

# Identification of Restoration Alternatives in North Fork of Lewis River



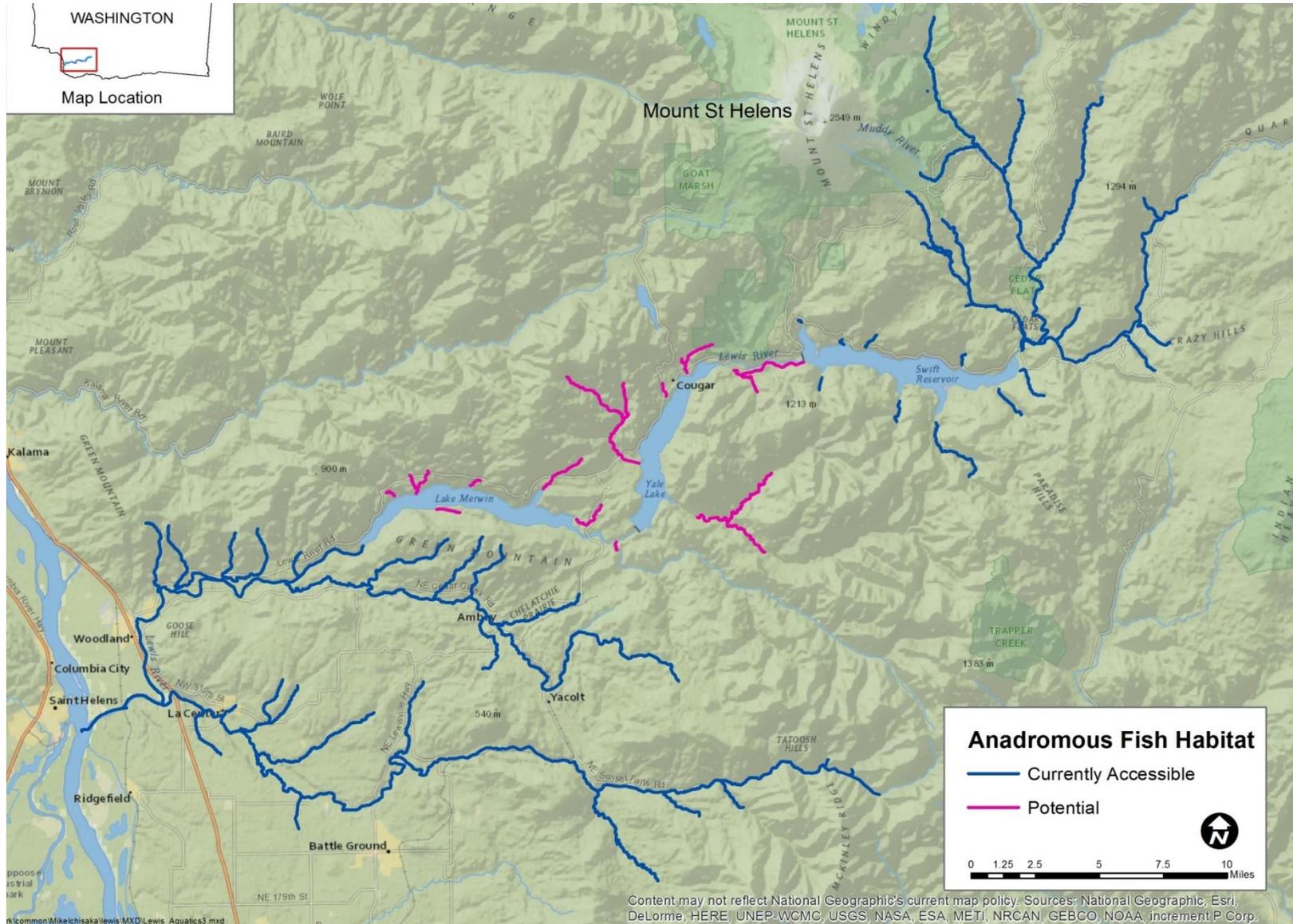
P. Roni and R. Timm



# Objectives and Tasks

- Assimilate and evaluate current data and utility for identifying restoration opportunities in NF and Lower Lewis
- Limiting life-stage and habitat x species
- Identify potential restoration opportunities

# Compliment/Parallel EDT Analysis



# 1. Review and Assess Existing Data and Utility Assessing Restoration Opportunities

## Kalama, Washougal and Lewis River Habitat Assessments

### Chapter 1: Ir

#### How Certain Are Salmon Recovery Forecasts? A Watershed-scale Sensitivity Analysis

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P. McElhany

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Lower

**Abstract** Complex relationships between landscape and aquatic habitat conditions and salmon (*Oncorhynchus* spp.) populations make science-based management decisions both difficult and essential. Due to a paucity of empirical data, models characterizing these relationships are often used to forecast future conditions. We evaluated uncertainties in a suite of models that predict possible future habitat conditions and fish responses in the Lewis River Basin, Washington, USA. We evaluated sensitivities of predictions to uncertainty in model parameters but substantially so (partial regression coefficients) >0.5 to <10%. We also estimated accuracy of several predictions using field surveys. Observations mostly fell within predicted ranges for riparian shade and fine-sediment deposition, but large woody debris estimates matched only half the time. We provide estimates to modelers for improving model accuracy: describe how managers can incorporate predictions into decision-making, thereby improve successful salmon habitat recovery.

