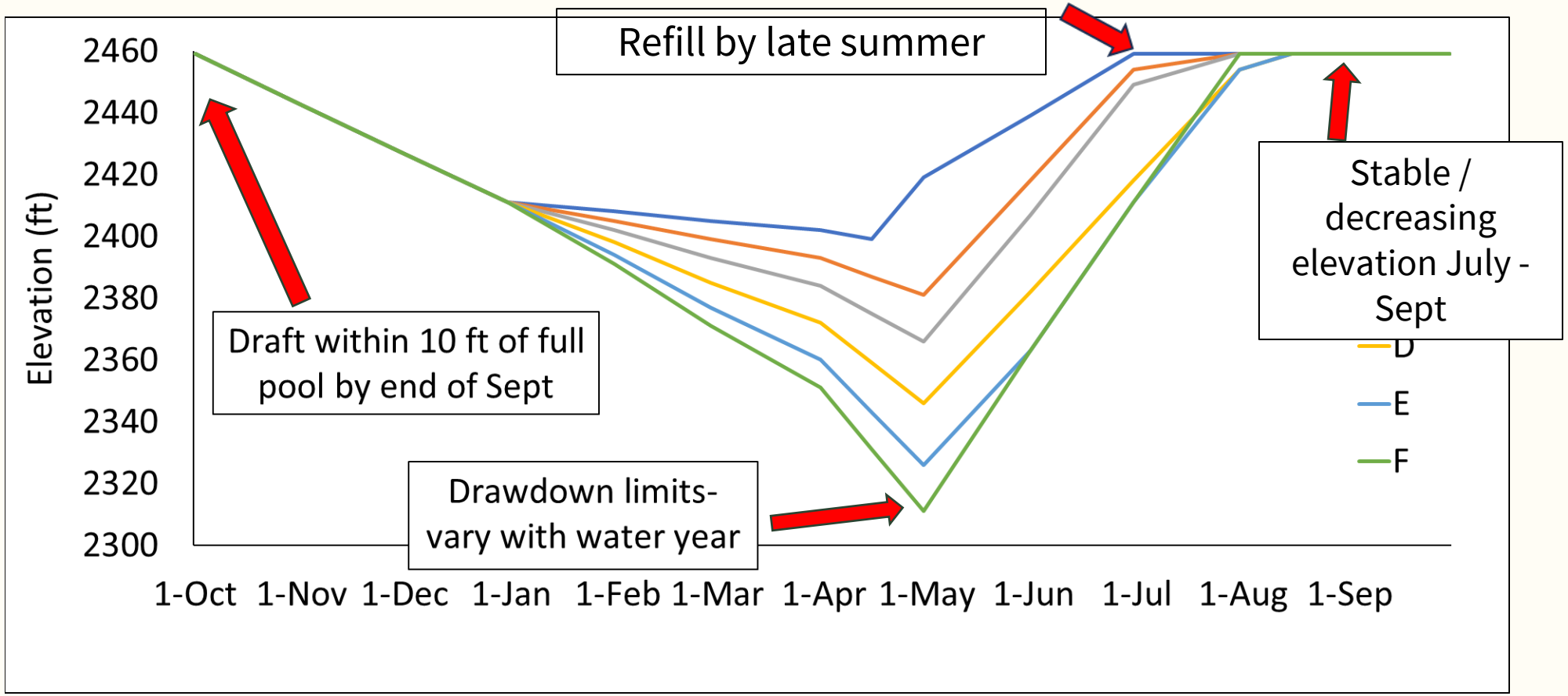
Storage Reservoir Operations – annual rhythm/seasonal characteristics

- Be at but not below early spring flood control minimum – rule curves based on runoff forecast
- Through spring: store + pass inflows
  - Lower river flow objectives – McNary/LG
  - Libby sturgeon pulse releases
- High priority refill by summer target dates

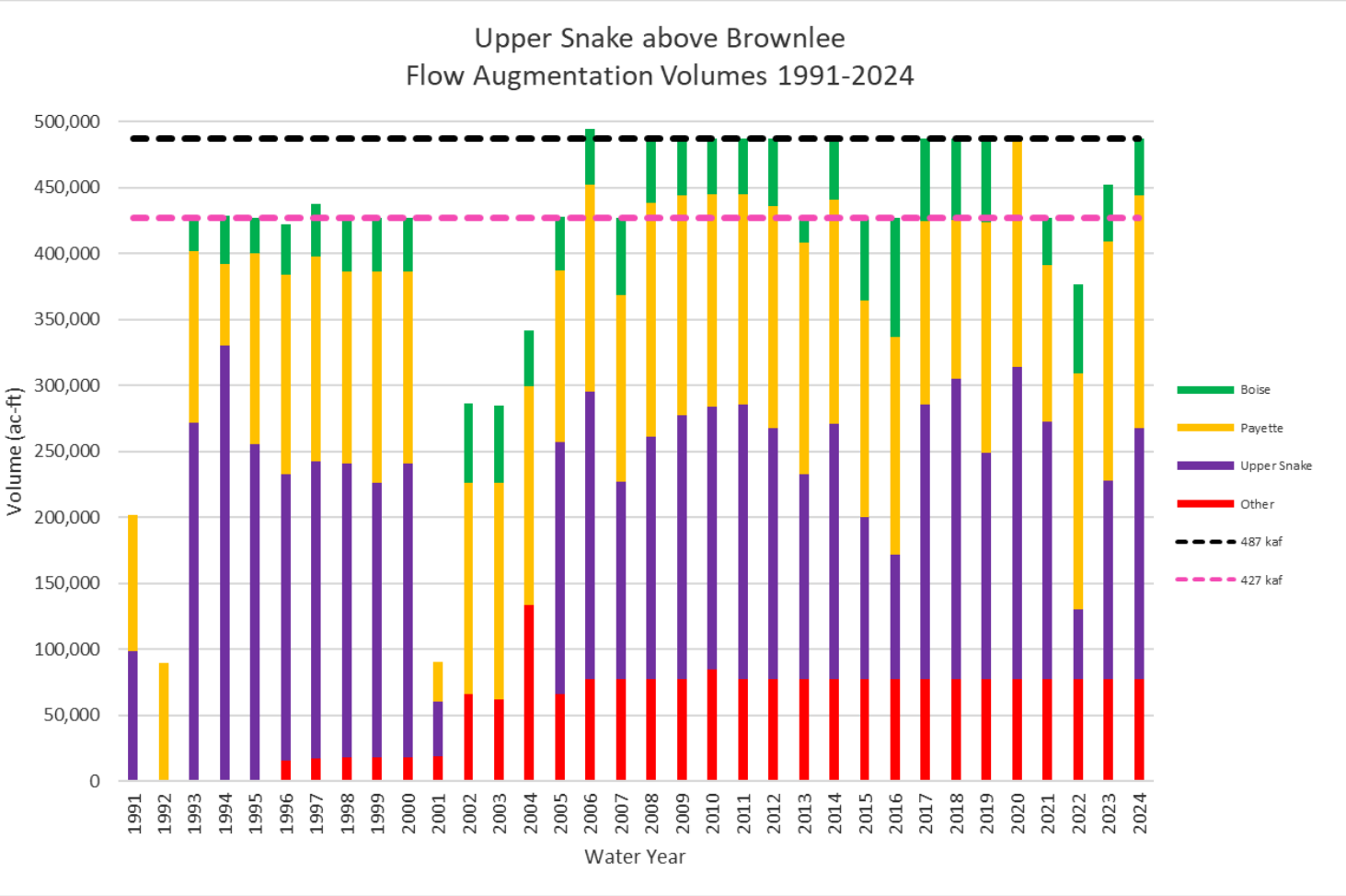
Storage Reservoir Operations – annual rhythm (cont.)

- Draft summer into early fall
  - Lower river flow objectives
  - Late summer temperature control (e.g., Dworshak)
  - Limits on releases - steady flows and steady declining elevations (Libby/HH)
- End of summer elevation limits – e.g., HH and Libby
- Fall/winter drafting mostly for power, but with other considerations, such as…
  - support for Vernita bar operations – fall chinook spawning, emergence, rearing from fall into spring
  - support for chum flow operations below Bonneville dam
- Draft winter, but do not go so deep you won't be able to be … at but no lower than early spring flood control minimum

Libby Dam Integrated Rule Curves



Upper Snake River volumes for salmon flows



Source: Peter Cooper USBR, personal communication

Flow augmentation in the Upper Snake River above Brownlee Reservoir has consistently met the 427,000 acre-feet target since 1993

The 487,000 acre-feet target has been met 60% of the time (12 out of 20 years).

In 2008, NMFS recommended the flow be released earlier for spring and summer migrants.

Seasonal average flow objectives – target ranges or targets

Spring:

