Lower Columbia River Chum Salmon: Status, IPM Development, and Habitat Restoration

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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

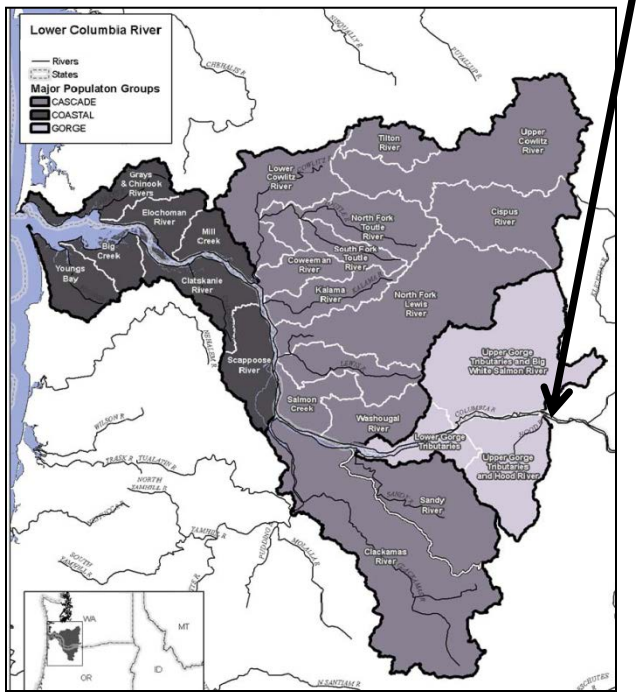
Historic Overview

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

- Upper distribution Celilo Falls

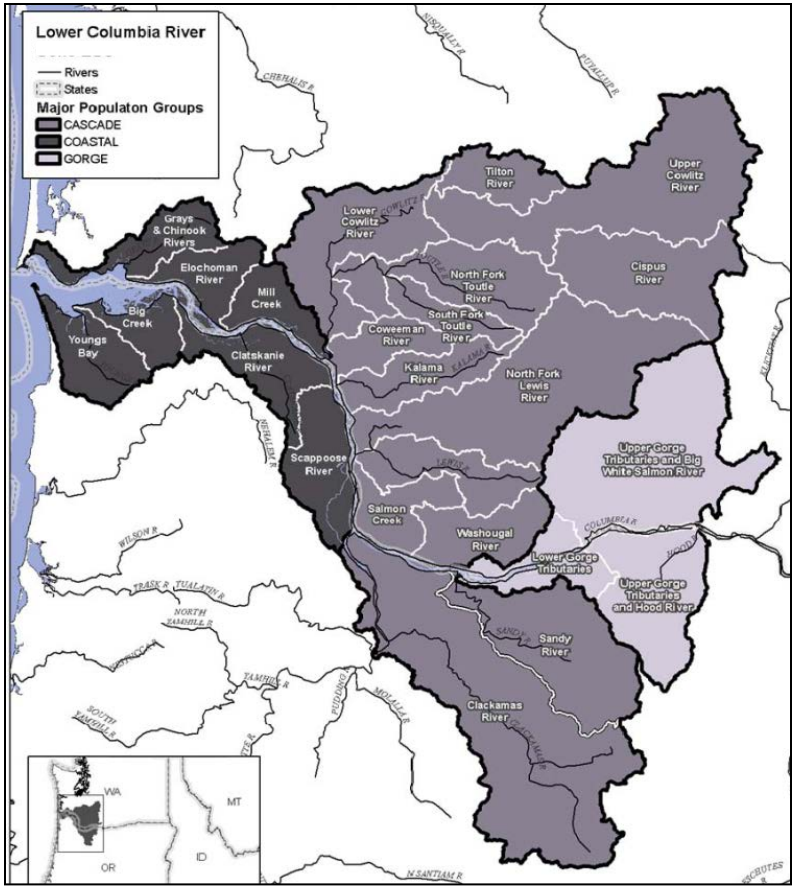
Decline in the 1940's

- 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)

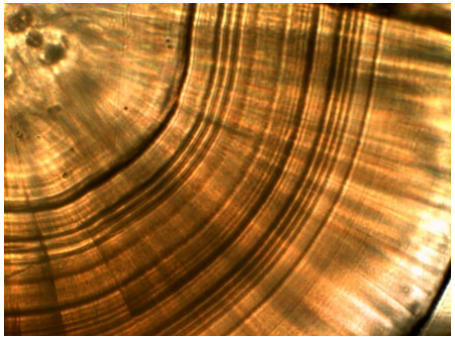


Recovery Approach

Habitat Restoration and Creation

Supplementation and Re-introduction

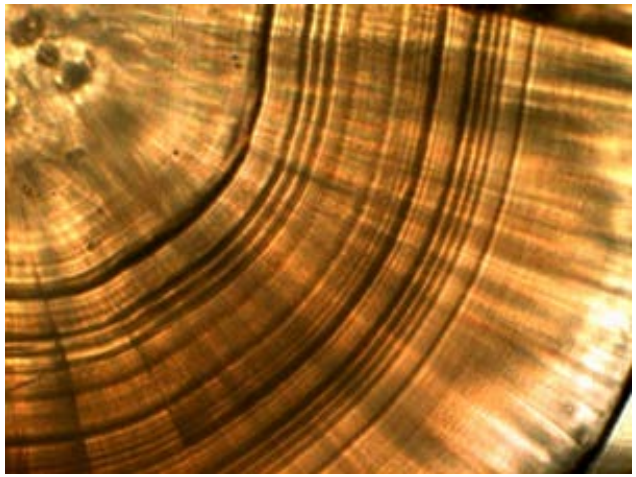
Monitoring



Monitoring

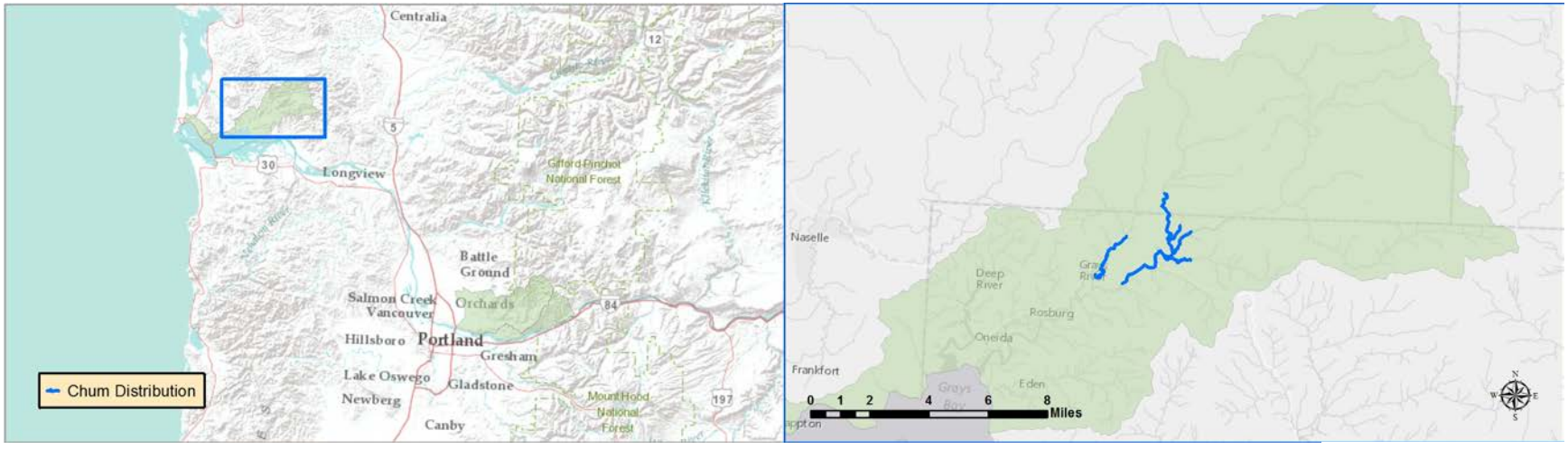
Viable Salmonid Population (VSP) parameter monitoring program