**Keywords** Uncertainty · Conservation · Landscape

#### 1 Introduction

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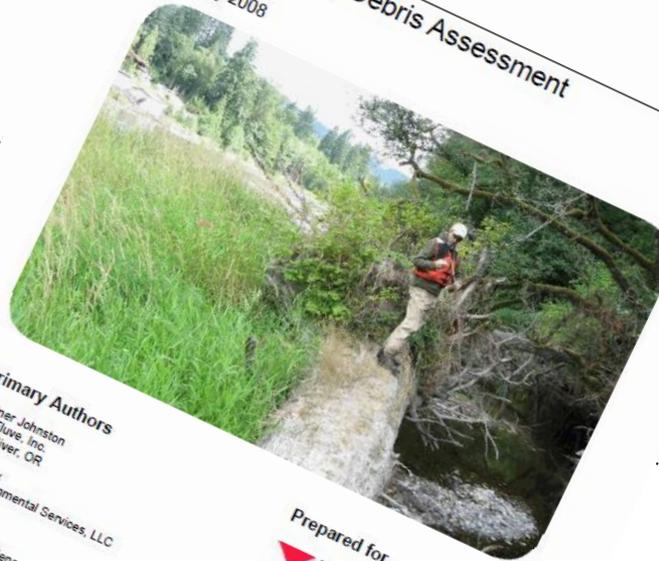
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## Lewis River Large Woody Debris Assessment

January 2008

Development of New Information to Inform Fish Passage Decisions at the  
Yale and Merwin Hydro Projects on the Lewis River

Annual Progress Report  
August 2015

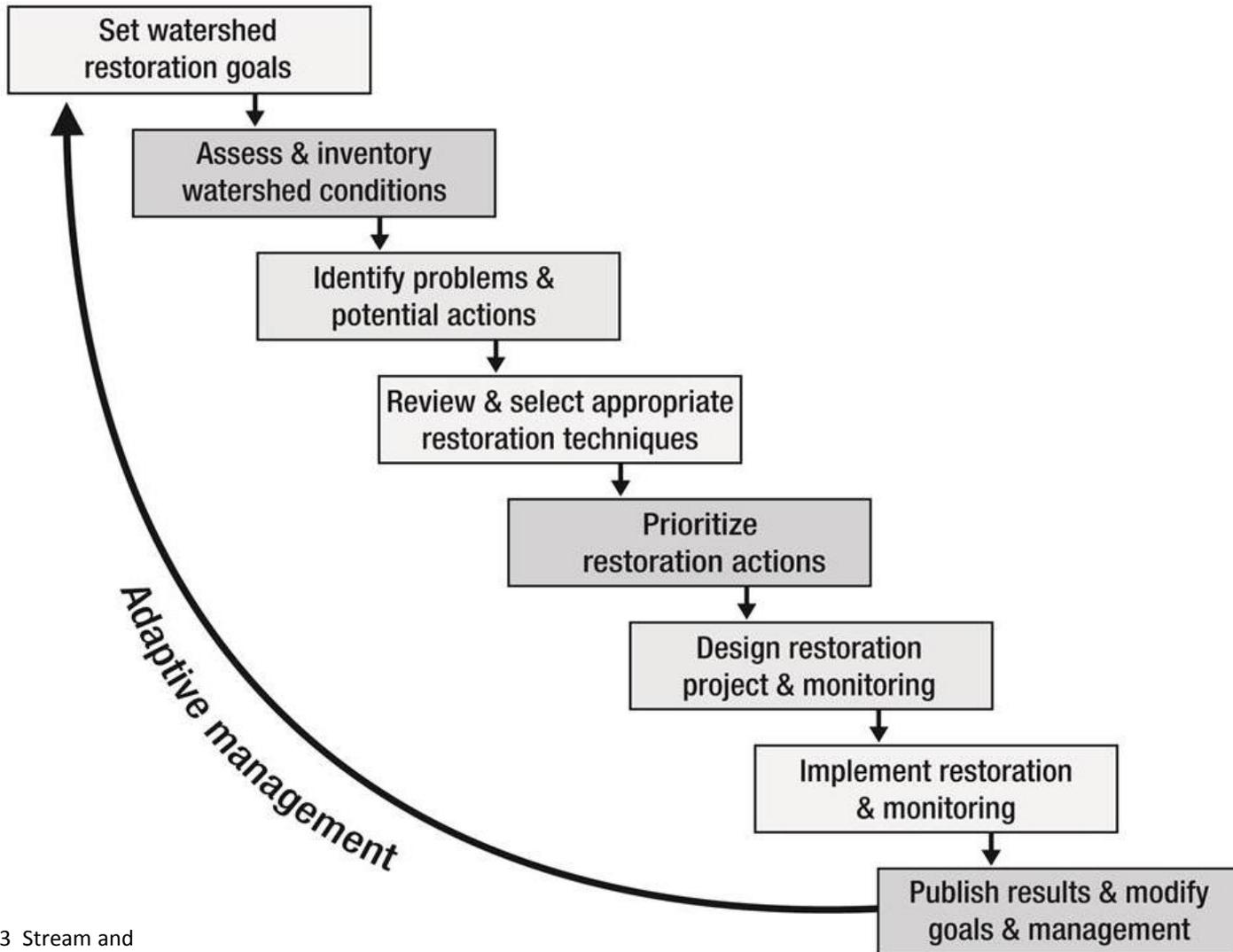
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# Steps in Restoration Process



# Goals of Different Assessments vs Restoration Steps

Methodology	Major Step in Restoration Process						
	Goals	Assess Condition	Limiting life stage	Problem ID	Select Tech.	Priorities	Design
<b>Fish-Habitat Models</b>							
Capacity limiting factor model	X		X				
Life cycle model	X		X				
EDT		X				X	
Food Web Models					X		
Climate change models	X				X	X	
<b>Assessment methods/techniques</b>							
Current historic habitat conditions	X	X		X	X		X
Riparian mapping/assessment	X	X		X	X		
Sediment budget/assessment	X	X		X	X		X
Hydrology	X	X		X	X		X
WQ/Nutrients	X	X		X	X		
Connectivity (e.g. barriers, revetm	X	X		X	X		
Basinwide habitat assessments	X	X		X			
<b>Reach assessments</b>							
BOR		X		X			X
2D							X

