Yakima River
Wapato Reach Assessment

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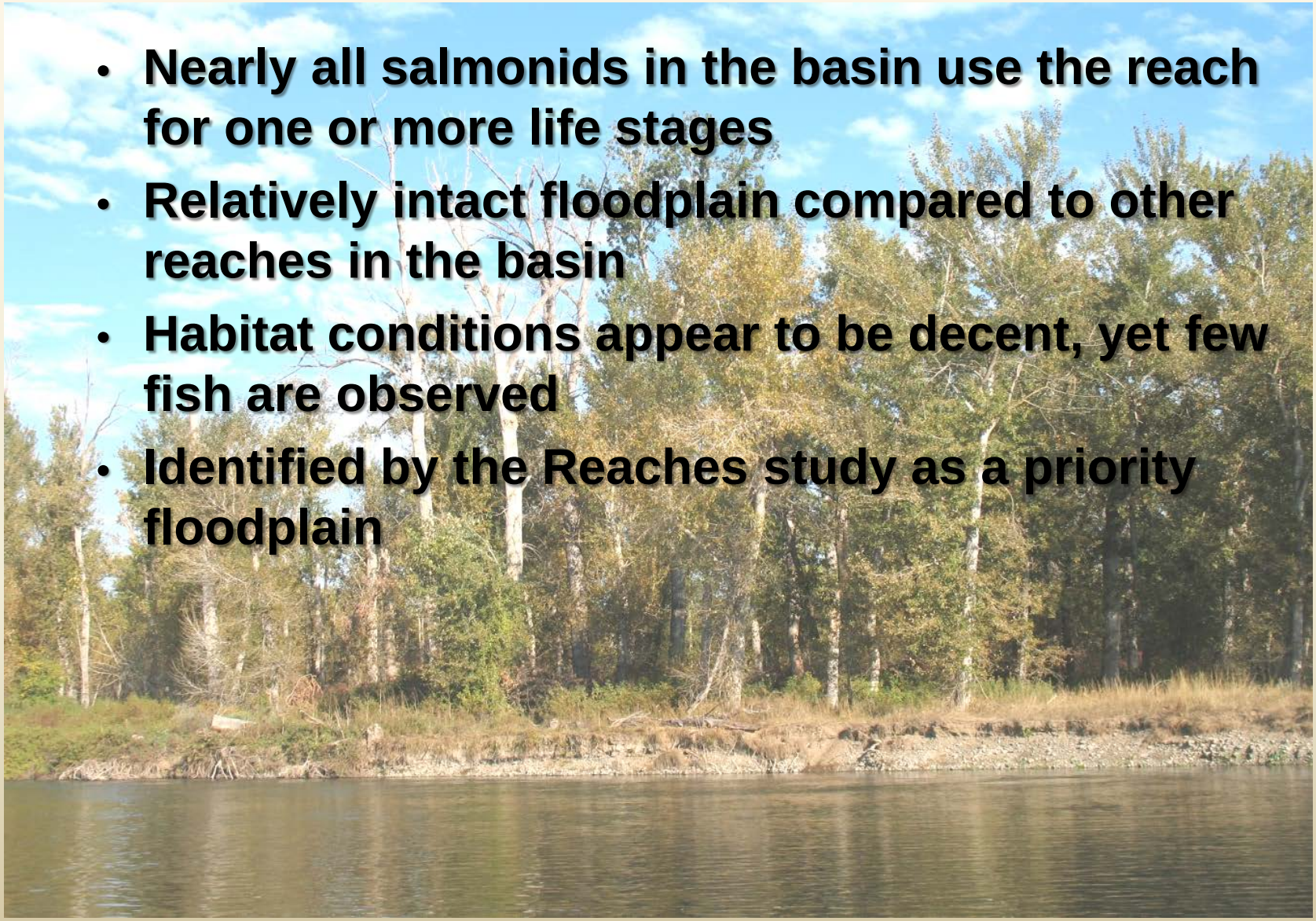
Presentation Outline

- Wapato Reach context and background
- Opportunities and Constraints
- Reach Assessment Goals and Scope
- Approach
- Results
- Future Work

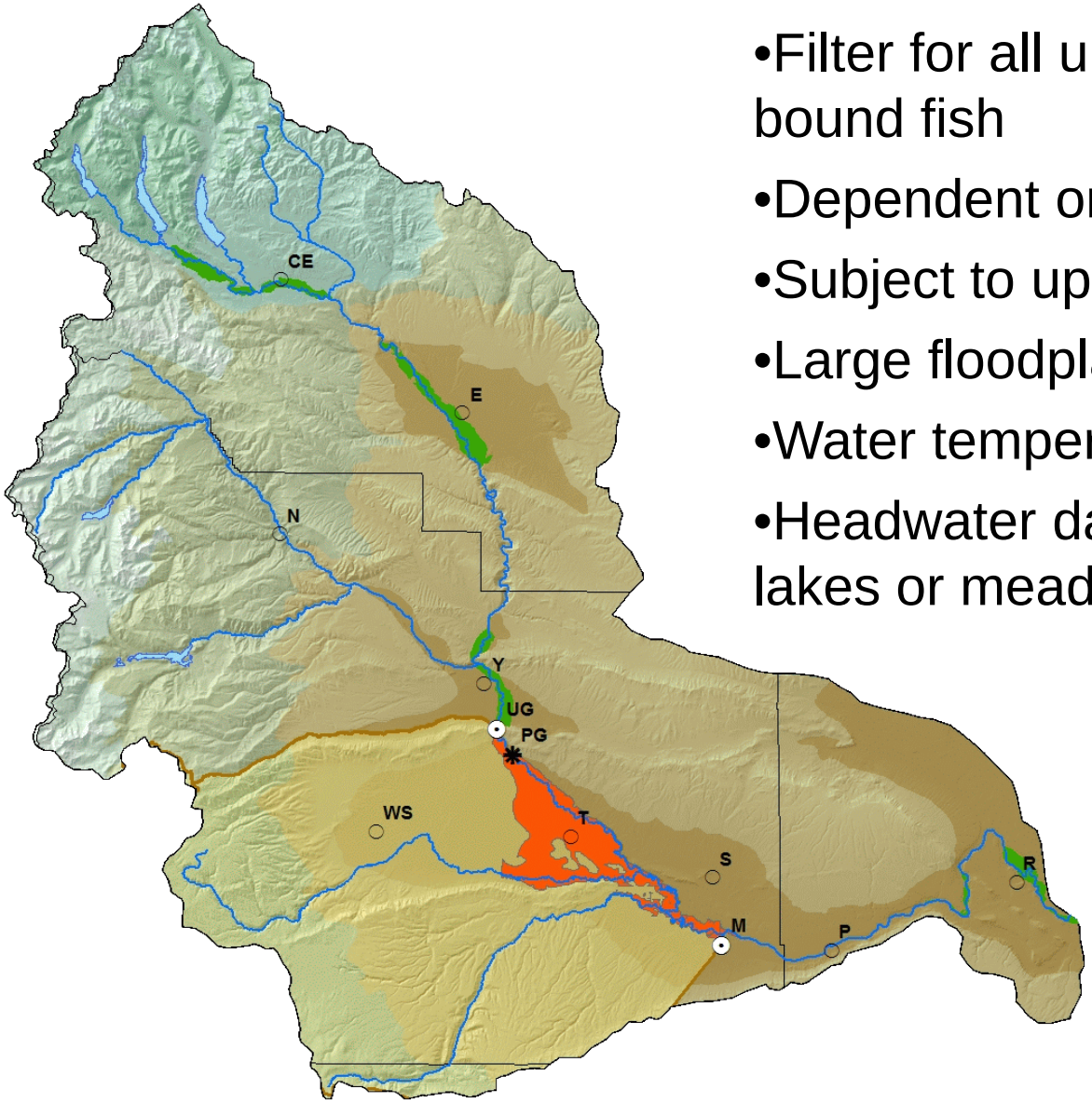
Why the Wapato Reach?