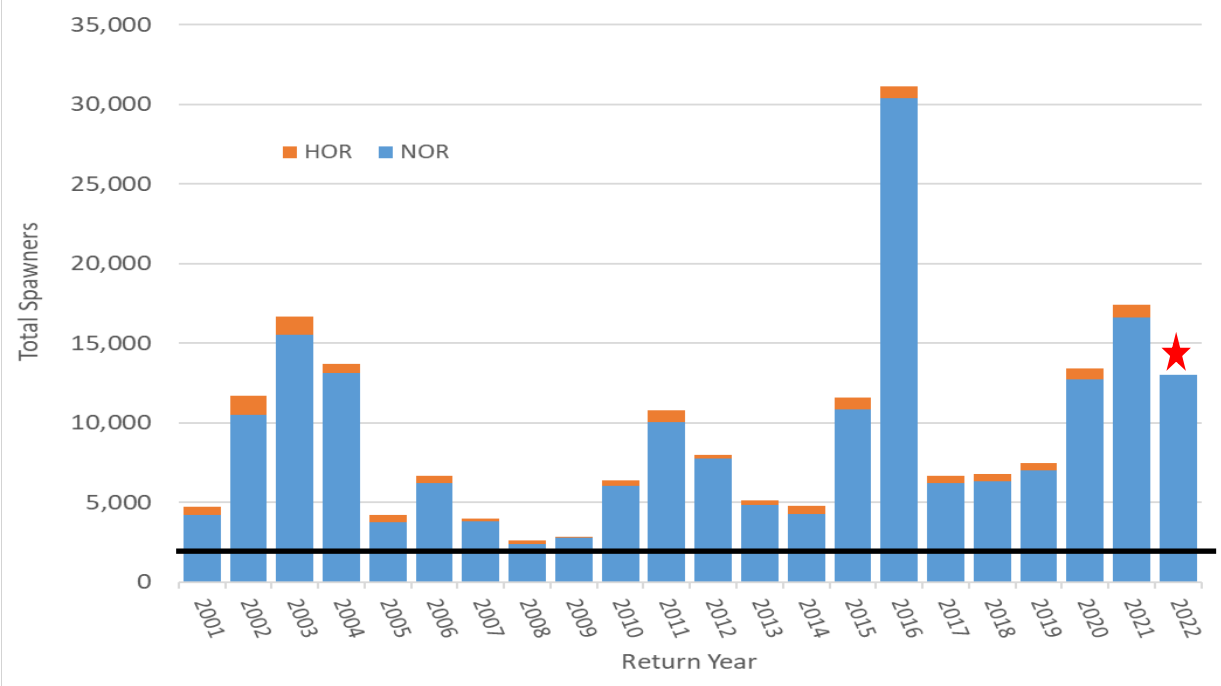
- Adult/juvenile abundance, calculation of productivity, spatial/temporal distribution, diversity metrics (age structure, genetic sampling),
- Includes life cycle monitoring in key areas
- All hatchery chum salmon production is identifiable (marked via otolith or Parental Based Tagging)
  - Monitoring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