# Data Sources vs Restoration Steps

Description of Data/Info	Data type			Provides data to assist with				
	Report	GIS, Excel, etc.	Geographic Coverage	Assess condition	Limiting life-stage or habitat	Rest. I.D.	Prioritization	Background Info
<b>Fish or Habitat Models</b>								
EDT outputs and source data		X	Basin	X	X		X	X
Salmon PopCycle Model	X	X	Basin					X
<b>Assessments</b>								
Integrated Watershed Assessment	X	X	Basin	X				X
Shoreline Master Plan, B.A.s, etc.	X		NF. Lewis					X
Recovery Planning reports/data	X		Lower			X	X	X
Watershed Assessment Models	X	X	Basin	X		X		
LWD assessment	X		Lower					
Channel types		X	Basin					
<b>Monitoring Data</b>								
Habitat and LWD surveys (USGS)		X	Upper Basin	X		X		X
Parr, smolt, spawner etc. surveys	X	X	Various					X
Other habitat survey data	X		Various					X

# Data Gaps (?)

- Historical habitat/channel/floodplain
- Consistent/detailed habitat data for Lower NF and Mainstem Lewis
- Summer and winter fish use data
- Other sediment/riparian data sources
  - Other than NOAA data

# 2. Limiting Life Stage and Habitat

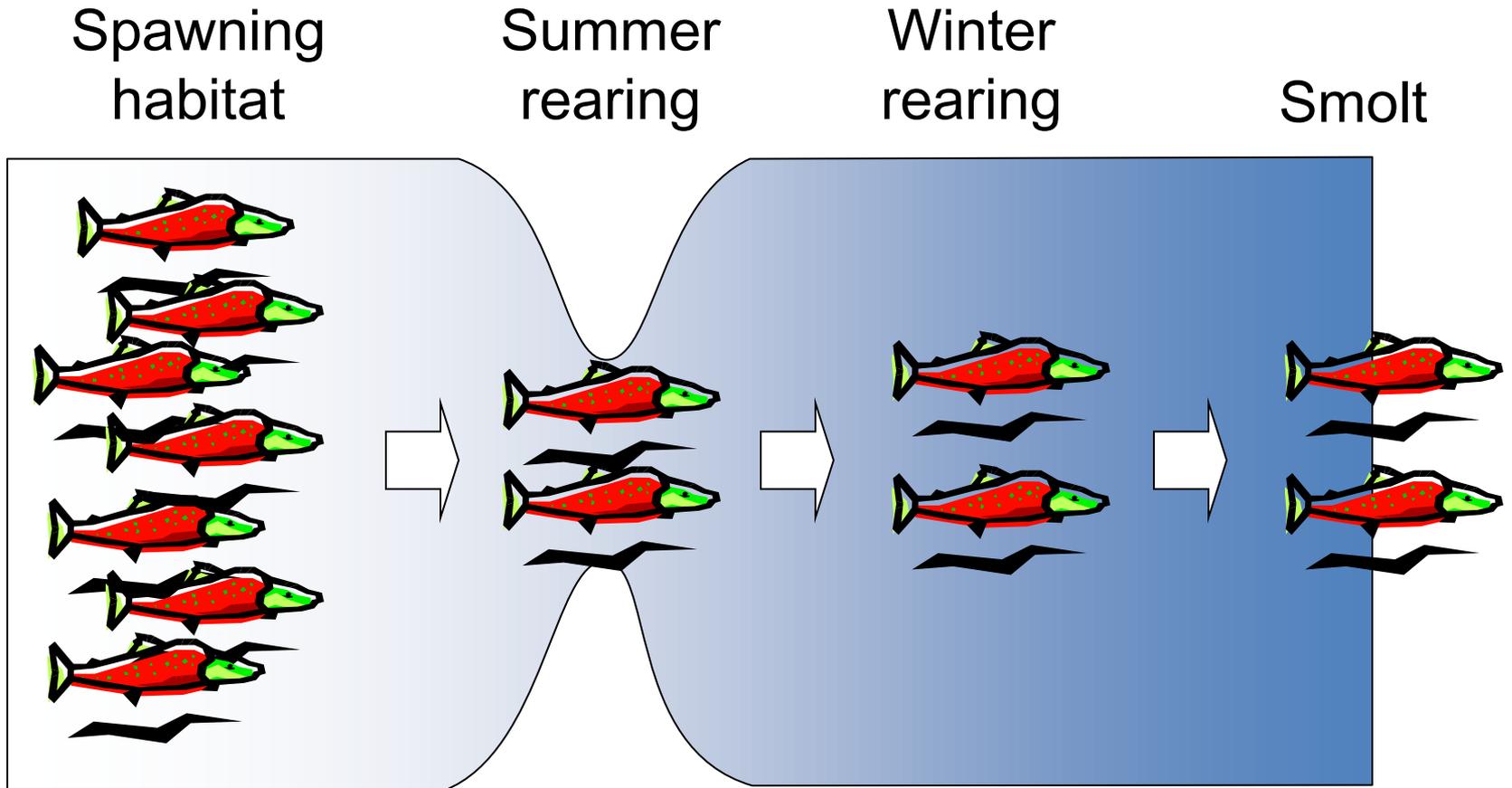
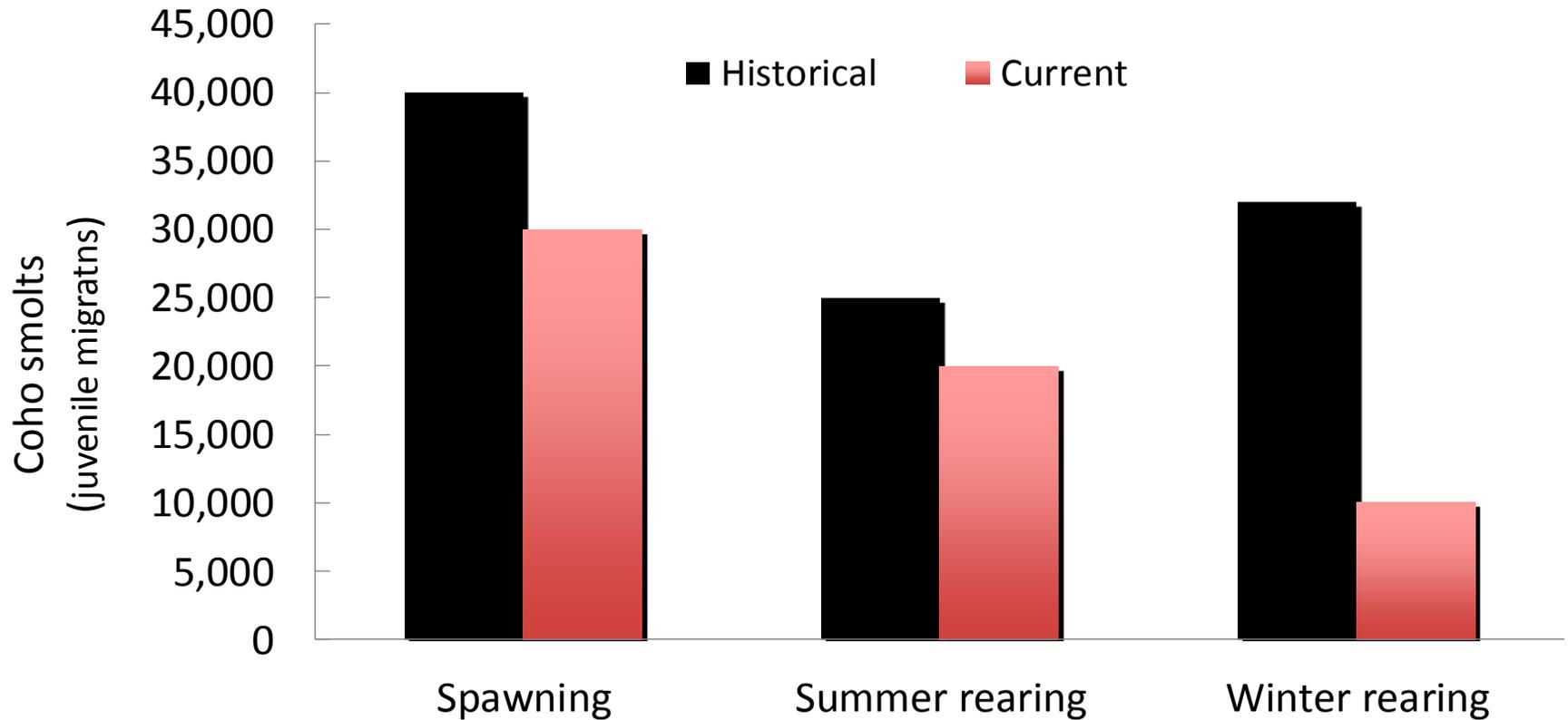


