Eagle Island Chum Salmon Spawning Channel Project

Todd Hillson, Washington Department of Fish and Wildlife

Washington Department of FISH and WILDLIFE

Outline

- Brief historical overview of Lower Columbia River (LCR) chum salmon
- LCR chum salmon limiting factors
- Why is this project important for recovery of LCR chum salmon
- A time-line and funding history of the Eagle Island spawning channel project
- Overview of the design
- Pre-proposal comments & questions

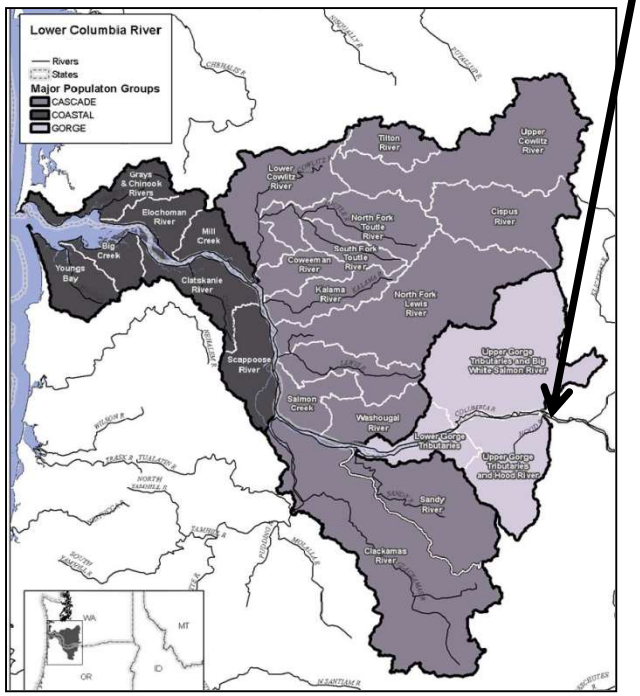
Historic Overview

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

- Upper Distribution Celilo Falls

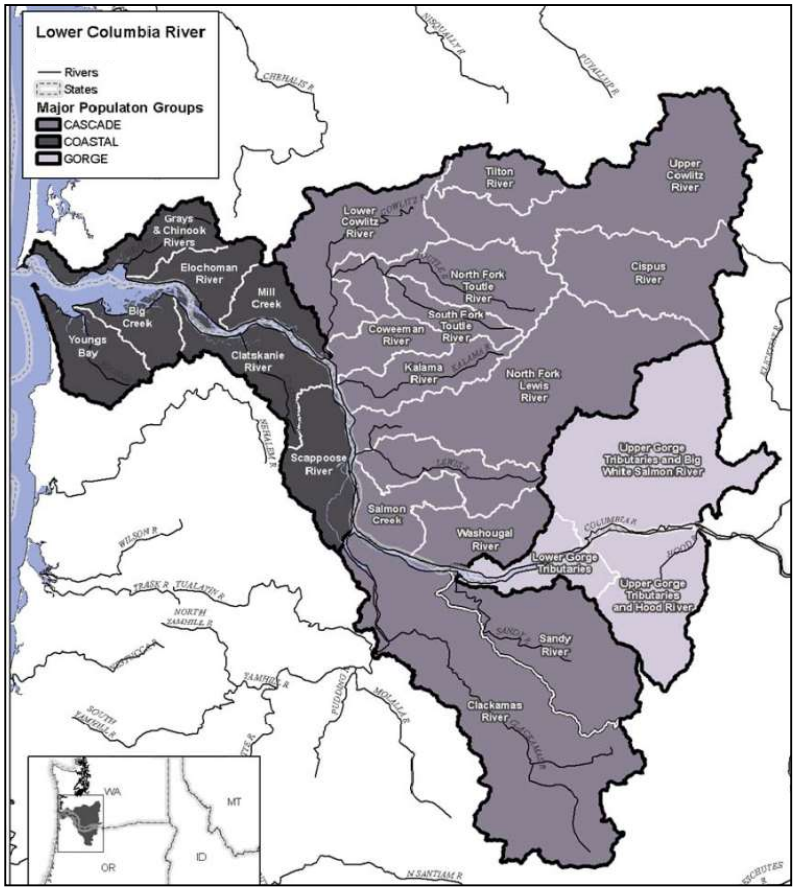
Decline in the 1940's

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

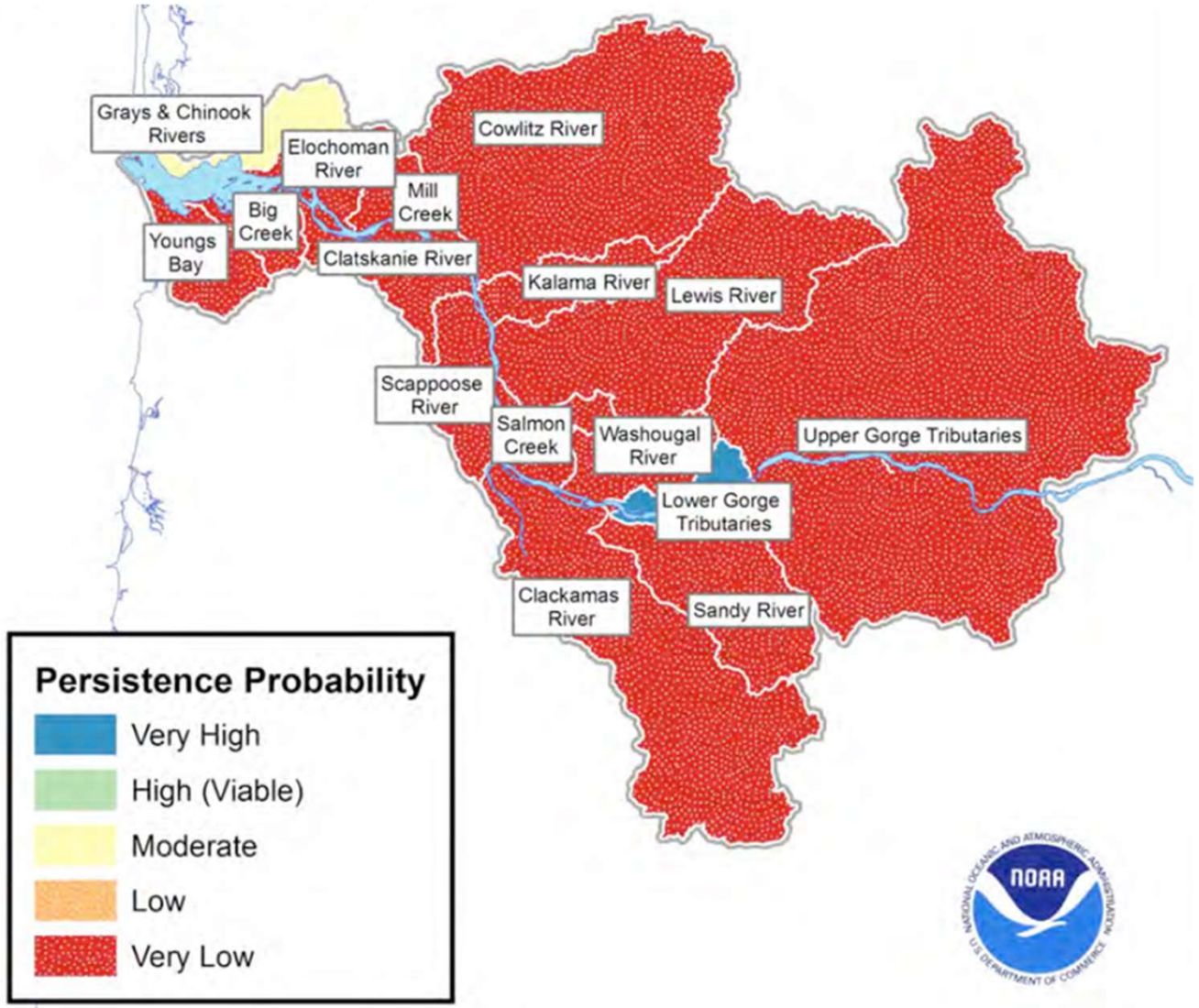


Endangered Species Act (ESA)

- Currently, between 1,000s & 10,000s of chum salmon return to the LCR
  - 17 historic populations in the 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)



