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

July 5, 2017

MEMORANDUM

TO: **Council members**

FROM: **Kendall Farley**

SUBJECT: **Lower Columbia River Chum Salmon: Status, Restoration and Recovery**

BACKGROUND:

Presenter: Todd Hillson, Lower Columbia River Chum Salmon Project Leader for the Washington Department of Fish and Wildlife.

Summary: This presentation will provide the Council with information on the status of the Lower Columbia River Chum Salmon, actions to implement the Lower Columbia River Salmon Recovery Plan, and will identify future activities needed to help improve the condition of this species.

Relevance: A total of 14 of the 17 chum salmon populations in the Evolutionary Significant Unit (ESU) are at high risk of extinction due to very low abundances while the remaining 3 populations are at low to moderate risk of extinction.

Background: Lower Columbia River Chum Salmon were listed for protection under the Endangered Species Act in 1999. In 2004 the Lower Columbia Fish Recovery Board (LCFRB) developed a plan for the recovery of chum salmon and other ESA listed salmon as part of the NPPC Subbasin Plan. The LCFRB updated the recovery plan in 2010, and NOAA finalized the federal recovery plan in 2013.

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More Info: NPCC 2004 Lower Columbia Salmon and Steelhead Recovery and Subbasin Plan
https://www.nwcouncil.org/fw/subbasinplanning/lowerColumbia/plan

LCFRB 2010 Lower Columbia Salmon and Fish & Wildlife Subbasin Plan at: https://www.lcfrb.gen.wa.us/librarysalmonrecovery

NOAA 2013 Lower Columbia River Recovery Plan for Salmon and Steelhead at:
http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/lower_columbia_river/lower_columbia_river_recovery_plan_for_salmon_steelhead.html

Lower Columbia River Chum Salmon: Status, Restoration, and Recovery.

Todd Hillson (Washington Department of Fish and Wildlife)

Washington Department of FISH and WILDLIFE

BONNEVILLE POWER ADMINISTRATION

LOWER COLUMBIA FISH RECOVERY BOARD — CELEBRATING 15 YEARS — 1998–2013

NOAA — NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION — U.S. DEPARTMENT OF COMMERCE

OREGON Fish & Wildlife

Outline

- Chum Salmon Background
- Limiting Factors
- BPA & Partners Chum Salmon Projects
  - Hatcheries
  - Habitat Restoration
  - Status & Trend Monitoring
- Recovery Approach
- VSP & Habitat Effectiveness Monitoring

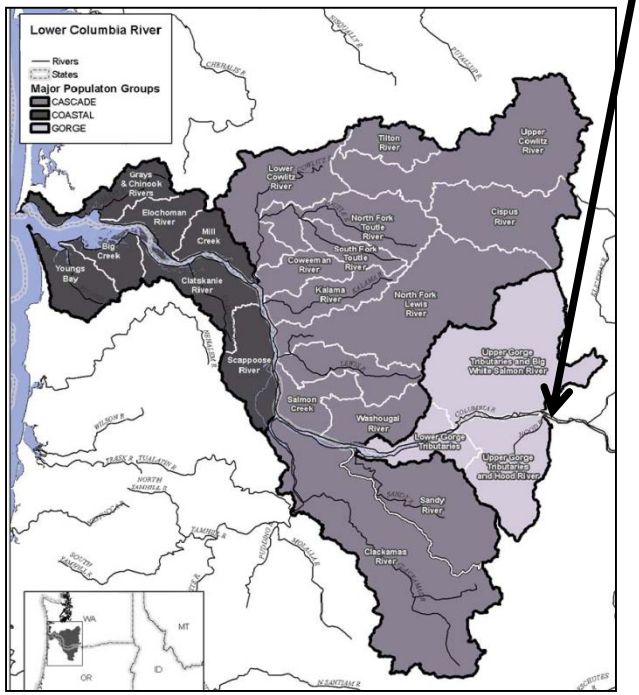
Historic Overview

Based on commercial landings & habitat 0.5 - 1 million chum salmon returned to Columbia River Basin (ISAB 2015-1)

- Upper distribution Celilo Falls

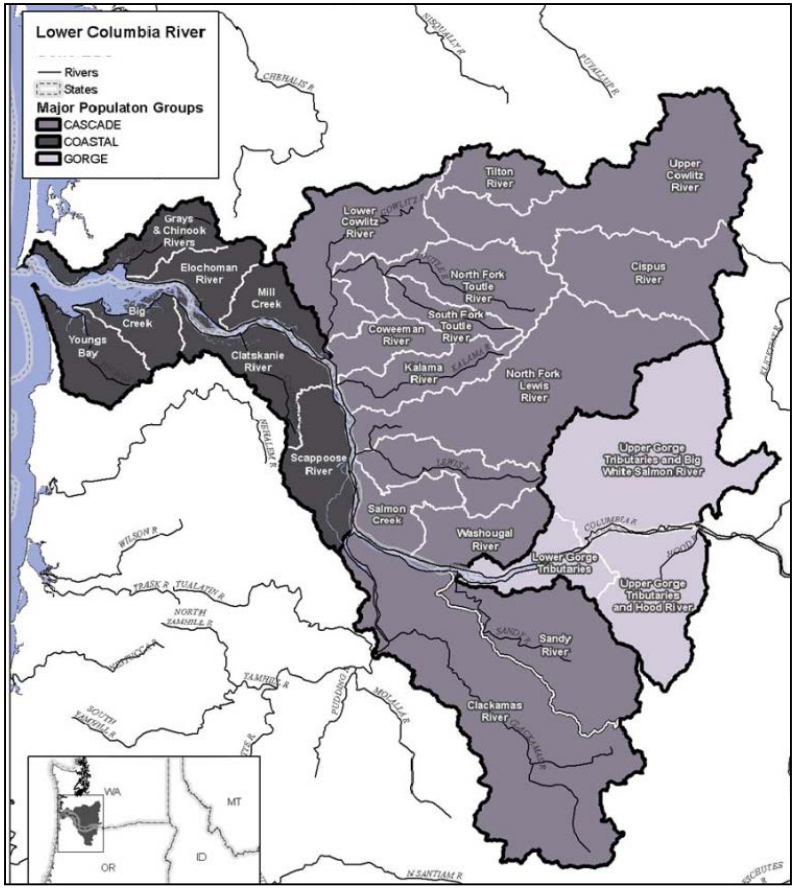
Decline in the 1940's

- Loss, degradation, and impeded access to spawning habitat
- Changes to estuary ecology and habitat
- Altered mainstem & tributary hydrology
- Harvest