Image Courtesy of G. Pess

# What Habitat and Life Stage is Limiting?



# Limiting Factors Analysis

Based on Reeves et al. 1989, Beechie et al. 1994, and others

**Habitat Data by  
Season & Life Stage**

**X**

**Seasonal Fish Density**

**X**

**Smolt Factor**

**=**

**Smolt Production Potential**



# Feasibility for Different Species

- **Coho**
  - Habitat data – yes, USGS and EDT outputs
  - Fish data – published values
- **Spring Chinook and Steelhead**
  - Habitat – yes
  - Fish density data
    - Need to assimilate

# 3. Identify potential restoration opportunities

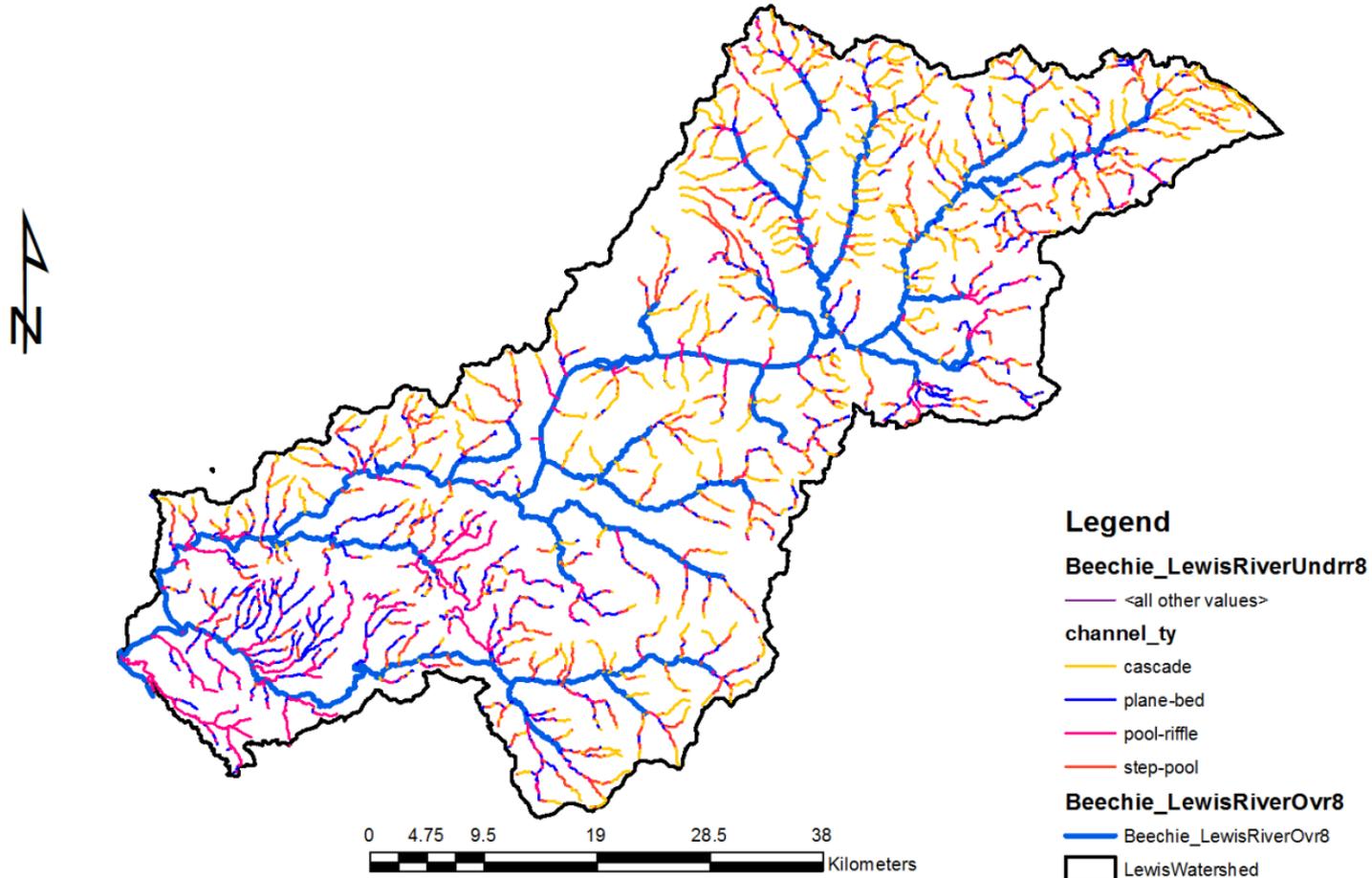


# 3. Identify potential restoration opportunities

- NOAA data
  - Channel types
  - Fullerton/Steel assessment and model outputs
- EDT reaches and priorities
- USGS data for EDT inputs