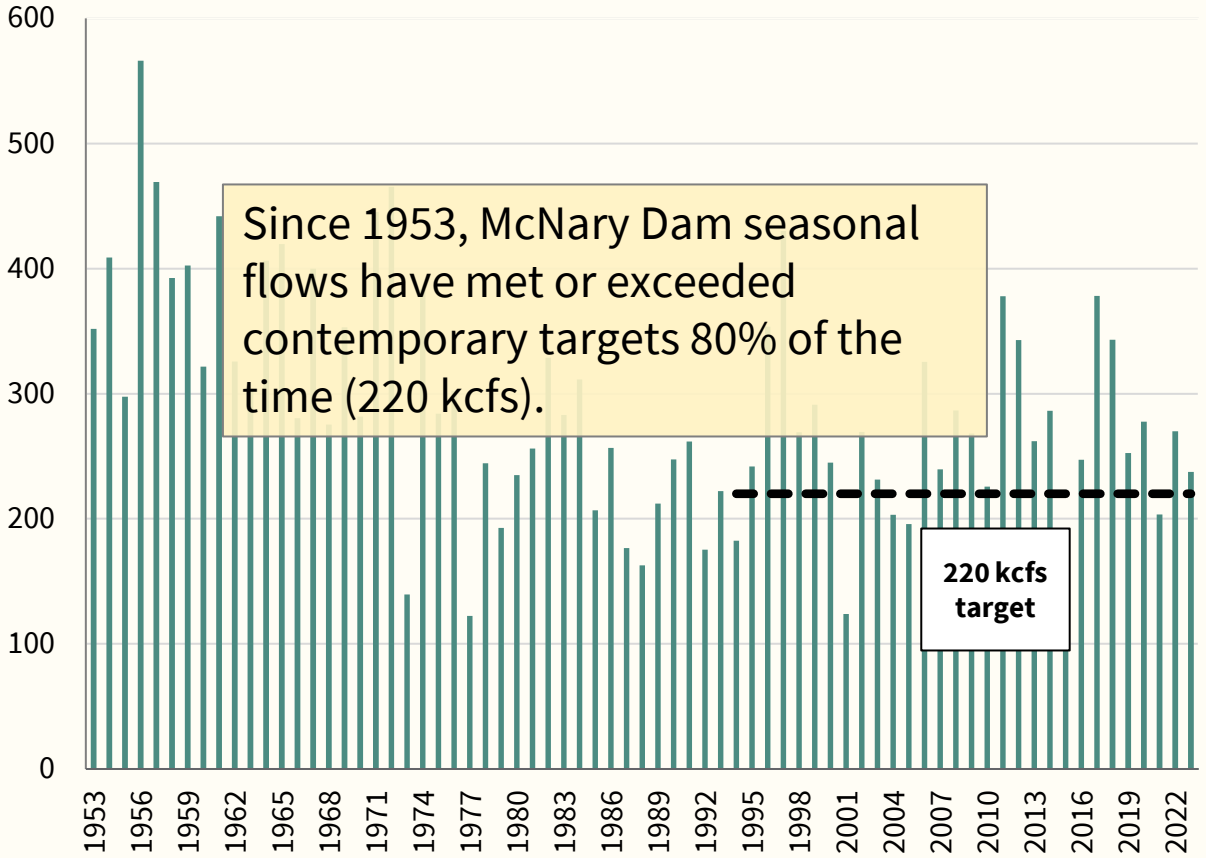
- Lower Granite: 85-100 kcfs
- McNary: 220-260 kcfs
- Priest Rapids target at 135 kcfs

Summer:

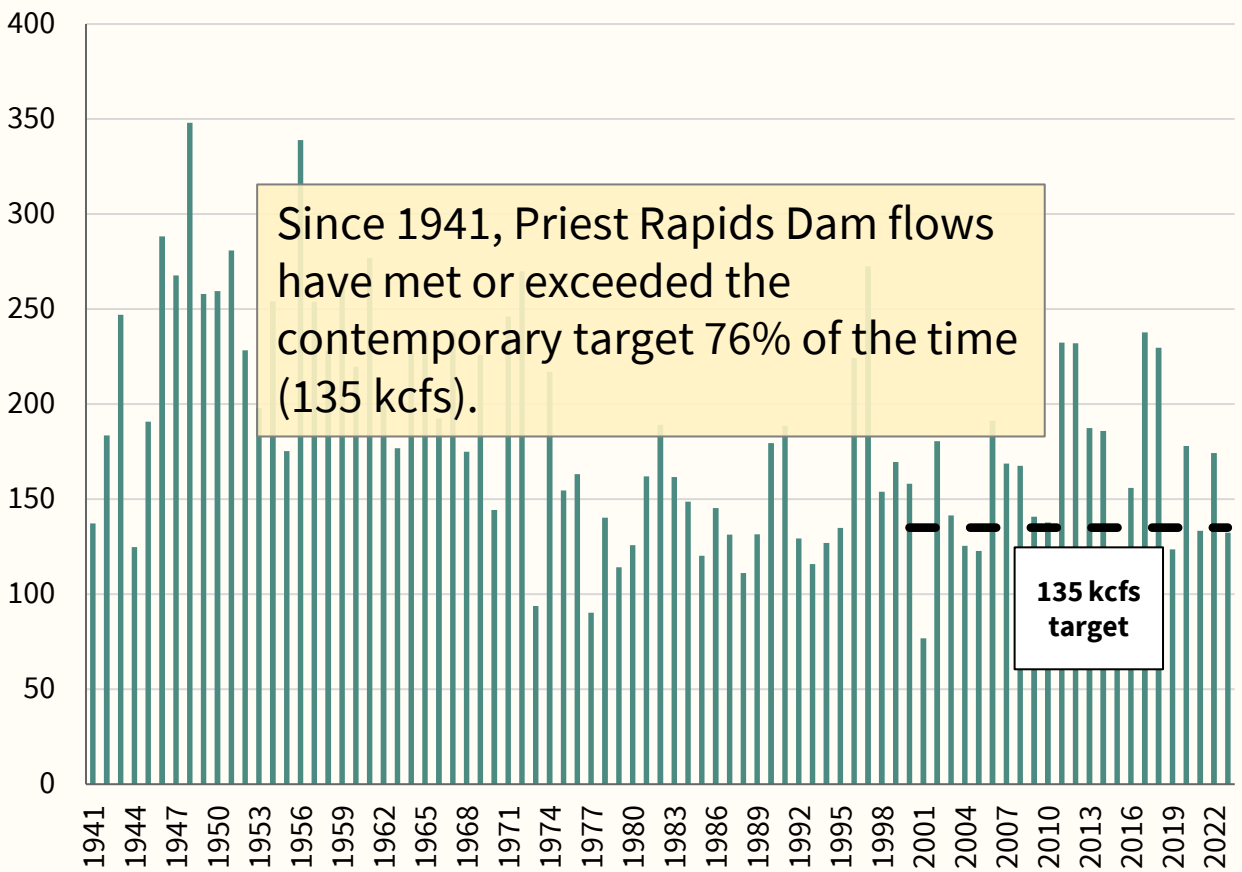
- Lower Granite: 50-55 kcfs
- McNary: 200 kcfs

Spring Season at McNary and Priest Rapids Dams

Average annual spring flow at McNary Dam



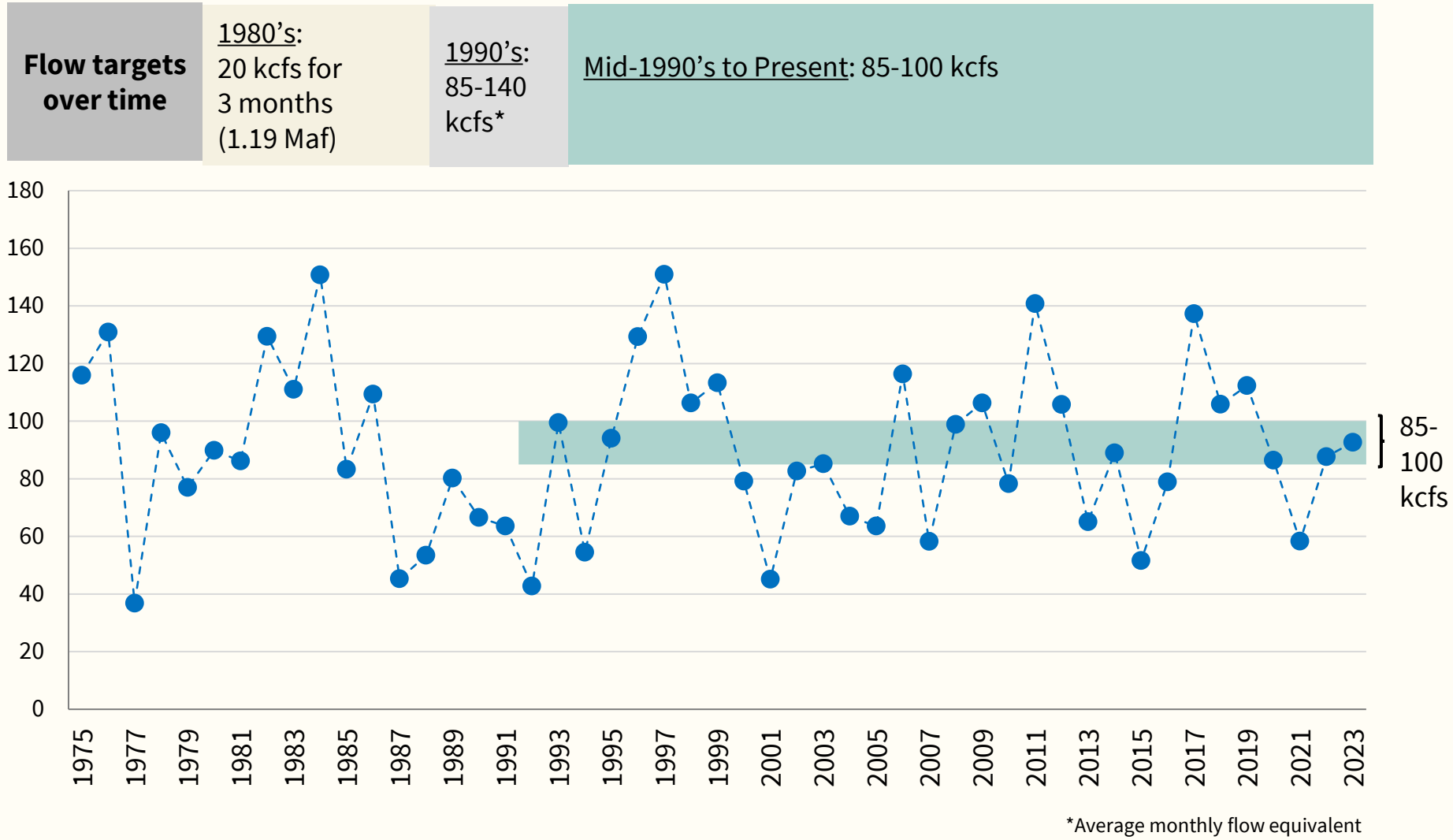
Average annual spring flow at Priest Rapids Dam



