

Evaluation of four types of salmon habitat restoration in Washington State

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Overview

- Salmon Recovery Funding Board (SRFB) Reach-Scale Effectiveness Monitoring Program
 - Funded more than 700 projects
 - Contributed more than \$241 million
 - Started monitoring program in April 2004

Outline

- Purpose of research
- Methods
- Analysis
 - Statistical
 - Performance benchmark
- Evaluation of project types
- Conclusions

Purpose

- Assess changes in stream reach
 - Fish abundance and passage
 - In-stream habitat
 - Channel connectivity
 - Constrained channel

Purpose – Fish passage



- Has fish abundance increased post-project?

Purpose – In-stream Habitat



- Has stream morphology improved and fish abundance increased post-project?

Purpose – Channel Connectivity



- Has stream morphology improved and fish abundance increased post-project?

Purpose – Constrained Channel



- Has stream morphology improved post-project?

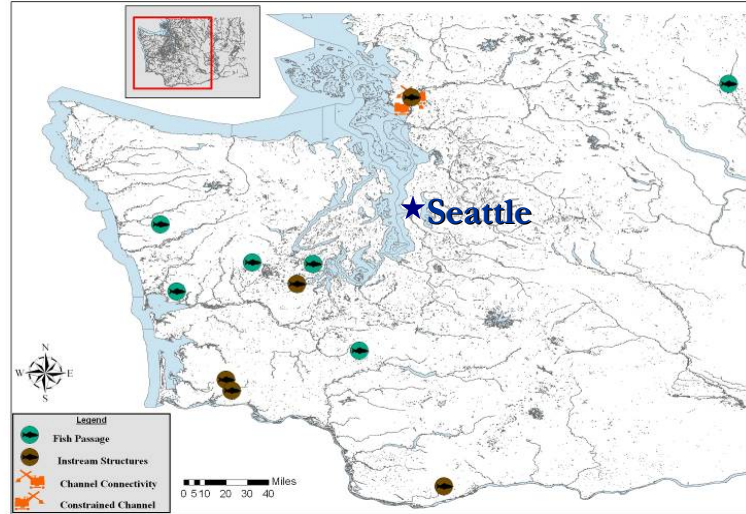
Methods

- Study design
 - “Before After Control Impact” - BACI
 - Multiple projects surveyed
- Field methods
 - Surveys for fish abundance and physical habitat
 - Based on SRFB monitoring protocols

Projects

Type	Project Name	2004	2005	2006
Fish Passage	Salmon River Tributary	Year 0	Year 1	Year 2
Fish Passage	Malaney Creek	Year 0	none	Year 1
Fish Passage	Chewuch River	none	Year 0	Year 1
Fish Passage	Peterson Creek	none	Year 0	Year 1
Fish Passage	Lucas Creek	none	Year 0	Year 1
Fish Passage	Polson Creek	none	Year 0	Year 1
In-Stream Habitat	Little Skookum Valley Creek	Year 0	none	Year 1
In-Stream Habitat	Salmon Creek	Year 0	Year 1	none
In-Stream Habitat	Skagit River Side Channel	Year 0	Year 1	none
In-Stream Habitat	Grays River	none	Year 0	Year 1
In-Stream Habitat	Upper Washougal River	none	Year 0	Year 1
Channel Connectivity	Skagit River Side Channel	Year 0	Year 1	Year 2
Constrained Channel	Skagit River Levee Setback	Year 0	Year 1	none

Project Locations in the State of Washington



Analysis - Statistical

- One-tailed paired-sample t test
 - Fish Passage
 - Adult coho salmon spawner abundance (fish/km)
 - Juvenile coho and chinook salmon abundance ($\#/m^2$)
 - Steelhead parr abundance ($\#/m^2$)
 - In-stream Habitat
 - Mean Thalweg residual depth (cm)
 - Volume of Large Woody Debris (LWD) ($m^3/100m$)
 - Surface Area (m^2)
 - Juvenile chinook salmon abundance ($\#/m^2$)