Status and Trends

Grays Status & Trend



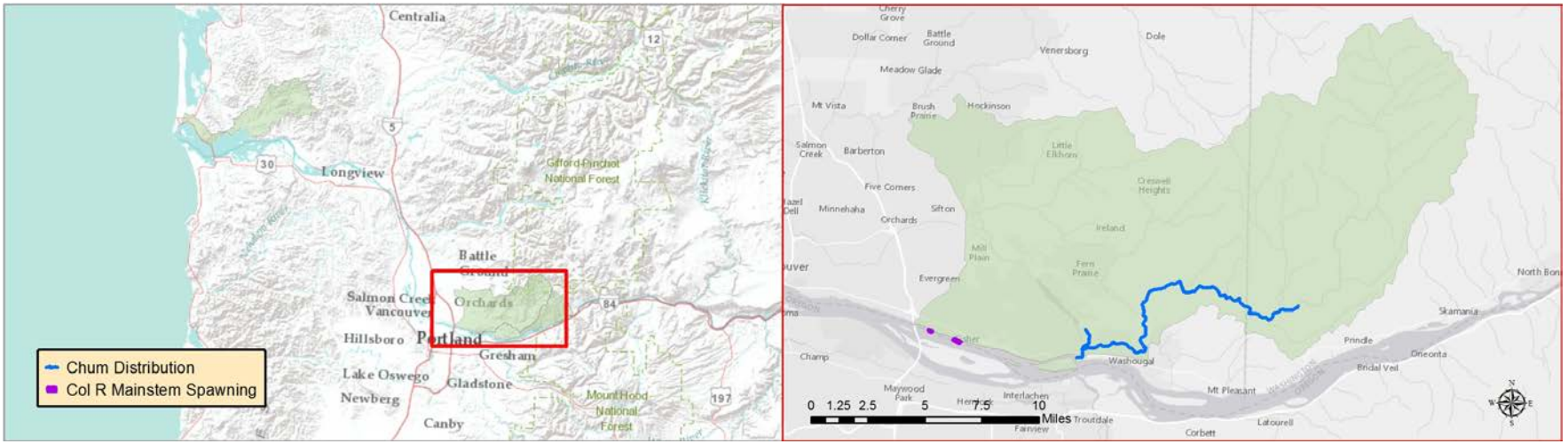


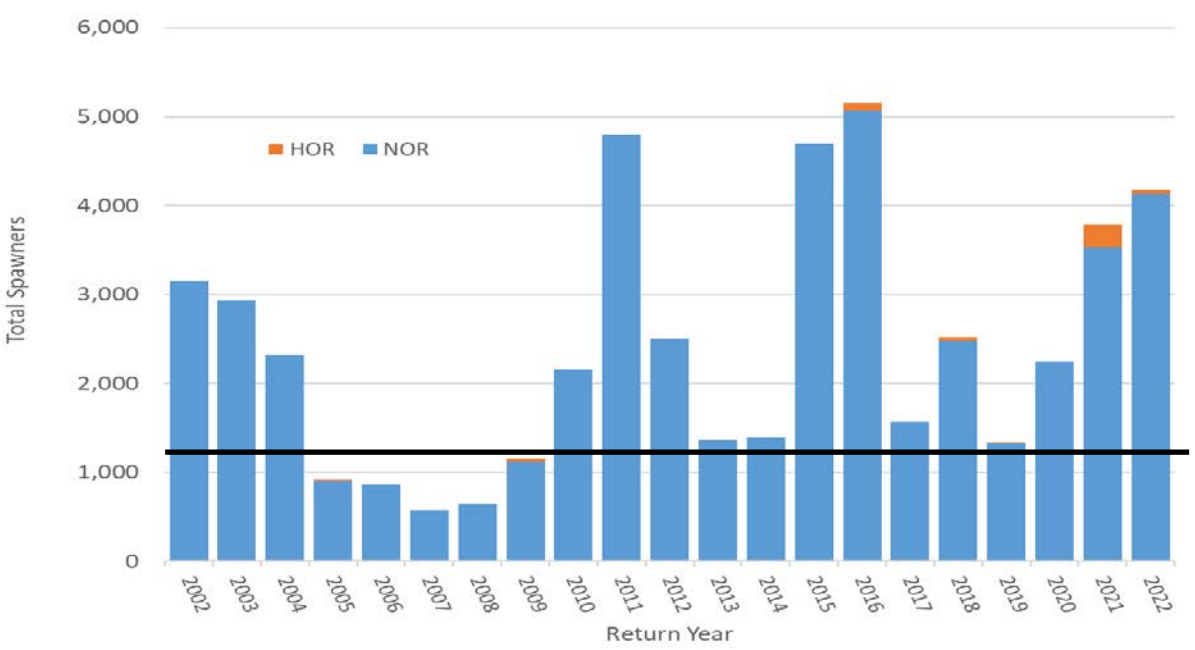
Minimum Viability goal = 1,600 spawners

Above Minimum Viability goal 100% in last 22 years

	Grays
2002-06	10,602
2003-07	9,059
2004-08	6,247
2005-09	4,078
2006-10	4,514
2007-11	5,334
2008-12	6,136
2009-13	6,642
2010-14	7,025
2011-15	8,065
2012-16	12,131
2013-17	11,862
2014-18	12,197
2015-19	12,732
2016-20	13,105
2017-21	10,360
2018-22	11,634

Washougal (I-205) Status & Trend



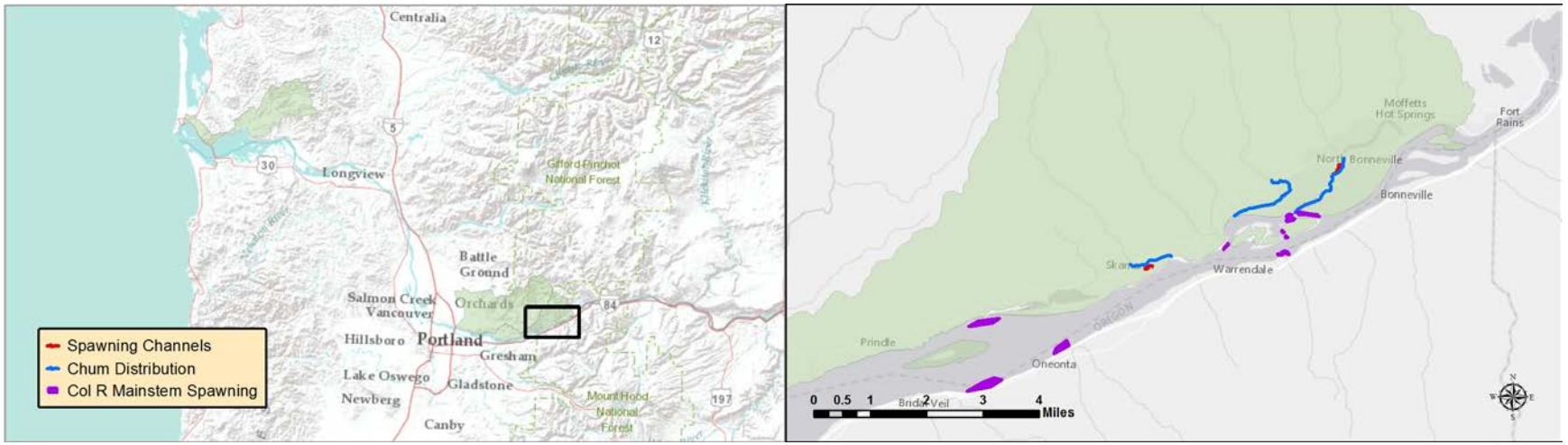


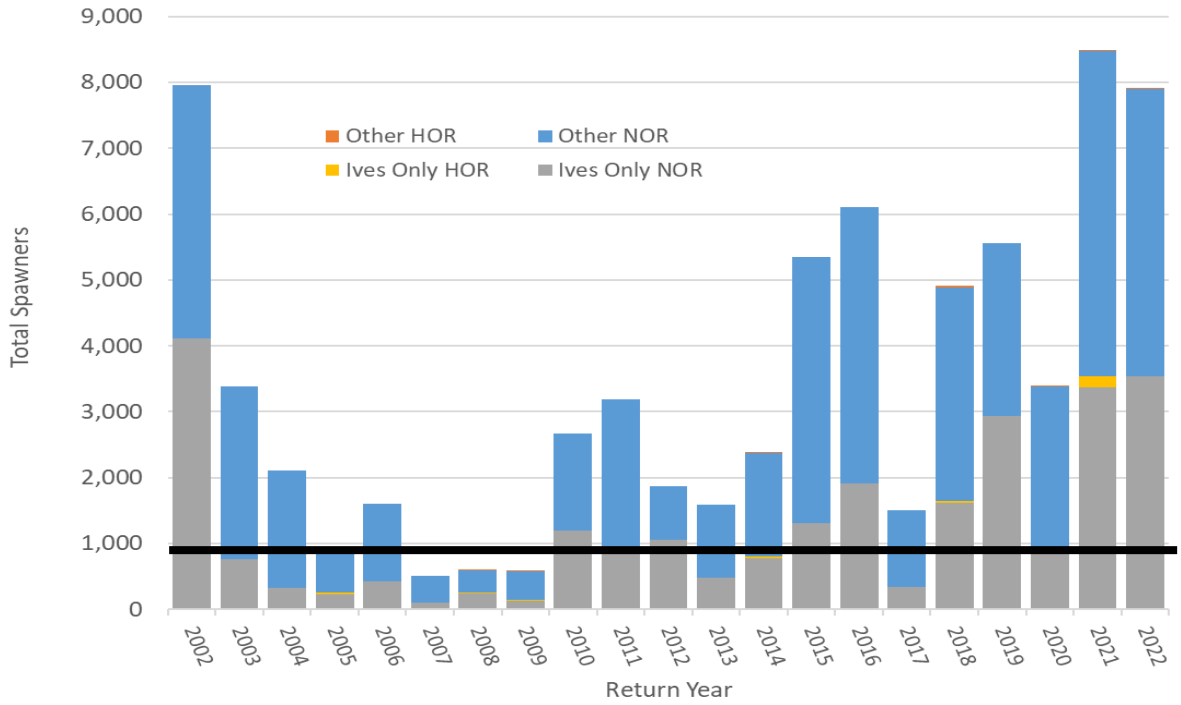
Minimum Viability goal = 1,300 spawners

Above Minimum Viability goal 16 of last 21 years

Washougal (I-205)	
2002-06	2,039
2003-07	1,525
2004-08	1,067
2005-09	833
2006-10	1,078
2007-11	1,864
2008-12	2,249
2009-13	2,393
2010-14	2,440
2011-15	2,949
2012-16	3,019
2013-17	2,834
2014-18	3,065
2015-19	3,055
2016-20	2,565
2017-21	2,290
2018-22	2,812

