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May 9, 2023

### **MEMORANDUM**

**TO: Fish and Wildlife Committee Members**

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

**SUBJECT: Trials and Tribulations: 25 years of Coho Reintroduction in the Methow and Wenatchee Basins**

### **BACKGROUND:**

**Presenter:** Jeff Caisman, Fisheries Biologist, Upper-Columbia Production Projects, Yakama Nation Fisheries Resource Management, Peshastin Field Office

Cory Kamphaus, Northern Ceded Lands Production Supervisor, Yakama Nation Fisheries Resource Management, Peshastin Field Station

**Summary:** By the end of the 20th century, native populations of coho salmon (*Oncorhynchus kisutch*) were largely extirpated from the Mid and Upper-Columbia Basins due to impassable mainstem Columbia hydropower dams, over-harvest, and habitat degradation. In 1996, the Yakama Nation began a study to determine the feasibility of reintroducing coho salmon, a historically important species, to the Wenatchee and Methow Rivers, using Lower-Columbia River stock. The objective of the program is to create a locally-adapted, naturally-spawning population capable of supporting harvest, by selectively collecting in-basin broodstock and augmenting naturally spawning populations with hatchery-reared smolt releases. The first broodstock collection and smolt releases, using Lower-Columbia stock, occurred in 2000. This presentation details twenty-five years of production, as well as monitoring and evaluation of coho, in the

Wenatchee and Methow Rivers. We will provide updates on coho populations in both basins, in addition to sharing future directions for the program.

**Relevance:** The Council's 2014 Columbia River Basin Fish and Wildlife Program has supported efforts by the Yakama Nation to reintroduce extirpated coho to the Yakima River Basin. A successful reintroduction approach would result over time in anadromous fish that are viable in areas where they were previously located and that meet harvest and habitat goals and objectives identified by the agencies and tribes

**Background:** Historically, between 44,000 to 150,000 coho returned to the Yakima River. Coho that spawned in tributaries above Bonneville Dam were extinct by the late 1980s as the result of impacts including habitat alterations, construction of impassable dams on some tributaries, and historic overfishing in the ocean and in the Columbia below Bonneville. In the 1990s, programs to reestablish natural populations were initiated by the Yakama Nation in the Yakima, Wenatchee and Methow rivers, and by the Nez Perce Tribe in the Clearwater River. The Yakama Nation's long-term vision for coho reintroduction is:

To re-establish naturally spawning coho populations in mid-Columbia tributaries to biologically sustainable levels which provide significant harvest in most years.

To achieve their goal, the Yakama Nation established biological objective was to:

Develop a locally adapted, naturally spawning coho stock in the Wenatchee and Methow river basins capable of supporting harvest.

The Yakama Nation set out to answer two questions about the feasibility of coho reintroduction:

- 1) Determine whether a broodstock can be developed from lower Columbia River coho stocks whose progeny can survive in increasing numbers to return as adults to the mid-Columbia region and
- 2) Initiate natural reproduction in areas of low risk to sensitive species and in other select areas to study the risks and interactions with sensitive species.

Both feasibility study goals were achieved.

Today, the combined returns to the Wenatchee and Methow rivers in recent years have been as high as about 65,000 fish, and in some years fewer than 5,000. These fish contribute between 30 and 40 percent of the coho harvest in the tribal fishery between Bonneville and McNary dams. Continued supplementation and habitat restoration will be necessary for some period before self-sustainability may be achieved.

More Info:

**Methow Coho Story** <https://yakamafish-nsn.gov/methowcohostory>

Coho were once abundant in the mid-Columbia region with estimates of adult populations of about 30,000 in the Methow, where they may have once been the most common salmon species. They started disappearing from the area by the 1900s for a variety of reasons and by the 1930s they were considered extinct in the Mid-Columbia region.