Analysis – Performance Benchmark

- Percent increase greater than 20% in the Mean Difference

$$\left(\frac{\text{Mean Year 1 Difference} - \text{Mean Year 0 Difference}}{\text{Mean Year 0 Difference}} \right) \times 100$$

- Fish Passage
- In-stream Habitat
- Channel Connectivity*
- Constrained Channel

Evaluation of Project Types

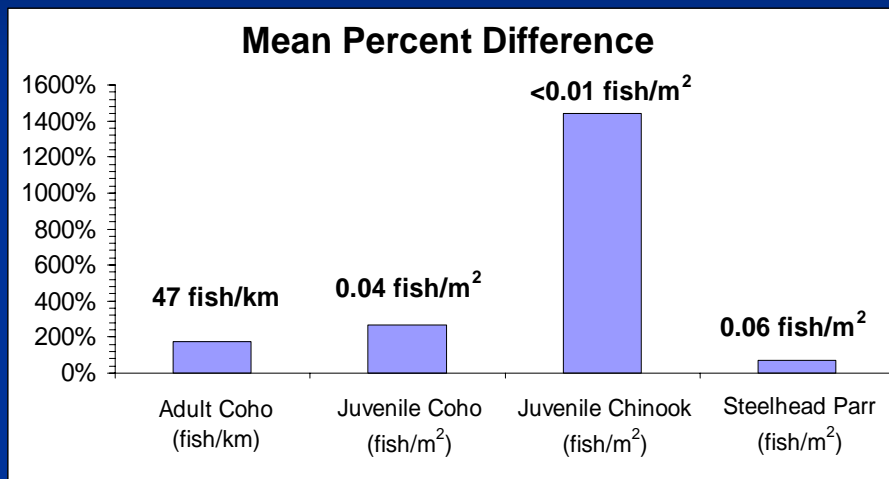


Fish Passage - Evaluation



Fish Passage Analysis

- Objective - restore upstream passage



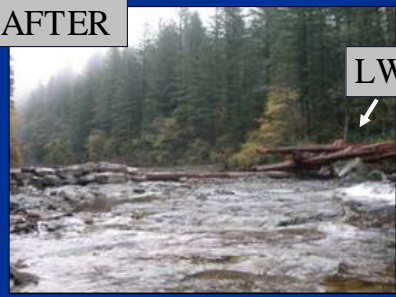
In-stream Habitat - Evaluation



BEFORE



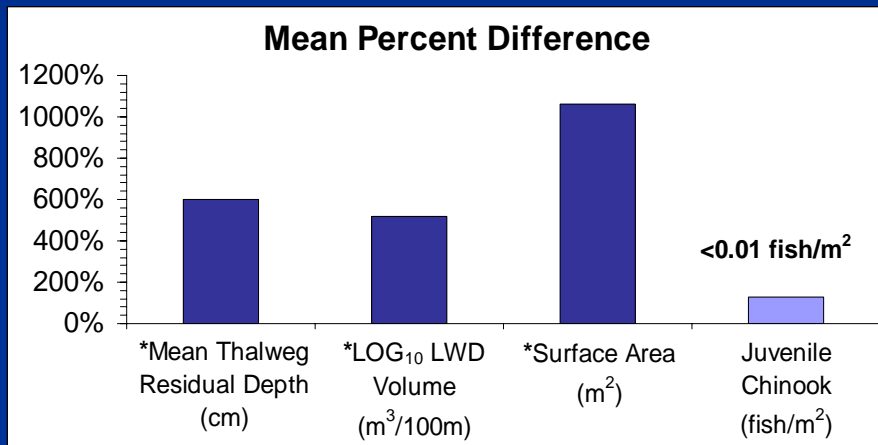
AFTER



LWD

In-stream Habitat Analysis

- Objective - increase in-stream cover, spawning, and resting areas

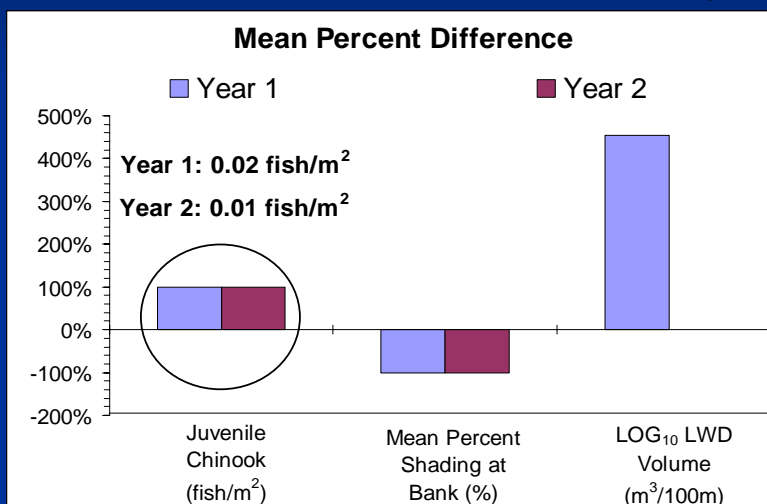


Channel Connectivity - Evaluation



Channel Connectivity Analysis

- Objective - restore side channel rearing areas

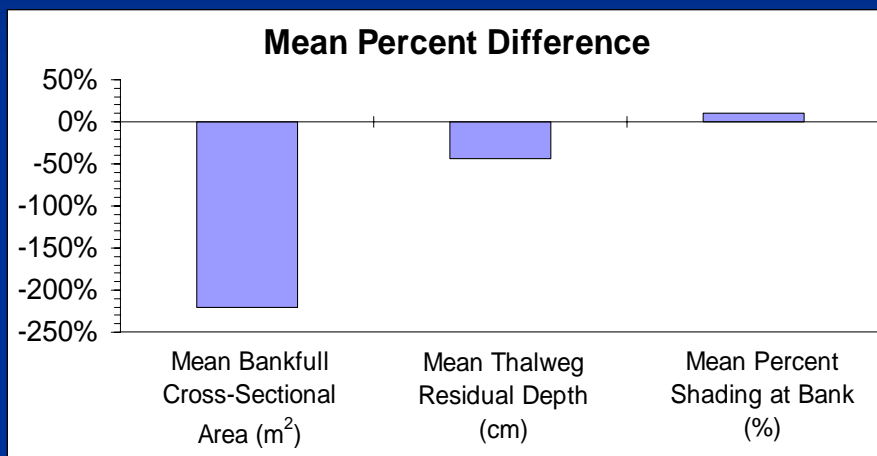


Constrained Channel - Evaluation



Constrained Channel Analysis

- Objective - restore natural flood-flow channel capacity



Conclusions

- Fish Passage Category:
 - Fish abundance increase greater than 20%
- In-stream Habitat Category:
 - Significant at increasing physical habitat, and
 - Fish abundance increase greater than 20%
- Channel Connectivity and Constrained Channel Categories:
 - Only one project in each category, but more to come!

Conclusions

- SRFB – Reach-scale effectiveness monitoring program:
 - Sampling multiple projects, in multiple years
 - One year of before data
 - Difficult to find controls
 - Timing of data collection
 - Projects don't always fit into a single type
 - Summary, more projects and more years are needed.

Find the Fish



Thank You!



- Tetra Tech EC – Jennifer O'Neal
- Salmon Recovery Funding Board
- University of Washington – Dr. Susan Bolton
- National Marine Fisheries Service – Dr. Phil Roni
- River Restoration Northwest

■ FOR SRFB INFORMATION and REPORTS:
<http://www.iac.wa.gov/srfb/default.asp>