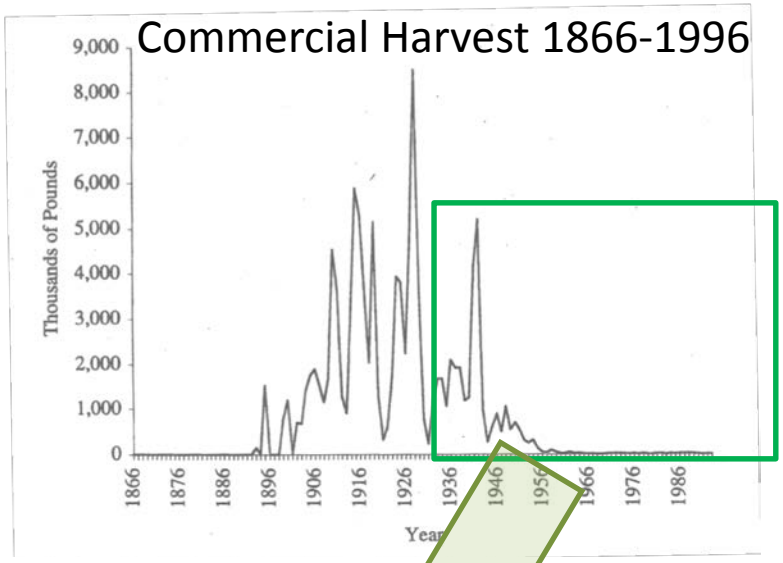


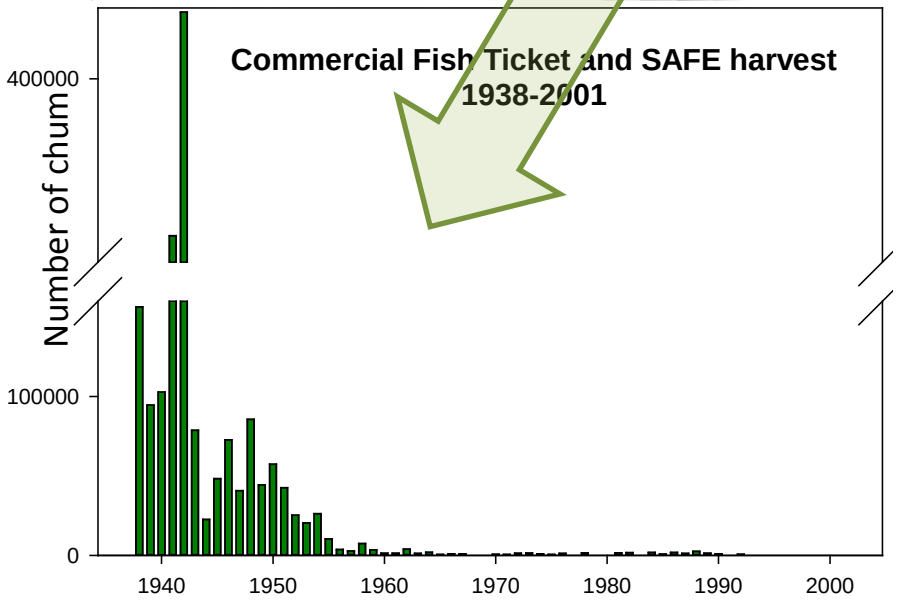
Endangered Species Act (ESA)

- Currently, between 1,000s & 10,000's of chum return
  - 17 historic populations in Columbia River (90% of which are extirpated)
  - Limited current distribution (mostly in Washington)
- Listed as threatened under Endangered Species Act in 1999
  - 1 ESU for Lower Columbia River
  - Divided into 3 geographic stratum (Coast, Cascade & Gorge)



Limiting Factor -Harvest





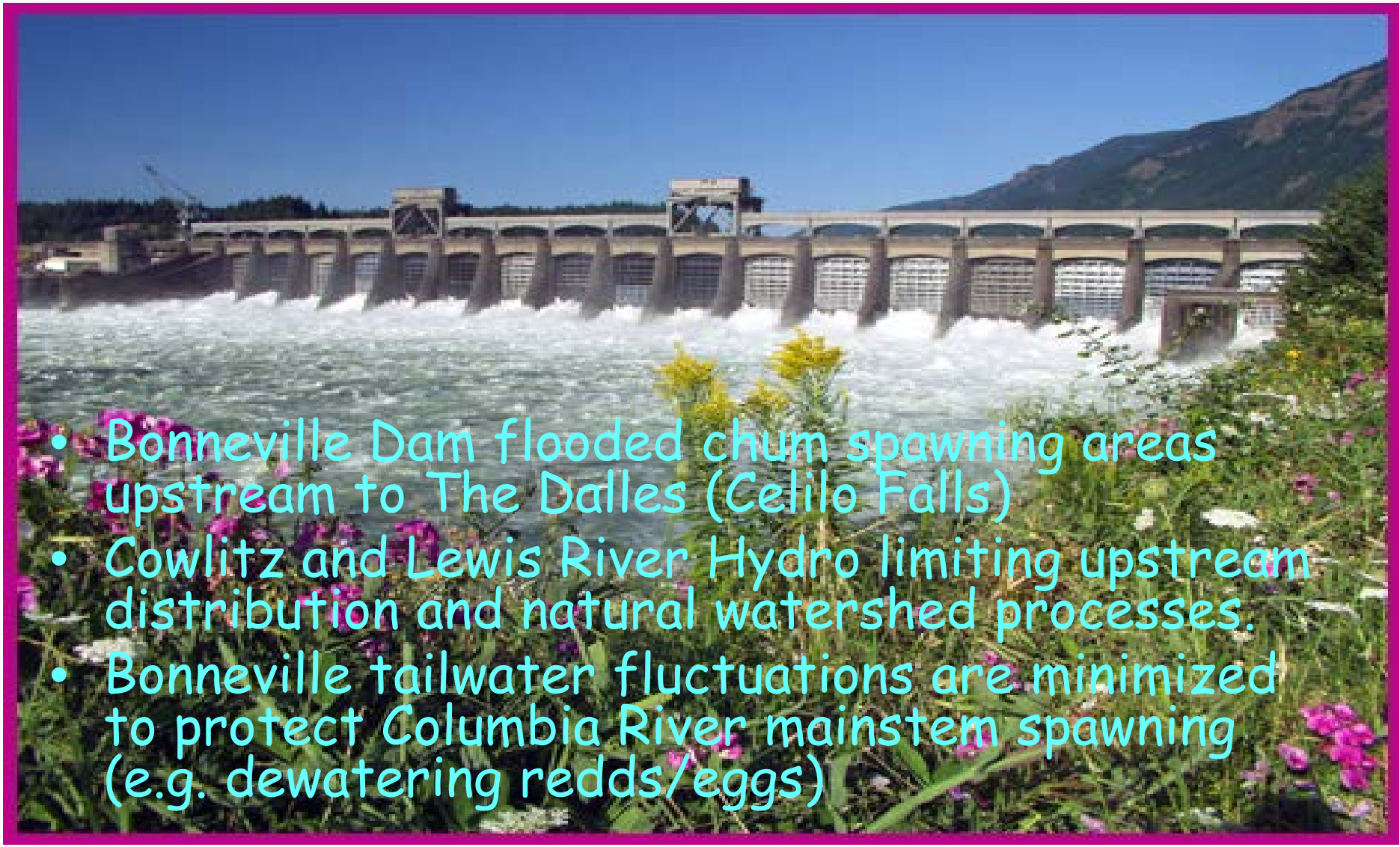
Historic Catch

- Landings 1M-8M lbs, which equals 0.1 -0.5M adult chum
- Appropriate harvest rate for healthy population of chum salmon is 48% Chapman (1986)
- Fisheries managers reduced harvest in 1950's due to decline in abundance

Current harvest

- Harvest prohibited for hatchery and wild chum salmon
- Incidental impacts in hatchery Chinook and/or coho salmon targeted commercial fisheries limited to <5%.

Limiting Factor-Hydro



- Bonneville Dam flooded chum spawning areas upstream to The Dalles (Celilo Falls)
- Cowlitz and Lewis River Hydro limiting upstream distribution and natural watershed processes.
- Bonneville tailwater fluctuations are minimized to protect Columbia River mainstem spawning (e.g. dewatering redds/eggs)

Limiting Factor - Habitat

- Key chum salmon spawning and incubation habitat occurred in off-channel or braided portions of rivers.
- Because this habitat produces high egg to fry survival which is needed to sustain populations when ocean survival is low.
- Typically this type of habitat occurred in the lowest portions of rivers and has been negatively impacted by agriculture, dikes, levees and population growth.

EF Lewis Historic Channels

BPA & Partners Chum Project Summary

Initiated Conservation Hatcheries

- Jump start reintroduction & reduce extinction risk in degraded watersheds
- Grays River
  - Reduced extinction risk in Grays River Basin (Release ~175,000 fry)
  - Supplied eyed eggs to Oregon to initiate hatchery program for reintroductions
- Duncan Creek
  - Reintroduction (Release ~ 45,000)
  - Evaluating Reintroduction strategies
    - Direct Adult versus Fed-Fry releases