**Yakima River Basin Coho Reintroduction Feasibility Study**

[https://critfc.org/wp-content/uploads/2013/07/Newsome\\_Yakima-River-Basin-Coho-Reintroduction-Feasibility-Study.pdf](https://critfc.org/wp-content/uploads/2013/07/Newsome_Yakima-River-Basin-Coho-Reintroduction-Feasibility-Study.pdf)

**Mid-Columbia Coho Restoration Program Master Plan**

[https://yakamafish-nsn.gov/sites/default/files/projects/Mid\\_C\\_coho\\_MP\\_2\\_8\\_17\\_sm.pdf](https://yakamafish-nsn.gov/sites/default/files/projects/Mid_C_coho_MP_2_8_17_sm.pdf)

**Extirpation and Tribal Reintroduction of Coho Salmon to the Interior Columbia River Basin**

[https://www.researchgate.net/publication/263366776\\_Extirpation\\_and\\_Tribal\\_Reintroduction\\_of\\_Coho\\_Salmon\\_to\\_the\\_Interior\\_Columbia\\_River\\_Basin/citation/download](https://www.researchgate.net/publication/263366776_Extirpation_and_Tribal_Reintroduction_of_Coho_Salmon_to_the_Interior_Columbia_River_Basin/citation/download)

# Trials and Tribulations: 25 Years of Coho Reintroduction in the Methow and Wenatchee Basins

Jeff Caisman and Cory Kamphaus  
Yakama Nation



# Salmon in the Columbia Basin

- Historically averaged 7-16 million salmon returning to Columbia Basin annually (Chapman 1986)
- Supported annual tribal harvest of 1.8-5.4 million fish (Meengs and Lackey 2005)





# Mid-Columbia Coho



- Historical coho abundance (Mulan 1983)
  - Entiat: 9,000-13,000
  - **Methow: 23,000-31,000**
  - **Wenatchee: 6,000-7,000**
- Coho decimated in early 1900's, functionally extirpated by early 1990's
- **Goal: Re-establish naturally spawning population of coho with opportunities for tribal harvest**



# Reintroduction Approach

- **Broodstock Development Phase 1**
  - Develop mid-Columbia broodstock from lower-Columbia coho
  - Wenatchee ✓ Methow ✓
- **Broodstock Development Phase 2**
  - Encourage local adaptation by moving adult capture sites upstream
  - Methow ✓
- **Natural Production Phases**
  - Introduce coho to new habitat
  - Increase fitness in natural environment
  - Reduce reliance on hatchery-reared fish

# Coho Reintroduction

- Feasibility study launched in 1996
- Using Lower-Columbia donor stock to develop locally-adapted population
- **Objective: Develop a locally-adapted, natural spawning coho stock**
  - 3-year mean escapement > 1,500 fish
  - 23% harvest rate





# Methow and Wenatchee Basins

## Methow Basin



Natural Implementation Phases

## Wenatchee Basin



Broodstock Development 2

# Performance Indicators

1. Release-to-smolt survival
2. In-pond survival
3. Pre-release condition
4. Smolt run timing
5. Spawning escapement and distribution
6. Natural production
7. Egg-to-emigrant survival
8. Smolt-to-adult ratio (SAR)
9. Adult-to-adult productivity
10. Harvest rates

# Wenatchee Production Operations

- 5 in-basin acclimation ponds
- Leavenworth National Fish Hatchery
- Average Annual Totals
  - 500 females spawned
  - 1.4 million eggs
  - 1 million smolts released





# Methow Production Operations

- 7 in-basin acclimation ponds
- Winthrop National Fish Hatchery
- Average Annual Totals
  - 325 females spawned
  - 900,000 million eggs
  - 700,000 smolts released





# Monitoring Methods





# Challenges to Reintroduction

1. Adapting Lower-Columbia coho donor stock to longer upstream travel
2. Expanding in-basin distribution of coho spawning
3. Increasing annual returns to the point of establishing fishery