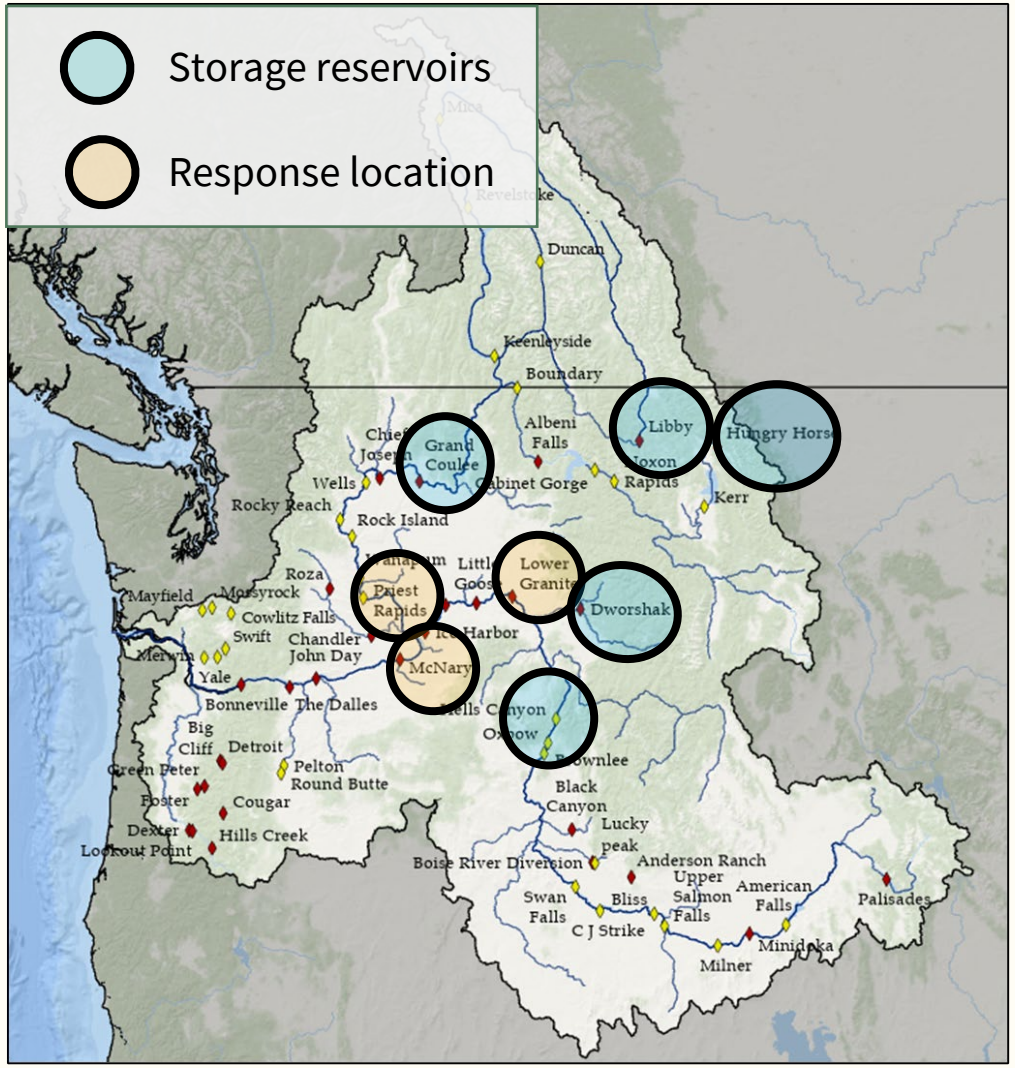
Note: Contemporary flow data and targets available on Program Tracker, SPI E3-1

Spring season at Lower Granite Dam

- The minimum target flow of 85 kcfs has been met 57% of the time since 1975 and 61% of the time since 1995.
- There is less capacity to regulate flows in season at Lower Granite Dam than at Priest Rapids Dam or McNary.



*Average monthly flow equivalent

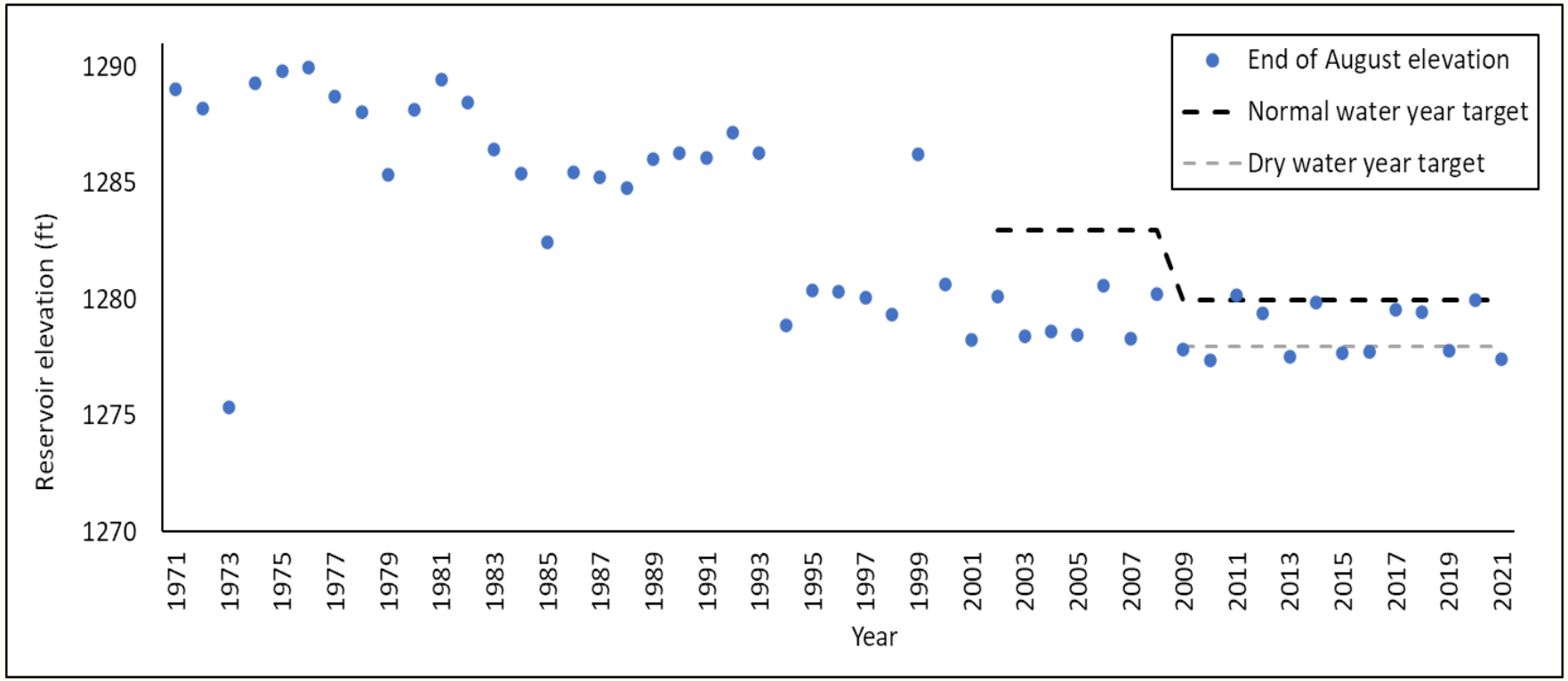


Location of major dams (diamonds; red = federally owned, yellow = publicly or privately owned) in the Columbia River Basin.

Summary of spring juvenile migration results

- Seasonal flow targets are driven by annual precipitation.
- McNary and Priest Rapids Dams often meet or exceed spring target flows.
- Lower Granite Dam meets or exceeds target flows less often.
- Managers use **adaptive in-season management** to work within annual water constraints.