# Channel Types for Lewis River Basin

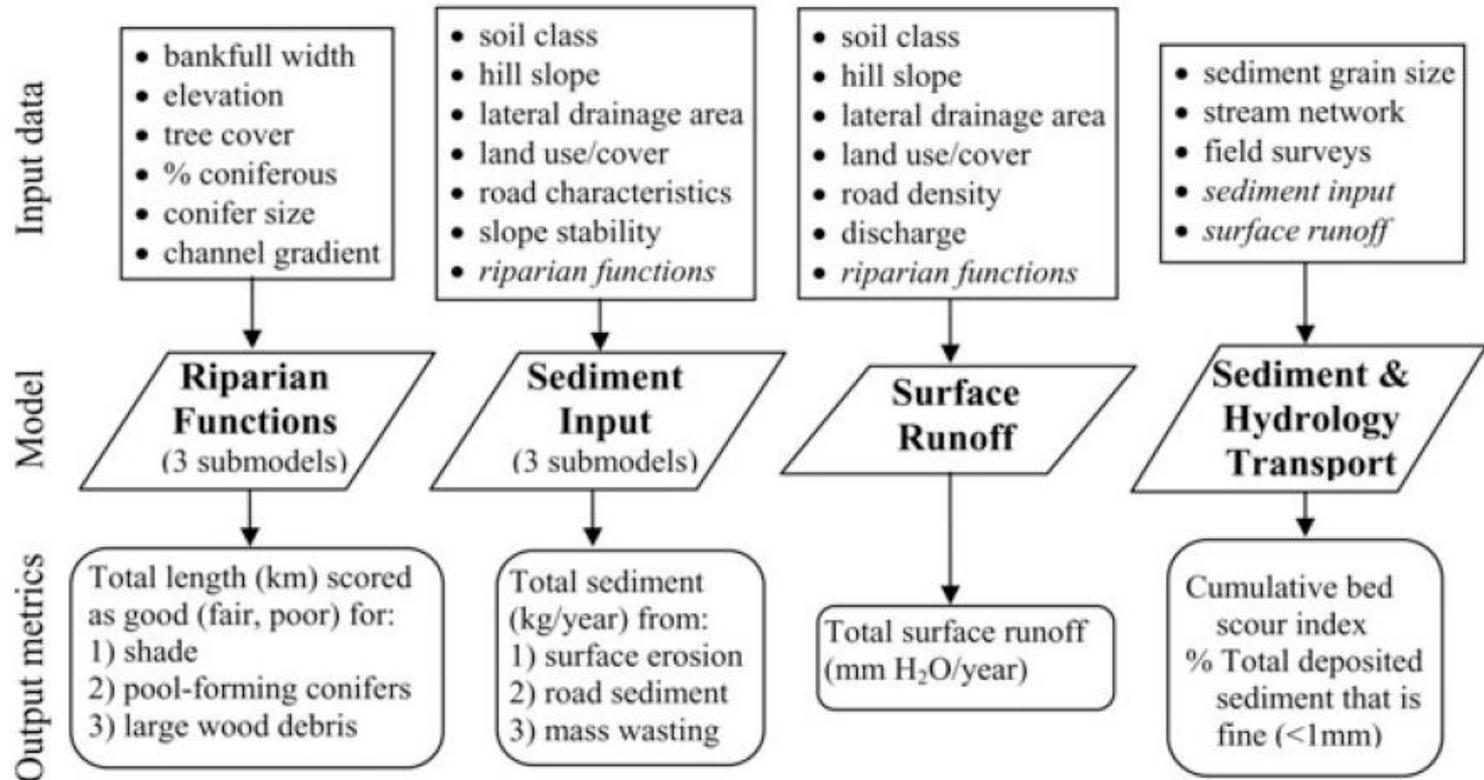
Lewis River Tributary Channel Types



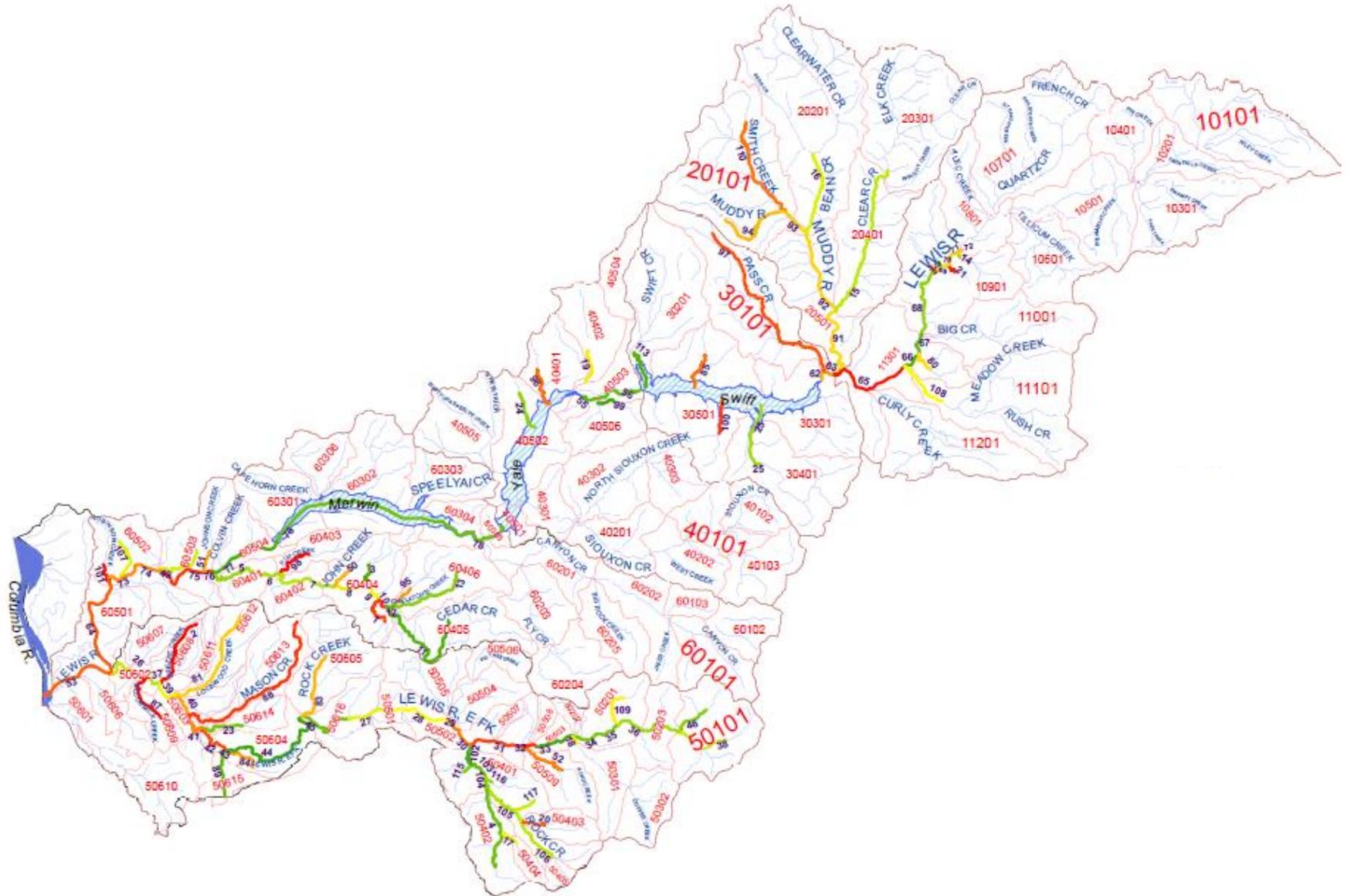
Data from Beechie and Imaki 2014

# NOAA Assessment

Fullerton et al. 2010

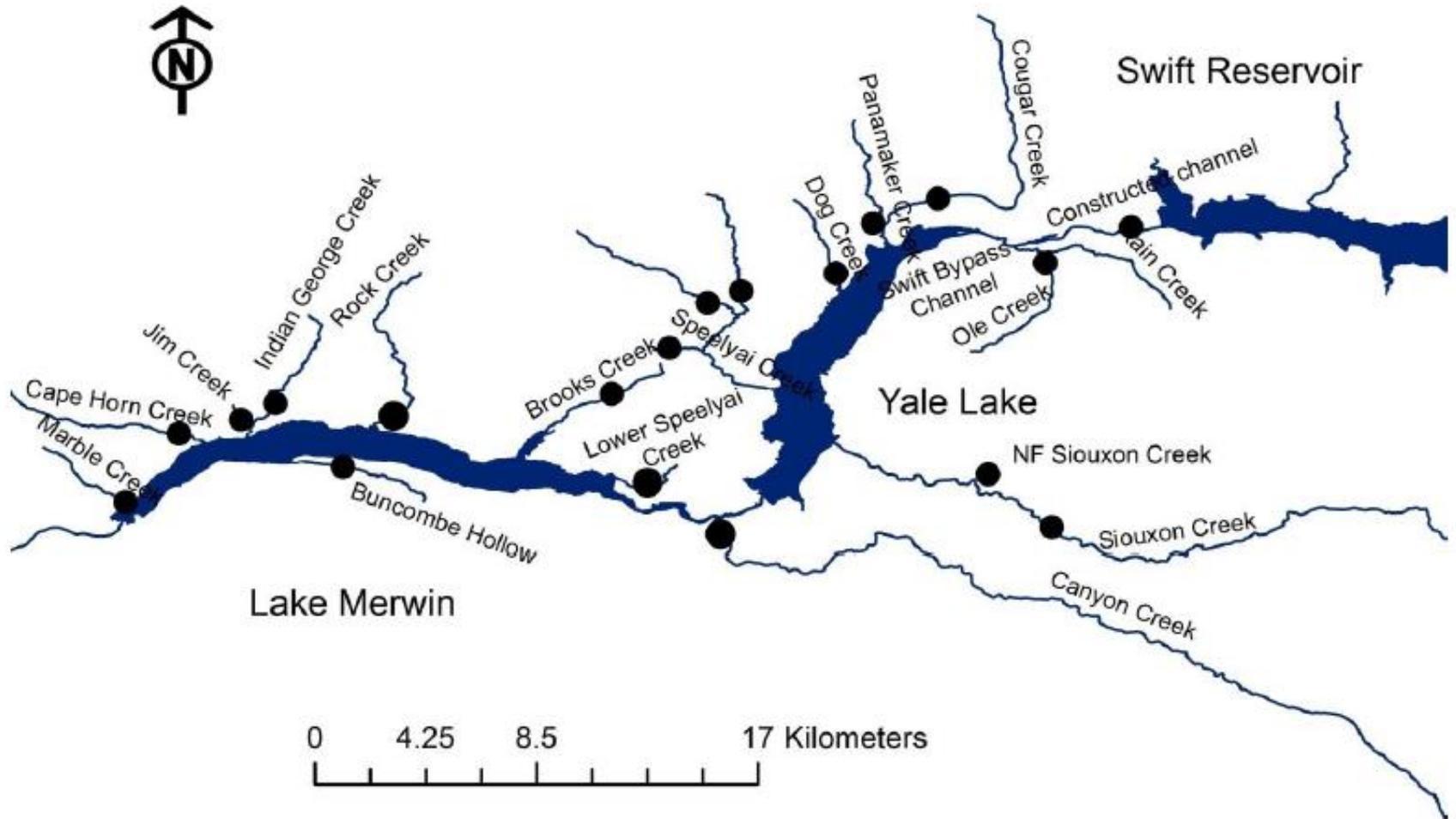