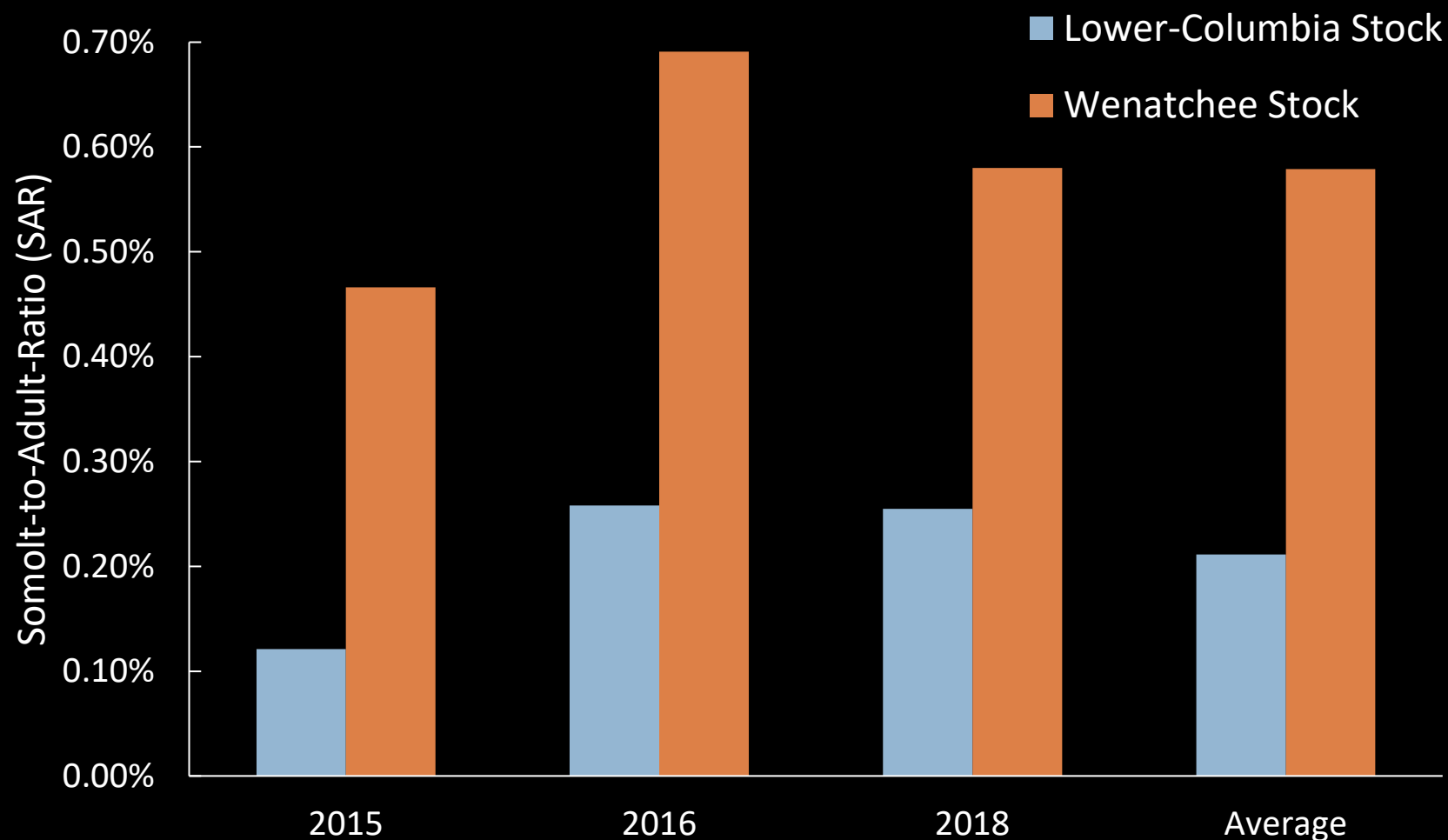
# 1. Adapting Lower-Columbia Donor Stock

- Do 4<sup>th</sup> and 5<sup>th</sup> generation Wenatchee stock show adaptation to Mid-Columbia as compared to Lower-Columbia donor stock?
- 3 years of side-by-side smolt releases of Lower-Columbia and Wenatchee stocks
- Compared smolt-to-adult ratios between groups (SAR)

Number of coho smolts by release year and source stock

Stock	2015	2016	2018	Total
<b>Lower-Columbia</b>	96,206	73,720	34,662	204,588
<b>Wenatchee</b>	84,750	107,397	116,259	308,406

# 1. Adapting Lower-Columbia Donor Stock



- Higher SAR for Wenatchee stock vs. donor stock ( $p < .001$ )
- Indicates local adaptation is occurring
- Suggests potential for selective broodstock collection to increase spawning range within basin