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



LCR Chum Salmon Limiting Factors

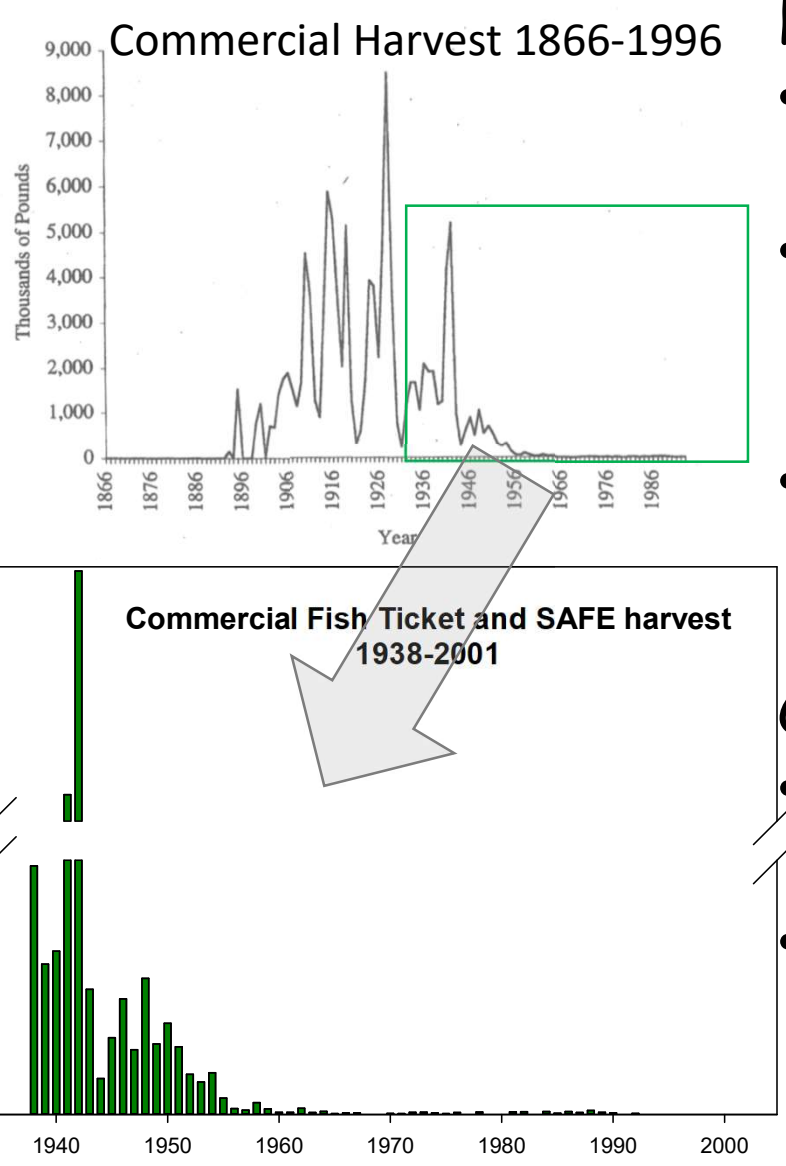
Harvest

Hydro

Hatcheries

Habitat

Limiting Factor - Harvest



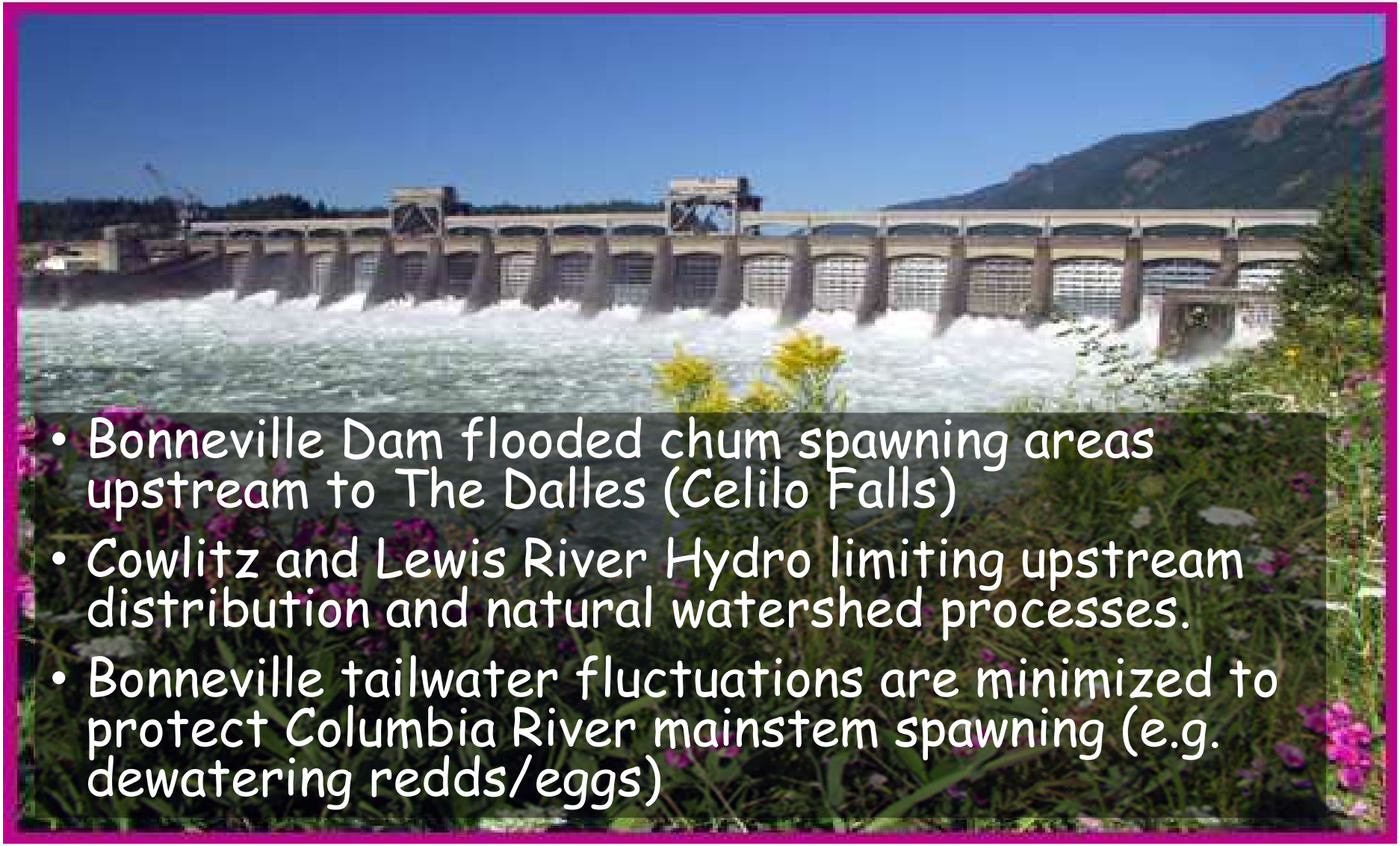
Historic Catch

- Annual Landings of adults ranged from 100-500K adults
- Appropriate harvest rate for a healthy population of chum salmon is 48% (Chapman 1986)
- Fisheries Managers reduced harvest in 1950s due to declines in abundance

Current Harvest

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

Limiting Factor - Hydro

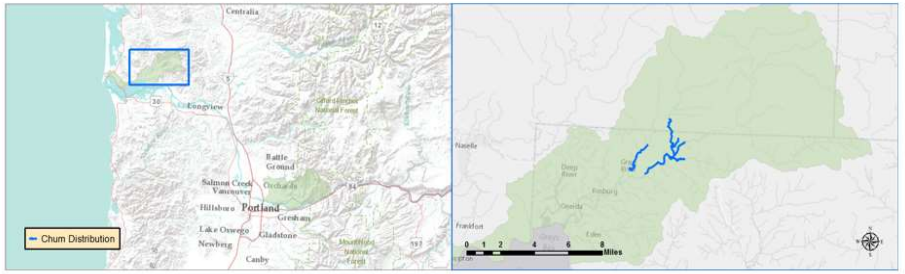


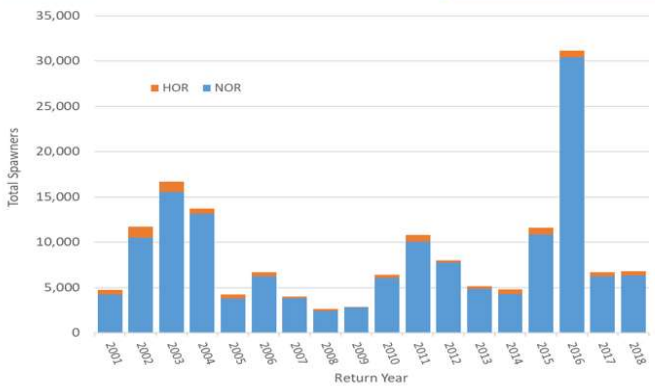
- Bonneville Dam flooded chum spawning areas upstream to The Dalles (Celilo Falls)
- Cowlitz and Lewis River Hydro limiting upstream distribution and natural watershed processes.
- Bonneville tailwater fluctuations are minimized to protect Columbia River mainstem spawning (e.g. dewatering redds/eggs)

Limiting Factor - Hatcheries

- Little/no current or historical impact from LCR chum salmon hatchery programs
  - Currently four hatchery chum programs in the LCR – Grays, Big Creek (ODFW), Lewis, and Duncan
  - All WDFW Programs are integrated with annual values of recent pNOB >90-95% and pHOS ranging from 0-10%
- Potential predation impact on fry outmigrants from releases of hatchery yearling age juveniles

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
2013-17	11,862
2014-18	12,370

Delisting goal = 1,600 spawners

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

Completed Habitat Restoration

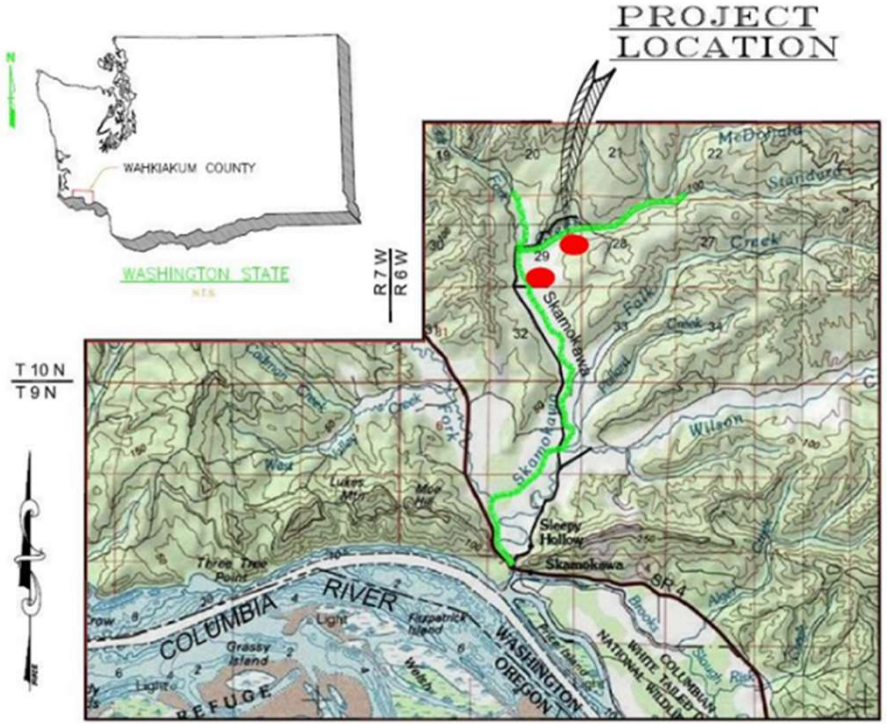
Duncan Creek spawning channels constructed in 2001 & upgraded in 2008, extended in 2011

Hamilton Springs constructed in 1980s, upgraded and extended in 2011

LCFEG implementation of multi-species restoration

Skamokawa Spawning Channels

- Completed in summer of 2017
- ELJ and small berms installed to protect two spawning channels (Emlen & McNally)



Crazy Johnson Spawning Channels

- Completed in fall of 2017 by the LCFEG

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 Spawning area – 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 higher, and less variable, egg-to-fry survival compared to river channel survival

Why is high egg-to-fry/ freshwater survival critical to recovering LCR chum salmon?