- **Nearly all salmonids in the basin use the reach for one or more life stages**
- **Relatively intact floodplain compared to other reaches in the basin**
- **Habitat conditions appear to be decent, yet few fish are observed**
- **Identified by the Reaches study as a priority floodplain**

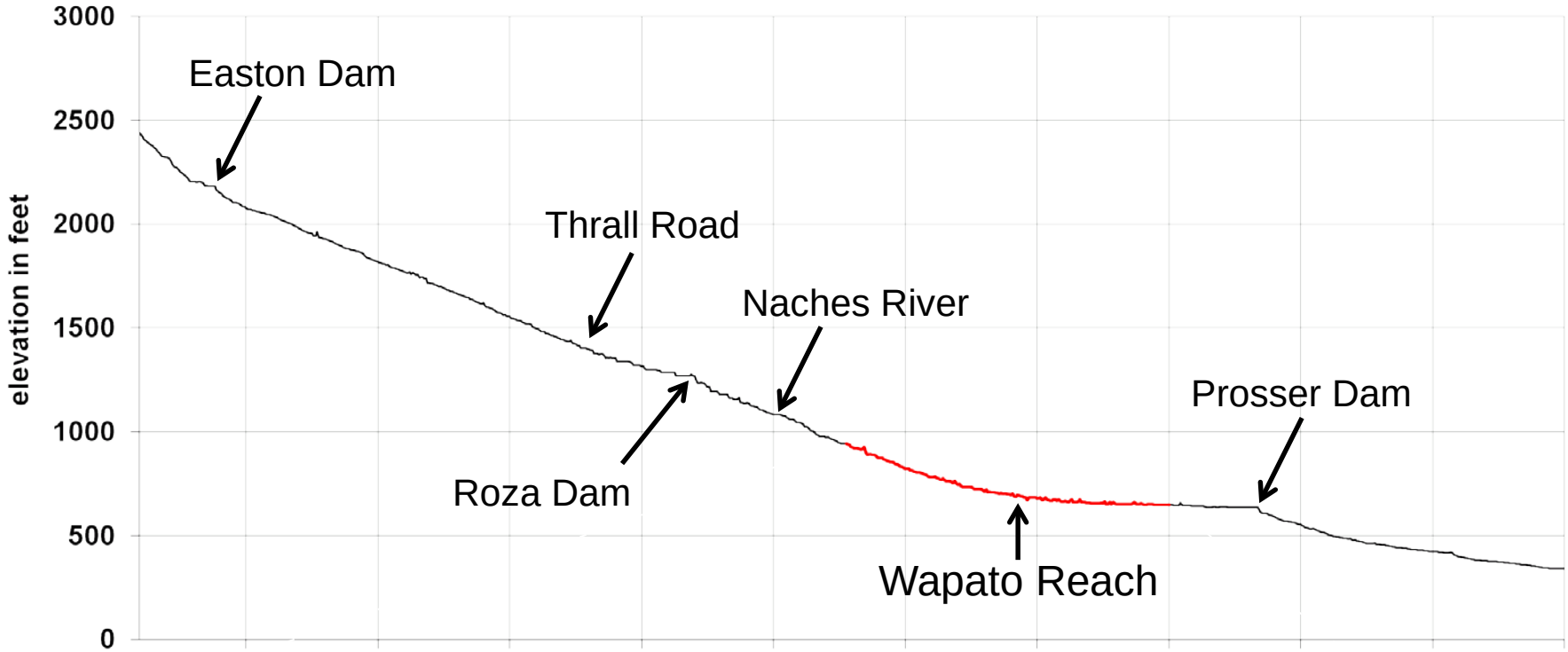
Background

Mid-Lower Basin Landscape Context



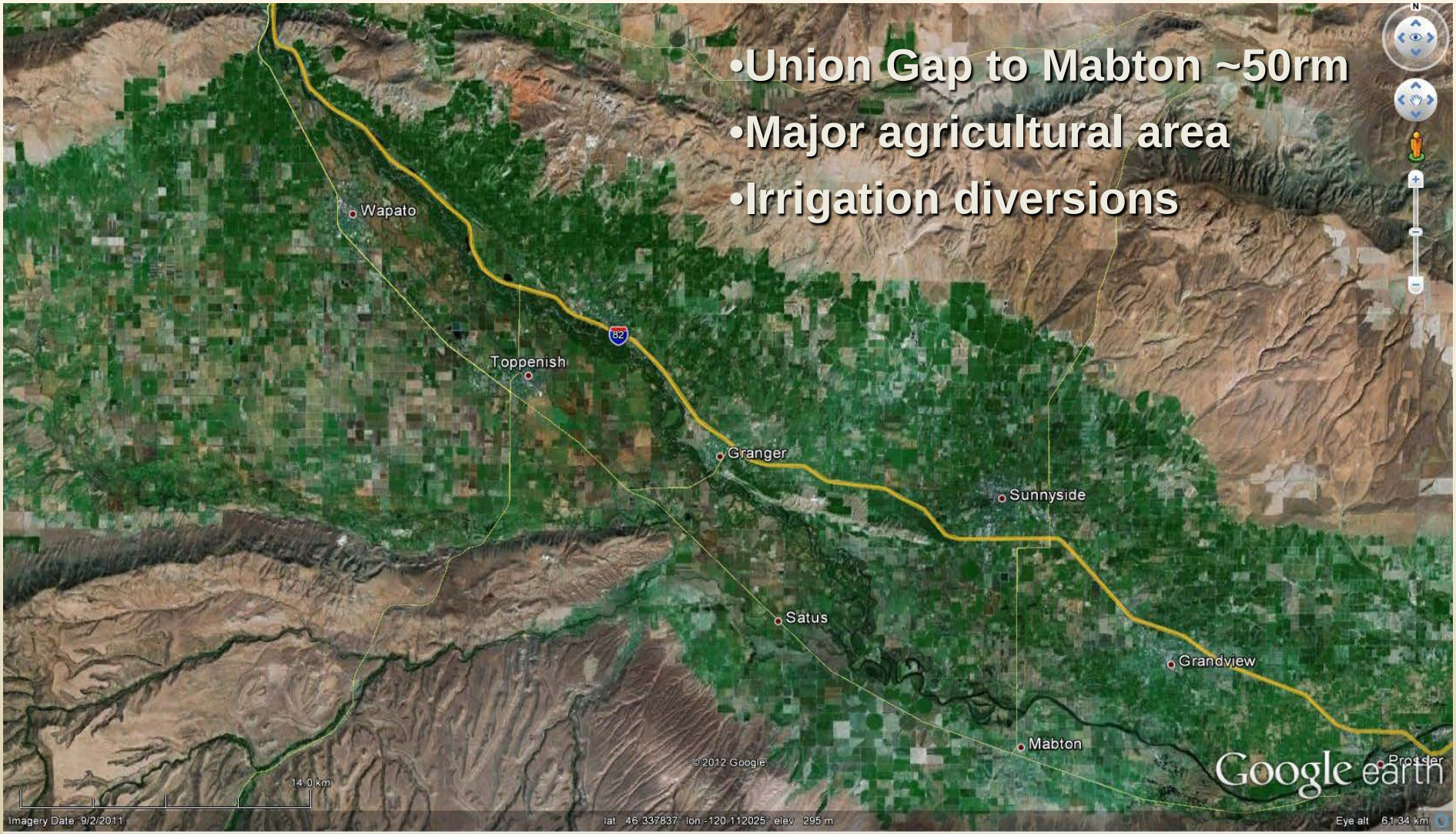