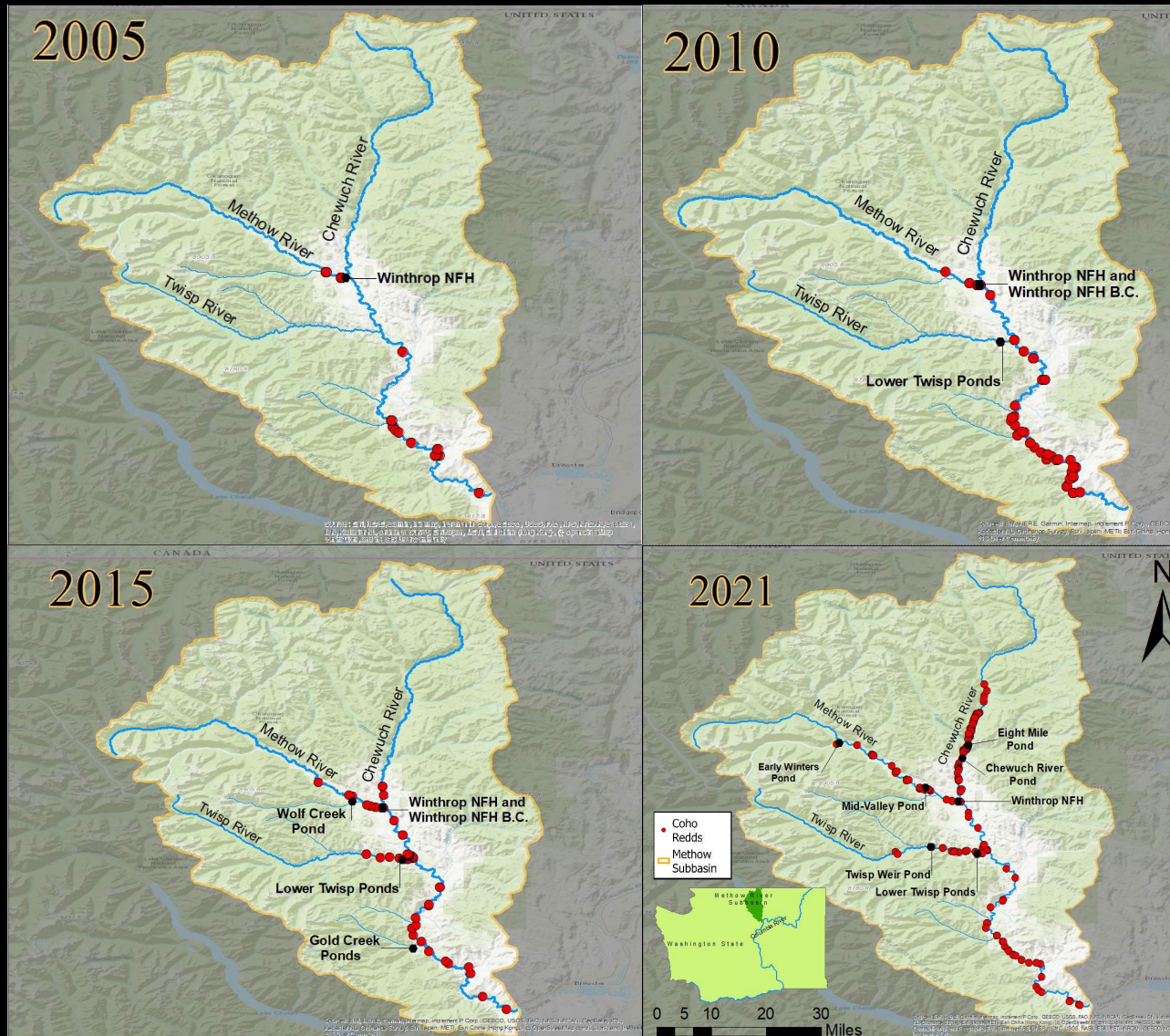
## 2. Expanding In-Basin Coho Distribution

- How do we expand in-basin distribution of coho?
- In-basin collection of coho broodstock
  - Expanding collections further upstream when possible
- Using natural/semi-natural acclimation ponds to increase adult dispersion and distribution within the basin





