Chehalis River Basin Comprehensive Salmonid Enhancement Plan

Presented by
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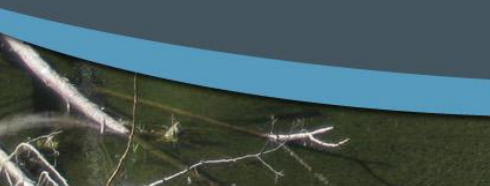
Project Background

- Engrossed Substitute House Bill 2020
  - "Address the potential for flood mitigation through upstream water retention facilities, including benefits and impacts to fish and potential mitigation of impacts"

Anchor QEA Scope of Work

- Identify potential opportunities to improve salmon habitat in Water Resource Inventory Area (WRIA) 23
  - Phase I - Identify salmon enhancement projects in WRIA 23
  - Phase II - Prioritize project list; estimate benefits and costs



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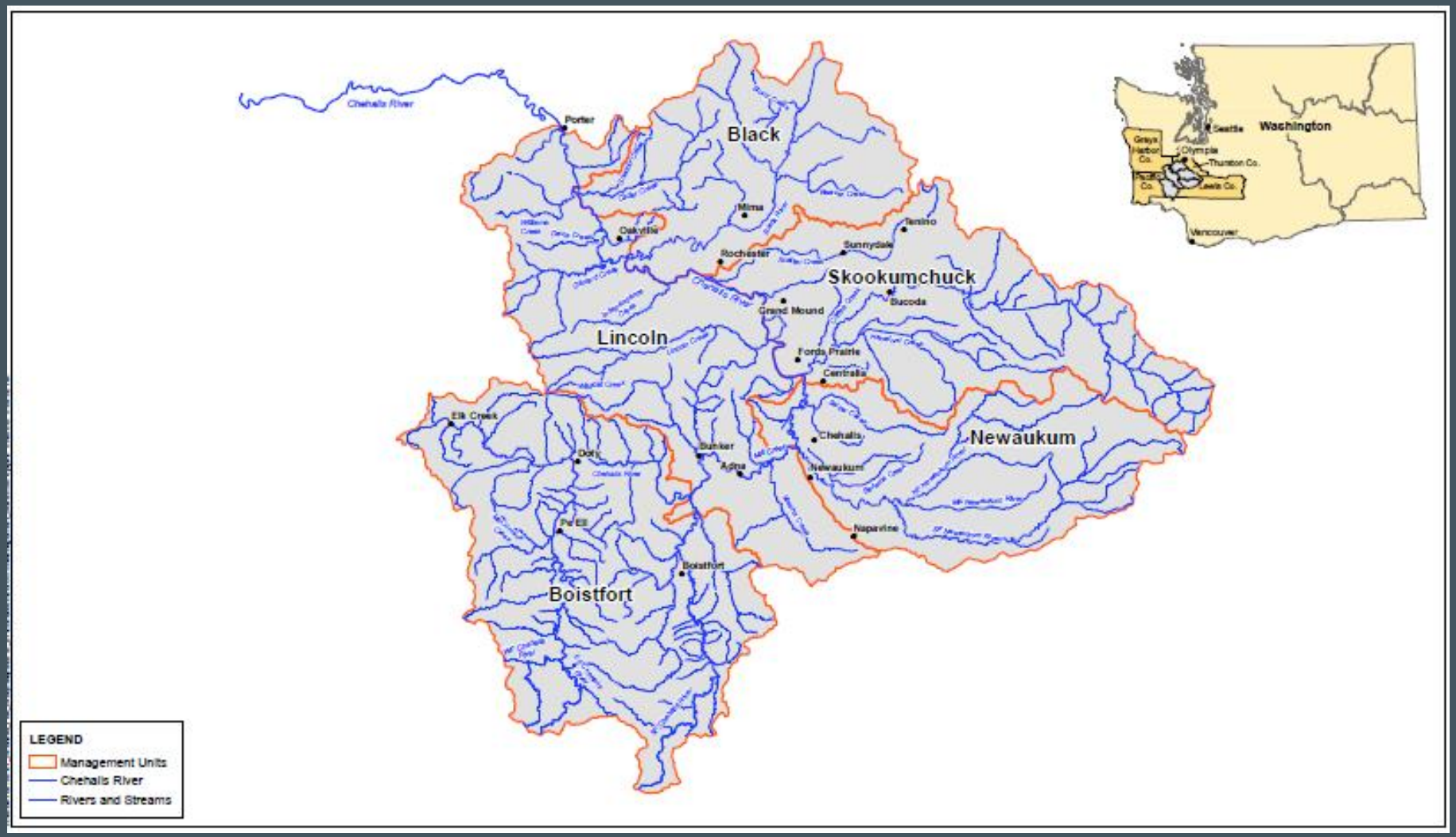
Draft Report Review Process

- Proposed comment period May 17-June 7, 2012
- Anchor QEA is proposing to address comments and provide final report and comment-response table by June 21. The Flood Authority may adjust these dates to fit their needs.