- Filter for all up and down-stream bound fish
- Dependent on downstream passage
- Subject to upstream flow regulation
- Large floodplain
- Water temperature driven by air temp
- Headwater dams on former glacial lakes or meadows

Yakima River Long Profile

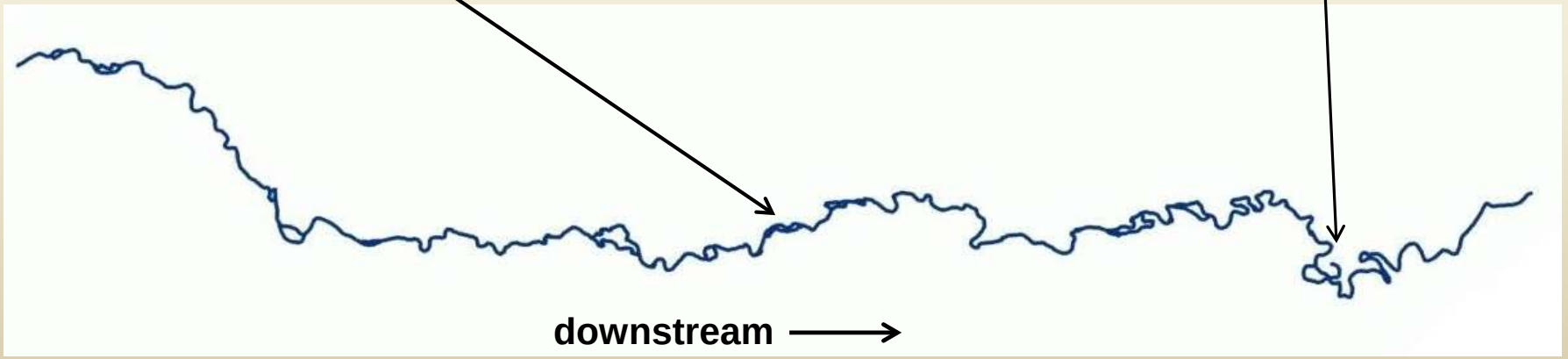


- Base level controlled by Prosser Dam (previous falls)
- Major channel and habitat type transition
- No large sources of sediment input within reach