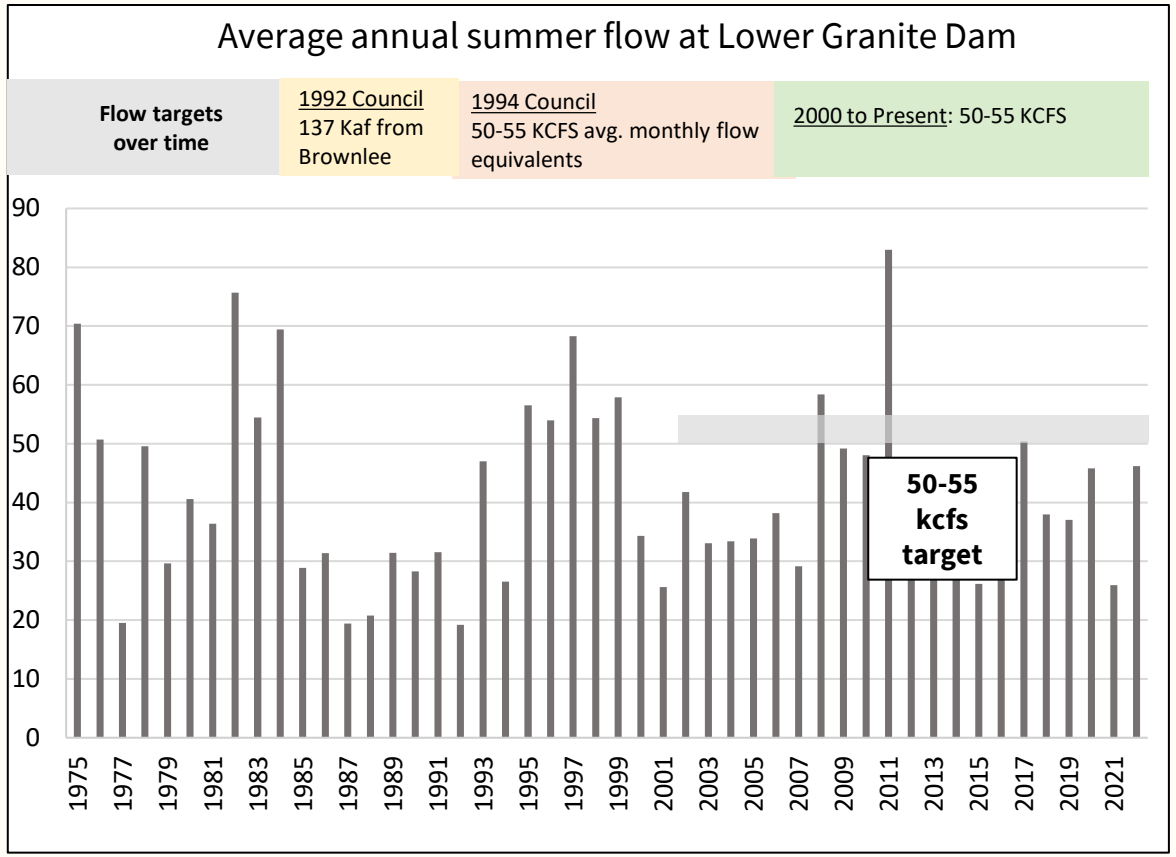
Summer flows and temperature management



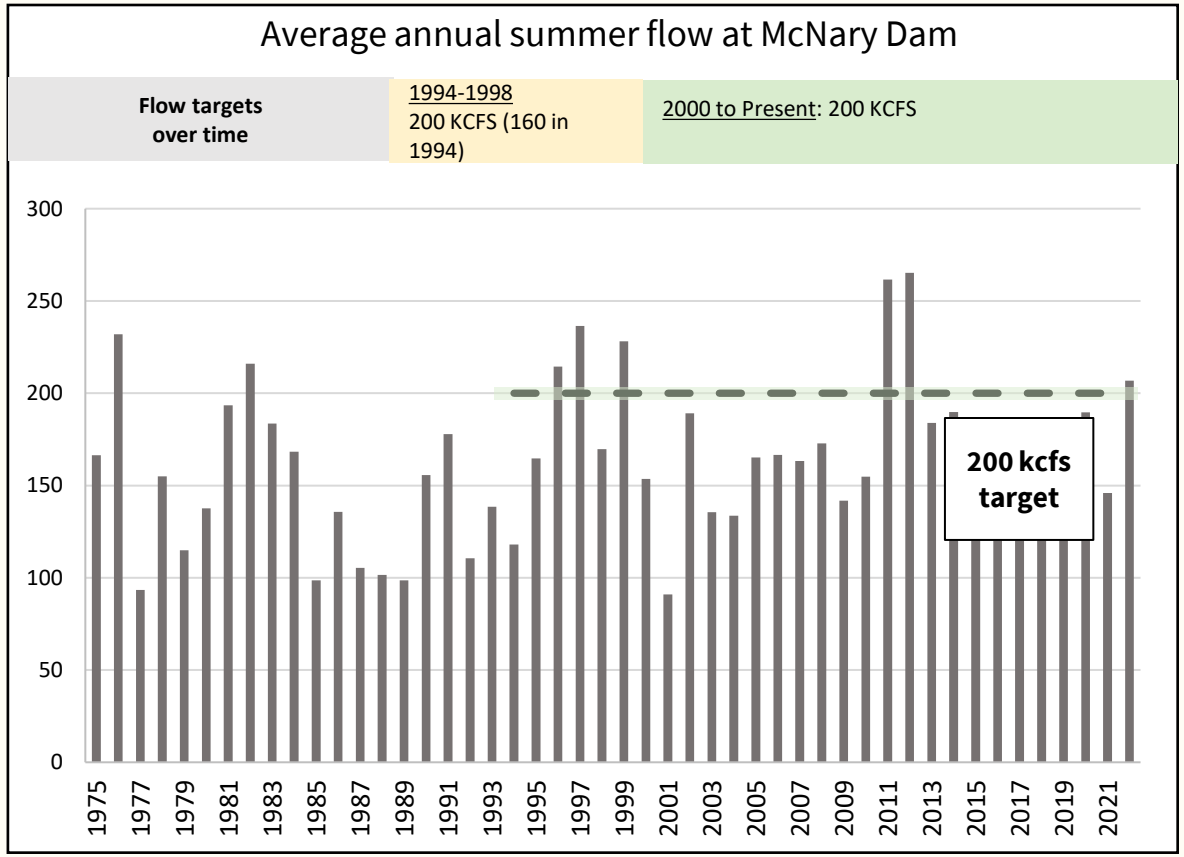
Reservoir elevation (ft; blue dots) at the end of August relative to draft limit (black dash), at Lake Roosevelt, Grand Coulee Dam, 1971 – 2021.

In order to meet summer basin flow and velocity objectives, water is drafted from upstream reservoirs including Grand Coulee (Lake Roosevelt) and Dworshak Dams.

Summer flows and temperature management



The contemporary average summer flow target range at LGR is 50-55 KCFS

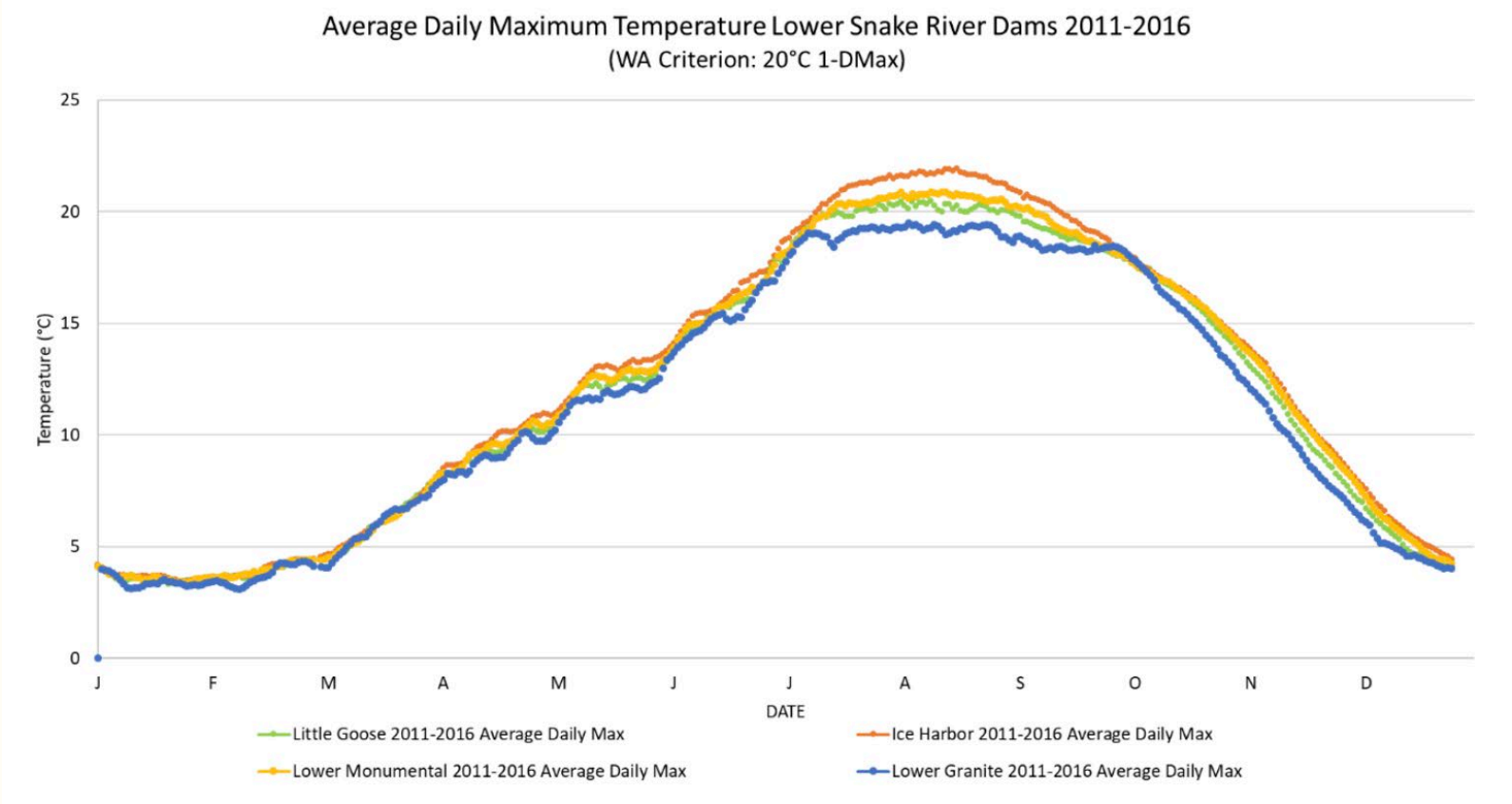


The contemporary average summer flow target at MCN is 200 KCFS

Note: Contemporary flow data and targets available on Program Tracker, SPI E3-1

Summer flows and temperature management

- Target water release temperatures vary: 48°F (8.9°C) to 51°F (10.6°C) during July and August.
- Target water temps balance fish production at the downstream Dworshak National Fish Hatchery and anadromous needs in the lower Snake River.
- Cool summer releases from Dworshak typically contribute 25-45% of the Snake River flow.

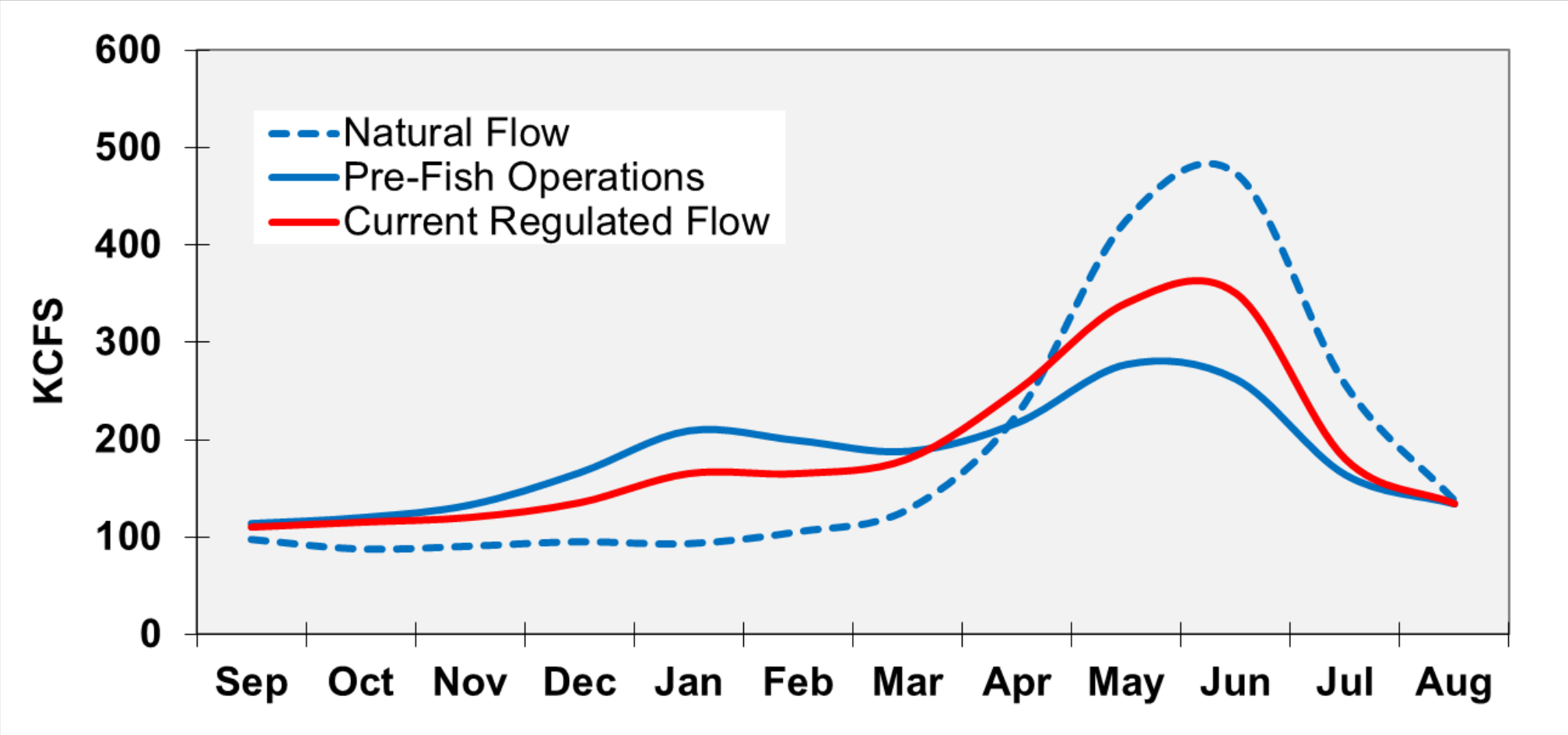


Snake River warming as it flows downstream from Lower Granite Dam (blue) to Ice Harbor Dam (orange). Source: epa.gov