# 2. Expanding In-Basin Coho Distribution (Methow)

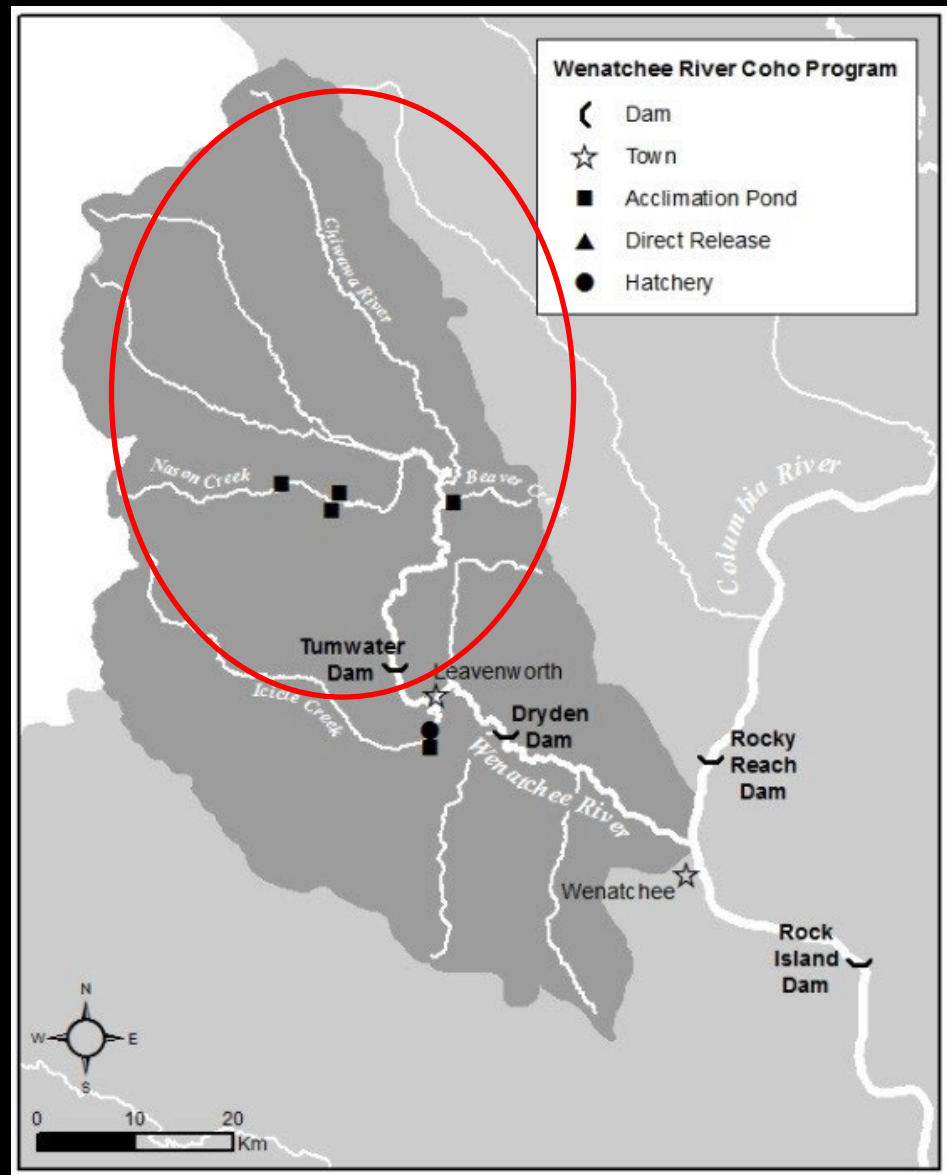


- Increased dispersion of spawning coho
- Due in part to upstream expansion of acclimation ponds