Completed Habitat Restoration

Duncan Creek spawning channels constructed in 2001 & upgraded in 2008,2011

Hamilton Springs constructed in 1980's & upgraded in 2011

LCFRB implementation of multi-species restoration

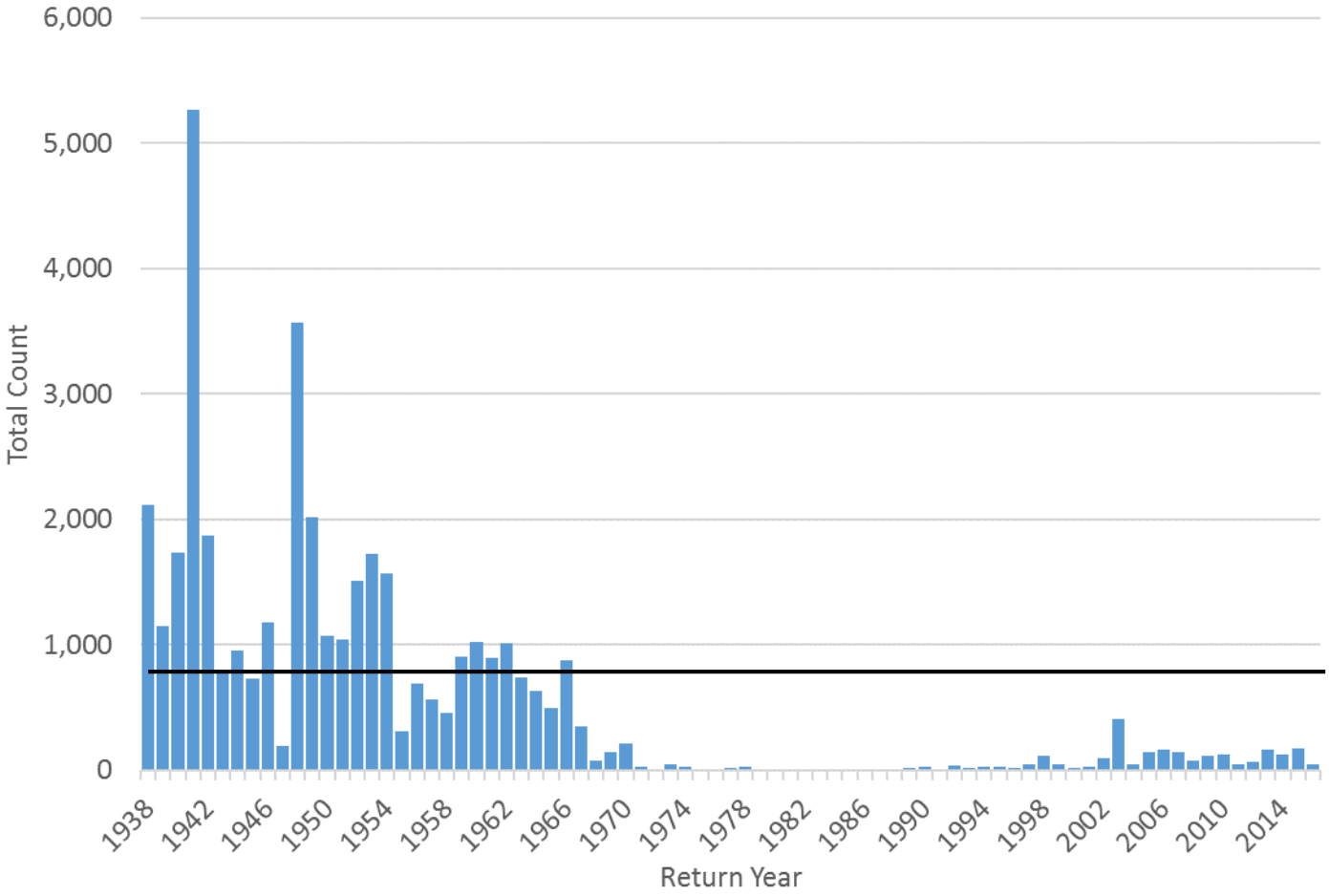
Habitat Effectiveness Monitoring

- Spawning channel egg-to-fry survival
  - Duncan Creek Channels - mean=54%, range 35-86%
  - Hamilton Springs - mean=48%, range 38-60%
- Natural Off-Channel egg-to-fry survival
  - Crazy Johnson Creek – mean 28%, range 18-38%
- River channel egg-to-fry survival
  - Grays River mean=17%, range 2-33%

- Natural and artificial off-channel sites have much high egg-to-fry survival than river channel survival

Upper Gorge Status & Trend

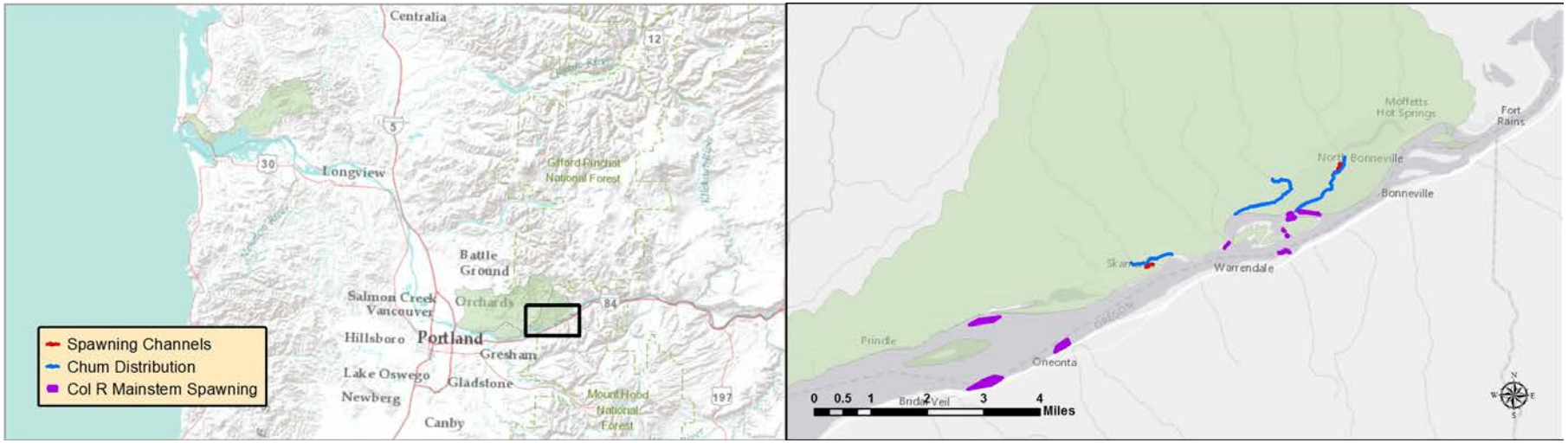
- Based on Bonneville Dam Counts

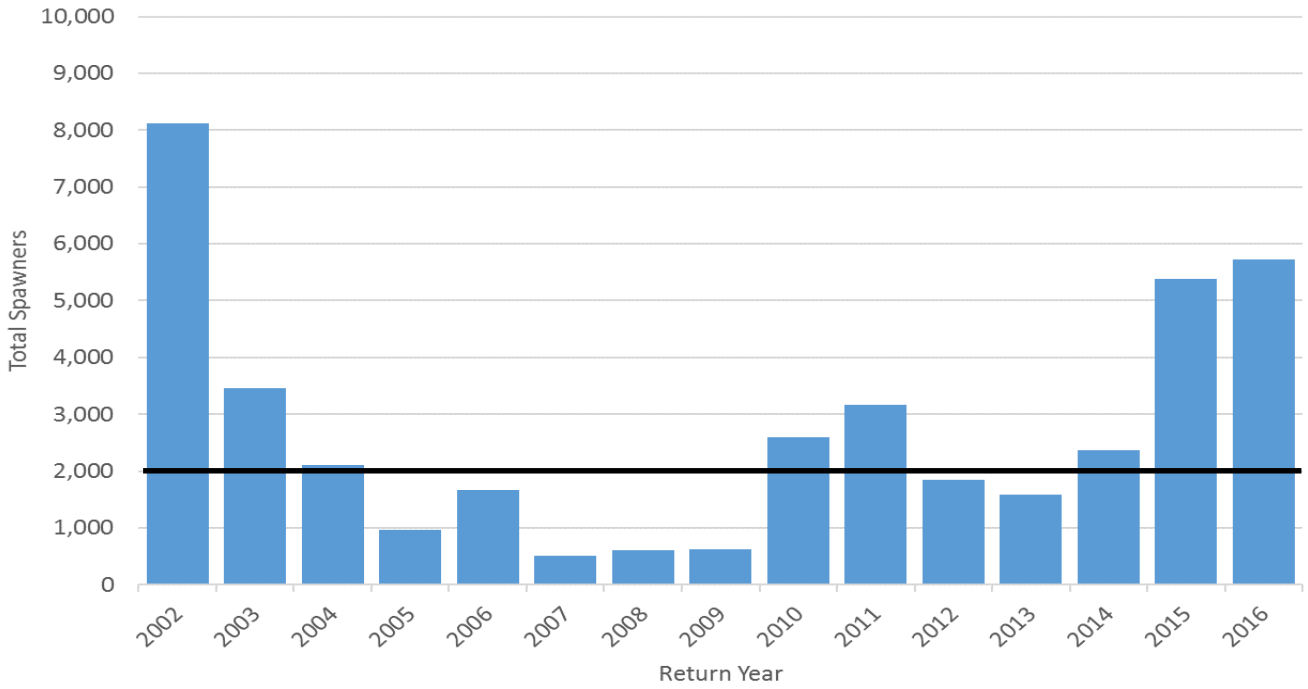


Upper Gorge	
2002-06	171
2003-07	180
2004-08	113
2005-09	126
2006-10	123
2007-11	100
2008-12	85
2009-13	103
2010-14	106
2011-15	116
2012-16	115