Lower Gorge Status & Trend





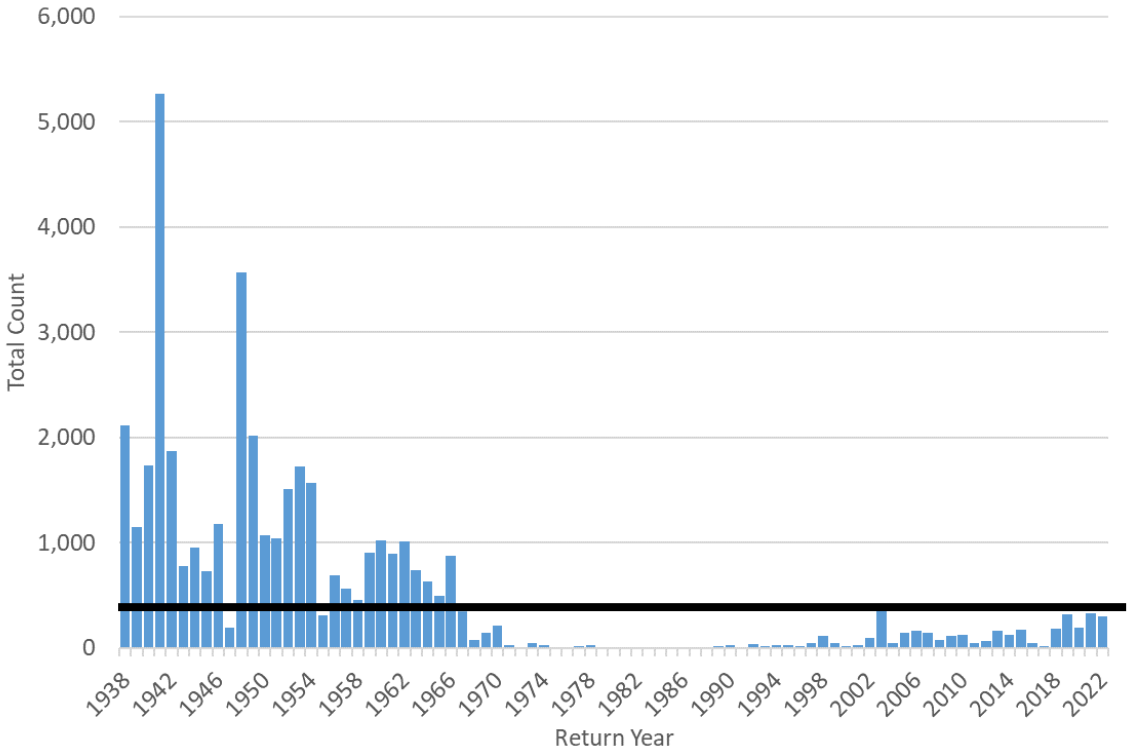
Minimum Viability goal = 1,000 spawners

Above Minimum Viability goal 19 out of 23 recent years

	Lower Gorge
2002-06	3,189
2003-07	1,700
2004-08	1,139
2005-09	833
2006-10	1,188
2007-11	1,505
2008-12	1,775
2009-13	1,979
2010-14	2,333
2011-15	2,867
2012-16	3,450
2013-17	3,377
2014-18	4,029
2015-19	4,671
2016-20	4,278
2017-21	4,719
2018-22	5,999