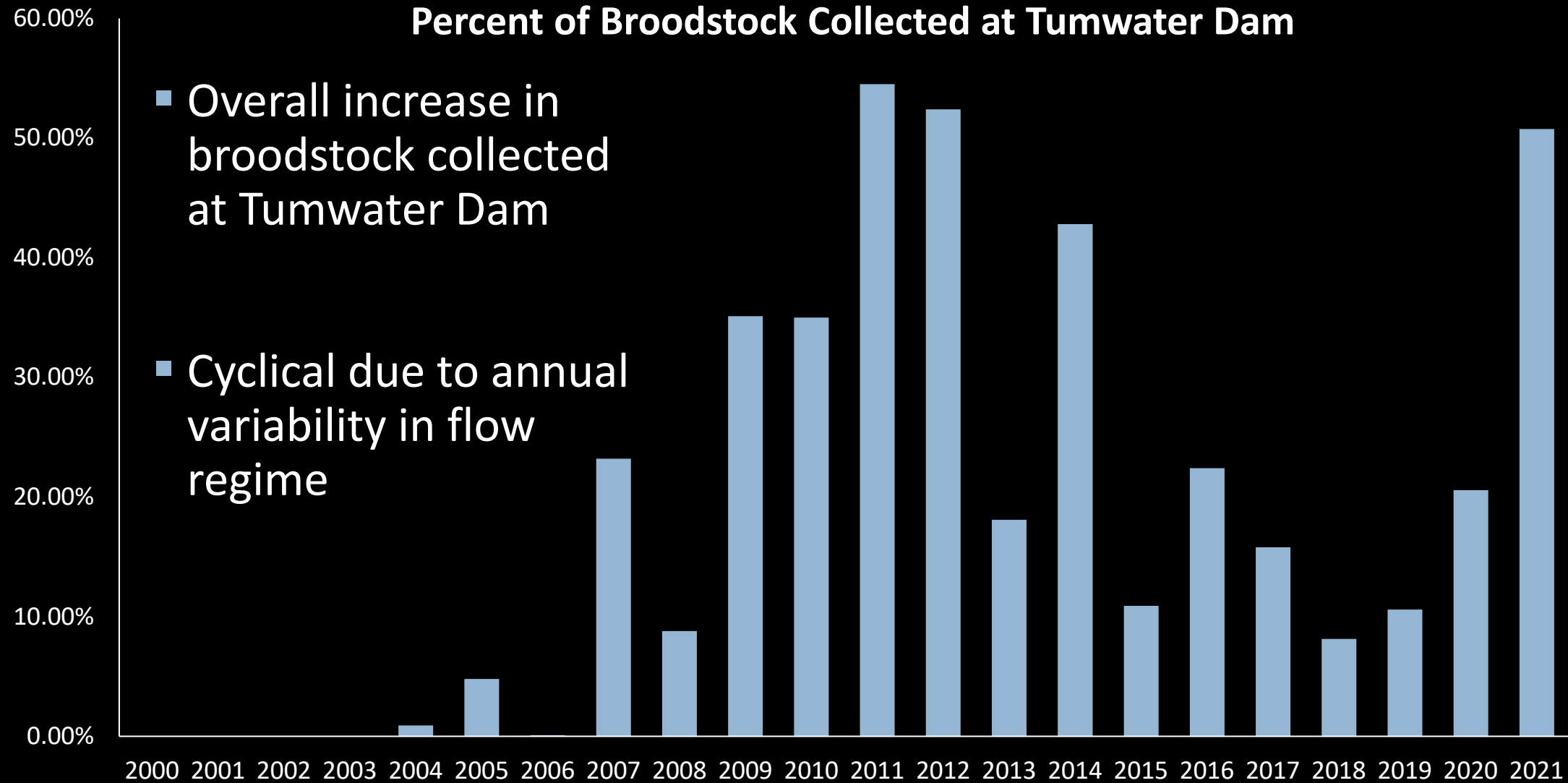
# 2. Expanding In-Basin Coho Distribution (Wenatchee)