Note: Contemporary temperature data and targets available on Program Tracker, SPI E2-2, E2-4

Natural and Regulated Flows

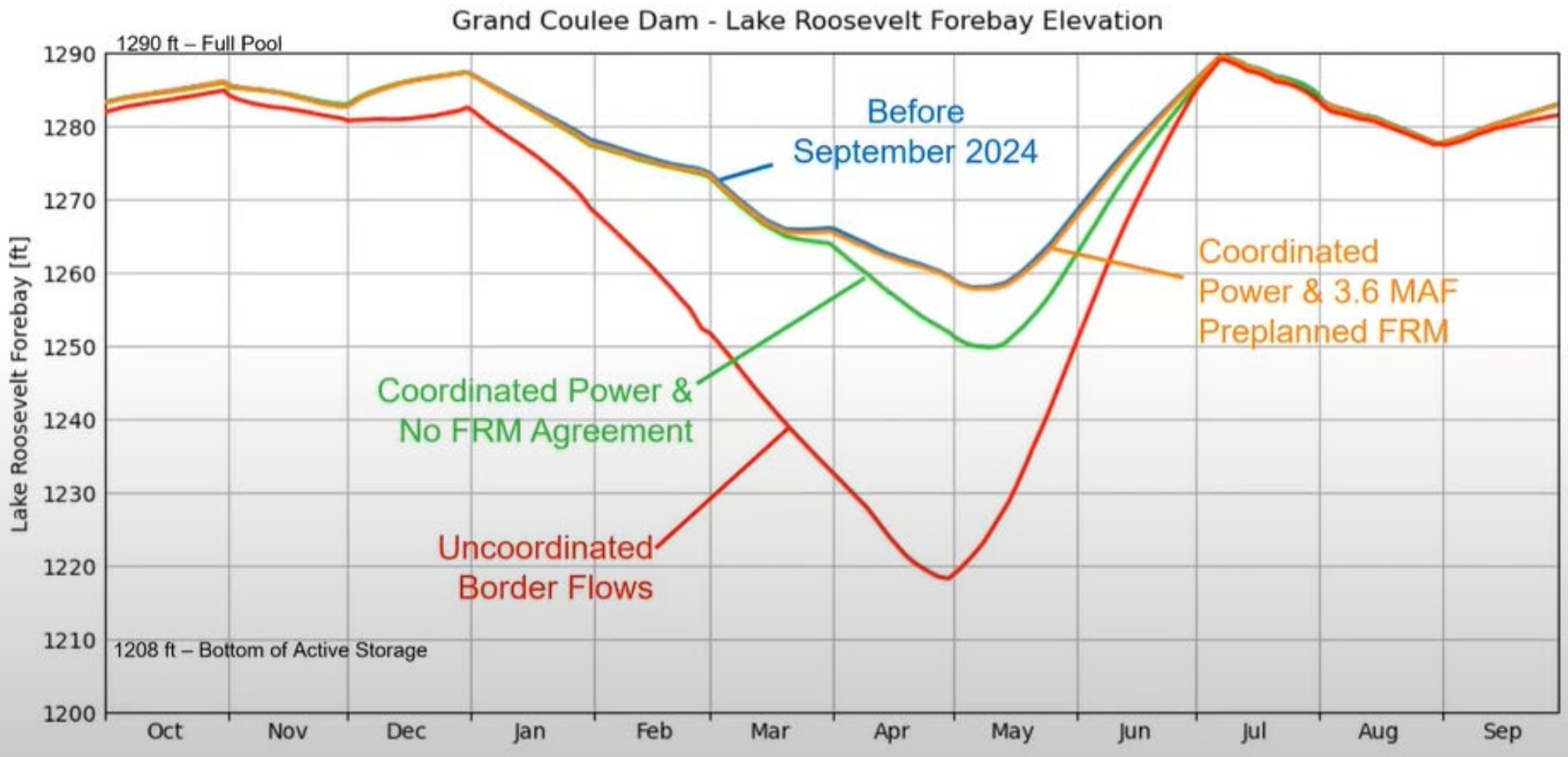
(At The Dalles Dam, averaged over 80 years)



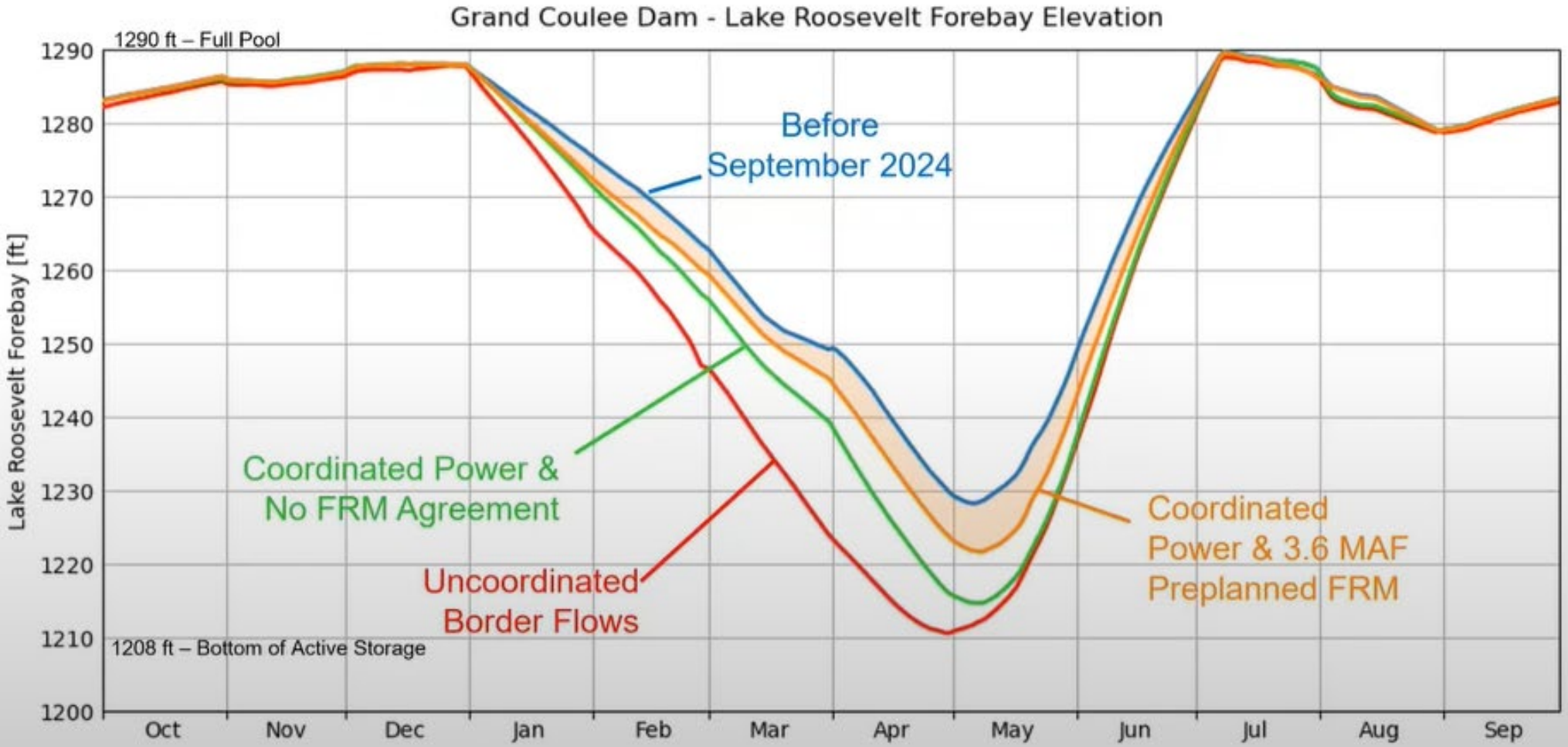
Storage Reservoir Operations (cont'd)

- A word about Grand Coulee operations …
- A word about the effects of Columbia River Treaty operations
  - basic pattern of flood risk management/coordinated power ops – flows across the border
  - annual non-power use agreement
  - CRT Agreement in Principle – flood risk management, nonpower 1 to 1.5 MAF; coordinated power ops
  - effects in US – GC; John Day
- Storage operations/flow objectives for fish – seasonal averages only; no daily standards/limits/targets, outside of "minimize ramping" and some minimum flow levels (see below)
- Climate change considerations