Phase 1 Report Study Area

- Projects identified within Management Units (MUs)
  - Mainstem Chehalis
  - Boistfort
  - Lincoln
  - Newaukum
  - Skookumchuck
  - Black

Management Units (MUs)



Phase 1 Report Data Sources

- *Salmon and Steelhead Habitat Limiting Factors; Chehalis Basin and Nearby Drainages WRIAs 22 and 23* (Smith and Wegner 2001)
- *Chehalis Basin Salmon Habitat Restoration and Preservation Work Plan for WRIAs 22 and 23* (Work Plan; Grays Harbor Lead Entity Habitat Work Group 2011)
- *Lewis County Conservation District (LCCD) Culvert Survey Reports* (LCCD 2006, 2007, and 2009)
- *Chehalis Basin Fish Passage Barrier Ranking and Project Development* (Mason Conservation District 2010)
- *U.S. Army Corps of Engineers Draft Twin Cities Flood Reduction Project* (2011) Mitigation Site Evaluations. Appendix A.
- Washington Recreation and Conservation Office PRISM database

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Phase 1 Report Data Sources (cont.)

- *Chehalis Basin Watershed Assessment* (Washington Department of Ecology, Stanley et al. 2010)
- *Flood Protection and Ecosystem Services in the Chehalis River Basin* (Earth Economics 2010)
- *Chehalis River Basin Comprehensive Flood Hazard Management Plan* (Flood Authority 2010)
- Habitat Work Schedule
- GIS and LiDAR
- Workshop
- Interviews

Phase 1 Report

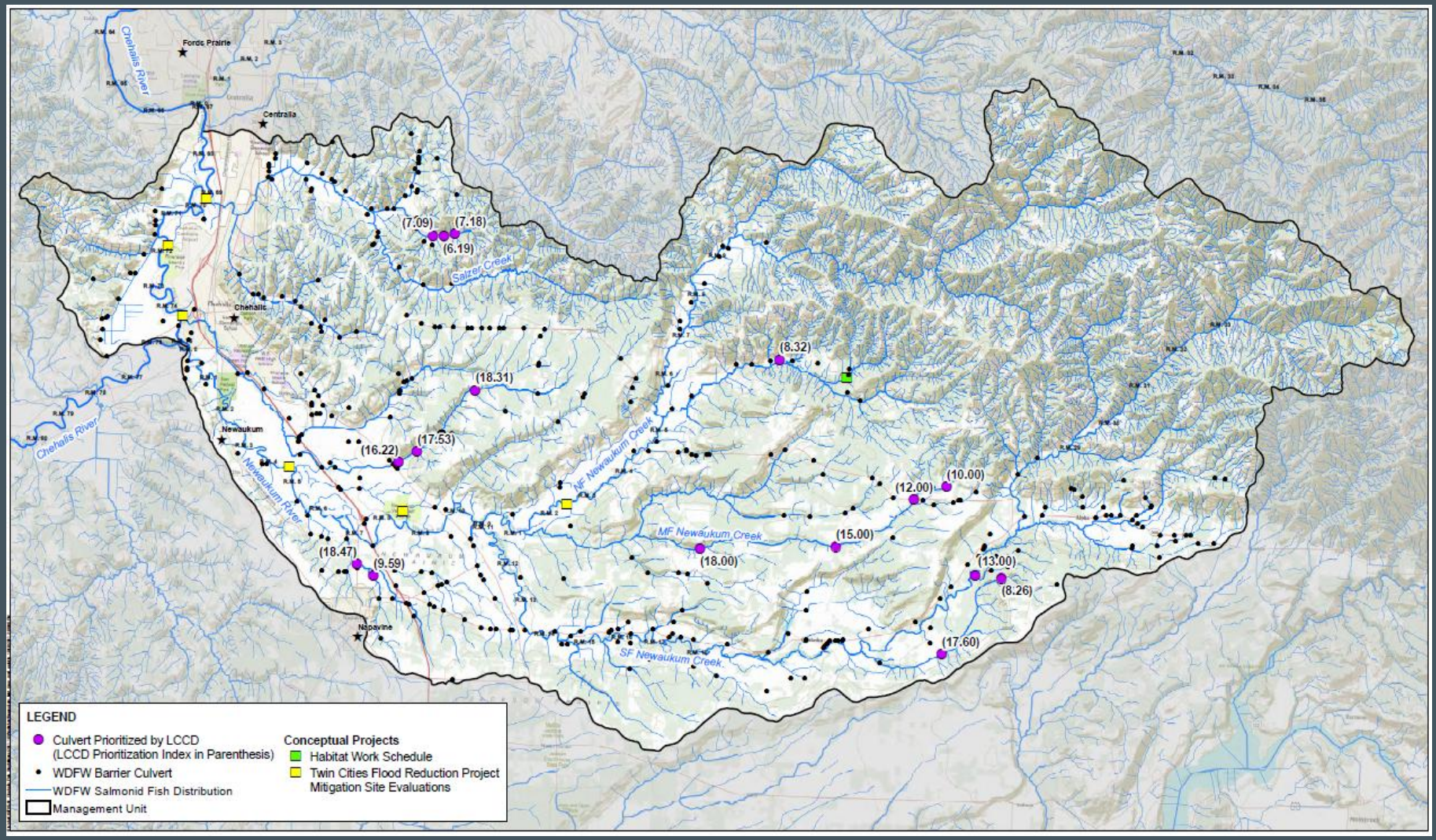
- Limiting factors (LF) previously identified in watershed
  - Floodplain conditions
  - Riparian conditions
  - Large woody debris (LWD)
  - Fish passage
  - Water quality
  - Water quantity
  - Streambed sediment
- In each MU, the LF assigned to Tier 1 (most degraded), Tier 2, and Tier 3