# EDT Reach Outputs



# Other Habitat Data – USGS

Potential Anadromous Habitat Available/Surveyed (36 kms)



# Outputs/Expected Results

- Initial priority reaches
- Underlying causes of degradation
- Potential restoration/habitat improvement actions by reach

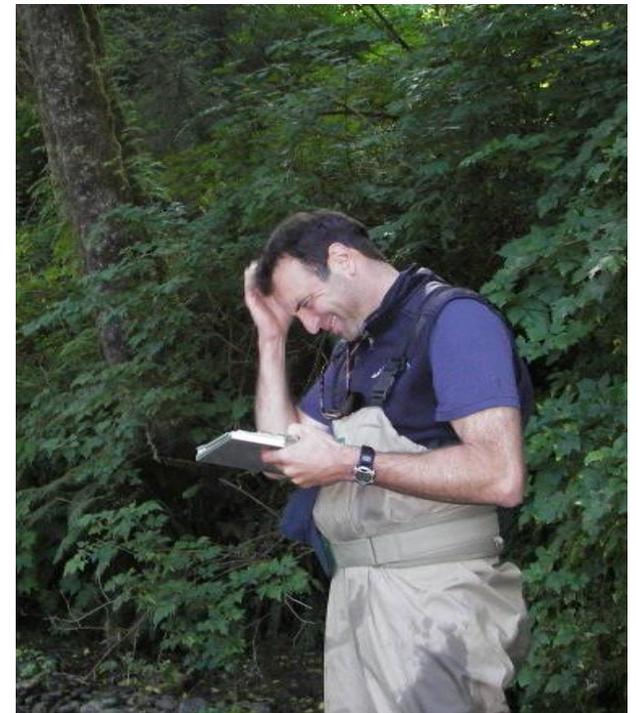