1) Necessary to overcome the low Smolt-to-Adult Survival Rates (SARs) experienced by LCR chum salmon as fry migrants

2) Critical for populations to persist during prolonged periods of poor ocean conditions

Ocean Indicators & Forecasting

- There has been a lot of research on how ocean conditions affect the growth and survival of juvenile salmon in the northern California Current
- Standardized physical and biological metrics have been developed to describe ocean conditions – known as "ecosystem indicators"
- These ecosystem indicators have been used to forecast adult returns for Chinook and coho salmon
- WDFW uses these same ecosystem indicators to predict SARs and forecast adult chum salmon returns to the Columbia River

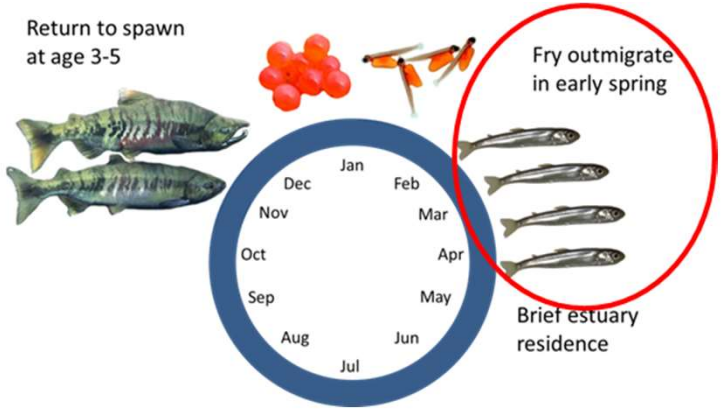
	Year																	
Ecosystem Indicators	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*
PDO (Sum Dec-March)	5.07	-1.75	-4.17	1.86	-1.73	7.45	1.85	2.44	1.94	-0.17	-3.06	-5.41	2.17	-3.65	-5.07	-1.67	1.24	9.26	6.69
PDO (Sum May-Sept)	-0.37	-5.13	-3.58	-4.22	-0.26	3.42	2.96	3.48	0.28	0.91	-7.63	-1.11	-3.53	-6.45	-7.79	-3.47	5.07	8.08	6.6
ONI (Average Jan-June)	1.12	-1.07	-1.07	-0.40	0.18	0.27	0.20	0.47	-0.30	0.08	-0.98	-0.23	0.55	-0.72	-0.43	-0.30	-0.28	0.67	1.48
46050 SST (°C, May-Sept)	13.66	13.00	12.54	12.56	12.30	12.92	14.59	13.56	12.77	13.87	12.39	13.02	12.92	13.06	13.26	13.37	13.43	14.05	13.88
Upper 20 m T (°C, Nov-Mar)	12.27	10.31	10.12	10.22	10.08	10.70	10.85	10.60	10.61	10.04	9.33	10.19	11.01	10.02	9.62	10.09	9.47	12.75	12.02
Upper 20 m T (°C, May-Sept)	10.38	10.13	10.19	9.77	8.98	9.62	11.39	10.73	9.97	9.99	9.30	9.90	10.14	10.05	9.95	10.63	10.97	10.04	10.20
Deep temperature (°C, May-Sept)	8.59	7.63	7.74	7.56	7.46	7.81	7.89	7.97	7.83	7.58	7.48	7.73	7.89	7.81	7.56	7.94	8.38	8.08	7.89
Deep salinity (May-Sept)	33.54	33.86	33.78	33.86	33.85	33.68	33.66	33.77	33.85	33.88	33.87	33.72	33.61	33.74	33.75	33.76	33.53	33.71	33.83
Copepod richness anom. (no. species, May-Sept)	4.54	-2.58	-3.41	-1.03	-1.12	1.99	1.42	4.39	2.68	-0.63	-0.76	-0.64	3.12	-2.13	-1.31	-2.51	-0.11	7.76	8.32
N. copepod biomass anom. (mg C m^{-3}, May-Sept)	-0.76	0.04	0.15	0.15	0.29	-0.13	0.06	-0.84	-0.01	0.14	0.26	0.15	0.16	0.44	0.39	0.28	0.26	-0.33	-0.90
S. copepod biomass anom. (mg C m^{-3}, May-Sept)	0.60	-0.23	-0.21	-0.21	-0.23	0.09	0.20	0.55	0.07	-0.07	-0.23	-0.19	0.21	-0.14	-0.19	-0.20	-0.02	0.43	0.52
Biological transition (day of year)	263	134	97	101	108	156	132	230	180	81	64	65	169	82	125	91	162	Never	Never
Ichthyoplankton biomass (log (mg C 1000 m^{-3}) Jan-Mar)	0.12	0.90	1.80	1.25	1.05	0.46	0.58	0.83	0.59	0.60	1.84	0.89	1.65	0.61	0.99	1.16	0.43	1.63	1.47
Ichthyoplankton community index (PCO axis 1 scores; Jan-Mar)	-2.13	10.40	-42.67	-31.69	-36.80	1.39	49.41	47.23	-38.11	8.26	-40.10	15.31	26.19	7.60	-35.45	-27.36	-15.69	48.49	55.72
Chinook salmon juvenile catches (no. km^{-1} June)	0.26	1.27	1.04	0.44	0.85	0.63	0.42	0.13	0.69	0.86	2.56	0.97	0.89	0.46	1.32	1.35	0.86	0.57	0.82
Coho salmon juvenile catches (no. km^{-1} June)	0.35	2.29	1.50	2.87	2.51	3.58	1.13	0.23	1.13	3.49	3.37	1.87	1.84	1.26	1.12	4.91	1.63	1.95	1.38
Principal Component scores (PC1)	4.92	-2.16	-2.82	-2.09	-2.53	0.87	2.41	3.58	-0.08	-0.95	-4.71	-1.49	0.88	-1.79	-2.65	-2.10	0.74	4.94	5.04
Principal Component scores (PC2)	1.53	-0.04	0.05	-0.85	-1.49	-0.53	2.31	0.25	-0.24	-0.09	-2.14	0.65	-0.44	1.60	0.63	0.58	3.09	-2.14	-2.74
Ecosystem Indicators not included in the mean of ranks or statistical analyses																			
Physical Spring Trans. UI based (day of year)	83	88	134	120	84	109	113	142	109	70	87	82	95	105	123	97	129	103	86
Physical Spring Trans. Hydrographic (day of year)	187	119	142	129	120	141	157	209	123	136	102	136	169	119	140	106	162	124	164
Upwelling Anomaly (April-May)	-14	19	-36	2	-12	-34	-27	-55	-14	9	0	-5	-35	-36	-35	-21	-37	50	28
Length of Upwelling Season UI based (days)	191	205	151	173	218	168	177	129	195	201	179	201	161	153	161	163	133	175	186
SST NH-5 (°C, May-Sept)	11.30	11.08	11.04	10.98	10.15	10.85	12.85	11.73	11.36	11.80	10.66	11.99	11.41	11.08	11.66	11.66	11.71	11.57	11.76
Copepod Community Index (MDS axis 1 scores)	0.65	-0.89	-0.90	-0.83	-1.02	-0.27	-0.23	0.46	-0.06	-0.72	-0.96	-0.86	-0.29	-0.77	-0.83	-0.91	-0.39	0.52	0.85
Coho Juv Catches (no. fish km^{-1} Sept)	0.11	1.12	1.27	0.47	0.98	0.29	0.07	0.03	0.16	0.15	0.27	0.01	0.03	0.30	0.13	NA	NA	NA	NA

NOTE: The SST at 46050 for 2011 is an estimated value due to a lack of buoy data from January to July.

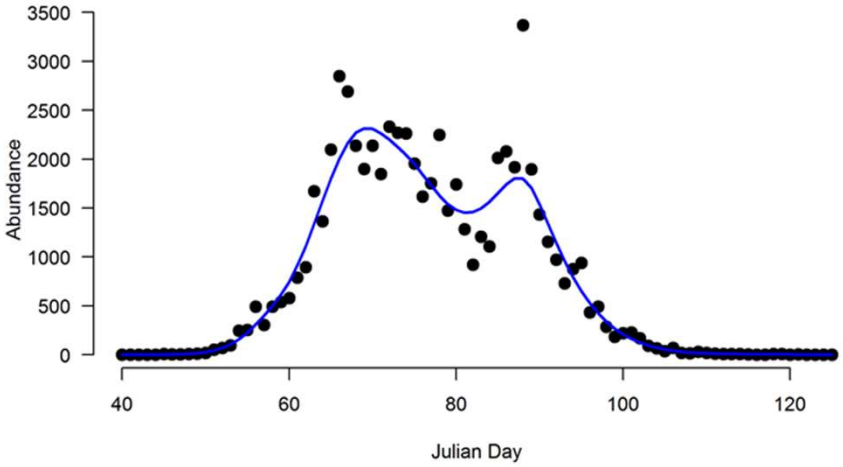
	Year																	
Ecosystem Indicators	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*
PDO (Sum Dec-March)	16	6	3	12	7	18	11	15	13	9	5	1	14	4	2	8	10	19	17
PDO (Sum May-Sept)	10	4	6	5	11	15	14	16	12	13	2	9	7	3	1	8	17	19	18
ONI (Average Jan-June)	18	1	1	6	12	14	13	15	8	11	3	10	16	4	5	7	9	17	19
46050 SST (°C, May-Sept)	15	8	3	4	1	7	19	14	5	16	2	9	6	10	11	12	13	18	17
Upper 20 m T (°C, Nov-Mar)	18	11	8	10	6	14	15	12	13	5	1	9	16	4	3	7	2	19	17
Upper 20 m T (°C, May-Sept)	15	11	13	4	1	3	19	17	7	8	2	5	12	10	6	16	18	9	14
Deep temperature (°C, May-Sept)	19	6	8	4	1	10	12	16	11	5	2	7	14	9	3	15	18	17	13
Deep salinity (May-Sept)	18	3	8	4	5	15	16	9	6	1	2	13	17	12	11	10	19	14	7
Copepod richness anom. (no. species, May-Sept)	17	2	1	7	6	13	12	16	14	10	8	9	15	4	5	3	11	18	19
N. copepod biomass anom. (mg C m^{-3}, May-Sept)	12	13	9	10	3	15	12	18	14	11	6	8	7	1	2	4	5	16	19
S. copepod biomass anom. (mg C m^{-3}, May-Sept)	19	2	5	4	3	13	18	19	12	10	1	7	15	9	8	6	11	16	17
Biological transition (day of year)	17	11	6	7	8	12	10	16	15	3	1	2	18	4	9	5	13	19	19
Ichthyoplankton biomass (log (mg C 1000 m^{-3}) Jan-Mar)	19	10	2	6	8	17	16	12	15	14	1	11	5	13	9	7	18	4	5
Ichthyoplankton community index (PCO axis 1 scores; Jan-Mar)	9	13	1	6	4	10	18	16	3	12	2	14	15	11	5	7	8	17	19
Chinook salmon juvenile catches (no. km^{-1} June)	16	4	5	18	10	13	17	19	12	8	1	6	7	15	3	2	9	14	11
Coho salmon juvenile catches (no. km^{-1} June)	18	7	12	5	6	2	15	19	16	3	4	9	10	14	17	1	11	8	13
Mean of ranks	16.4	7.0	5.7	6.9	5.8	11.9	14.6	15.5	11.0	8.7	2.7	8.1	11.8	7.9	6.3	7.4	12.0	15.3	15.3
Rank of the mean rank	19	6	2	5	3	13	15	18	11	10	1	9	12	8	4	7	14	16	16
Ecosystem Indicators not included in the mean of ranks or statistical analyses																			
Physical Spring Trans. UI based (day of year)	3	7	18	15	4	12	14	19	12	1	6	2	8	11	16	9	17	10	5
Physical Spring Trans. Hydrographic (day of year)	18	3	13	8	5	12	14	19	6	9	1	4	17	3	11	2	15	7	16
Upwelling Anomaly (April-May)	9	3	18	5	8	13	12	19	9	4	6	7	14	16	15	11	18	1	2
Length of Upwelling Season UI based (days)	6	2	17	11	1	12	9	19	5	3	8	3	14	16	15	13	18	10	7
SST NH-5 (°C, May-Sept)	8	6	5	4	1	3	19	15	9	17	2	18	10	7	13	12	14	11	16
Copepod Community Index (MDS axis 1 scores)	18	5	4	8	1	13	14	16	15	10	2	6	12	9	7	3	11	17	19
Coho Juv Catches (no. fish km^{-1} Sept)	17	2	1	4	3	6	12	14	8	9	7	15	13	5	10	NA	NA	NA	NA