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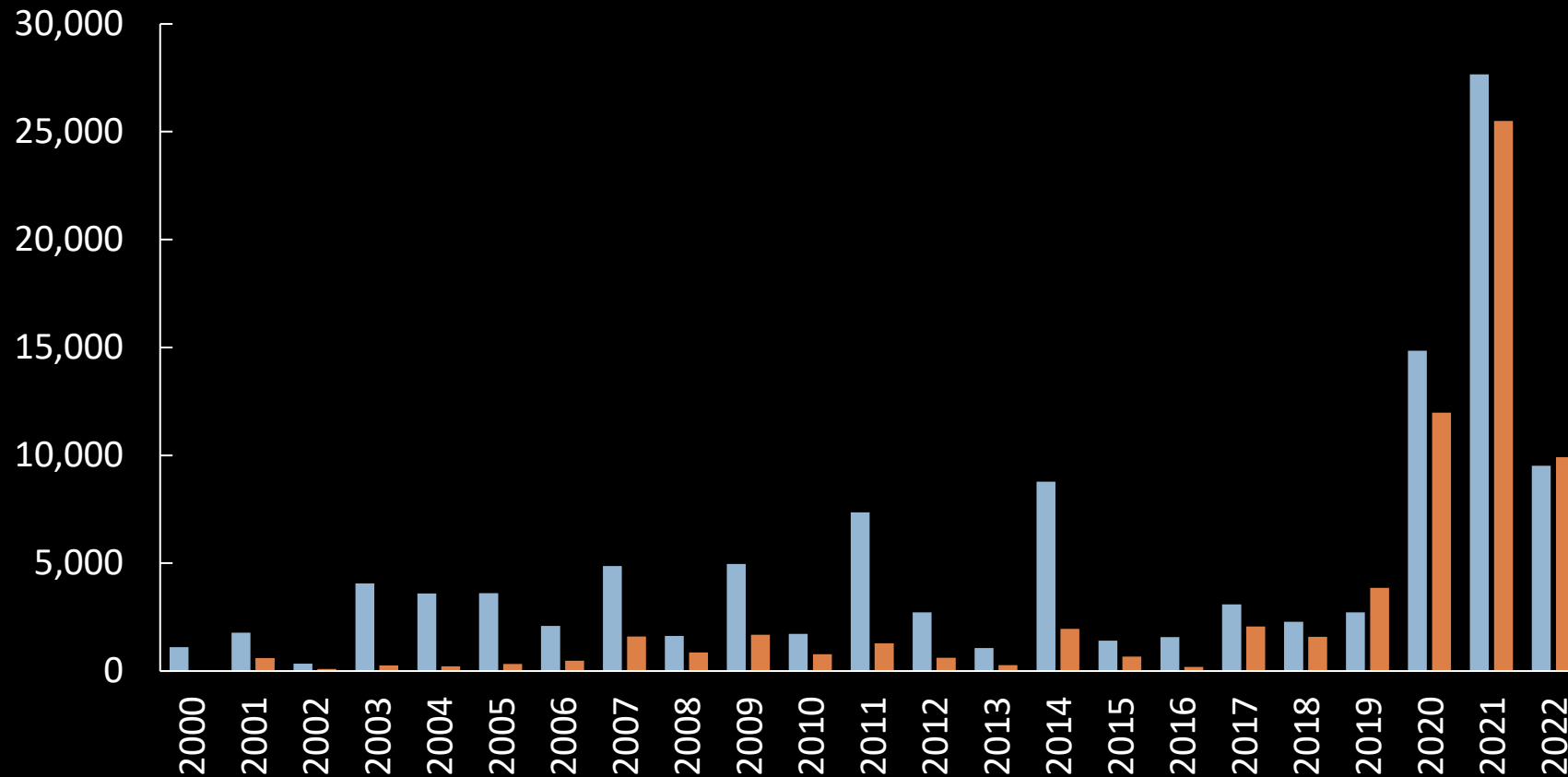
## 2. Expanding In-Basin Coho Distribution (Wenatchee)



# 3. Increasing Escapement to Support Fishery

## Coho Escapement

■ Wenatchee ■ Methow



- Overall increase in total escapement for both basins
- Record returns of 27,656 and 25,496 fish for the Wenatchee and Methow, respectively in 2021



# 3. Increasing Escapement to Support Fishery





# Conclusions and Future Directions

- Shown local adaptation potential from Lower-Columbia donor stock
- Continue broodstock selection for adults above velocity barrier and evaluate individual success
- Continued upstream expansion of acclimation sites
- Outplanting of returning adults beginning in 2023



# Acknowledgements



- Mid-Columbia Coho Operations & Maintenance and Monitoring & Evaluation teams
- Funding sources: Bonneville Power Administration, Chelan County PUD, Grant County PUD
- Leavenworth and Winthrop National Fish Hatchery staff
- Washington Department of Fish and Wildlife
- Bioanalysts Inc.