Phase 1 Report

- Eighty-nine programs or projects addressing limiting factors were identified (Table 3 of Phase 1 Report)
  - 49 addressed multiple LF
  - 27 for fish passage
  - 7 for riparian conditions
  - 6 for floodplain conditions

- Within WRIA 23, there are 643 culvert barriers, 300 of those were included in Phase 1 projects

Phase 1 – Newaukum MU



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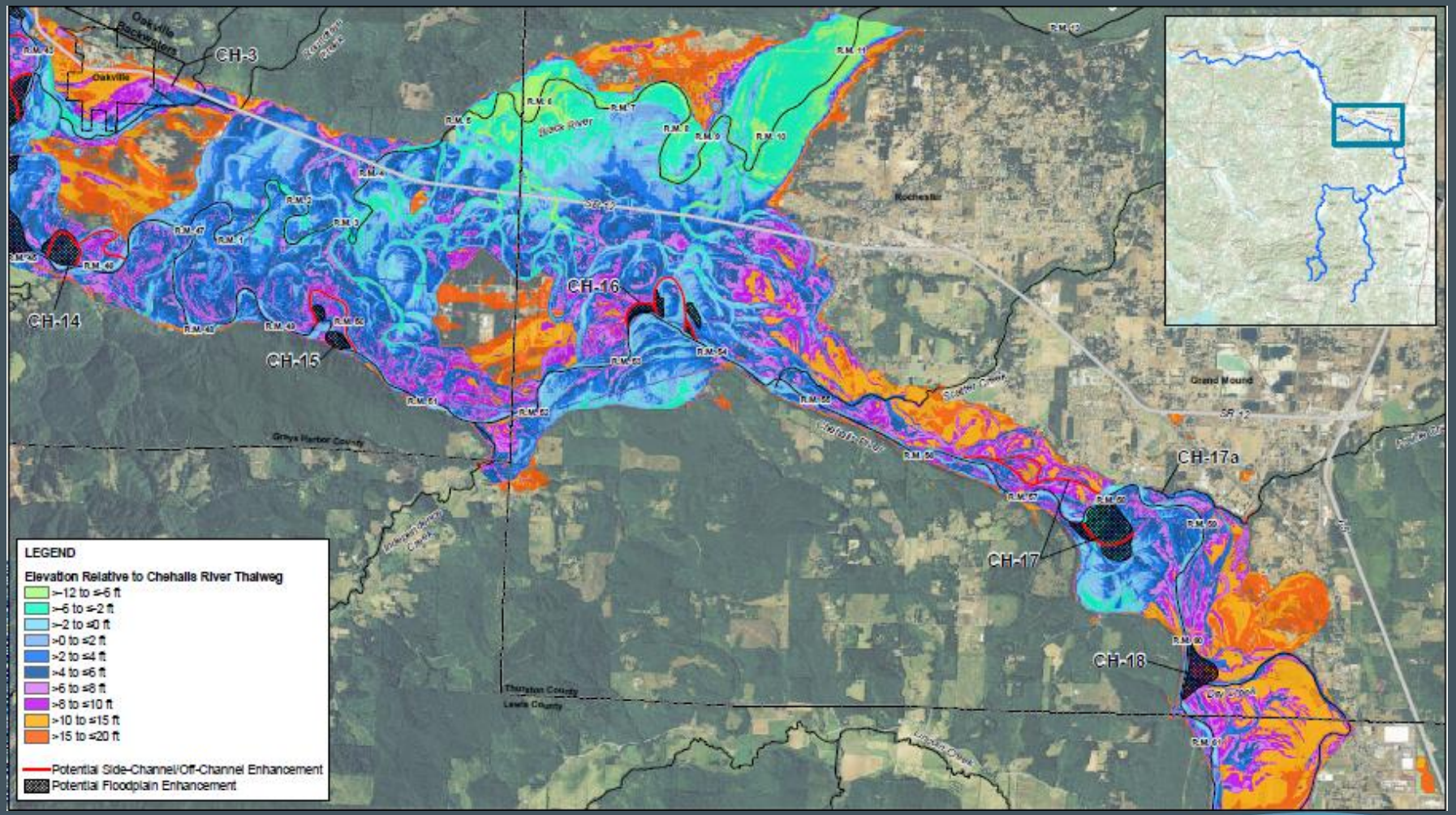
Phase 1 – Relative Elevation Maps – Mainstem Chehalis MU