LAKE ROOSEVELT: DRY TO AVERAGE YEARS



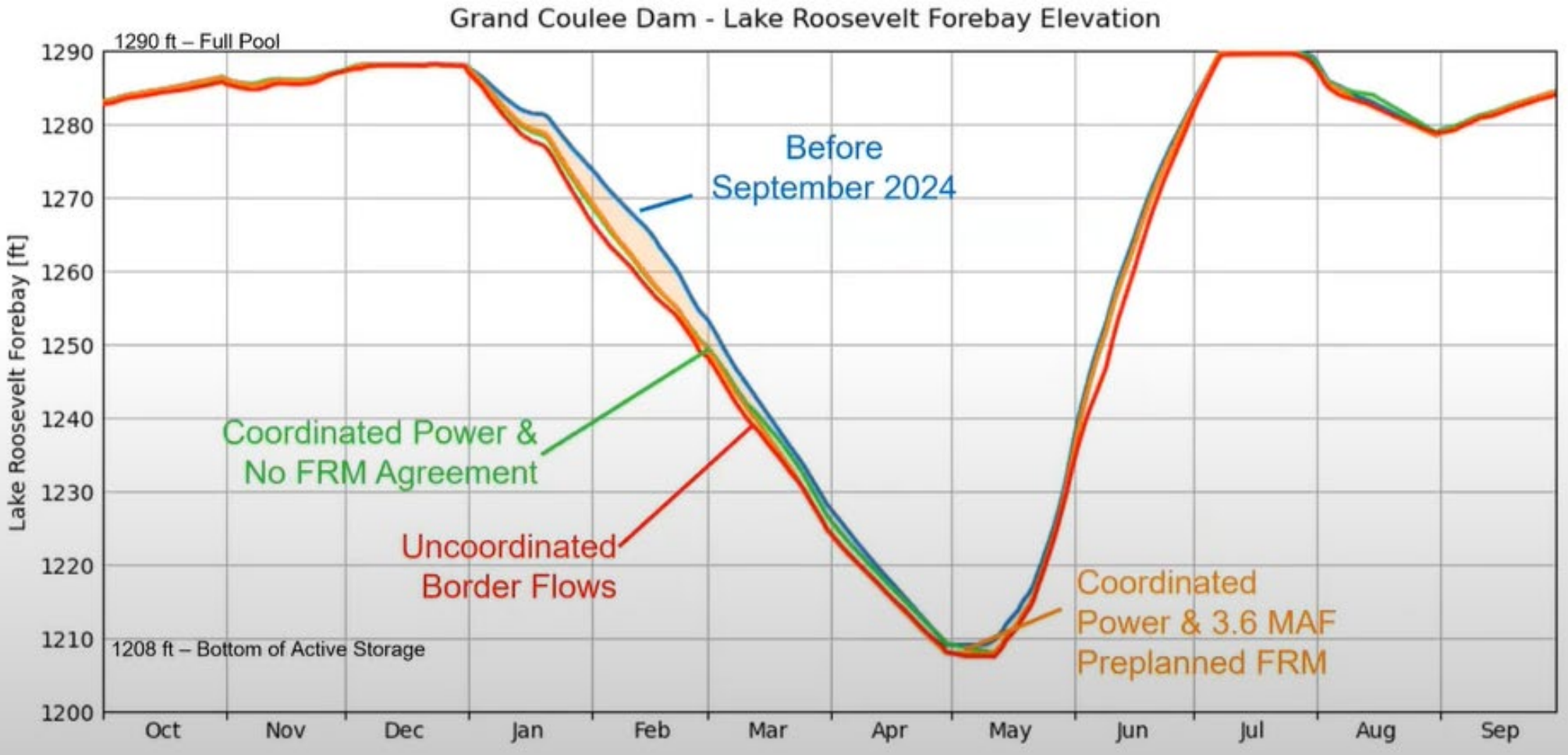
LAKE ROOSEVELT: MODERATELY WET YEARS

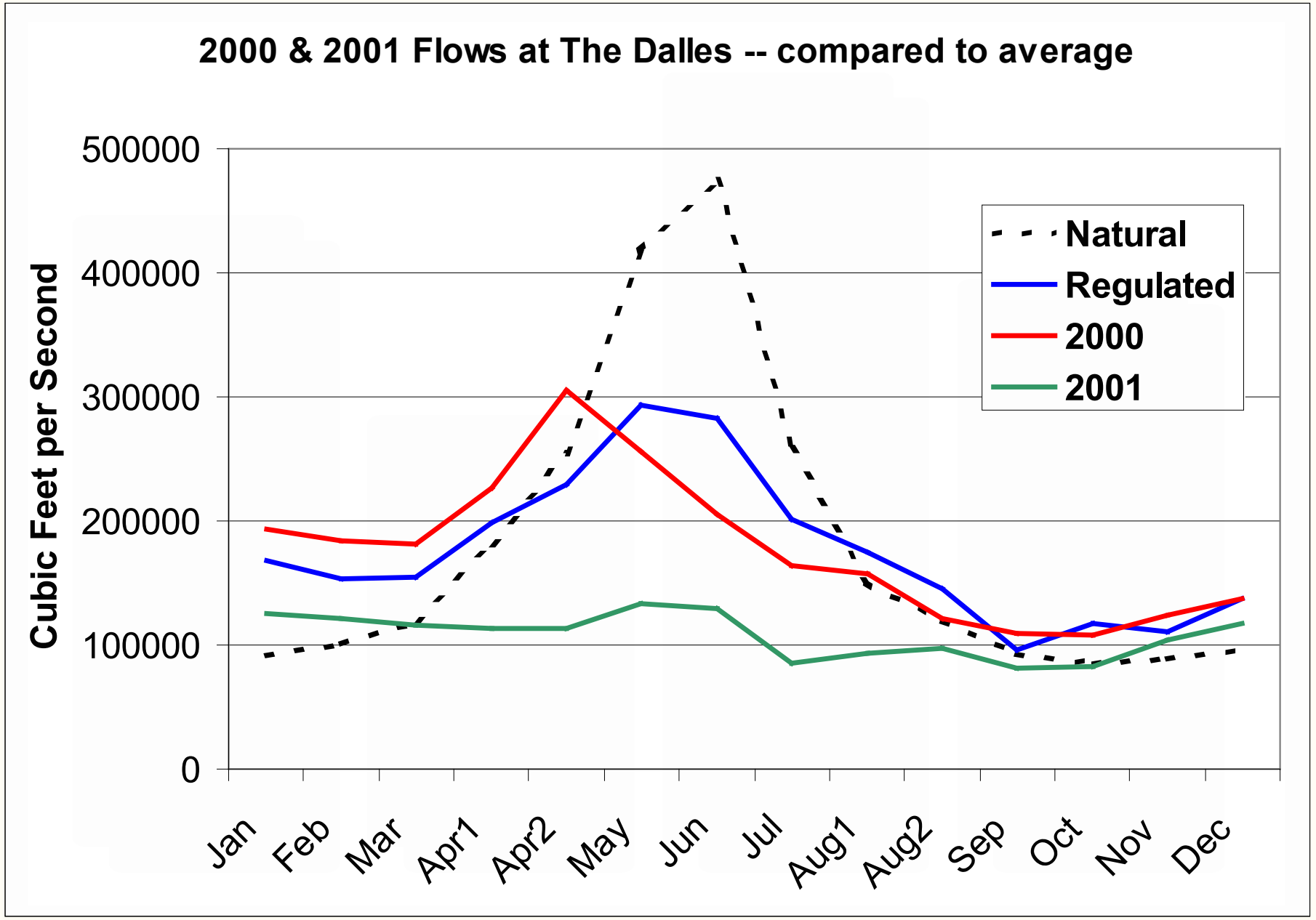


LAKE ROOSEVELT: VERY WET YEARS

Percentile: 0th 60th 90th 100th

Dry | Wet




2000 & 2001 Flows at The Dalles -- compared to average
Cubic Feet per Second
500000
400000
300000
200000
100000
0
Jan
Feb
Mar
Apr1
Apr2
May
Jun
Jul
Aug1
Aug2
Sep
Oct
Nov
Dec
Natural
Regulated
2000
2001

Run-of-the-River Project Operations (lower Columbia and lower Snake dams plus mid-Columbia PUD dams and Chief Joseph Dam)

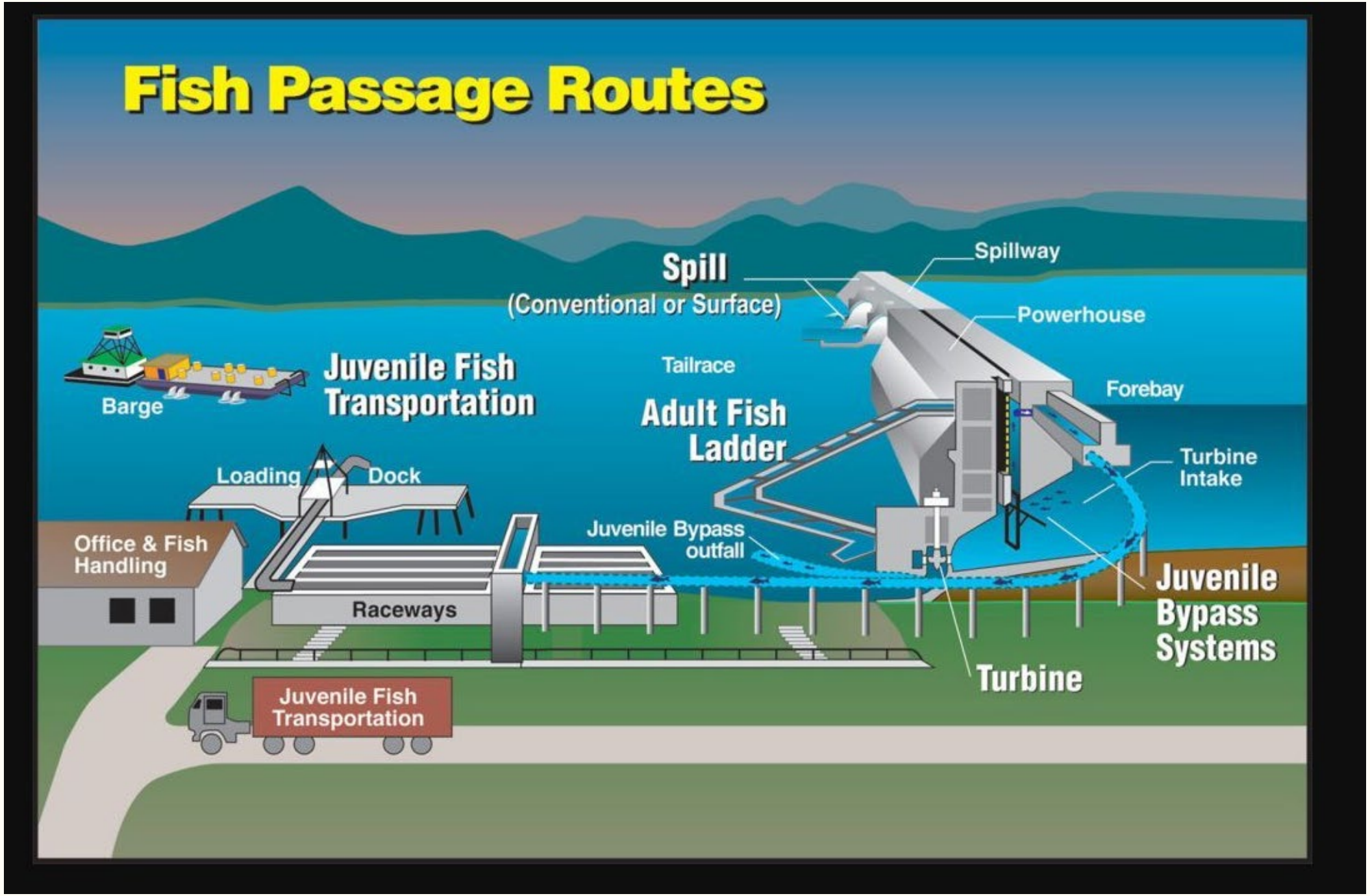
Sources:

- BiOps/CRSO EIS preferred alternative
- Program/Accords
- 2023 RCBA settlement

Run-of-the-River Project Operations

Juvenile salmon passage and routes – turbines; screens and bypass systems; collection and transport; spill – and adult passage and relationship to operations

- Spring Chinook
- Other salmon and steelhead
- Lamprey/sturgeon?