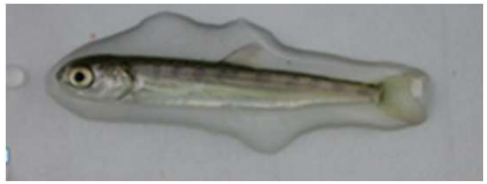
Early Life History for Chum Salmon

- Juveniles emigrate from February to early May
- Size 38-42mm (~1.6 inches)
- Working Hypothesis: Early marine (first year) survival explains most of the variability in ocean survival
- Data Analysis
  - Grays Hatchery releases & Duncan spawning channel production paired with broodyear adult returns are used to estimate smolt-to-adult return rates (SARs)
  - NOAA Ocean Indicators (PC1 scores)
  - Logit(SARs) = a + b(Principle Component 1)

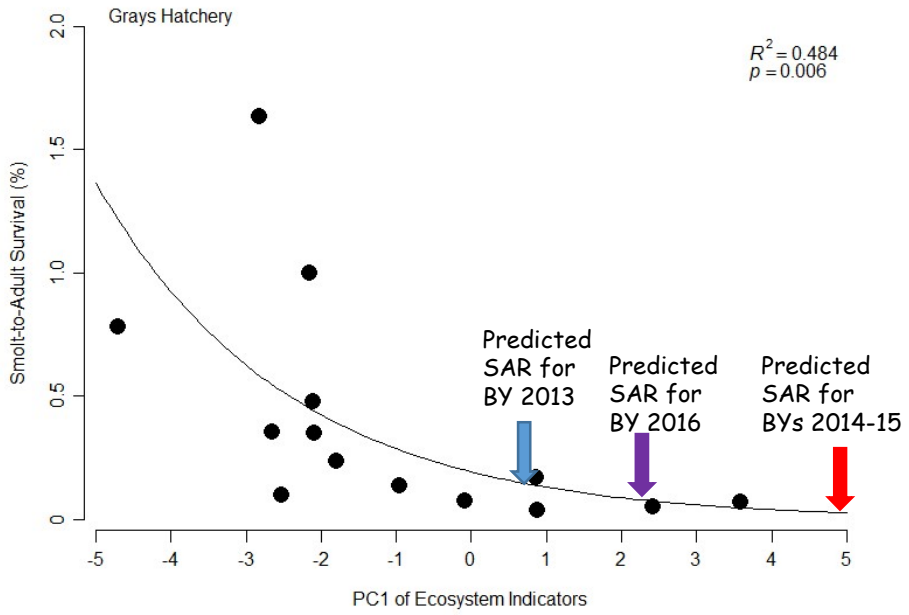


2016 Duncan Creek outmigration counts

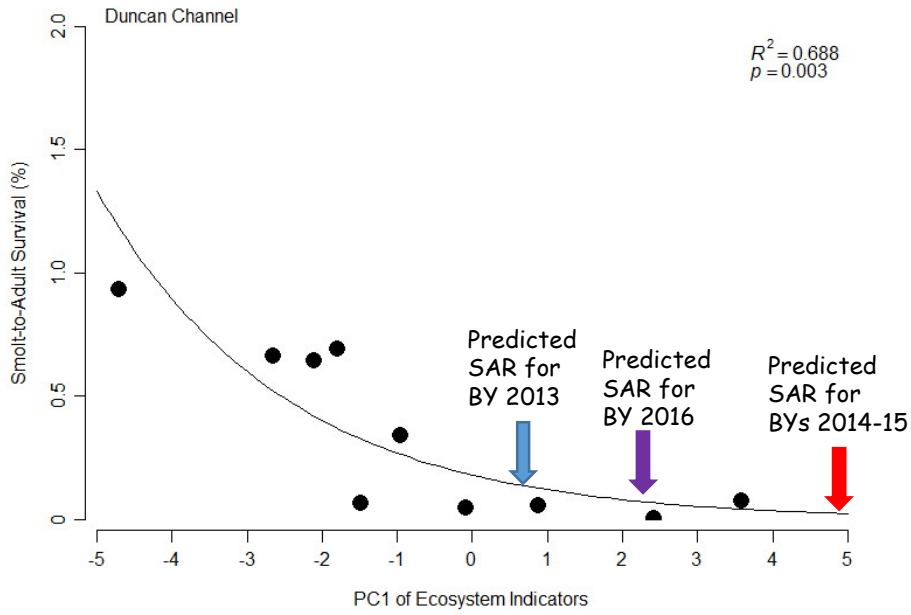




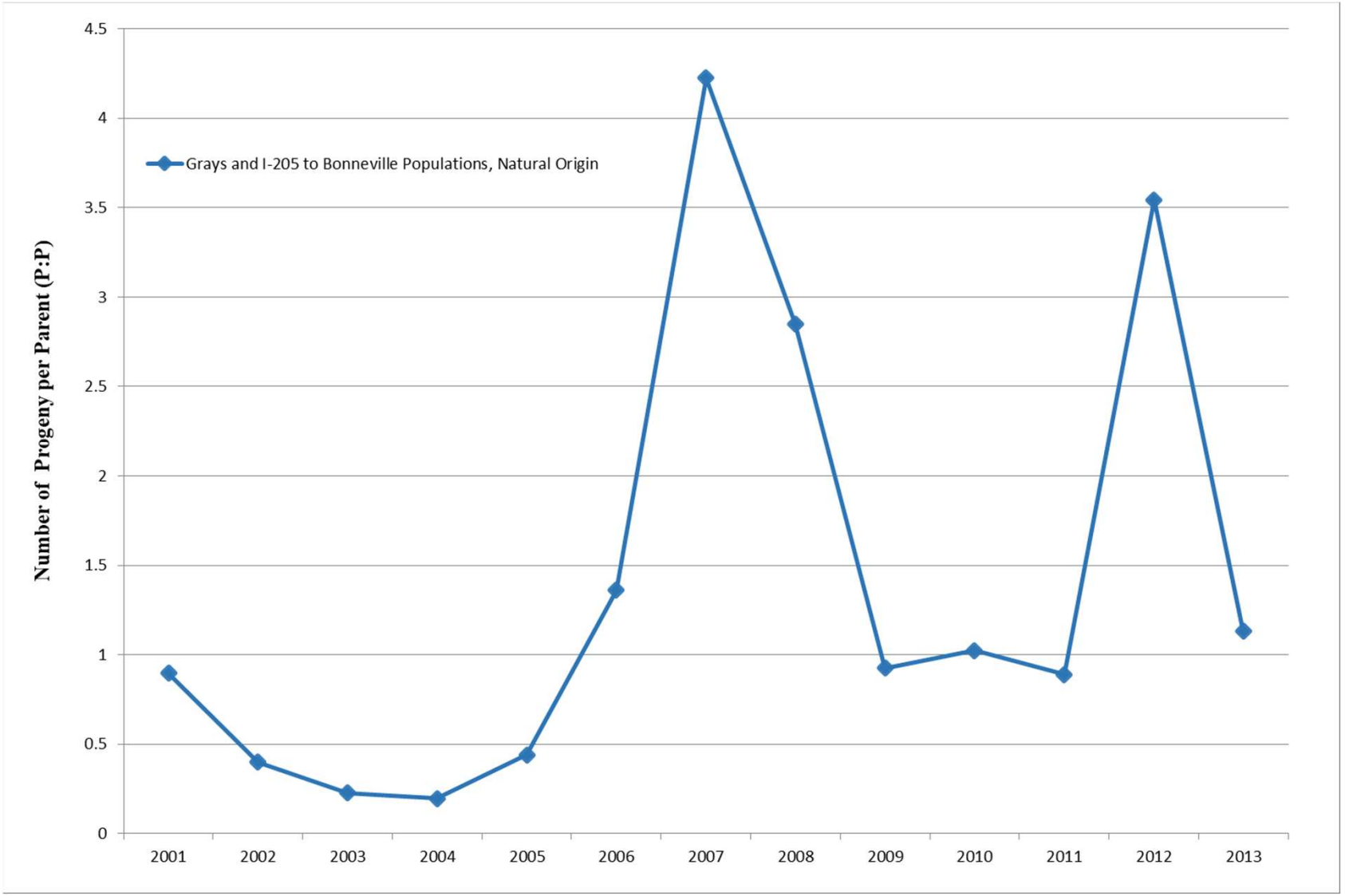
Logistic Regression Results



Grays River Hatchery-origin,
Broodyears 1998-2007, 2009-2012



Duncan Spawning Channel-origin,
Broodyears 2003-2012

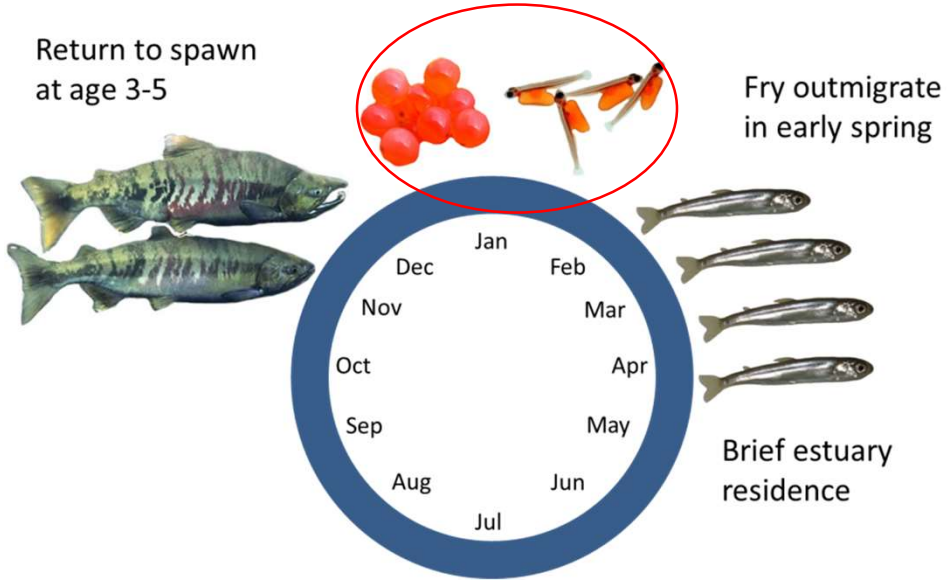


Progeny-Per-Parent, values greater than 1.0 equals population growth, in only 46% of recent NOR cohort/ broodyear returns.

Limiting Factors Summary

- Ocean survival explains much of the variation in life cycle survival but, except for estuary restoration, not much can be done to improve ocean survival.
- The only remaining healthy chum salmon populations have protected spawning and incubation areas.
- 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.



Timeline of Overall Project

- 2010 to 2012 - Scoping project initiated under BPA Project 2008-710-00 (LCR chum BiOp project) to identify sites within the Lewis River basin with the potential to support a large chum salmon spawning channel
  - Ten sites were initially identified, six in the EF Lewis River basin and four in the Lewis River basin
  - Reduced to four sites (two each in the EF Lewis and Lewis)
  - In the summer of 2011, sites were surveyed, test pits and pump tests were conducted at all sites; piezometers were installed to monitor groundwater over a chum salmon spawning and incubation season.
  - After considering all evaluation results and criteria, the Eagle Island Site was determined to have the most potential
  - In 2012, additional surveys and groundwater monitoring were conducted along with an analysis of the hydrology and hydraulic conditions at the Eagle Island Site.
  - A 30% design plan and design report were generated

Timeline - Continued

- 2013 – Goal was to move project into construction phase
  - However, BPA budget issues prevented substantial progress towards construction
  - Funds from BPA LCR chum BiOp project were used to conduct another year of groundwater monitoring and generate a comprehensive report and final design plans