Upper Gorge Status & Trend

- Based on Bonneville Dam Counts

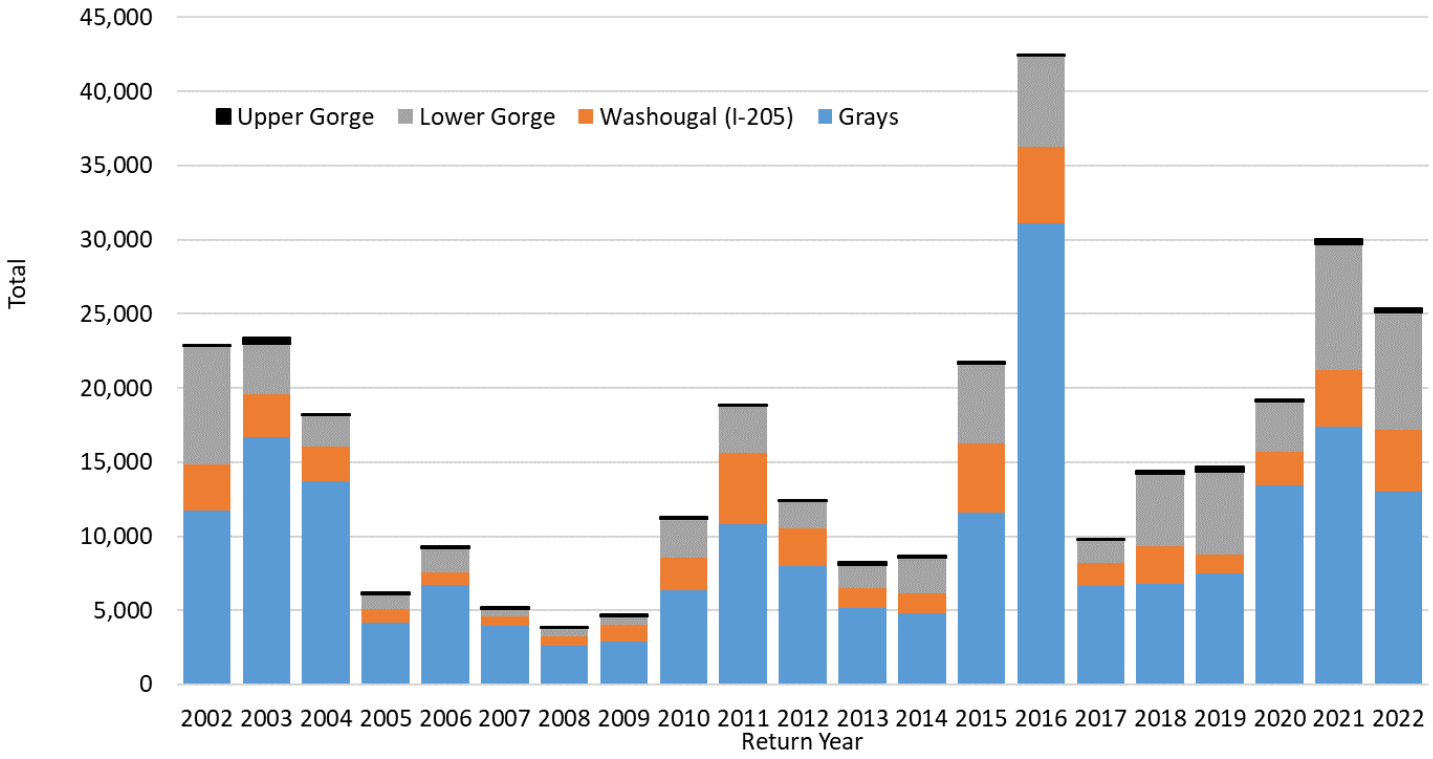


Minimum Viability goal = 450 spawners

Last time above Minimum Viability goal was 1966

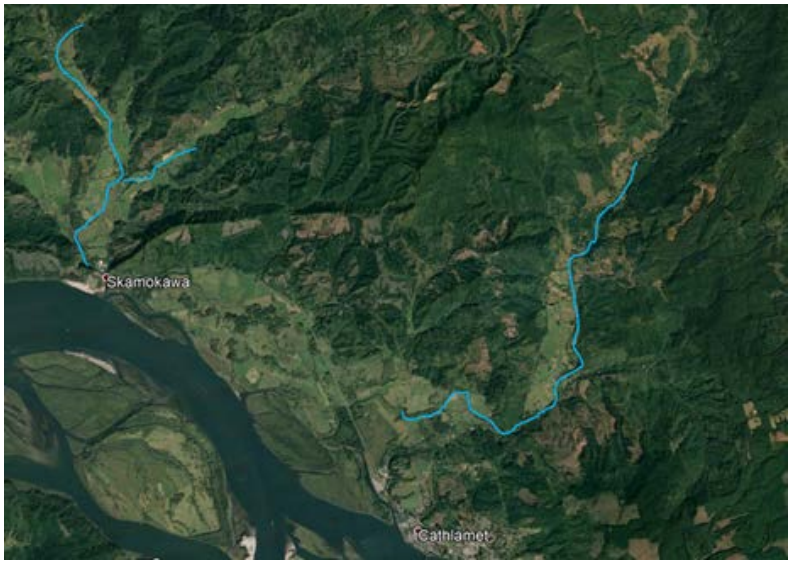
	Upper Gorge
2002-06	171
2003-07	180
2004-08	113
2005-09	126
2006-10	123
2007-11	100
2008-12	85
2009-13	103
2010-14	106
2011-15	116
2012-16	115
2013-17	107
2014-18	109
2015-19	185
2016-20	151
2017-21	209
2018-22	264

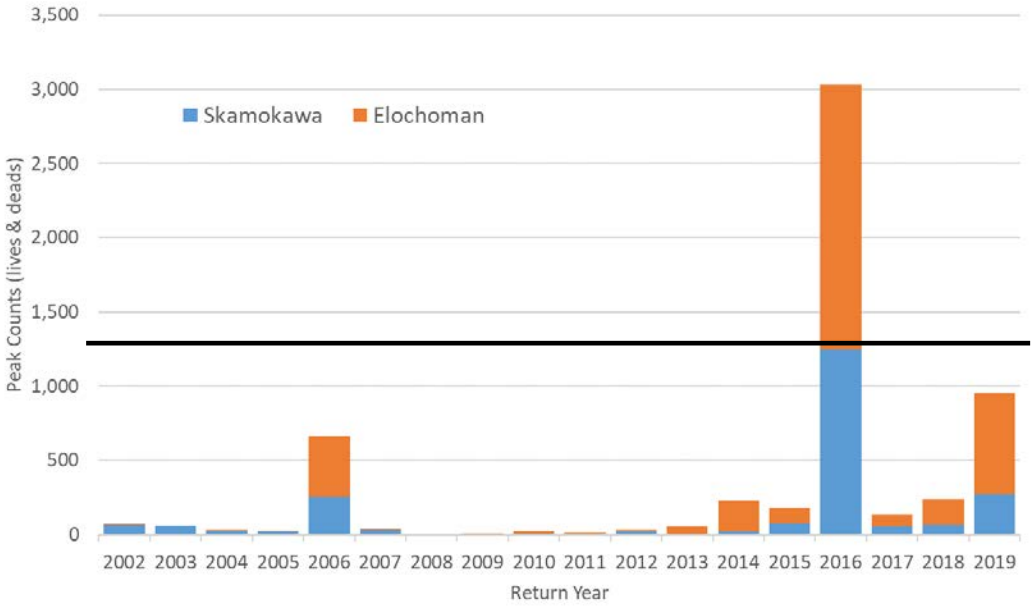
Grays, Washougal, & Gorge Populations



	LCR
2002-06	16,008
2003-07	12,472
2004-08	8,578
2005-09	5,888
2006-10	6,912
2007-11	8,813
2008-12	10,255
2009-13	11,121
2010-14	11,912
2011-15	14,006
2012-16	18,725
2013-17	18,188
2014-18	19,421
2015-19	20,619
2016-20	20,114
2017-21	17,628
2018-22	20,759