# But, site visits required to..

- Confirm
- Feasibility
- Design



# Summary

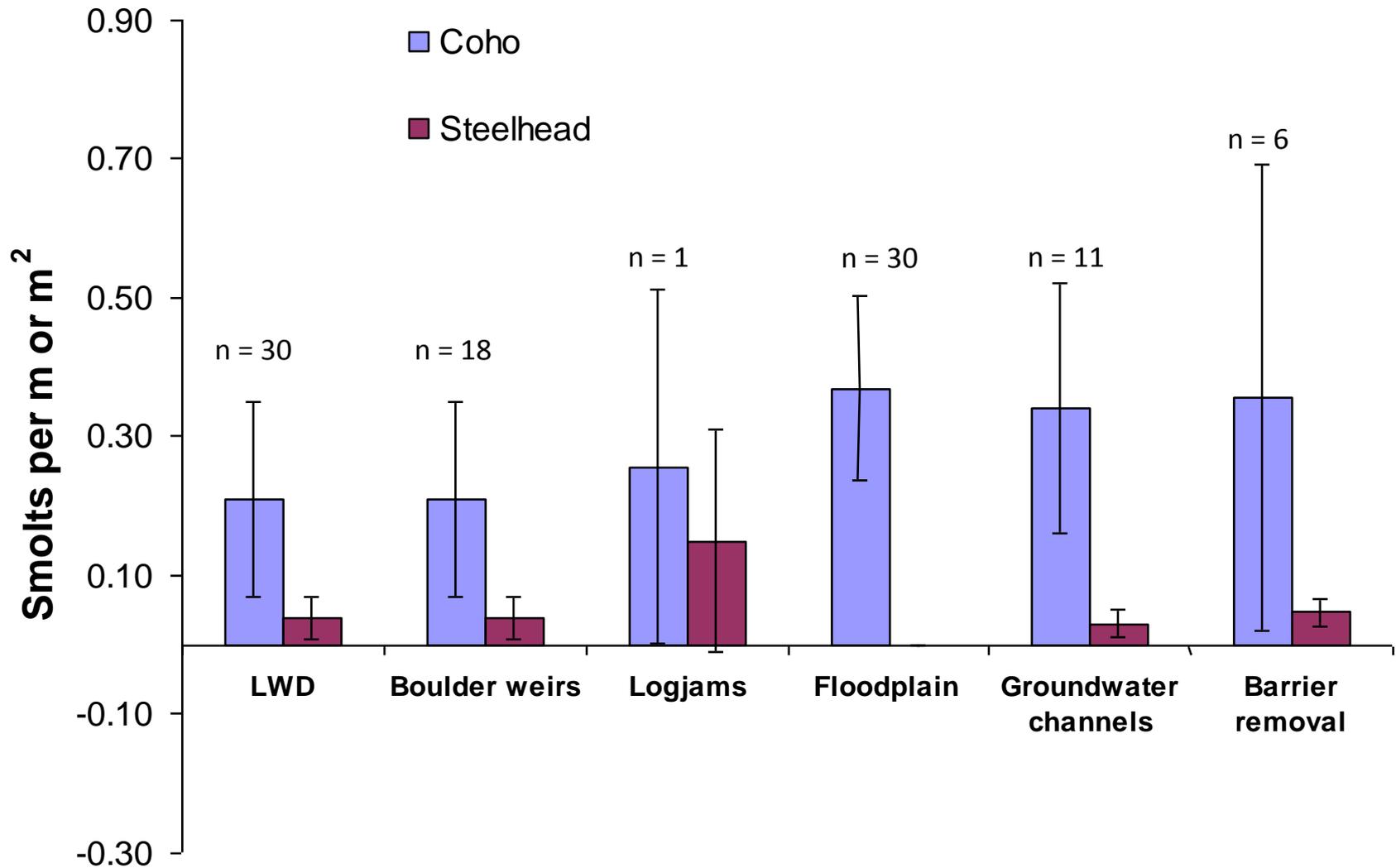
- Overview of three tasks
  - Existing info and data gaps
  - Limiting habitat and life stage
  - Restoration opportunities
- Other data sources?
- Questions?