Phase 1 – GIS Maps

Phase 1 Projects Summary

Management Unit	Number of Fish Barriers	Linear Feet of Floodplain Enhancement	Acres Riparian Preservation/Restoration	LWD Pieces
Black	15	-	200	-
Boistfort	73	-	404	-
Lincoln	114	-	-	-
Newaukum	54	3,100	620	560
Skookumchuck	44	9,597	32	800
Chehalis Mainstem	-	118,790	859	2,336
Total	300	131,487	2,115	3,696

Phase 2

- Prioritize Phase 1 projects
- Estimate salmonid habitat benefits
- Estimate costs

Phase 2 – Prioritization Approach

- Project prioritization approach
  - Floodplain and riparian projects (53 total)
    - Decision support system (scoring) based on Beechie et al. 2008
    - Evaluation criteria are scored, summed, and weighted
  - Fish passage projects
    - Ranking system develop by LCCD and MCD
    - Estimated percent passable, number of fish species, and stream miles available upstream

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Phase 2 – Prioritization

- Evaluation criteria for floodplain and riparian projects
  - Limiting factors addressed
  - Salmonid species present
  - Size of project
  - Certainty of response
  - Other criteria were examined but not included in final analysis (e.g., likelihood of funding, ownership, and cost)
  - Focused on ecological criteria

Phase 2 – Prioritization

- Evaluation criteria scoring system
  - Weighted criteria to reflect ecological significance
    - Limiting factor – 33 percent
    - Salmonid species present – 33 percent
    - Size of project – 17 percent
    - Certainty of response – 17 percent

Prioritization Score = $(HLF_{SC} * HLF_{WGT}) + (Species_{SC} * Species_{WGT}) + (Size_{SC} * Size_{WGT}) + (Certainty_{SC} * Certainty_{WGT})$

Where: HLF = habitat limiting factors, Species = number of salmonid species, Size = size of project, Certainty = certainty of project success, SC = score, WGT = weighting factor

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Example of Floodplain and Riparian Projects Ranking

Project Identifier	Location	Type of Project	Limiting Factors Addressed	Number of Species	Size of Project	Certainty of Response	Total Score	Rank
CH-13	Near RM 43	Oxbow reconnection, side channel/floodplain enhancement	11.9	13.8	6.8	6.1	38.6	**1**
CH-11	Near RM 36	Oxbow reconnection, side channel/floodplain enhancement	11.9	13.8	5.1	6.1	36.9	**2**
CH-6	State Route 6 oxbow	Oxbow reconnection, riparian restoration, install LWD	11.9	13.8	5.1	6.1	36.9	**2**
CH-7	Oxbow Lake Reconnection	Oxbow reconnection, riparian restoration, install LWD	11.9	13.8	5.1	6.1	36.9	**2**