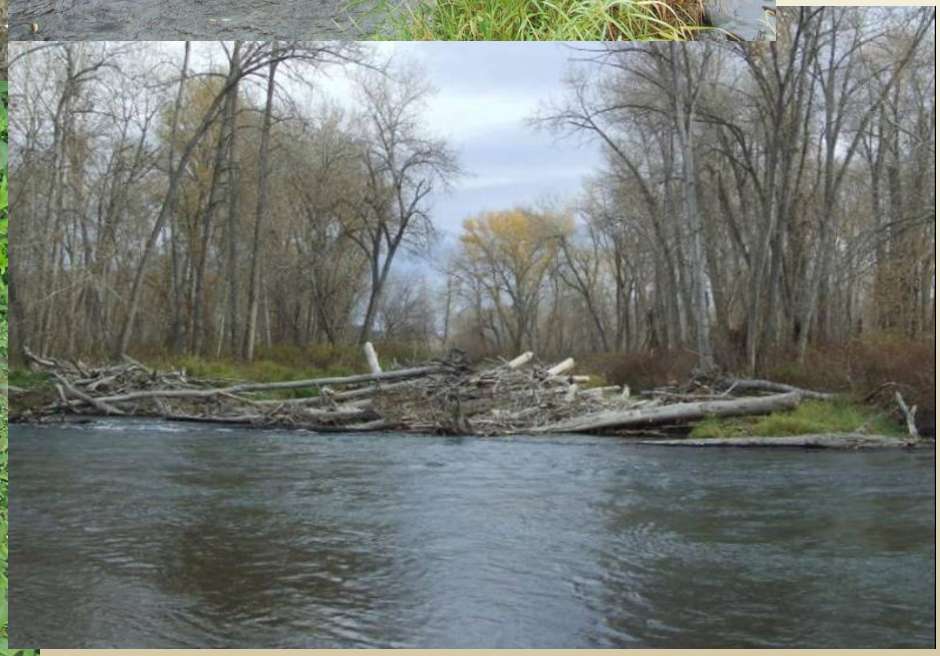
Wapato Reach



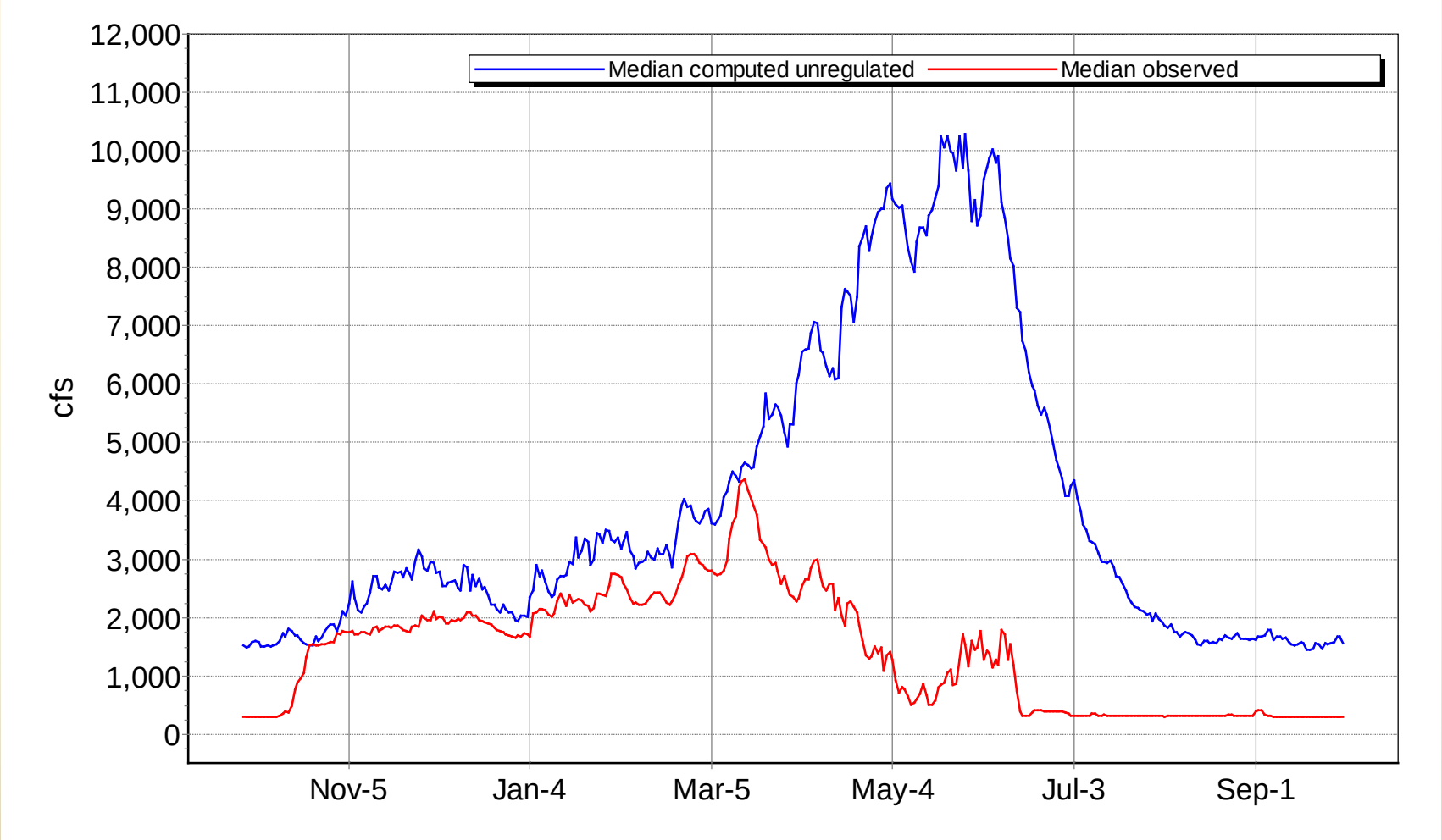
Downstream channel change



Riparian-intact remnant

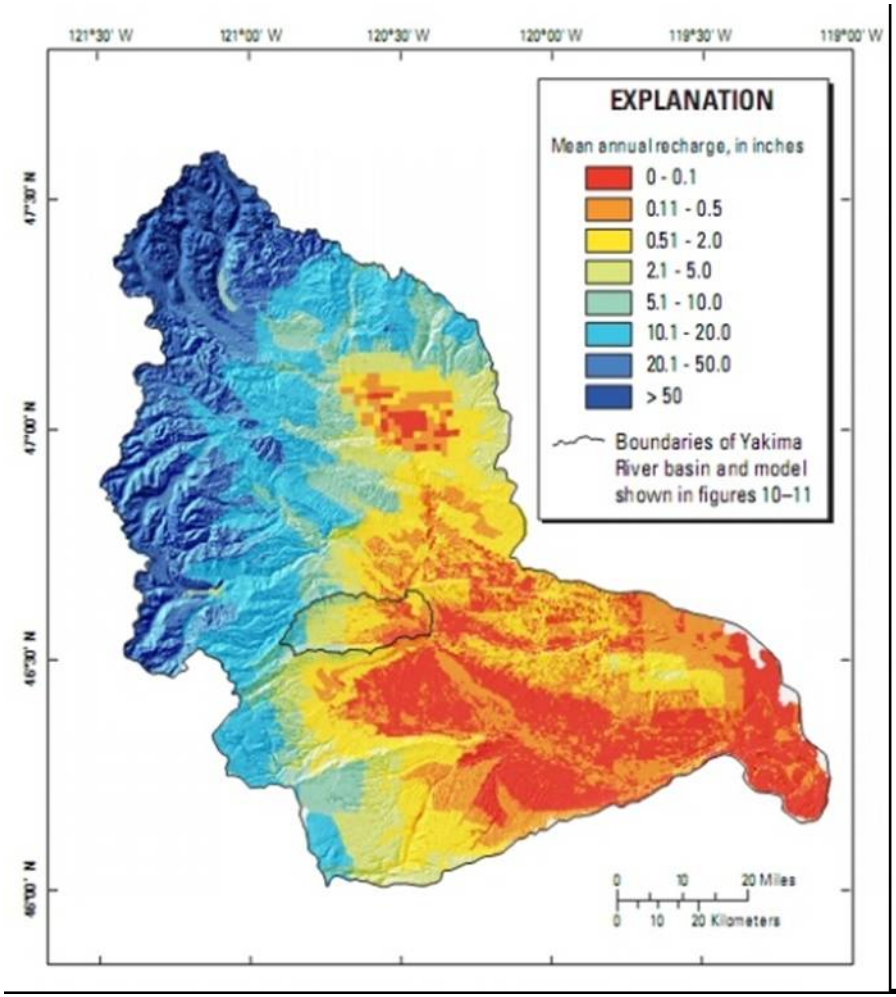