# Additional Analysis



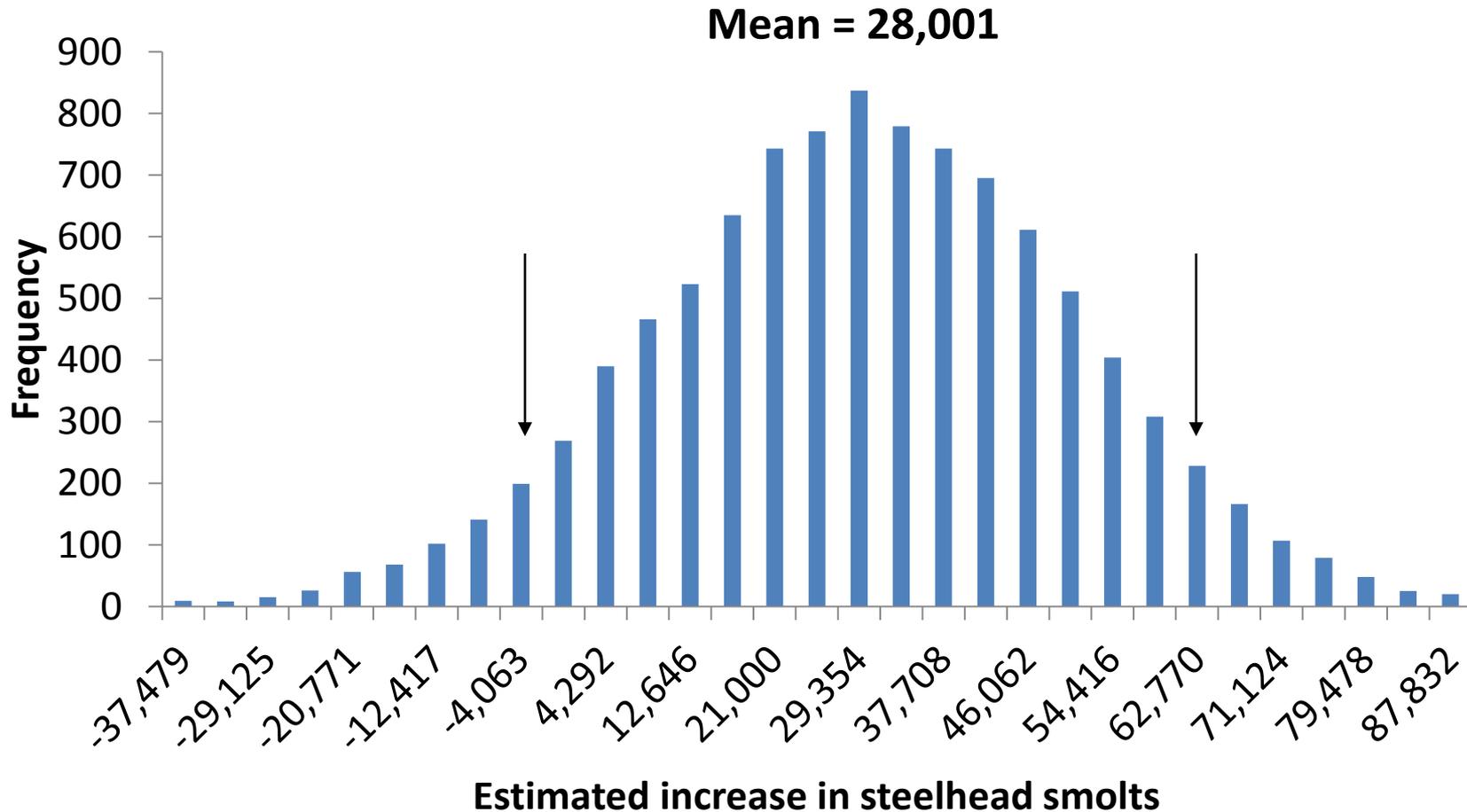
# Estimating Response to Restoration



# Increase in Steelhead Smolts

## Scenario 1 – Restore All Habitat

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# Contribution by restoration action