Phase 2 – Prioritization

- Fish passage projects ranking
  - Ranking system developed by LCCD and MCD
  - Estimated percent passable, number of fish species, and stream miles available upstream
  - LCCD ranked top 100 culverts using actual physical habitat measurements upstream of culverts
  - This list of culvert projects from LCCD should be given priority when considering which culverts to replace first

Phase 2 – Salmonid Benefits

- Salmonid benefits from enhancement project list
  - Quantify benefits from all potential projects
  - Use Remand Habitat Workgroup (RHW) approach to estimate percent increase in habitat and freshwater survival over existing conditions
  - RHW approach uses existing literature on limiting factors, current and potential status of habitat variables, habitat actions, and weightings to estimate increase in salmonid freshwater survival

RHW Approach

- Identify limiting factors
- Estimate the "current" status of limiting habitat factors as a percent of optimal condition (0-100%)
  - Condition was based on properly functioning condition (PFC) (NMFS 1996)
  - Assumed 3 different scenarios - a low, medium, and high estimate of PFC
- Weight the importance of each limiting habitat factor (scaled from 0.00-1.00 with sum = 1.00); floodplain conditions, riparian conditions, LWD, and fish passage were weighted equally
- Weight MUs; each MU was assigned an equal weight (1/6 = 0.167)

Salmonid Benefits - RHW Approach

- Identify specific habitat actions that will address the limiting habitat factor

- The habitat action must directly or indirectly address the limiting factor and/or threat

Specific Habitat Enhancement Actions

Management Unit	Number of Fish Barriers Fixed	Linear Feet of Floodplain Enhanced	Acres Riparian Preservation/ Restoration	LWD Pieces Added
Black	15	-	200	-
Boistfort	73	-	404	-
Lincoln	114	-	0	-
Newaukum	54	3,100	620	560
Skookumchuck	44	9,597	32	800
Chehalis Mainstem	-	118,790	859	2,336
Total	300	131,487	2,115	3,696

Salmonid Benefits - RHW Approach

- Estimate the "potential" status of limiting habitat factors as a percent of optimal condition (0-100%)
  - Condition that should result if the habitat action is implemented
  - Assumed that if enhancement projects are implemented, then Tier 1 LF would improve to Tier 2, Tier 2 to Tier 3, and Tier 3 would improve by 10%, 15%, or not at all in the low, medium, and high scenarios respectively

Salmonid Benefits - RHW Approach

- Low scenario:
  - Tier 1 = 50% of optimal, Tier 2 = 60%, Tier 3 = 70%
- Medium scenario:
  - Tier 1 = 25% of optimal, Tier 2 = 50%, Tier 3 = 75%
- High scenario:
  - Tier 1 = 10% of optimal, Tier 2 = 50%, Tier 3 = 90%

Salmonid Benefits - RHW Approach

- Assuming low, medium, and high improvements in habitat quality, it is estimated that habitat condition and thus egg-to-smolt survival could be increased from 14% to 73% if the prioritized projects are implemented

- RHW approach is adaptive and basin biologists and stakeholders can easily modify the input assumptions

Costs of Enhancement Projects

Management Unit	Estimated Cost of Floodplain and Riparian Projects	Estimated Cost of Culvert Projects	Total Cost per Management Unit
Black	$315,600	$1,205,000	$1,520,600
Boistfort	$12,366,600	$5,049,000	17,415,600
Lincoln	$315,600	$8,271,000	$8,271,000
Newaukum	$40,457,600	$3,777,000	$44,234,600
Skookumchuck	$2,175,000	$3,125,000	$3,125,000
Chehalis Mainstem	$75,574,200	0	$75,574,200
Total	$130,891,000	$21,427,000	$152,316,000

Questions and Answers

Are Benefits Enough to Mitigate for Dam?

- The multi-purpose dam providing water releases to maximize fish habitat and assuming target fish passage survival is predicted to reduce coho salmon and steelhead spawners by 28% and 32%, respectively
- Limiting factors analysis shows impairments in the basin
- If implemented, the potential enhancements could increase the condition of habitat and egg-to-smolt survival by 14% to 73%
- It appears the potential enhancements could mitigate for populations upstream of the dam, but there is uncertainty…