- 2014 – Funding was secured through the Odessa Water Withdrawal Project Mitigation Fund to secure construction permits and cost share construction cost.
  - Design was reviewed by LCFRB SRFB TAC in 2014 for fatal flaws – none found
  - Additional funds to complete construction would be requested from BPA through their LCR chum BiOp project.

Timeline - Continued

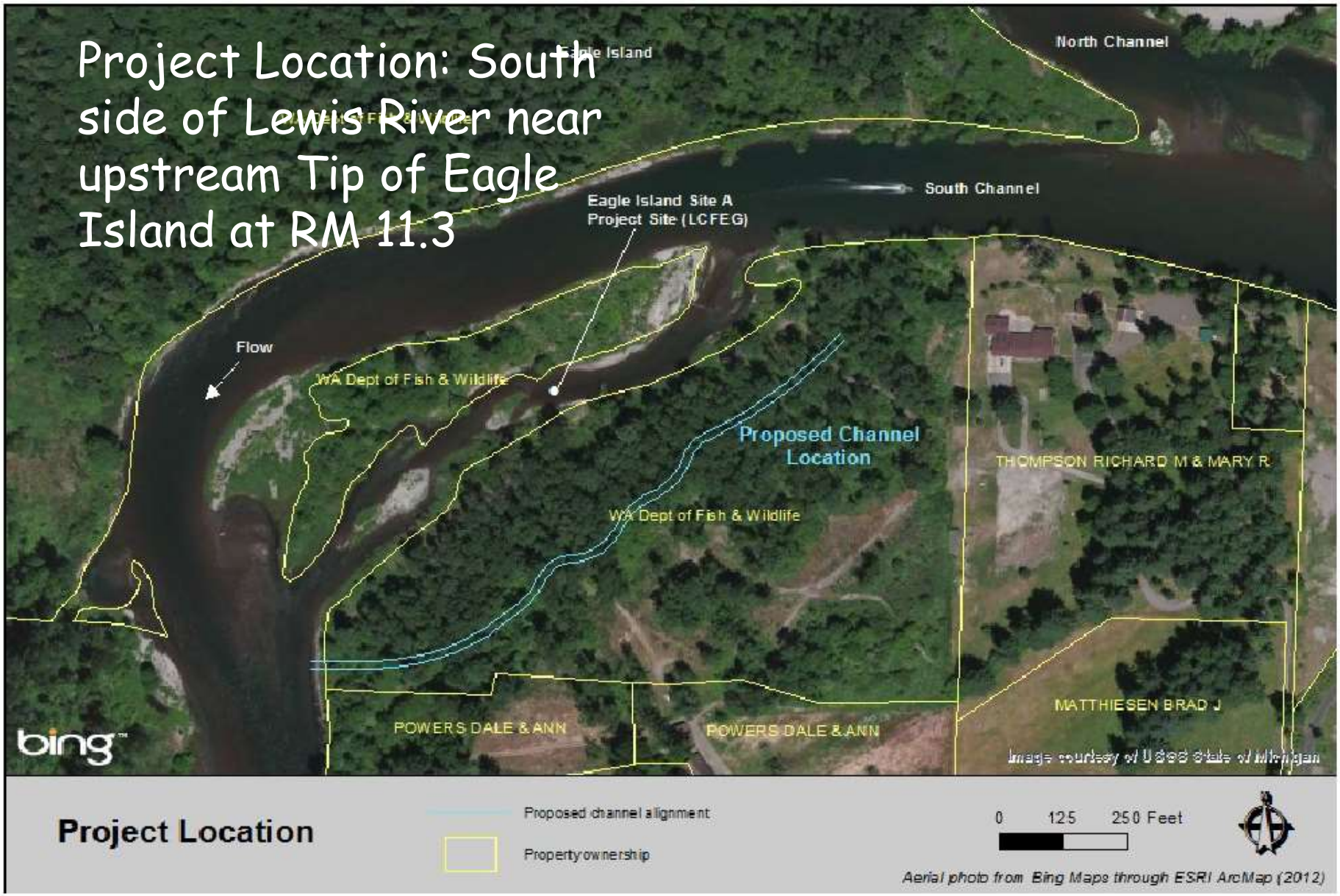
- Construction was planned to start at first opportunity after construction permits were secured (late Spring – Summer of 2015 or 2016)
  - All Construction permits were secured by Spring of 2016
  - Construction was planned to start in late Spring of 2016
  - Late Spring of 2016, funds from the BPA LCR chum BiOp project were used to purchase the majority of the construction materials needed (rock, spawning gravel, toe and pile logs, root wads, etc…)
  - Construction was delayed due to a landowner issue concerning the easement road to property. Purchased materials stored off-site.
  - Negotiated an agreement with landowner concerning easement in the fall of 2016.
  - They backed out at the last minute due to perceived impacts to their property from another project.
- Odessa Mitigation funding was repurposed in the fall of 2016 to construct one of the two Skamokawa basin chum salmon spawning channels in 2017

Timeline - Continued

- Re-engaged landowner with easement issue. Work to improve the easement road and move construction materials onto project site was scheduled for fall of 2017
  - Landowner changed position again and locked gate on easement road.
- January of 2018, the Title Company that insured the easement tried to negotiate with the landowner to resolve issues. Unfortunately, the landowner stated the easement issue could only be resolved through the court system.
  - The Title Company initiated a lawsuit against the landowner over the easement on May 2, 2018.
  - Summer of 2018 – Lawsuit was settled out of court.

History of Project Funding

- The BPA, through their LCR Chum BiOp project, have invested approximately $575K in this project to date
  - Scoping and evaluation, design reports and construction plans, and purchase of construction materials
- Approximately $215K of the Odessa Water Withdrawal Mitigation Fund was used for advancing this project towards construction
- Estimated final cost of project: $1.65 to $1.75 million
  - ~$890K has already been expended
  - Between $750-$850K needed to complete
    - $600-$800K from BPA and/or other sources
    - $100K SFRB grant