Flow Regime Highly Impaired

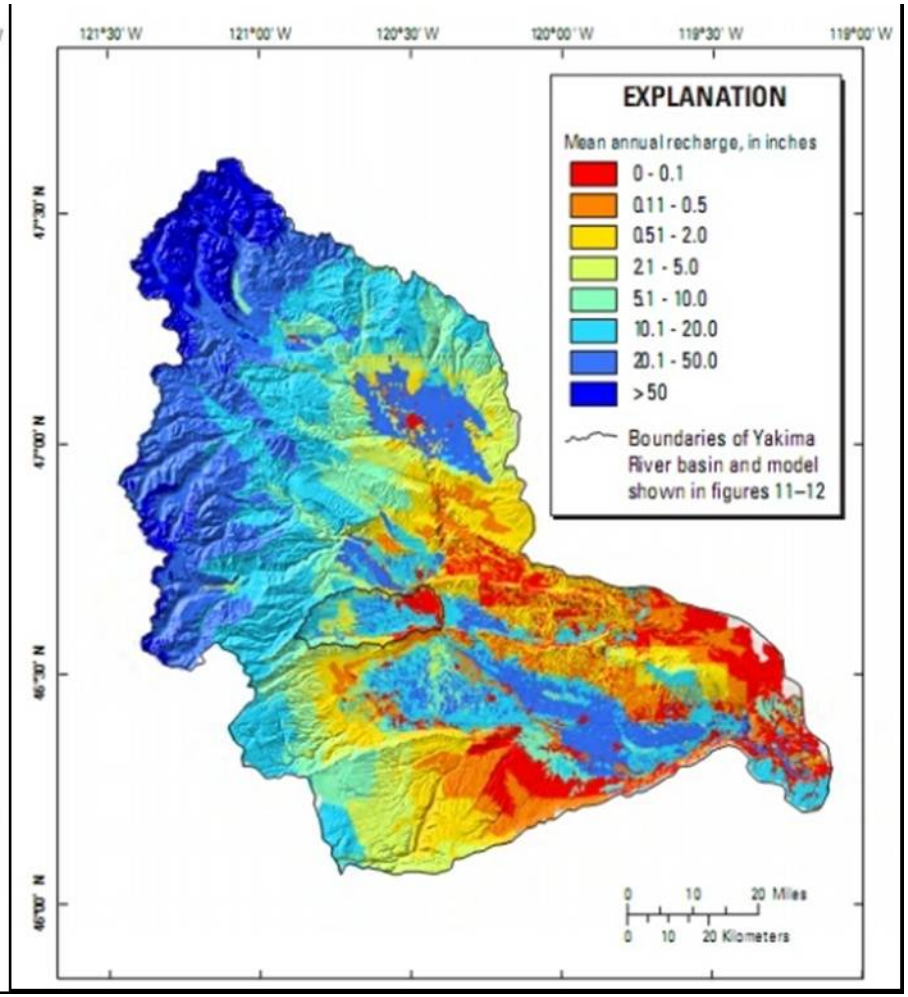


- Spring freshet drives ecology and physical processes
- Fish movement, sediment transport, riparian recruitment