Elochoman & Skamokawa Population





Minimum Viability
goal = 1,300 spawners

Lower Columbia River Chum Salmon Integrated Population Model







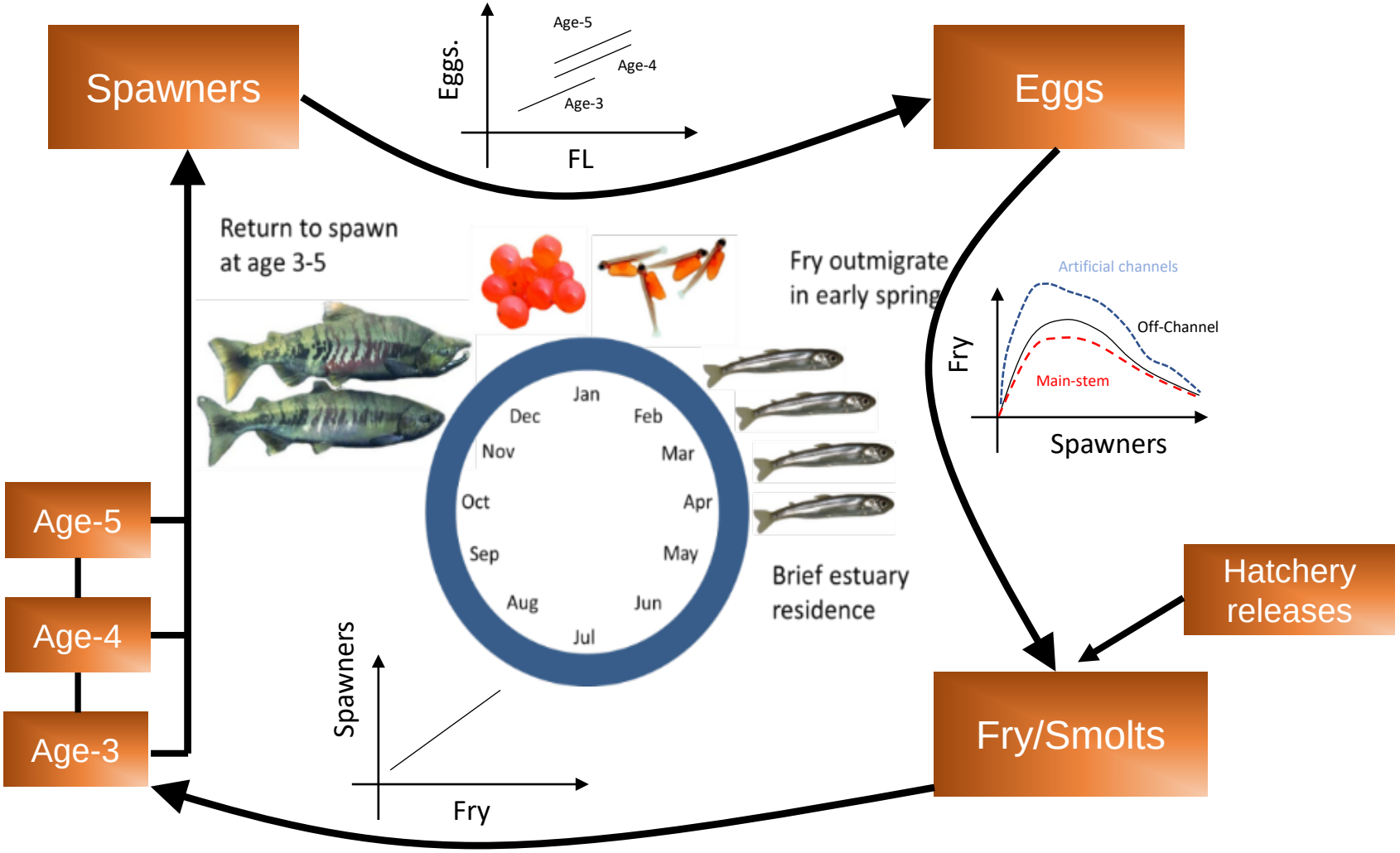





Impetus for developing an Integrated Population Model (IPM)

- WDFW has been employing a three-tiered recovery approach
- Status and trend data have been collected for ~4-5 generations
- Estimation and reporting has been at individual life-stages & populations
  - This approach limited our ability to understand or calculate:
    - Productivity and capacity of populations/spawning area/enhancement programs
    - Influence of habitat and environmental co-variates on freshwater and ocean survival
    - Spatial and temporal variability of survival & covariance among populations
    - Effectiveness of supplementation and habitat projects
    - Natural colonization rates
    - Estimate Long-Term Population Viability and Recovery Trends

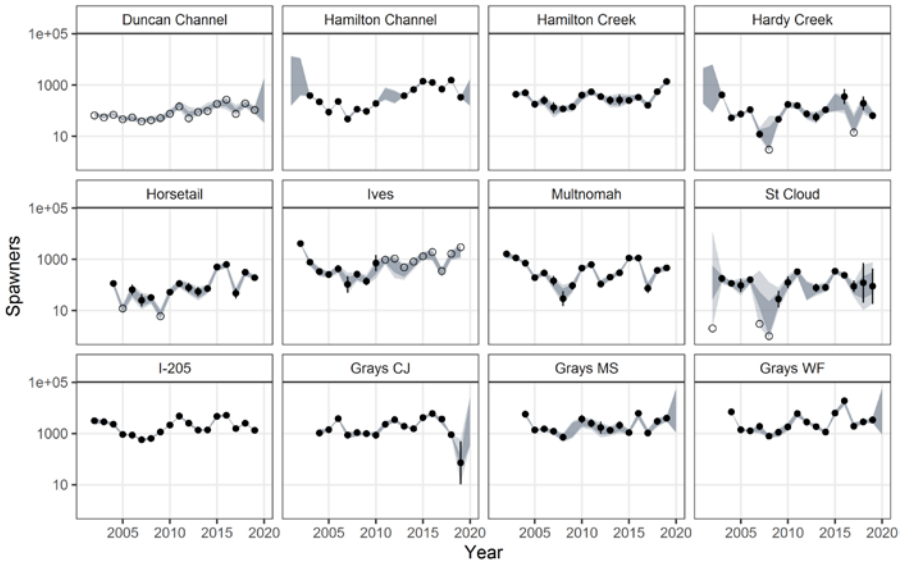
General LCR Chum Salmon Life-Cycle

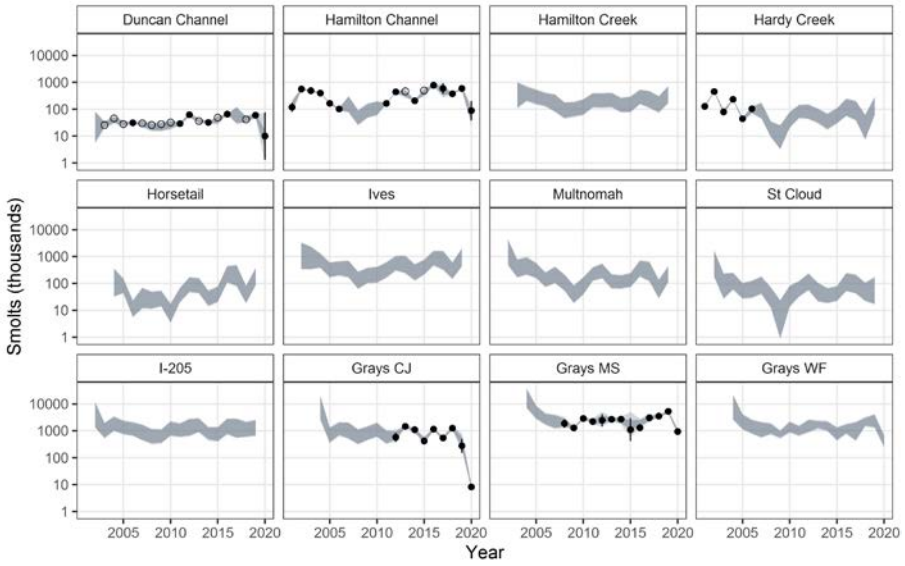


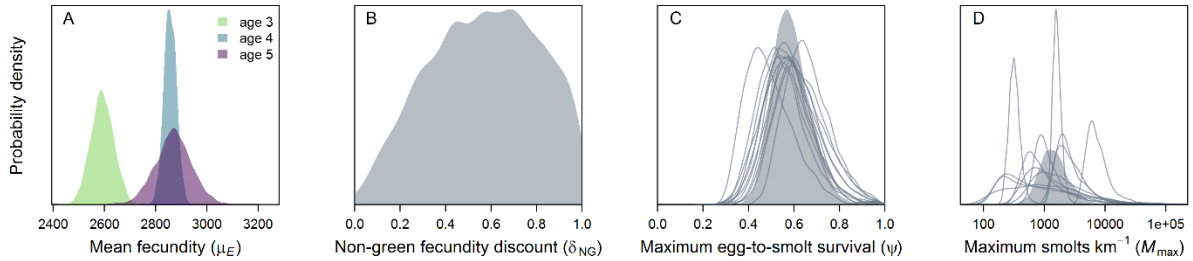
LCR Chum Salmon IPM

- Year One and Two
  - "Load" the M&E, hatchery, direct adult supplementation, and habitat data into the customized SalmonIPM model
  - Goal is to "explain" the status quo by characterizing spatiotemporal variation in freshwater productivity and marine survival.
- Year Three and beyond
  - Assess stage- and location-specific bottlenecks limiting viability at the population and ESU level
  - Help us evaluate the role/need/usefulness of supplementation
  - Help us prioritize habitat restoration