Delisting goal = 900 spawners

Lower Gorge Status & Trend

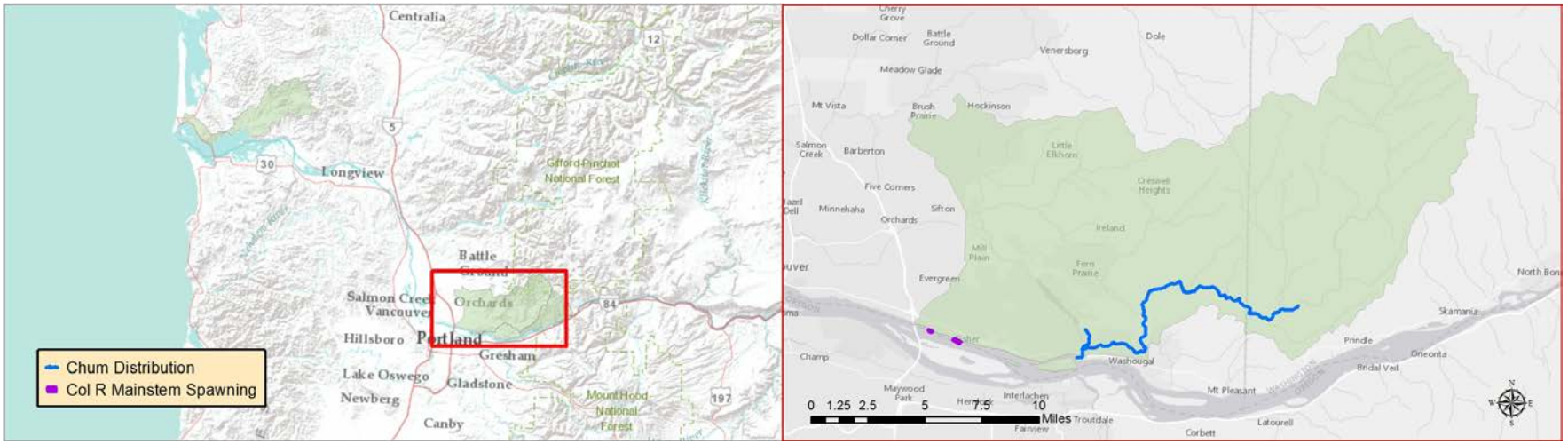


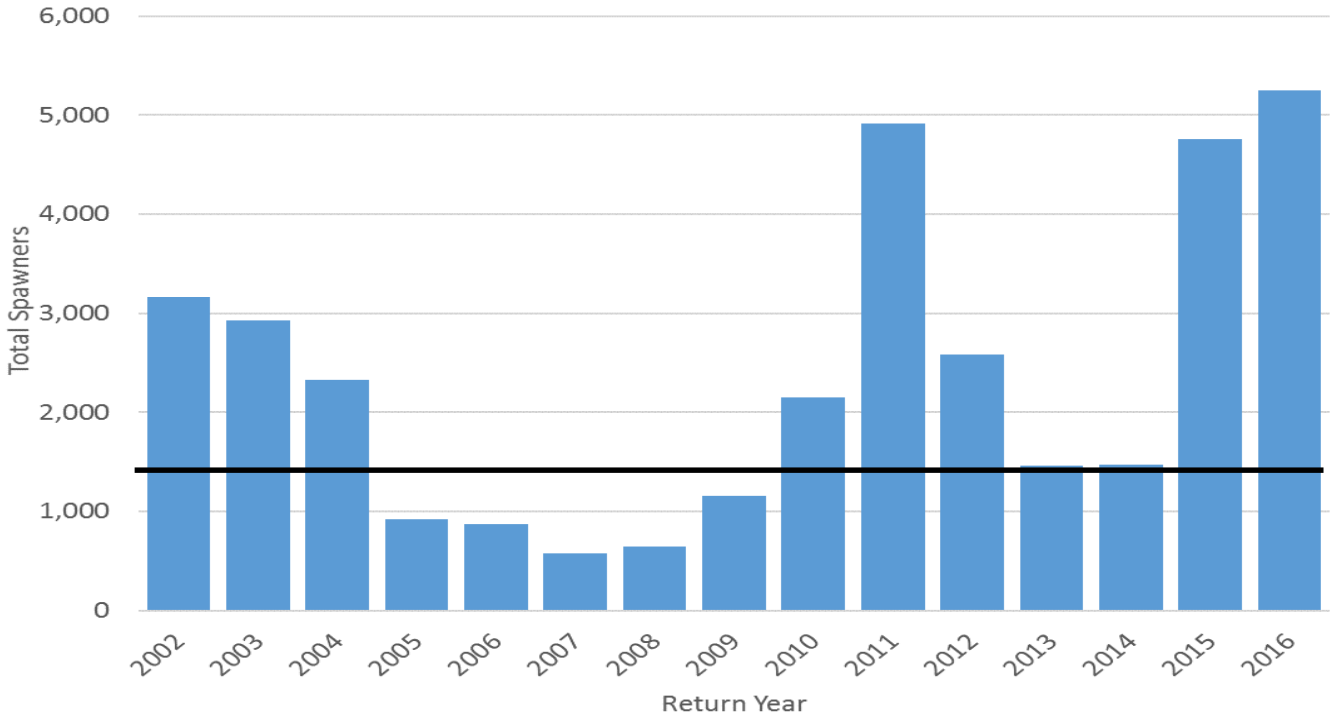


Lower Gorge	
2002-06	3,260
2003-07	1,738
2004-08	1,167
2005-09	870
2006-10	1,198
2007-11	1,499
2008-12	1,766
2009-13	1,962
2010-14	2,312
2011-15	2,867
2012-16	3,378