Fish Passage Routes
Spillway
Spill
(Conventional or Surface)
Powerhouse
Barge
Juvenile Fish Transportation
Tailrace
Forebay
Adult Fish Ladder
Turbine Intake
Loading
Dock
Juvenile Bypass outfall
Office & Fish Handling
Raceways
Juvenile Bypass Systems
Turbine
Juvenile Fish Transportation

Run-of-the-River Project Operations - spill

Spill operations – current sources: mainly 2023 RCBA

- Spring
  - “125 TDG Gas Cap” 24 hours a day
  - John Day and The Dalles
  - Transmission support; reserves; reliability
- Summer – one spill pattern for June and July; spill reduces August 1
- Fall/winter – spillway weir spill for some period every day from Sept thru Nov 15 and in March; purpose, including flows; zero generation issue in Snake

SPRING SPILL OPERATIONS

	Operation (2024–2033)
Season	**4/3 to 6/20**
Lower Granite (LWG)	125% TDG Gas Cap (or 40% when adult passage delays are detected)[20]
Little Goose (LGS)	125% TDG gas cap spill for 24 hours (to adult criteria), no flexible spill;[21] 125% TDG gas cap spill for 16 hours, 30% for 8 hours
Lower Monumental (LMN)	125% TDG Gas Cap (or 40% when adult passage delays are detected)
Ice Harbor (IHR)	125% TDG gas cap spill for 24 hours

Season	**4/10 to 6/15**
McNary (MCN)	125% TDG gas cap spill for 24 hours Maintain current minimum generation range of 50-60 kcfs for transmission services; powerhouse outflows may increase up to 80 kcfs for reserves (without a spill variance)
The Dalles (TDA)	40% for 24 hours Allocation of reserves may result in spill above 40% of river flows; maintain current minimum generation range of 50-60 kcfs for Transmission services
Bonneville (BON)	125% TDG gas cap spill for 24 hours (150 kcfs cap) Maintain current minimum generation range of 30-40 kcfs for Transmission services; powerhouse outflows may increase up to 60 kcfs for reserves (without a spill variance)

SUMMER SPILL OPERATIONS

	Operation (2024–2033)	Implementation Comments
Season	**6/21 to 7/31** **8/1 to 8/31**	
Lower Granite (LWG)	18 kcfs SW flow (as river flow allows)	Reducing summer spill flows on August 1 from 18 kcfs to SW flow (as river flow allows)
Little Goose (LGS)	30% SW flow or 7 kcfs spill	Reducing summer spill flows on August 1 from 30% to SW flow (or 7 kcfs spill)
Lower Monumental (LMN)	17 kcfs SW flow or 8 kcfs spill	Reducing summer spill flows on August 1 from 17 kcfs to SW flow (or 8 kcfs spill)
Ice Harbor (IHR)	30% SW flow or 9 kcfs spill	Reducing summer spill flows on August 1 from 30% to SW flow (or 9 kcfs spill)

Season	6/16 to 7/31 8/1 to 8/31	
McNary (MCN)	57% 20 kcfs	Reducing summer spill flows on 8/1 57% to 20 kcfs Like spring operations, increased powerhouse generation allowances will allow for additional generation to be brought on-line for the purpose of providing real-time operators greater access to reserve capacity prior to requiring variance tracking or declarations of power system emergency. As needed, these ranges will be utilized under low flow conditions (e.g., minimum generation and spill the rest) and when flexibility elsewhere has been maximized.
The Dalles (TDA)	40% 30%	Reducing summer spill flows on August 1 40% to 30%. Provide a target spill of 40% (or 30% in late summer) with range of ±5% for reserves.
Bonneville (BON)	95 kcfs 50 kcfs	Reducing summer spill flows on August 1 from 95 kcfs to 50 kcfs.


Bonneville Dam

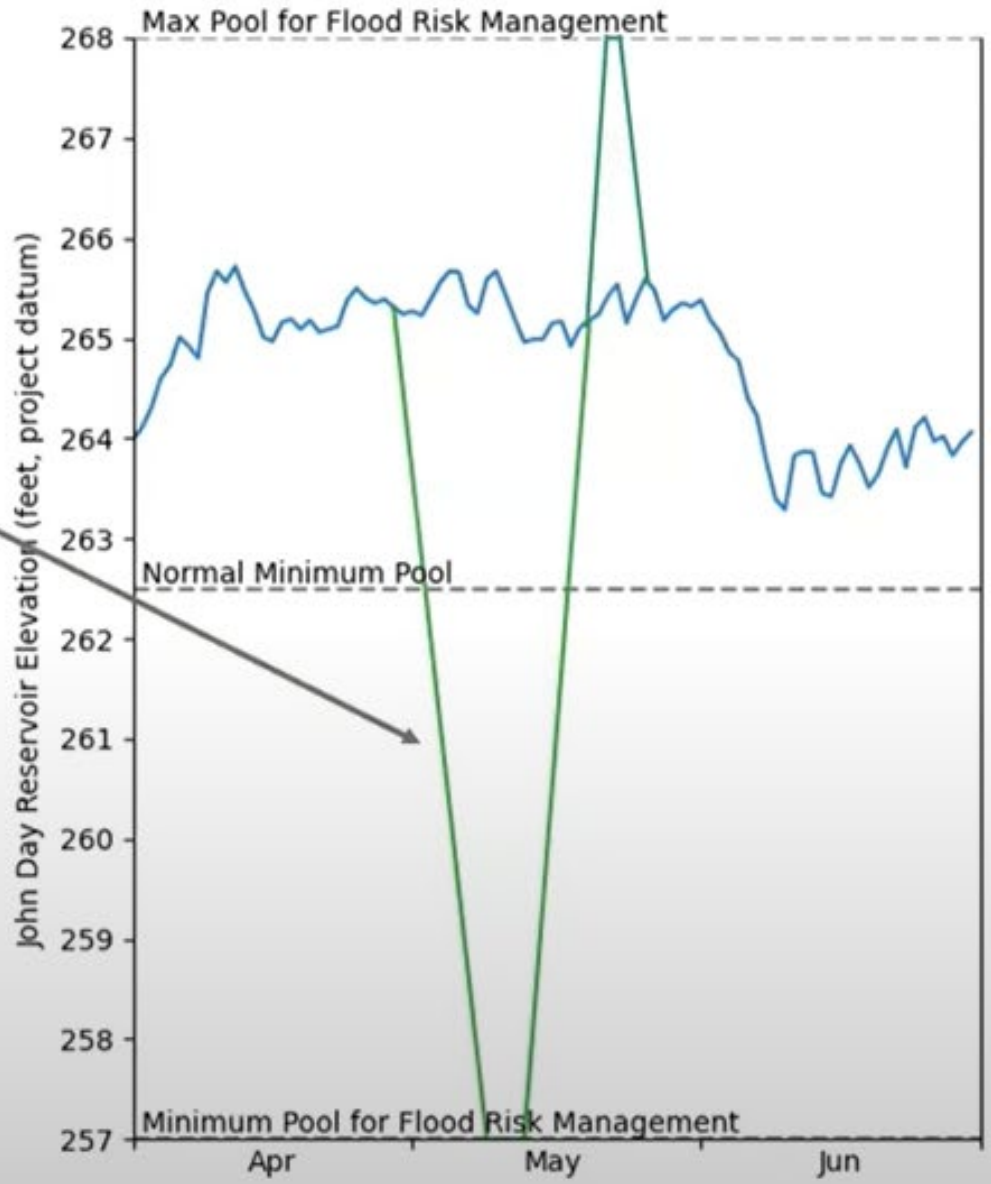
Run-of-the-River Project Operations (cont'd) – pool operations

- A note about pools and storage – especially John Day
- Importance – especially velocity
- Lower Snake: 1.5 MOP – within 1.5 feet of minimum operating pool in Snake during juvenile migration
- Lower Columbia – wider pool ranges
- John Day and FRM: elevation 262.5 to 264.5 (MIP+2 range) spring migration, 262-266.5 (operating range outside of migration), 268 (max), 257 (absolute min – FRM effects)

John Day (JDA)	262-266.5 (3/1-3/14) 262.5-266.5 (3/15-4/9) 264.5-266.5 (4/10-6/1) 262.5-266.5 (6/2-6/14) 262.5-264.5 (6/15-8/31)

JOHN DAY RESERVOIR WATER LEVELS

John Day reservoir may be drawn down and refilled for Real Time Flood Risk Management