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

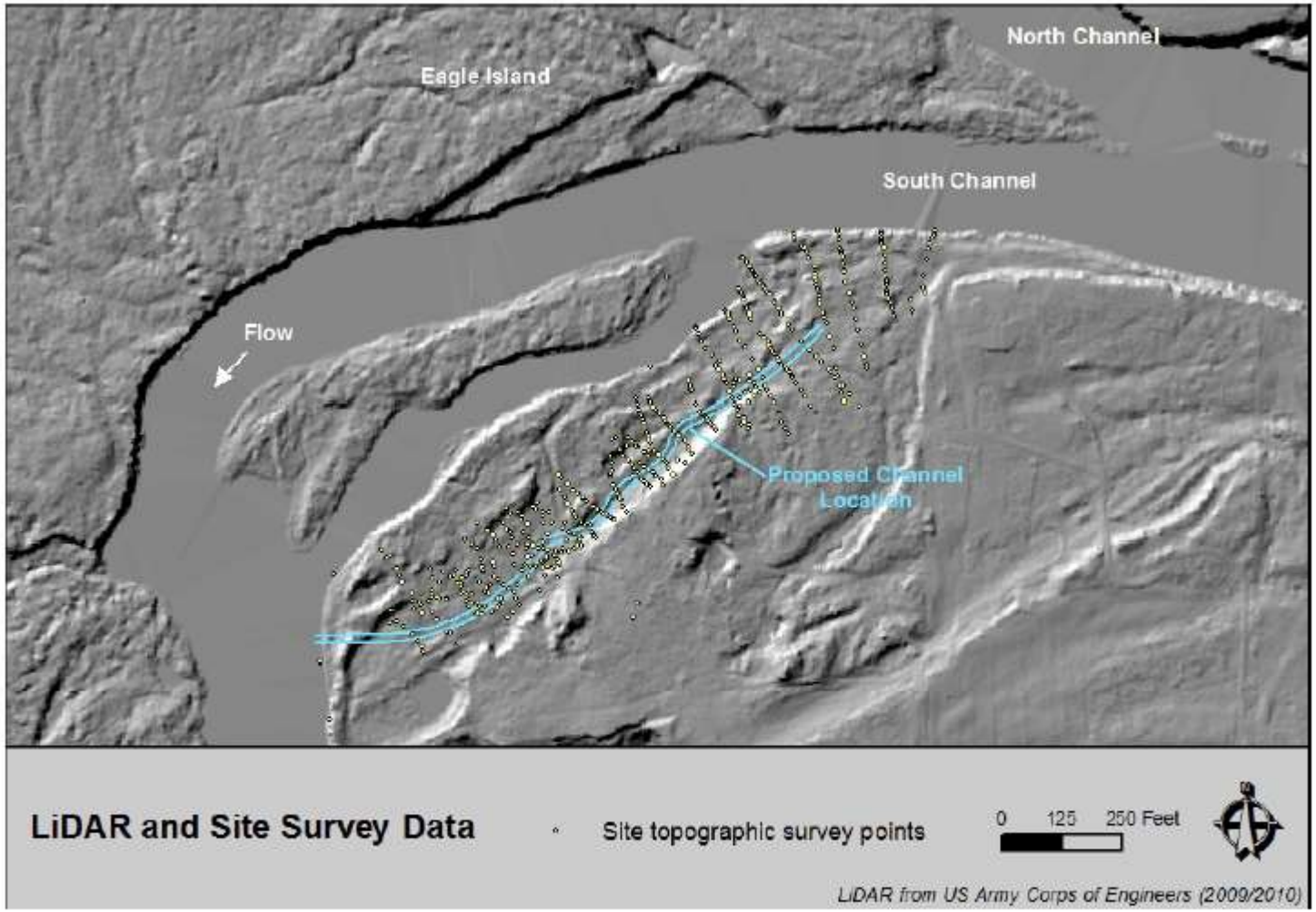
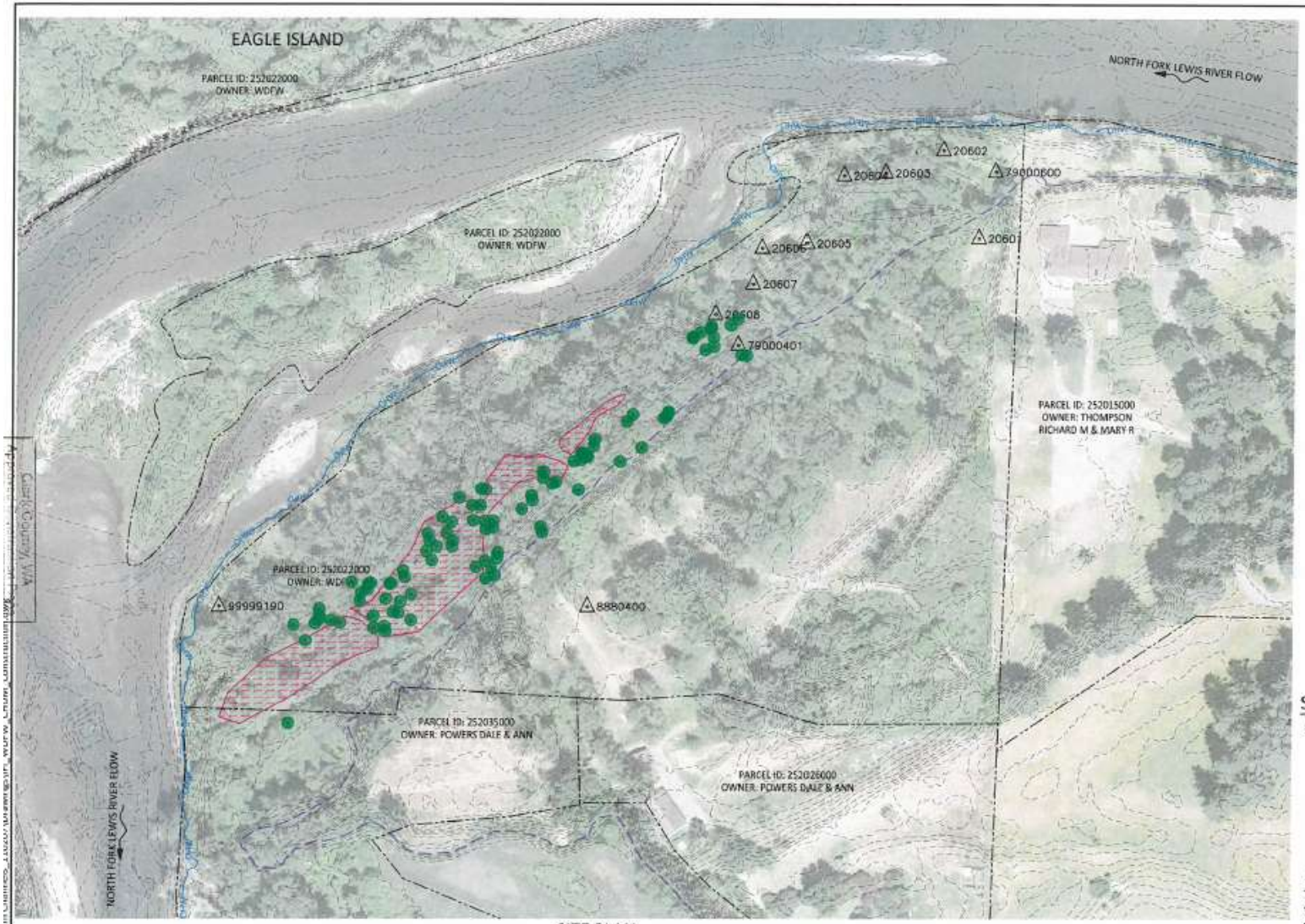


Figure 2. LiDAR hillshade map and site topographic survey points. Additional survey data of the North and South channels were also available and used for this project.

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



SITE PLAN

0 150 300
SCALE IN FEET

LEGEND

- CP600 △ SURVEY CONTROL POINT
- ORDINARY HIGH WATER
- EDGE OF EXISTING FLOODPLAIN
- EXISTING CONTOURS (1FT INTERVALS)
- PROPERTY LINES
- WETLAND - PALUSTRINE FORESTED (43,356 SQUARE FEET)
- EXISTING TREES

MICHAEL R. MCHALE — STATE OF OREGON — 78189 REGISTERED PROFESSIONAL ENGINEER

EXPIRES 8/25/2016

SURVEY CONTROL

POINT #	NORTHING	EASTING	ELEV.	DESC.
20601	227958.97	1084979	35.3348	cp601
20602	228093.074	1084924	31.9128	cp602
20603	228058.741	1084836	31.7898	cp603
20604	228054.871	1084772	31.0508	cp604
20605	227951.448	1084717	31.7058	cp605
20606	227943.802	1084650	28.1588	cp606
20607	227889.161	1084636	29.4308	cp607
20608	227842.826	1084580	33.5998	cp608
8880400	227397.62	1084388	37.5886	cp400
79000401	227795.747	1084615	29.0248	cp401
79000600	228060.609	1085003	31.3948	CP600
79000601	227958.951	1084979	35.2958	cp601
99999190	227397.76	1083826	28.9528	cp90