Delisting goal = 2,000 spawners

Washougal (I-205) Status & Trend

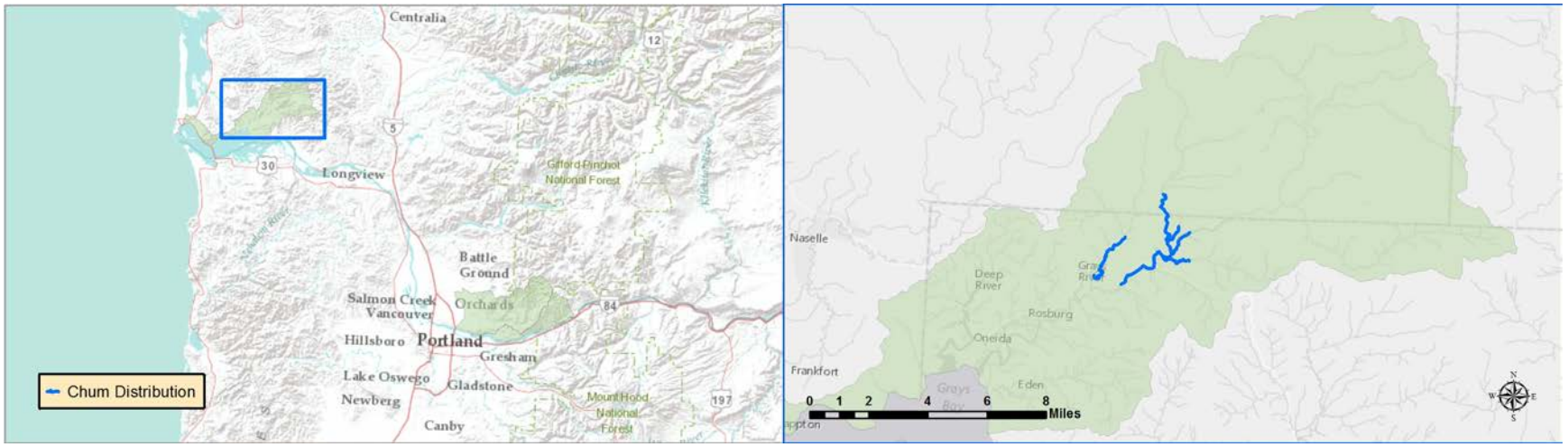


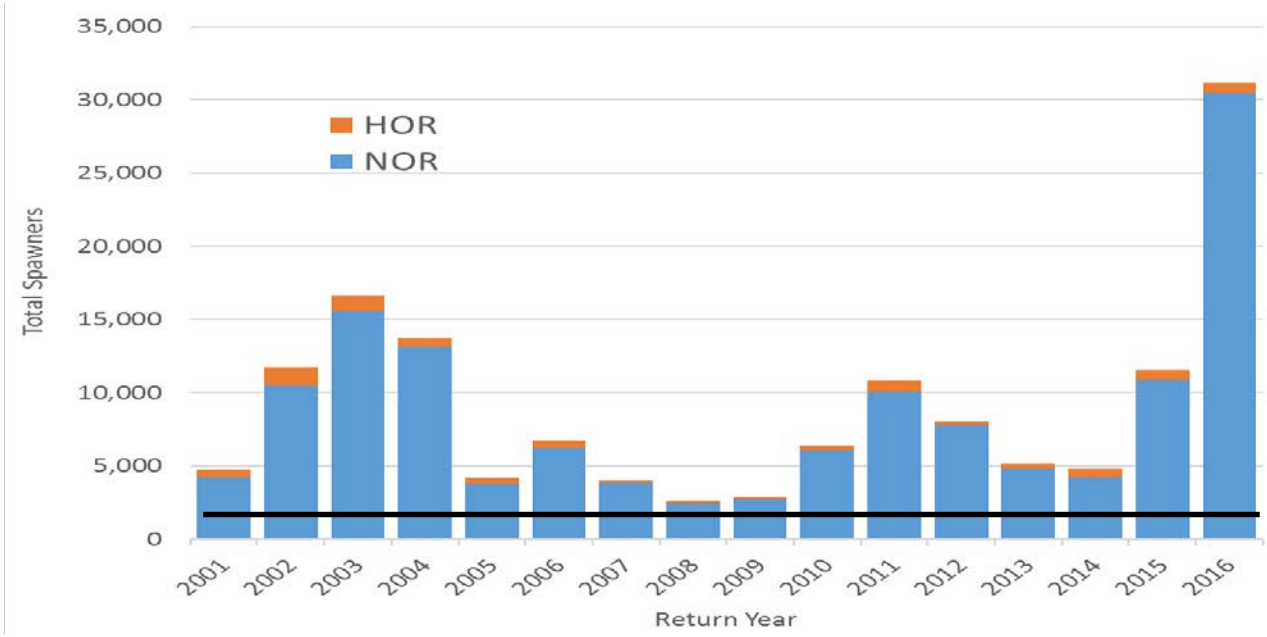


Washougal	
2002-06	2,028
2003-07	1,512
2004-08	1,067
2005-09	833
2006-10	1,078
2007-11	1,884
2008-12	2,294
2009-13	2,465
2010-14	2,528
2011-15	3,050
2012-16	3,120

Delisting goal = 1,300 spawners

Grays Status & Trend

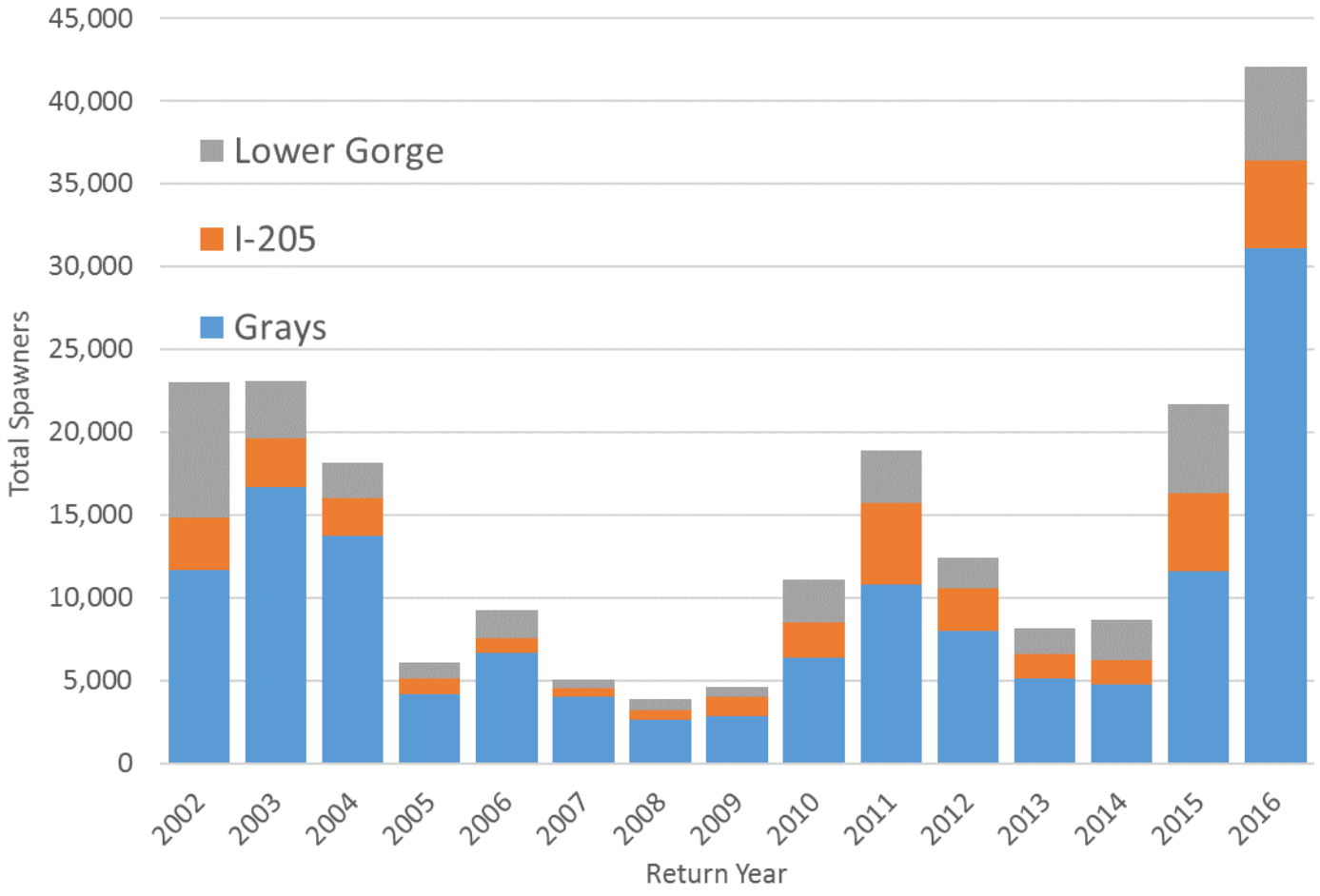




Grays	
2002-06	10,819
2003-07	9,237
2004-08	6,381
2005-09	4,174
2006-10	4,640
2007-11	5,517
2008-12	6,336
2009-13	6,873
2010-14	7,284
2011-15	8,293
2012-16	12,325