Results of Year One and Two







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 (watershed scale) habitat recovery actions
    - Allow watershed scale processes to take effect, which will take 25 to >100 years
- Goal to achieve egg-to-outmigrant survival in the range of 25% to 50% in spawning channels

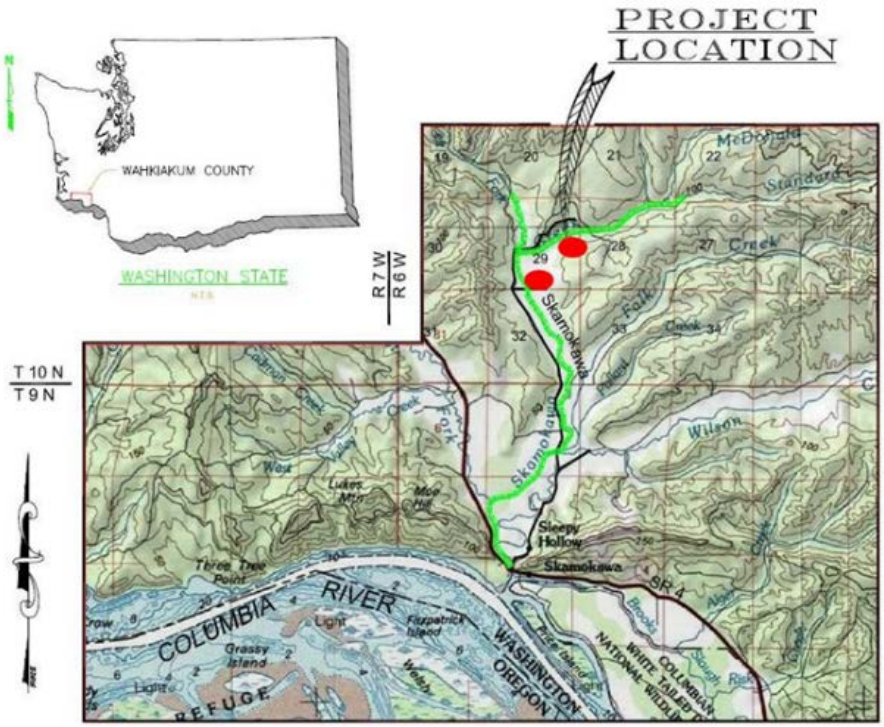
Completed Habitat Restoration

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

Hamilton Springs constructed in 1980's & upgraded in 2011

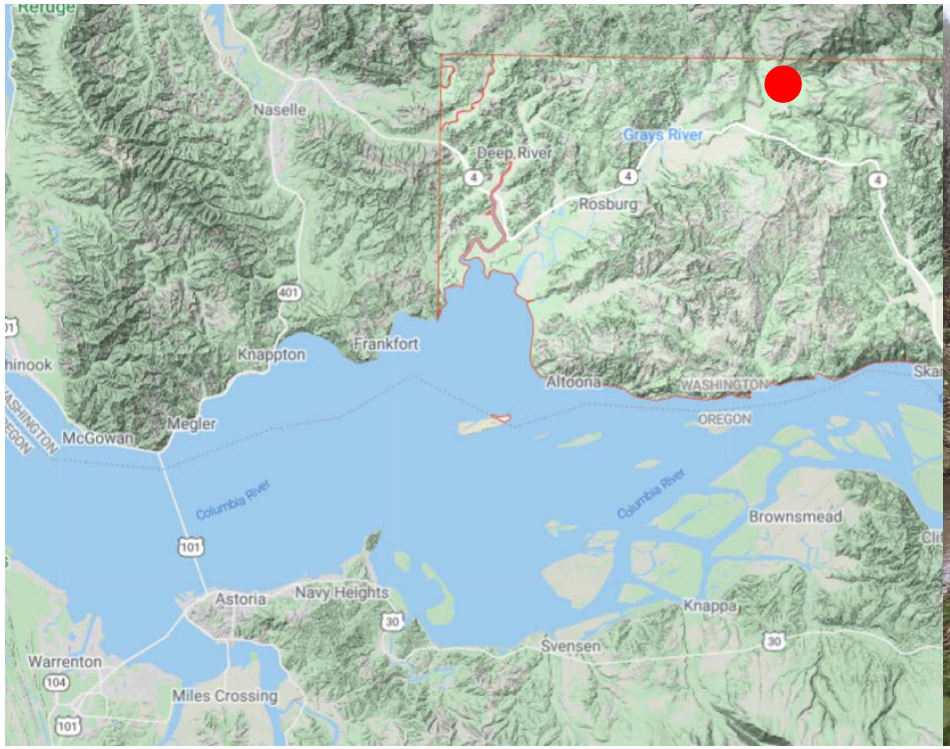
Skamokawa Spawning Channels

- Completed in summer of 2017 – BPA and Odessa funds
- Engineered Log Jams and small berms installed to protect



Crazy Johnson Spawning Channels

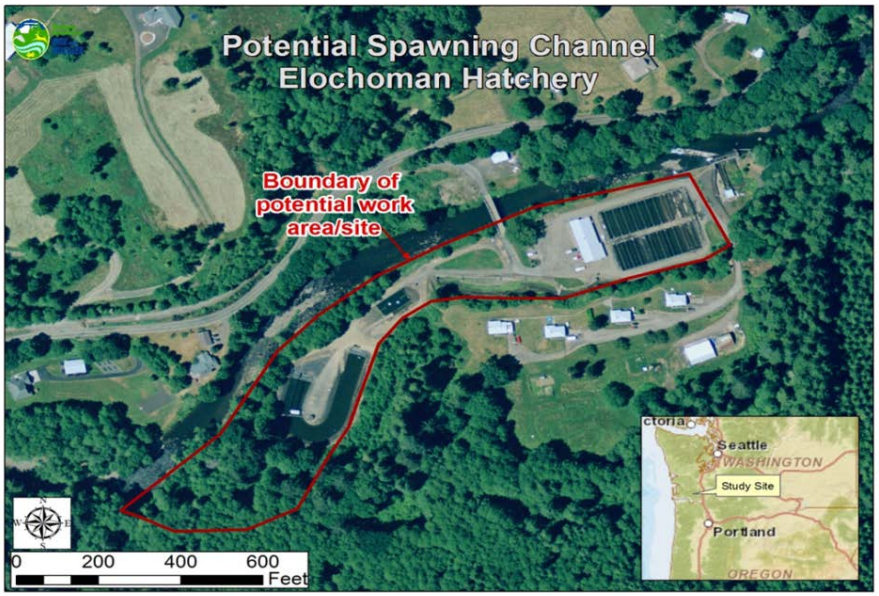
- Completed in fall of 2017 by the Lower Columbia Fish Enhancement Group using LCFRB SFRB funds