NO.	BY	DATE	REVISION DESCRIPTION

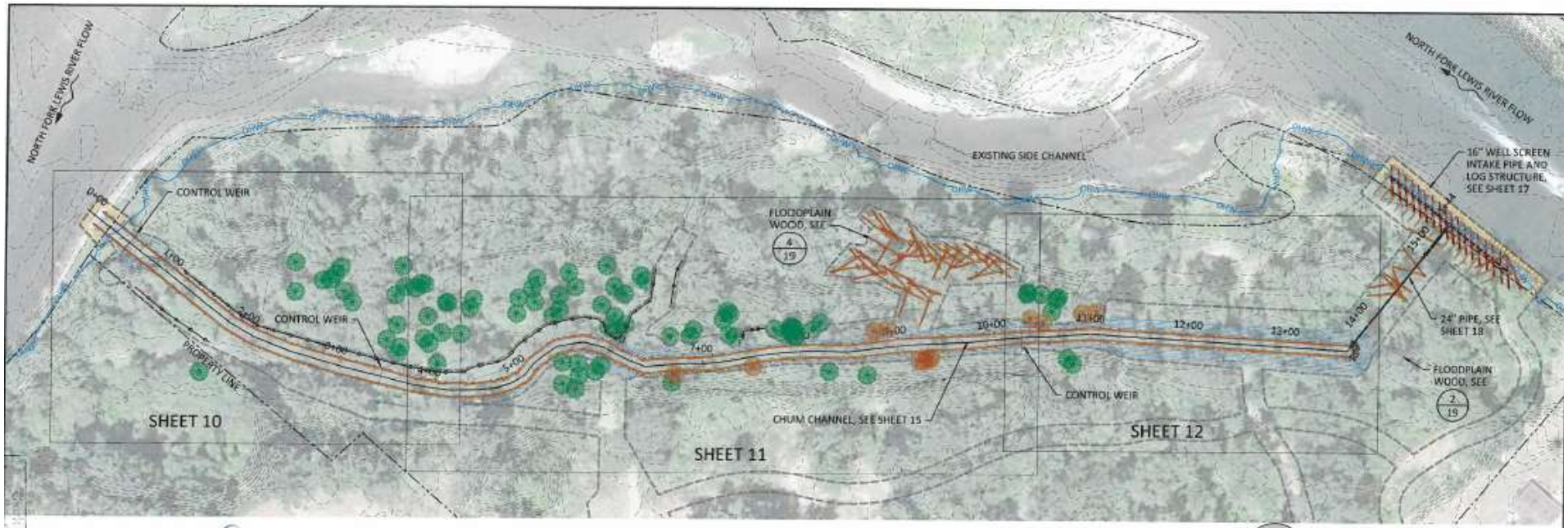
MJ,DF	MM,GJ	GJ
DRAWN	DESIGNED	CHECKED
MM	7/07/16	11-02-07
APPROVED	DATE	PROJECT

LEWIS RIVER - EAGLE ISLAND
CHUM SPAWNING CHANNEL
WOODLAND, WASHINGTON

inter-fluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

EXISTING CONDITIONS, OWNERSHIP, AND SURVEY CONTROL

SHEET 6 OF 20



PLAN

LEGEND

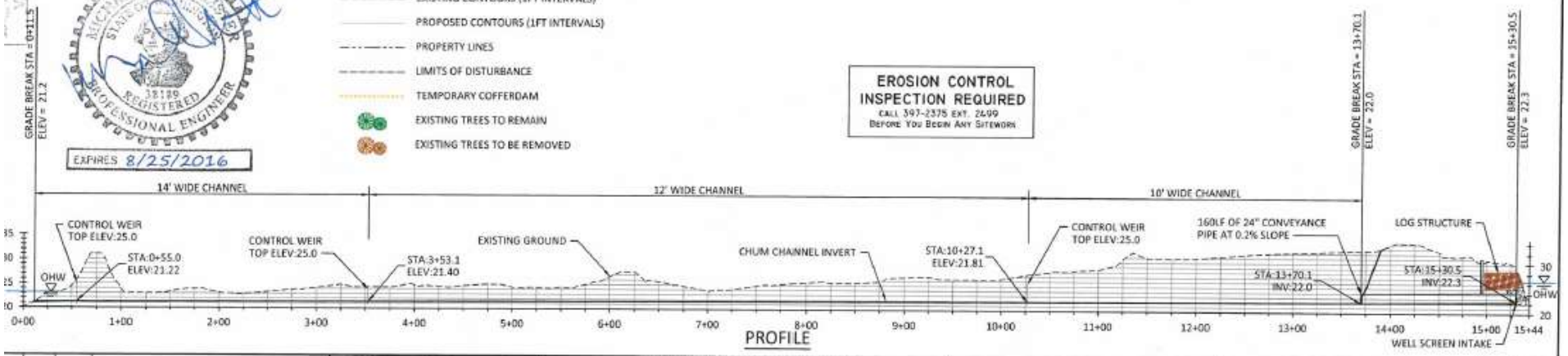
- ORDINARY HIGH WATER
- EXISTING CONTOURS (1FT INTERVALS)
- PROPOSED CONTOURS (1FT INTERVALS)
- PROPERTY LINES
- LIMITS OF DISTURBANCE
- TEMPORARY COFFERDAM
- EXISTING TREES TO REMAIN
- EXISTING TREES TO BE REMOVED

TEN EXISTING TREES TO BE REMOVED AND SALVAGED. REMOVED TREES SHALL BE USED IN LOG STRUCTURE OR FLOODPLAIN WOOD AT LOCATIONS SPECIFIED BY OWNER.

0 100 200
SCALE IN FEET

EROSION CONTROL INSPECTION REQUIRED
CALL 397-2375 EXT. 2409
BEFORE YOU BEGIN ANY SITEWORK

MICHAEL R. SCALISE
38189
REGISTERED PROFESSIONAL ENGINEER
EXPIRES 8/25/2016



PROFILE

NO.	BY	DATE	REVISION DESCRIPTION

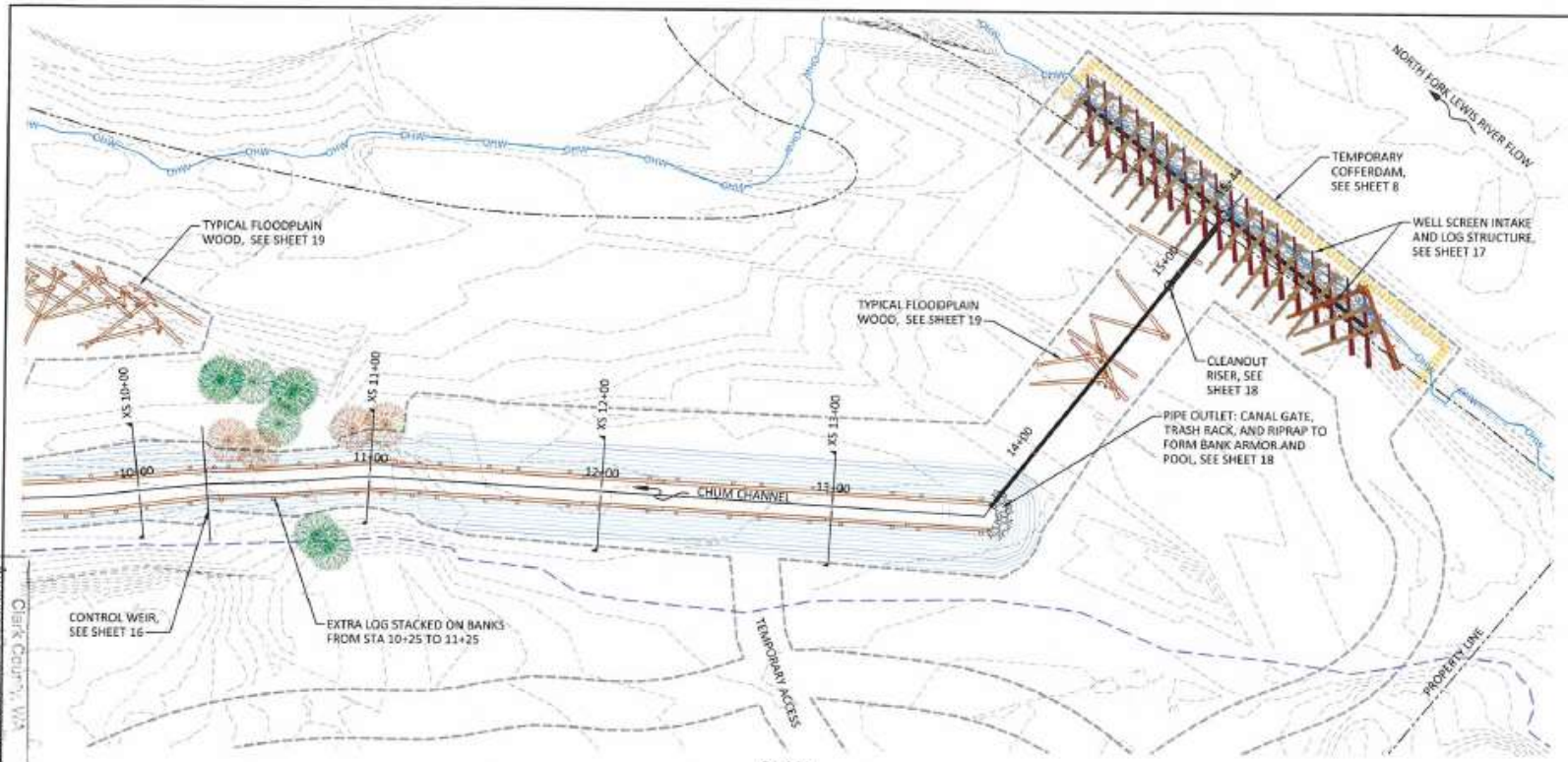
MJ.DF	MM.GJ	GJ
DRAWN	DESIGNED	CHECKED
MM	7/07/16	11-02-07
APPROVED	DATE	PROJECT

LEWIS RIVER - EAGLE ISLAND CHUM SPAWNING CHANNEL WOODLAND, WASHINGTON

inter·fluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

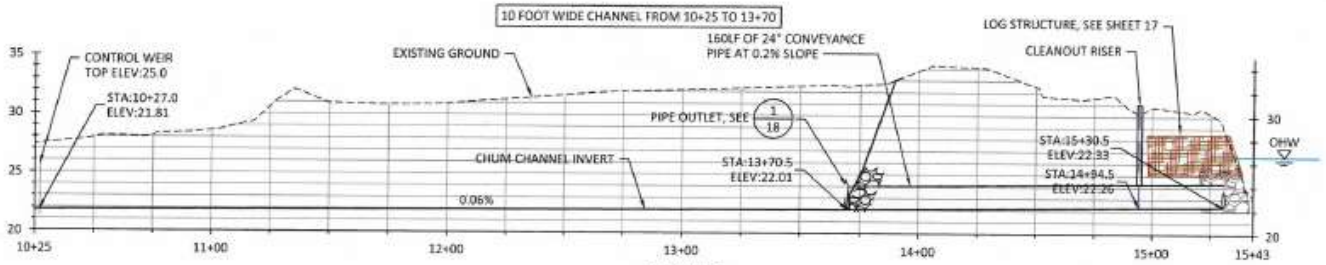
SHEET INDEX AND PROPOSED CONDITIONS PLAN & PROFILE

SHEET 9 OF 20



PLAN

SEE SHEET 13 FOR GRADING CROSS SECTIONS.



PROFILE

LEGEND

- ORDINARY HIGH WATER
- EDGE OF EXISTING FLOODPLAIN
- EXISTING CONTOURS (1FT INTERVALS)
- PROPOSED CONTOURS (1FT INTERVALS)
- PROPERTY LINES
- LIMITS OF DISTURBANCE
- TEMPORARY COFFERDAM
- XS 3+00 GRADING CROSS SECTIONS, SEE SHEET 13
- EXISTING TREES TO REMAIN
- EXISTING TREES TO BE REMOVED

0 50 100
SCALE IN FEET

EROSION CONTROL INSPECTION REQUIRED
CALL 397-2375 EXT. 2499
BEFORE YOU BEGIN ANY SITEWORK

MICHAEL R. McALLISTER
STATE OF WASHINGTON
38189
REGISTERED PROFESSIONAL ENGINEER

EXPIRES 8/25/2016

NO.	BY	DATE	REVISION DESCRIPTION

MJ,DF	MM,GJ	GJ
DRAWN	DESIGNED	CHECKED
MM	7/07/16	11-02-07
APPROVED	DATE	PROJECT

LEWIS RIVER - EAGLE ISLAND
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PROPOSED CONDITIONS
STA 10+25 TO 13+70

SHEET 12 OF 20

G:\U-Z\WDFW Chum Channels_110207\Drawings\VFI_WDFW_CHUM_Construction.dwg

Pre-Proposal
Comments & Questions

Lower Columbia Fish Recovery Board

- Why is this so expensive?
- Do you anticipate this being delayed further?
- What maintenance is expected?
- Consider adding other projects in the immediate vicinity.