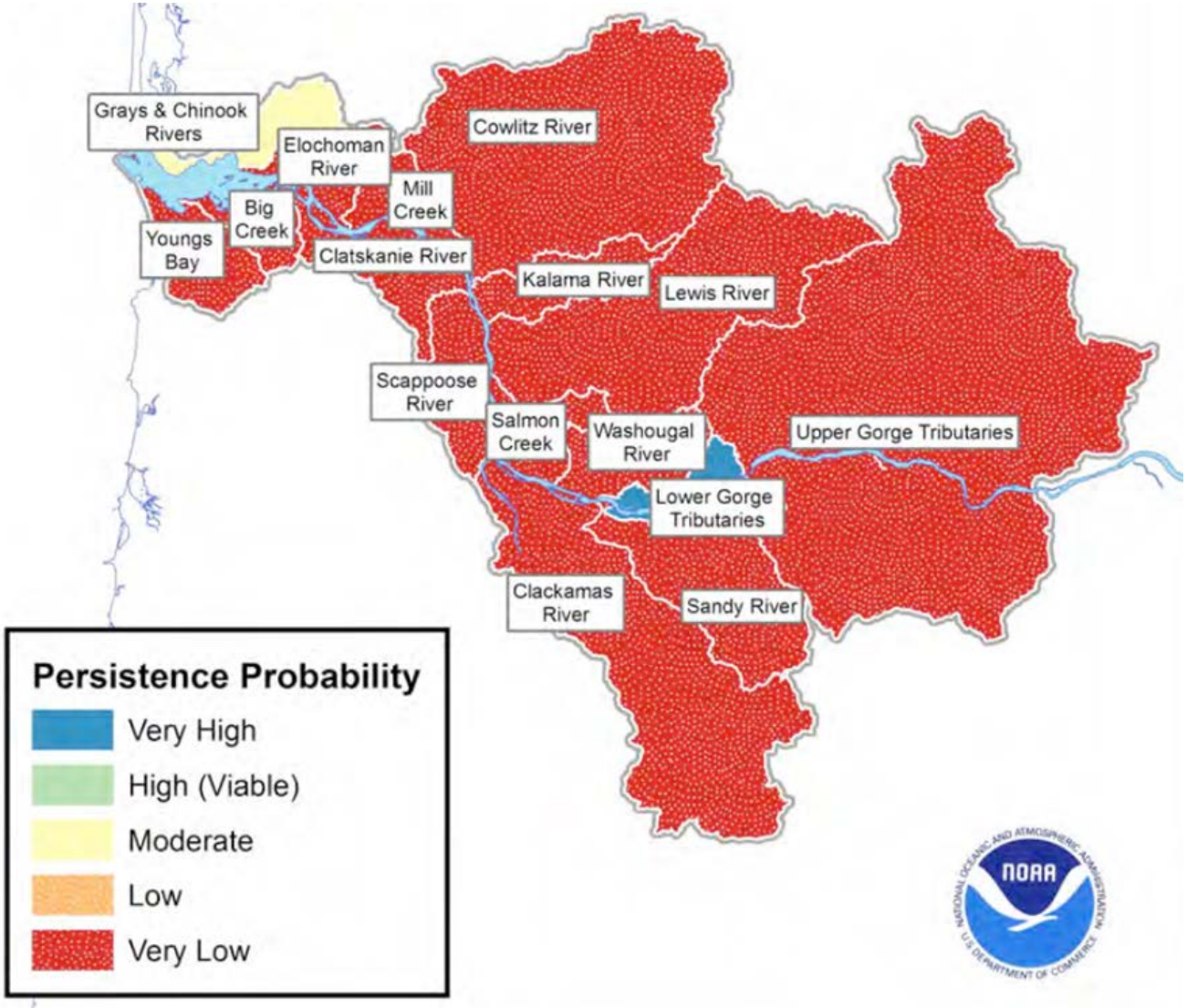
Delisting goal = 1,600 spawners

Grays, Washougal, & Gorge Populations



LCR	
2002-06	16,107
2003-07	12,487
2004-08	8,616
2005-09	5,877
2006-10	6,917
2007-11	8,899
2008-12	10,396
2009-13	11,300
2010-14	12,125
2011-15	14,210
2012-16	18,823

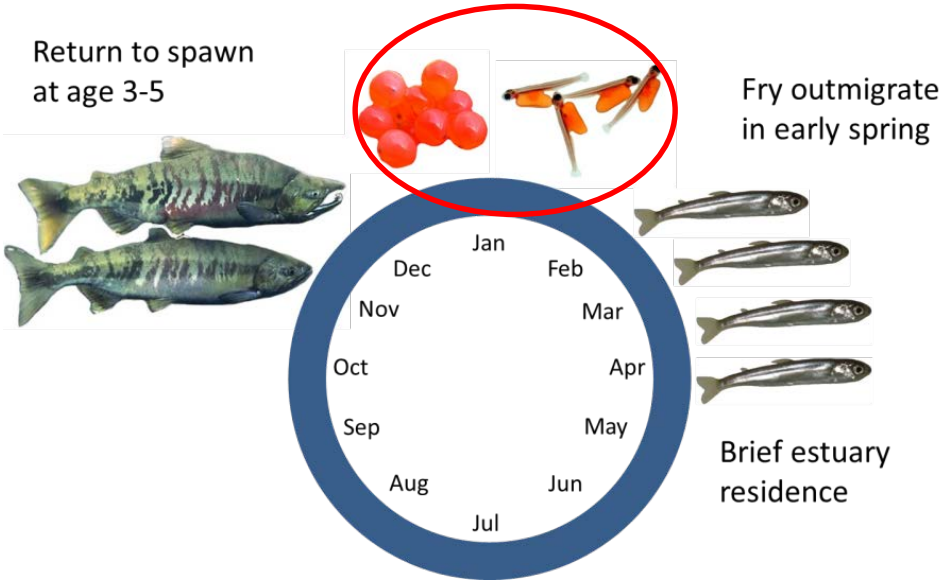
Lower Columbia River Salmon and Steelhead ESA Recovery Plan, NOAA - 2013



Limiting Factors Summary

- Ocean survival explains much of the variation in life cycle survival but except for estuary restoration, there is not much that can be done to improve ocean survival.
- The only remaining healthy chum salmon populations have protected spawning and incubation areas (mainstem Columbia River (near Bonneville and I-205) & Grays River)).
- High freshwater survival only exists in protected off-channel sites, below hydro regulated dams, artificial spawning channels, hatcheries, and remote site incubators.

- **Working Hypothesis:** The quality and quantity of spawning and incubation habitat is limiting recovery of this species.

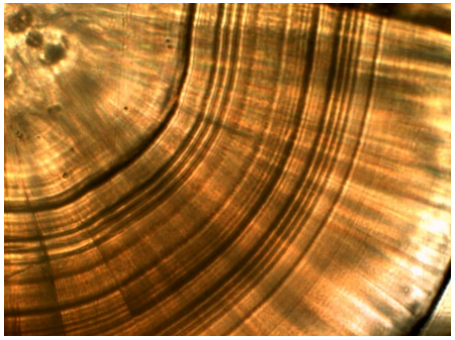


Recovery Approach

Habitat Restoration and Creation

Supplementation and Re-introduction

Monitoring



How do we proceed?

- Protect existing populations (Grays, Lower Gorge, Washougal) by protecting and/or enhancing existing habitat with high incubation survival & hatchery production if needed.

- Construct high-quality spawning habitat (spawning channels) until natural process can create high quality off-channel habitat.

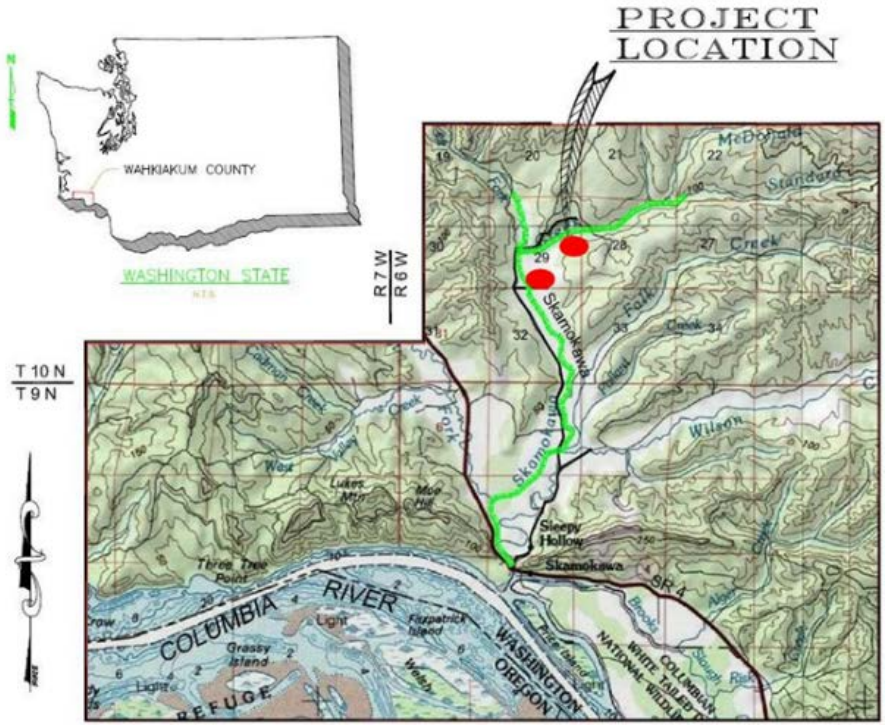
- Create spawning channels near existing populations to promote natural recolonization and/or use of hatchery releases to jump start population.