Lamprey Passage at Bonneville Dam

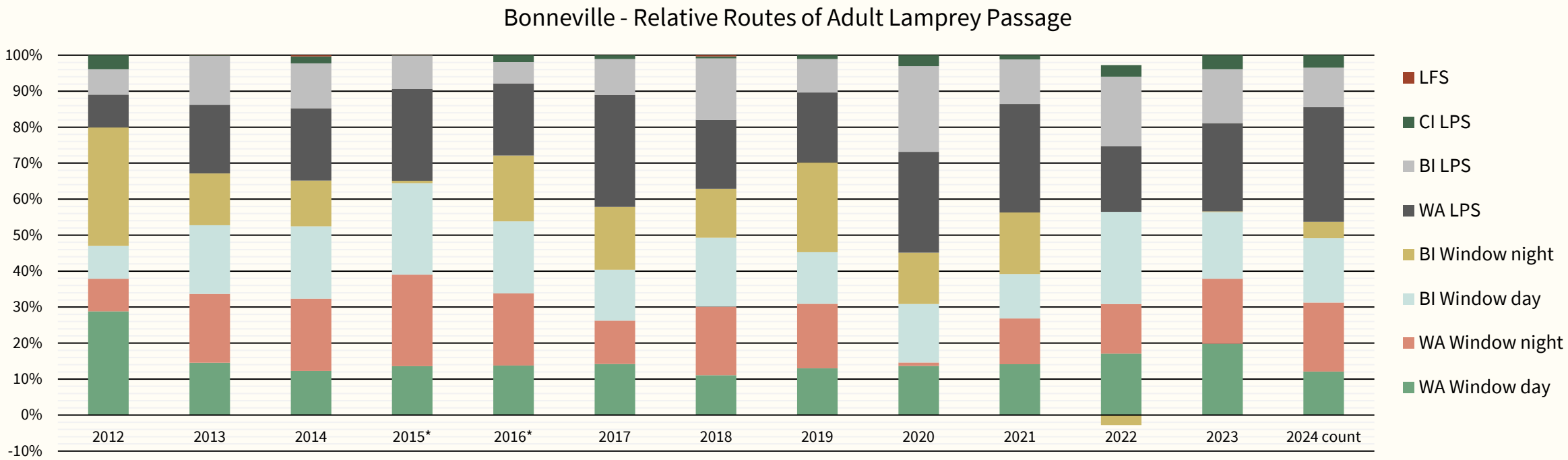


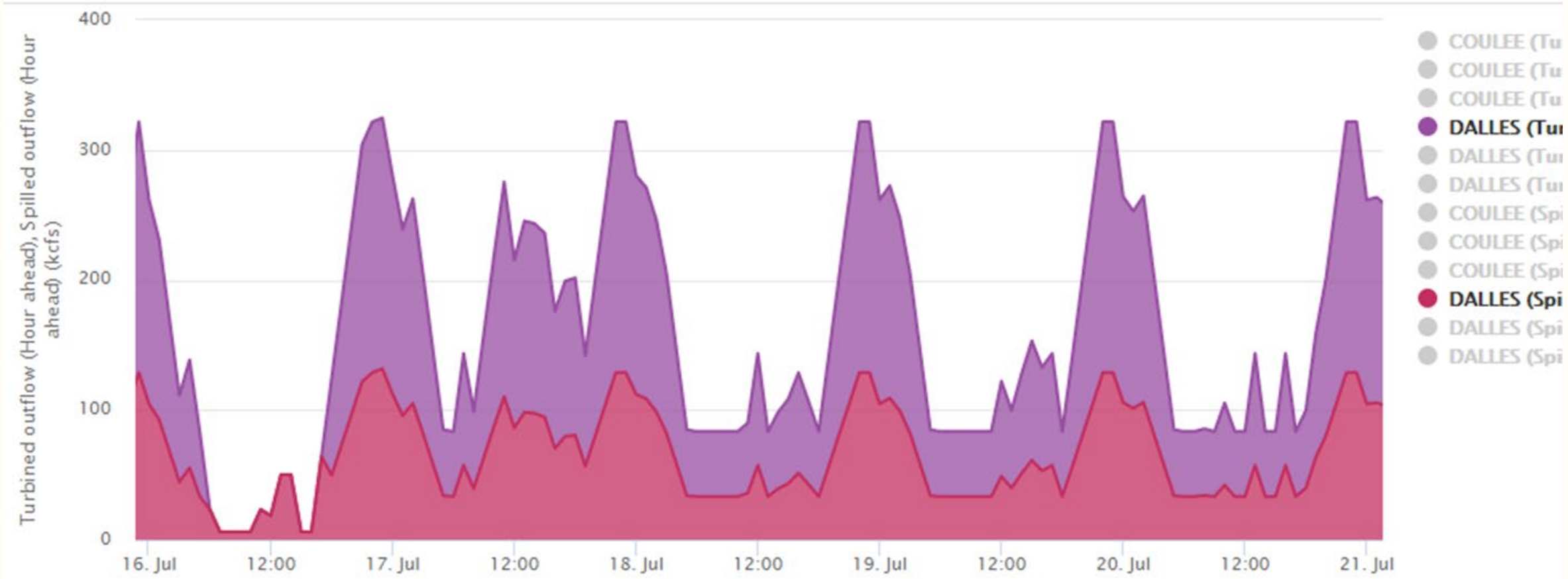
Figure 2. Proportional routes of passage for adult Pacific lamprey at Bonneville Dam. These can differ from PIT tagged or radio tagged fish. Data from table 2 above.
I've omitted negative WA night counts here for convenience in all years to allow comparison of trends. Just realize that LPS & LFS counts 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.

Run-of-the-River Project Operations (cont'd)

Flows – in large part determined by storage reservoir operations and base flows; but, run-of-the-river dam/pool operations effects

- Velocities and pool elevations
- Minimum generation amounts
- Total minimum flow – spill + minimum generation
- Daily ramping
- Winter in the Snake – zero generation at night
- Hanford Reach fall Chinook – Priest Rapids operations
- Chum flows in November – Bonneville operations

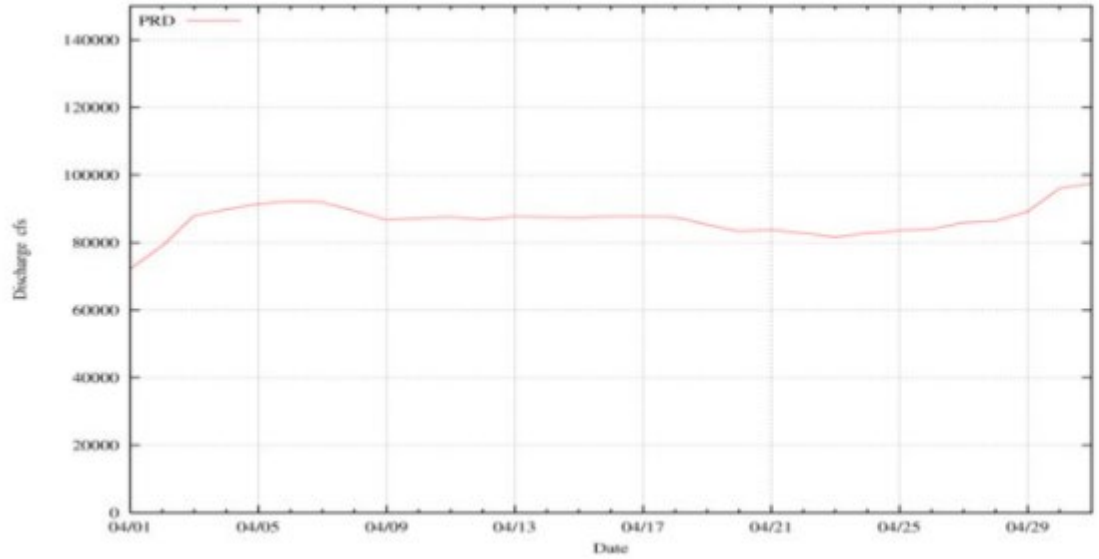
The Dalles Dam – five days in July 2031 (from analysis for the 2021 Power Plan)



Hanford Reach

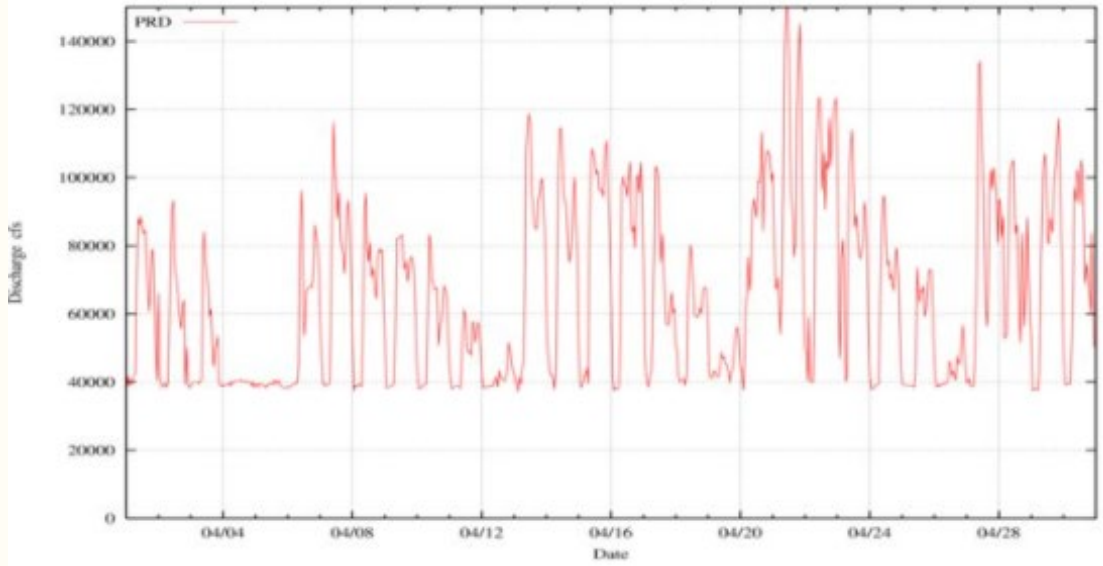
- Hanford Reach Fall Chinook Protection Program 2004
- Agreement between Mid-Columbia PUDs, Bonneville, NOAA, Washington, Colville Tribe
- Establish flow regimes that affect operations from Grand Coulee on through Chief Joseph and on down through the Mid-Columbia PUD dams – with ultimately discharge limitations out of Priest Rapids Dam
- From spawning through hatch to emergence and rearing – essentially fall to spring
- Purpose – to allow for spawning at the appropriate river levels and then minimize fluctuations that could undermine the redds and the emerging juveniles

Ramp rates



Caption

Figure 7. Hydrograph of daily discharge near Priest Rapids Dam for April 1941, during the 1940 spawning year (pre-Priest Rapids Dam construction).



Caption

Figure 6. Hydrograph of hourly discharge near Priest Rapids Dam for April 1964, during the 1963 spawning year (pre-Vernita Bar Agreement).

https://www.researchgate.net/publication/303858071_Simulation_of_Columbia_River_Hydrodynamics_and_Water_Temperature_from_1917_through_2011_in_the_Hanford_Reach/figures?lo=1