Groundwater regime highly modified

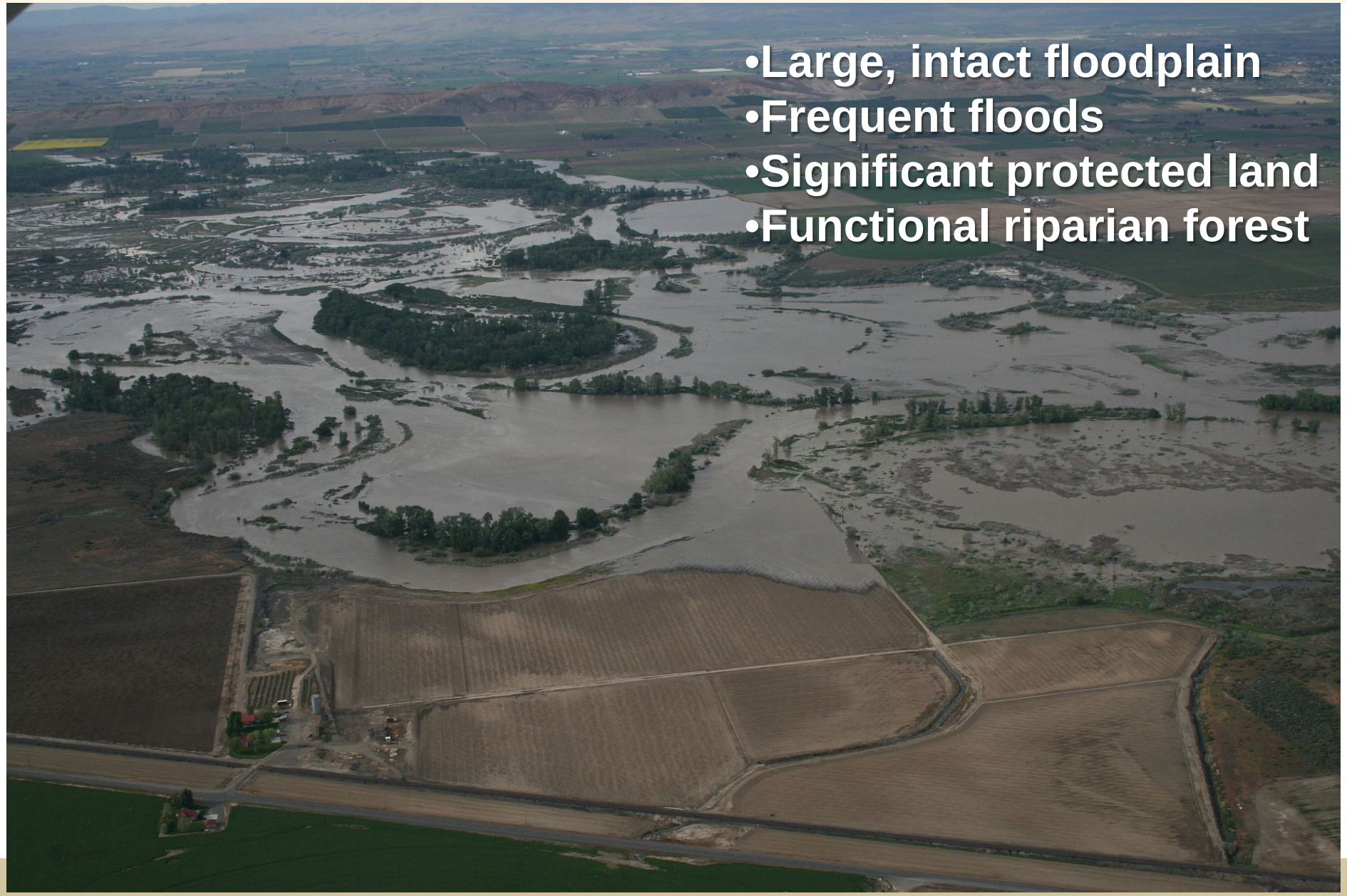


Historical



Current

Opportunities



Constraints

Assessment Goals

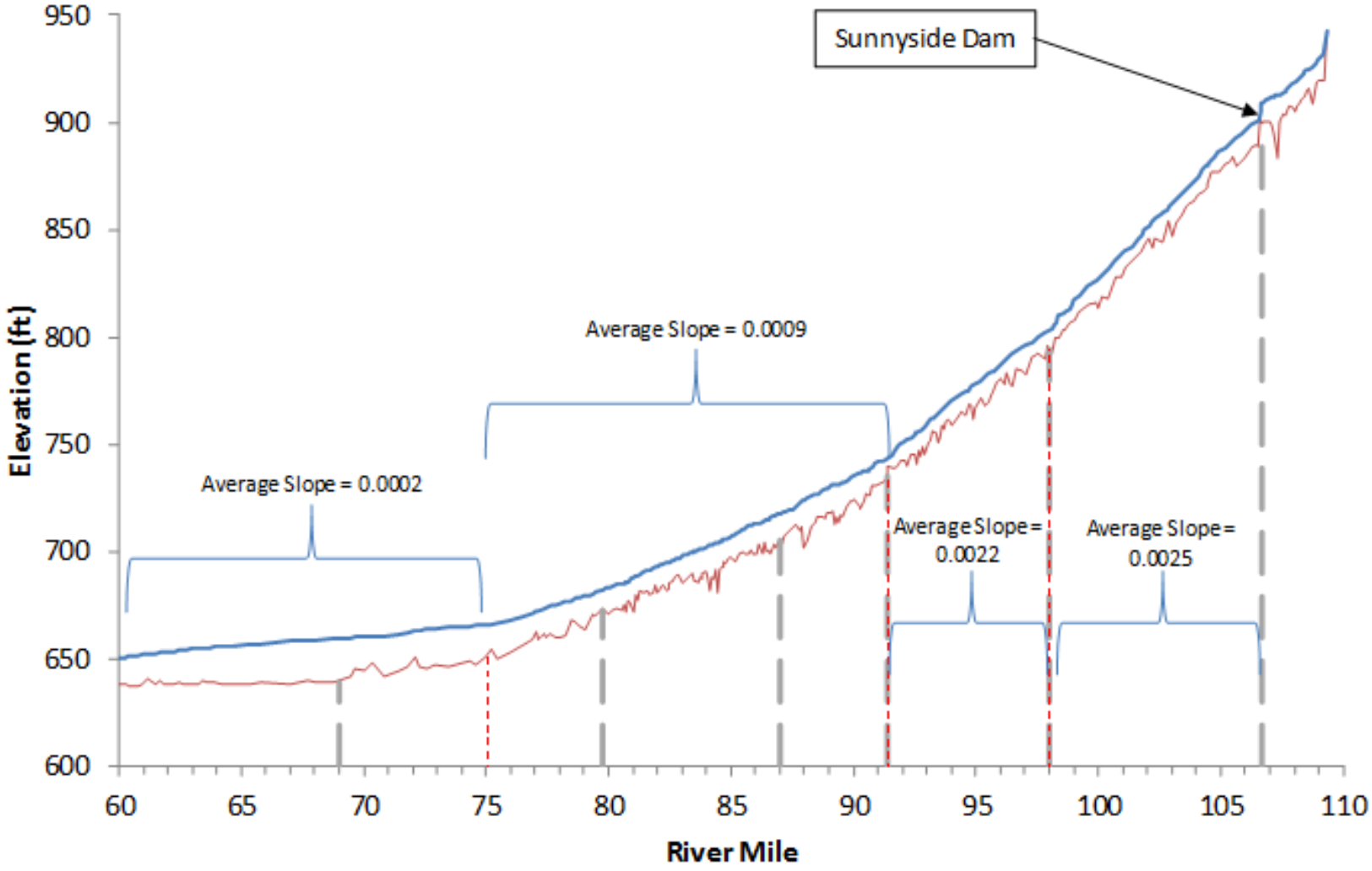
Approach

Assessment Approach

1. Develop conceptual framework
   - identify dominant physical processes relevant to restoration goals (geomorphic analysis)
   - define salmon/steelhead use of reach by season, life stage, and life history
2. EDT analysis
   - using targeted life stages and life histories, identify critical limiting factors
3. Synthesis and project development
   - develop restoration projects to address limiting factors; geomorphic analysis guides appropriate locations
4. Prioritize projects using multi-criteria scoring matrix