Habitat Restoration and Creation

- Focused on creation/restoration of high-quality off-channel chum salmon spawning habitat
  - Size projects for ~500 spawning pairs
    - Promote self sustaining, locally adapted populations
    - Reduce genetic risks
  - Protected off-channel sites with groundwater influence
  - Provide a bridge between present conditions and longer term habitat recovery actions
    - Allow watershed scale processes to take effect, which will takes 25 to >100 years
- Goal to achieve egg-to-outmigrant survival in the range of 25% to 50% in spawning channels

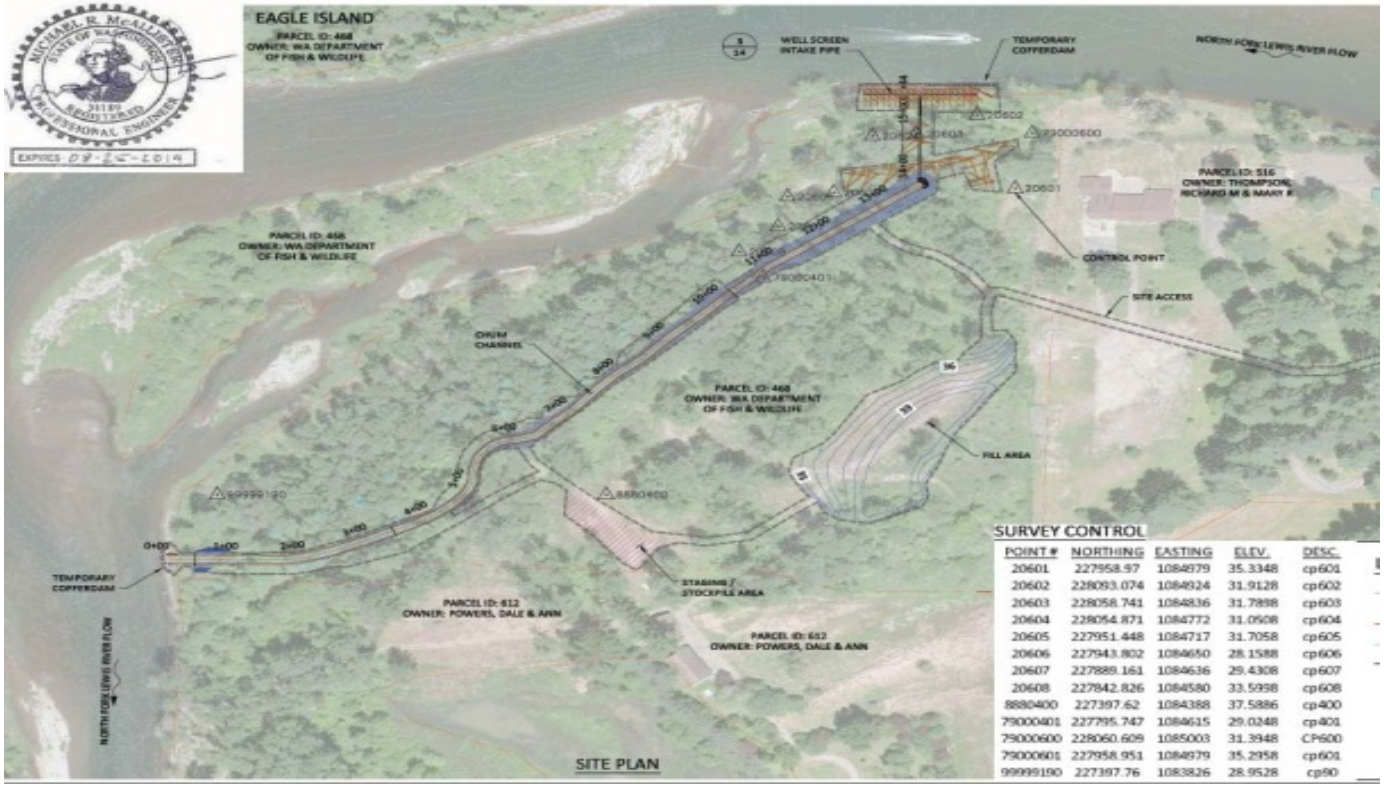
Skamokawa Sites – side channel restoration

- ELJ or small berms to protect two spawning channel (Emlen & McNally)
  - Emlen completed in June of 2017
  - McNally scheduled to be completed in August of 2017



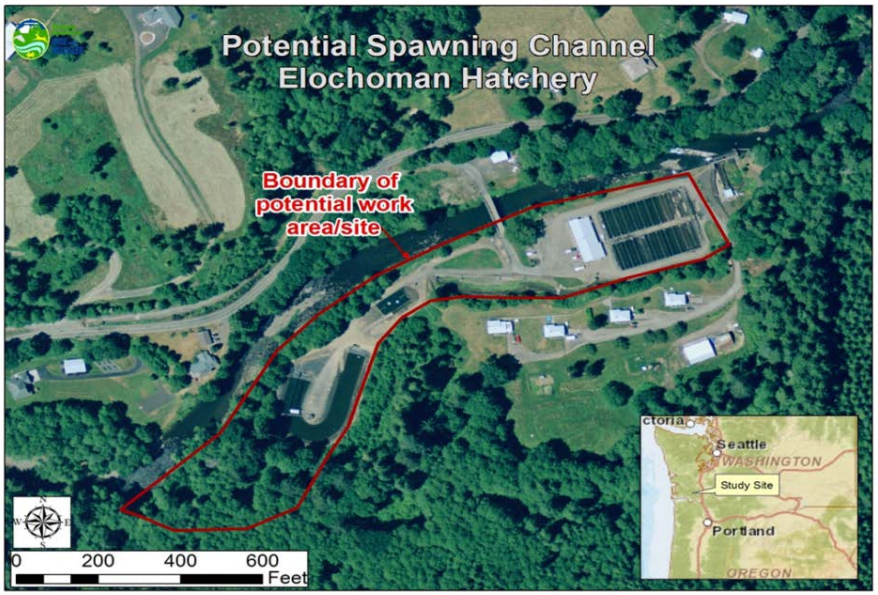
Restoration Examples – In-planning

- NF Lewis River – Eagle Island
  - Large capacity (~750 spawning pair @ 2m^2 per female)
  - Design completed 2015
  - Infiltration gallery
  - Completion dependent on funding