Utilities

- Reference channel adjacent to this proposed channel. How has the other channel performed?
- How does this channel differ in objective?
- How will benefits be determined (very few chum salmon available).
- What are the plans to bring Chum to use the channel (hatchery?).
- Other grants have been secured, and permitting and logs secured. Funds are for construction only (20% of total construction costs). Where do monitoring funds come from?

National Marine Fisheries Service

- Expand on benefits to focal reintroduction species.
- Monitoring should include juvenile use by other focal species.
- More detailed budget.

Cowlitz Tribe

- The regional value of chum population enhancement is well supported within the proposal. While constructed channels should be a second-to-last measure behind hatchery production, the constrained and controlled nature of the Lewis mainstem leaves few viable options for enhancing chum habitat and populations.

- This project entered into agreement with SRFB in July 2019. The budget provided to SRFB indicated that the total construction cost was $900,000 (total project cost, including A&E, was not supplied), of which SRFB provided $100,000. At that time, WDFW did not indicate that they would seek additional funds from the ACC or elsewhere to complete the project, other than a negotiated amount from BPA.

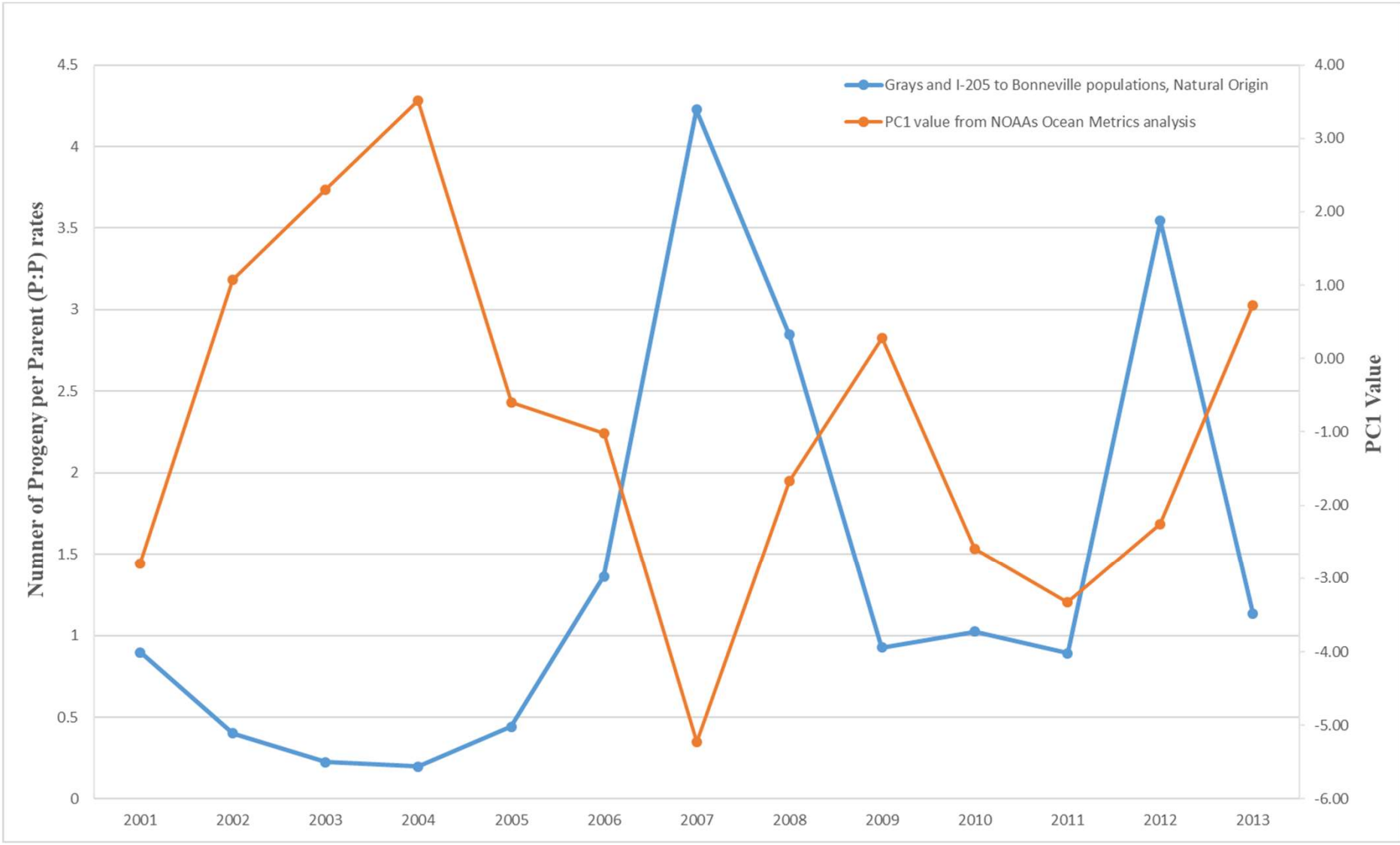
- The Aquatic Fund preproposal indicates that the $175,000 requested from the ACC is only 10% of the total project cost (i.e., total project $1.75 million). The Engineer's Estimate for construction provided by the applicant is roughly $700,000.

Cowlitz Tribe - continued

- The applicant states that WDFW has already expended $890K on the project without turning dirt (but an undefined portion of this money has been used to purchase construction materials). Please explain why this is a wise use of ACC funds, given the apparent free spending of other funds previously committed to the project without measurable progress on the project.

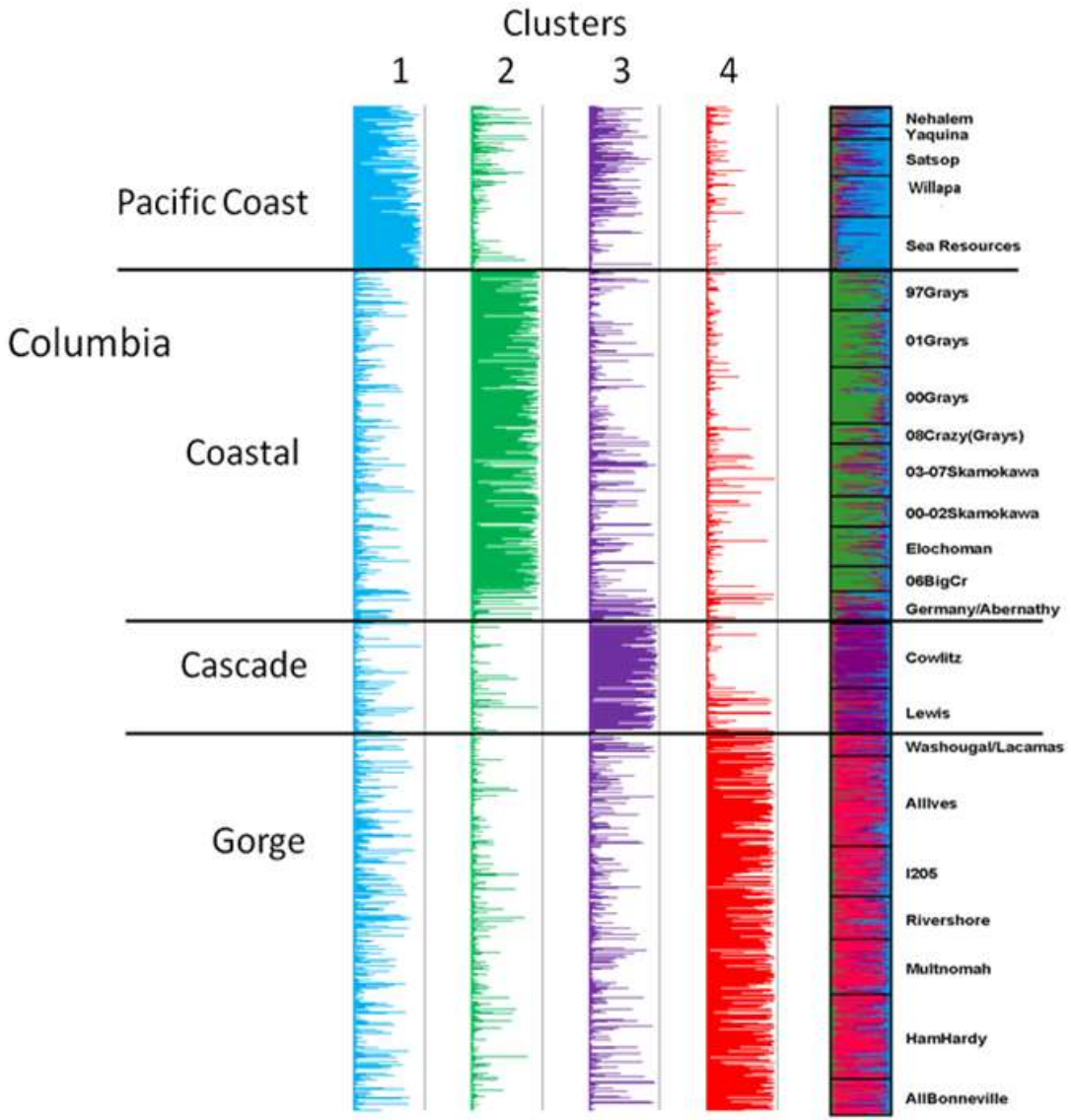
- The SRFB proposal listed Washington DNR State Owned Aquatic Lands (SOAL) as a landowner. The only landowner acknowledgement form attached is from WDFW. Has landownership changed on the project footprint?

- Groundwater chum channels constructed elsewhere in the Columbia Basin have required periodic maintenance to maintain their productivity. The addition of an infiltration gallery introduces an additional layer of long-term operational uncertainty. How would WDFW address the long-term operation and maintenance of this artificially constructed habitat?



Progeny Per Parent Values by BroodYear and corresponding PC1 values (negative is better) for outmigration year from NOAAs Ocean Metrics Analysis.

Project Location: South Side of Lewis River Near Upstream Tip of Eagle Island at RM 11.3



Individual ancestry values for combined contemporary and archived Lower Columbia River and Pacific Coast chum salmon collections from STRUCTURE analysis at K = 4.