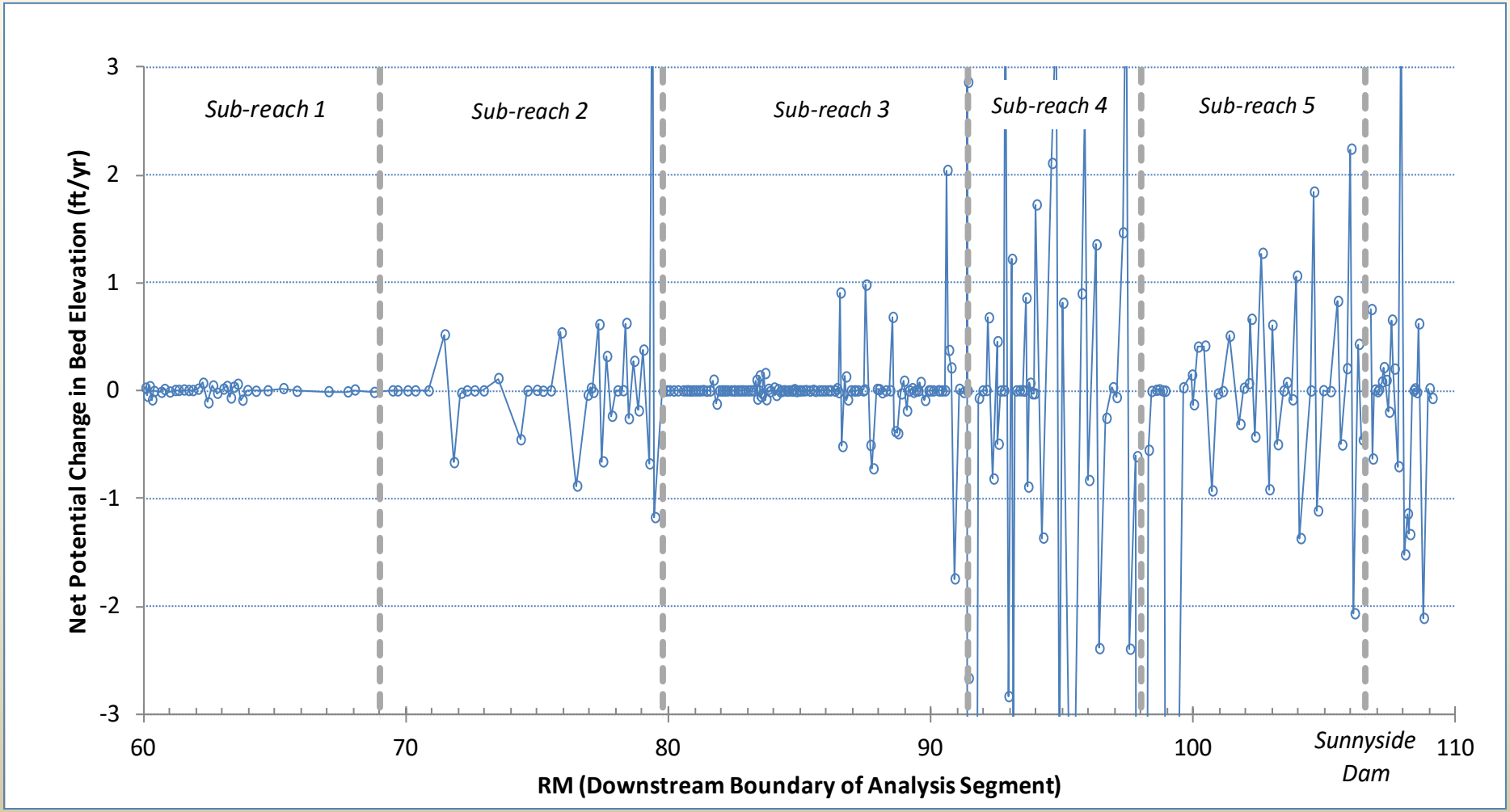
Geomorphic Assessment

Analysis of Longitudinal Thalweg and Water Surface Elevation



Geomorphic Assessment

Variation in Predicted Potential Bed Elevation Change over 50 yr period



Approach: Biological

- Conceptual models of patterns of species/life stage use in the Yakima Basin with a specific emphasis on the Wapato Reach
- Habitat potential and factors affecting species/life stage survival based on updated Ecosystem Diagnosis and Treatment (EDT) analysis
- Identification of reach scale environmental conditions to prioritize for restoration
- Analysis of species response to individual recommended restoration projects
- Analysis of cumulative benefits of multiple recommended projects