Elochoman Site - Defunct hatchery – unique opportunity

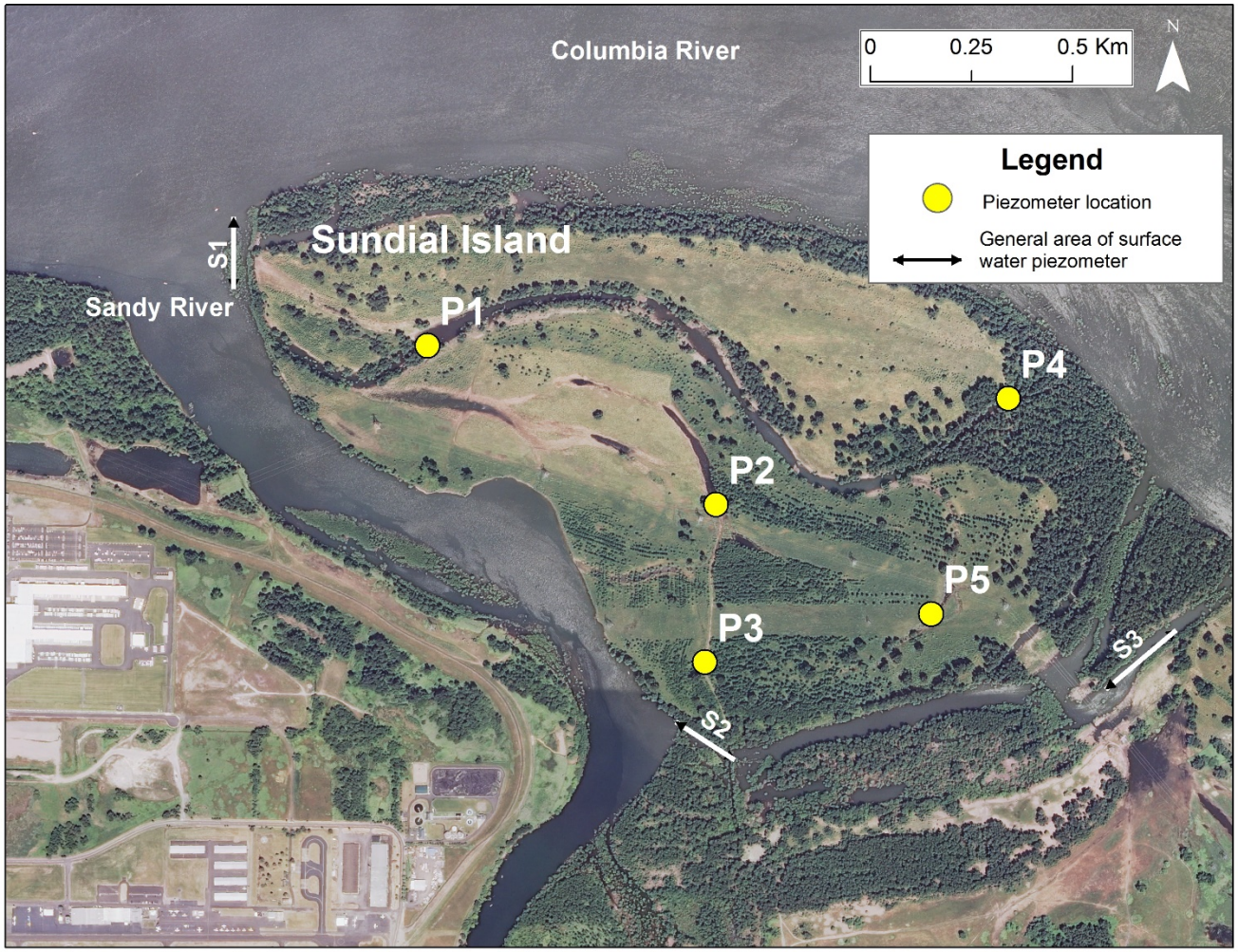
- Unique opportunity uses decommissioned hatchery site & infrastructure to construct spawning channel
- Final design completed 2016
- Completion date funding dependent



Sandy River, OR Delta

Scoping project began summer of 2015.

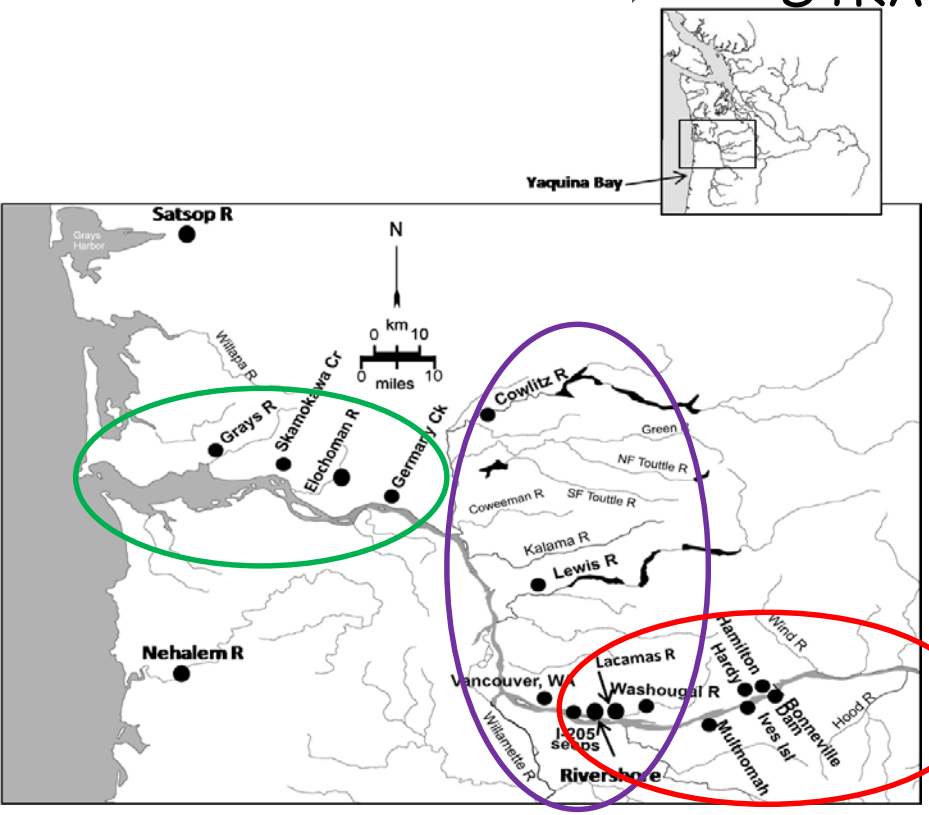
- Select location with best potential
- Test pits and groundwater assessments (pump test)
- Track groundwater levels November - May



Supplementation/Reintroduction

- Natural recolonization may take multiple decades or longer
- "Short-term" supplementation strategy of ~ 3 generations (12-15 years)
- Stepping stone approach- move from core pops inwards

GRAYS RIVER → CASCADE STRATUM ← LOWER GORGE



Coast Stratum

- Use Grays River to jump start Elochoman/Skamokawa projects & start Big Creek Hatchery broodstock for Oregon populations reintroduction.

Cascade Stratum

- Use I-205 to jump start Lewis River/Eagle Island restoration project.

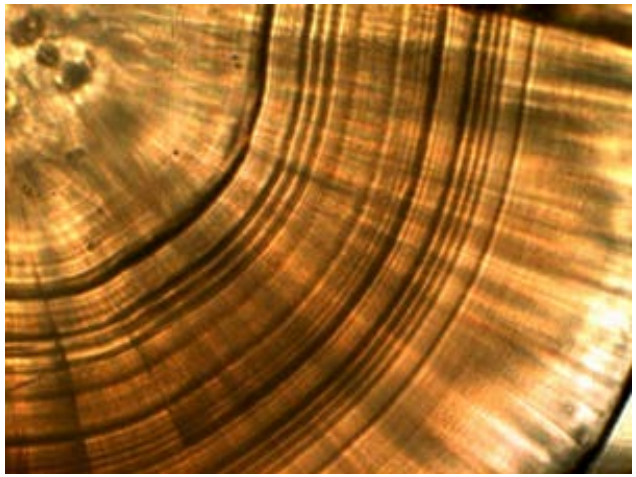
Gorge Stratum

- Being used to evaluate reintroduction strategies (Duncan Creek). Supplementation of Upper Gorge after construction of spawning habitat.

Monitoring

Viable Salmonid Population (VSP) parameter monitoring program

- Adult/juvenile abundance, spatial/temporal distribution, diversity metrics (age structure, genetic sampling), calculation of productivity
- Includes life cycle monitoring in key areas – OR and WA
- All hatchery chum salmon production is identifiable (marked via otolith or Parental Based Tagging)
  - Monitoring of proportion of Hatchery Origin Spawners (pHOS)



Monitoring

- Tributary Habitat Effectiveness monitoring
  - Focused on monitoring spawning channel performance
  - Calculation of egg-to-outmigrant survival using fish in/out monitoring – is it within the desired range (25-50%)?
  - Adaptive Management
    - evaluate different re-introduction strategies (adults/fry/eggs)
    - channel maintenance

Summary

For Columbia River Chum Salmon

- Marine survival rates are low, requiring high freshwater survival rates
- Spawning channels to maximize survival, some may require a more engineered approach, and serve as a bridge until watershed process & off-channel habitat are restored
- Supplementation/Reintroduction can jump-start rebuilding of populations
- Status/Trends, Fish In/Out and Effectiveness monitoring provide the ability to track progress.

Acknowledgements

Bonneville Power Administration

- Project 2001-053-00 – Reintroduction of Chum Salmon into Duncan Creek
- Project 2008-710-00 - Chum Salmon Restoration in the Tributaries below Bonneville Dam

NOAA - Fisheries

- Mitchell Act Funds
- Pacific Coastal Salmon Recovery Fund (PCSRF)

WA Dept. of Ecology/ Lower Columbia Fish Recovery Board (LCFRB)

- Odessa Subarea Groundwater Irrigation Program Mitigation


QUESTIONS?