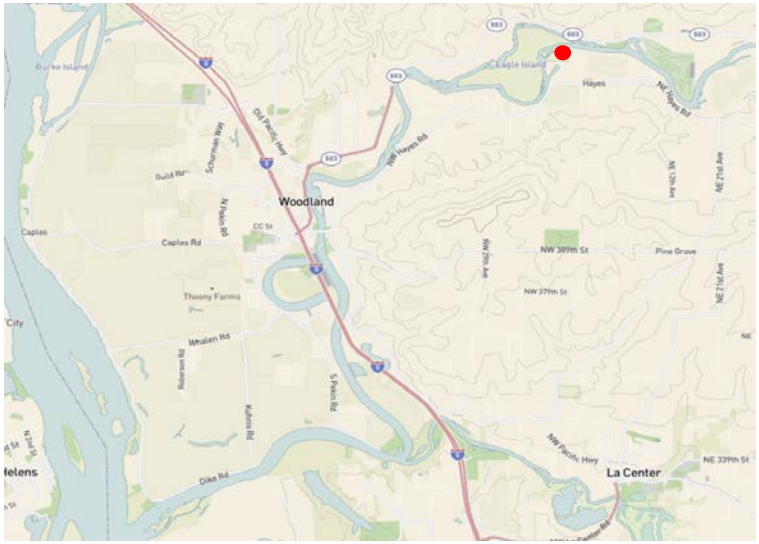
In-planning, Elochoman Hatchery Site

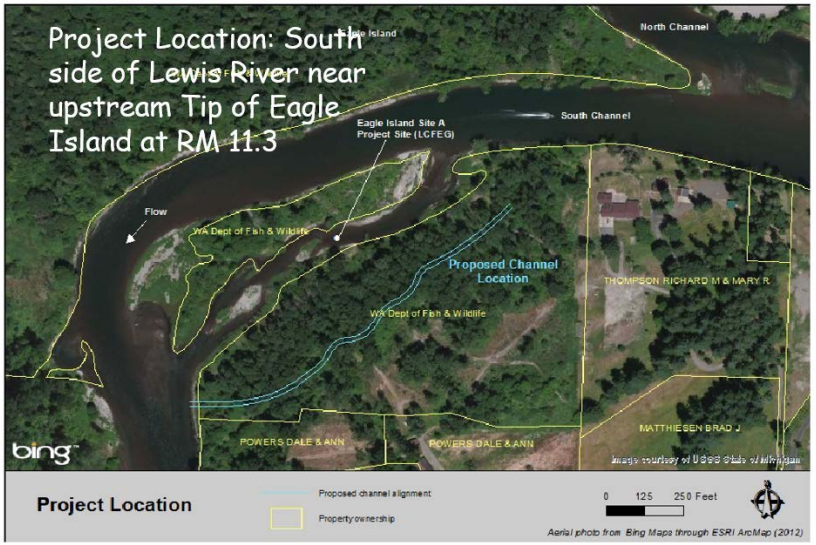
Closed WDFW hatchery site – unique opportunity

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



Eagle Island Spawning Channel, in-permitting (again ☹)





Source: Inter-Fluve Inc. Eagle Island Chum Spawning Channel FINAL DESIGN REPORT.

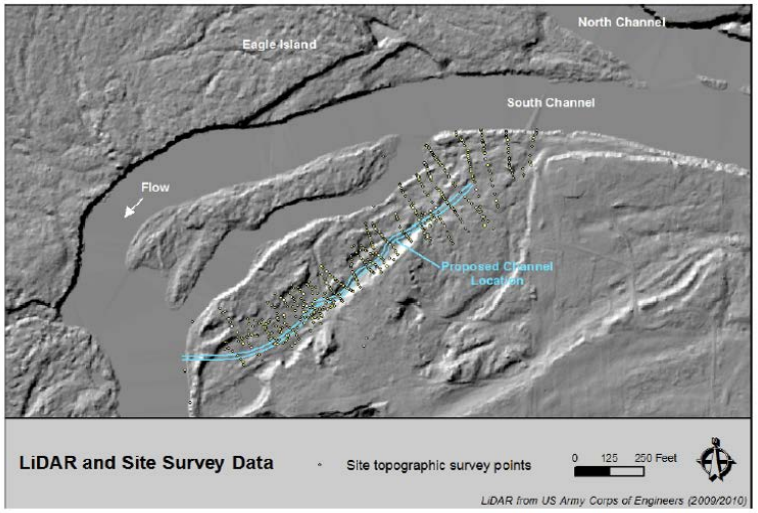


Figure 2. LiDAR hillshade map and site topographic survey points. Additional survey data of the North and South channels were also available and used for this project.

Source: Inter-Fluve Inc. 2013. Eagle Island Chum Spawning Channel FINAL DESIGN REPORT.

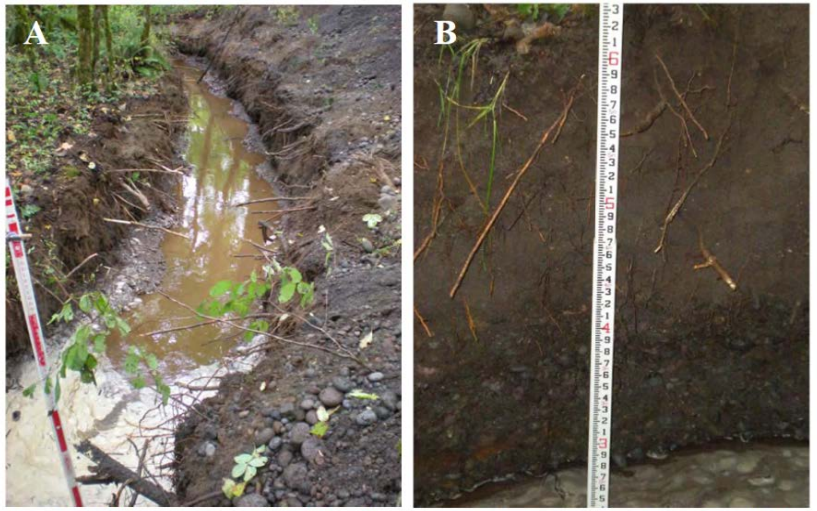


Figure 3. (A) looking upstream in the trench during the pump test. (B) The transition from soil, to sand, and finally alluvium can be seen in the wall of the trench.

Source: Inter-Fluve Inc. 2013. Eagle Island Chum Spawning Channel FINAL DESIGN REPORT.

Questions?

Courtesy of Derek Wiley, Oregon Department of Fish and Wildlife