Fish stock condition and use of reach

Figure D-2. Summer Chinook Life History

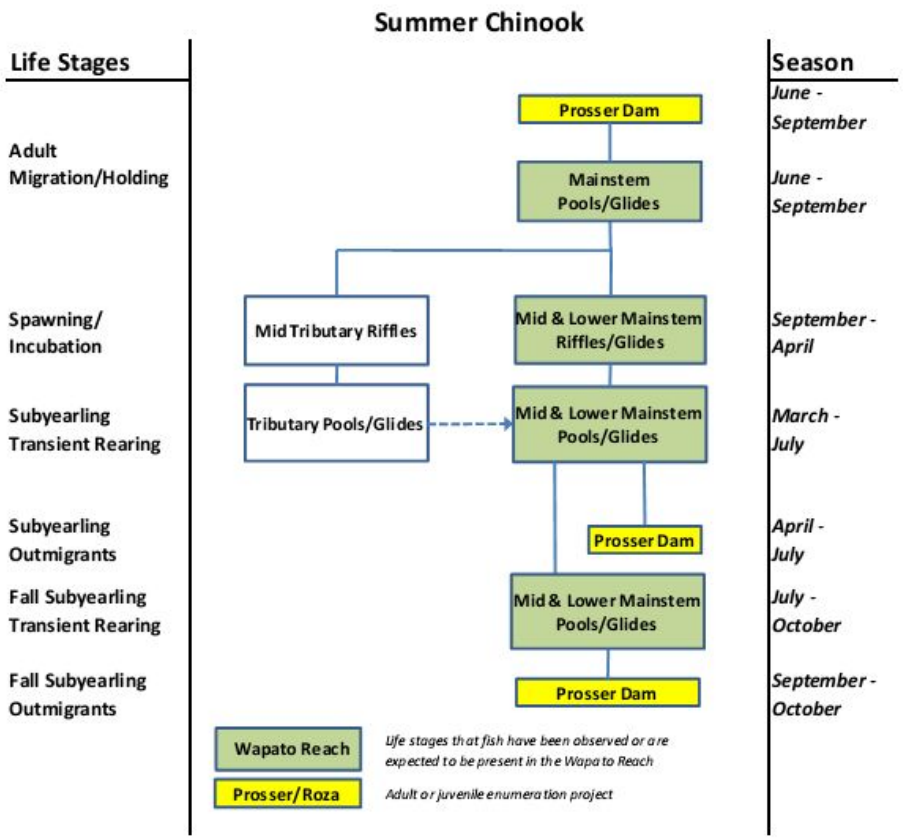


Figure 4-7. Summer Chinook Survival Factors

Summer Chinook - Current Condition			
Life Stage	Adult migrant/ prespwn	Egg incubation	Subyearling juvenile migrants
Overall Survival Loss	●	●	●
Factors Effect on Life Stage Survival			
Channel stability		●	●
Chemicals	●	●	●
Competition (w/ hatchery)			●
Flow	●	●	●
Food			●
Habitat diversity			●
Harassment/poaching	●		
Predation			●
Fine Sediment & Turbidity		●	●
Temperature	●	●	●
Key habitat quantity	●	●	●

Approach: Mechanisms of Benefit

Species	Life History Stage	Restoration Objective				
		Process-Based Restoration				Habitat Enhancement
		Encourage Meandering Planform, Establish Vegetated Islands	Establish or Promote Engage Side Channels across Range of Flows	Establish or Promote Engage Floodplain Channels across Range of Flows	Remove Rip Rap or Bank Hardening	Riparian Revegetation
Summer Chinook	Adult migration and holding	Provide temperature heterogeneity and thermal refuge				
	Egg incubation	Reduce bedload fine sediment				Reduce bedload fine sediment
	Subyearling juvenile migrants	Increase instream channel complexity, reduce vulnerability predators, and provide food chain support			Increase instream complexity; reduce vulnerability predators	Improve riparian condition and provide food chain support

Conclusions

Geomorphic Conclusions

Floodplain Channels for Potential Restoration

- Prioritize 2- year flood level channels and channels disconnected by levees
  - 2– year channels were considered to have a higher likelihood to provide higher quality off-channel habitat than 10-year flood level channels
  - 100-year channels were not considered at this time because of higher costs to restore these channels
- Prioritize channels with a lower avulsion risk based on low to moderate channel migration rates

Geomorphic Conclusions

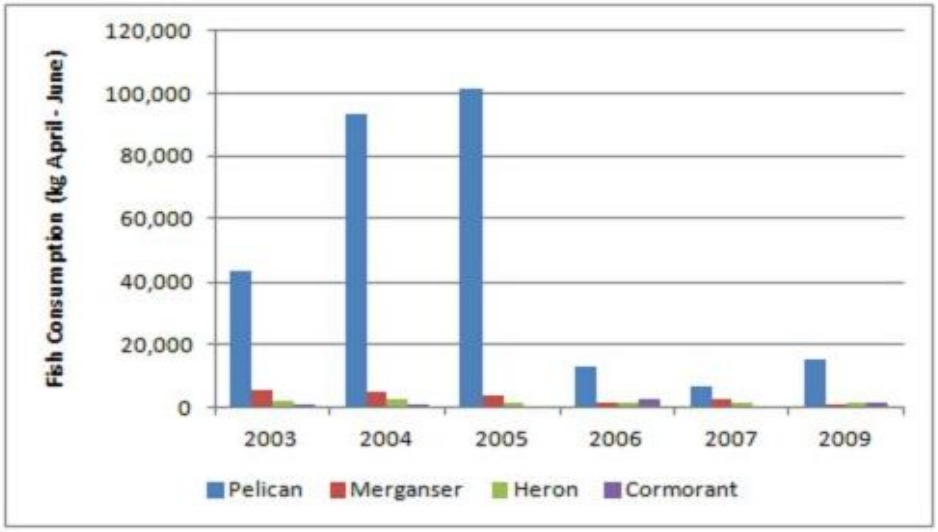
Locations for Instream Structures

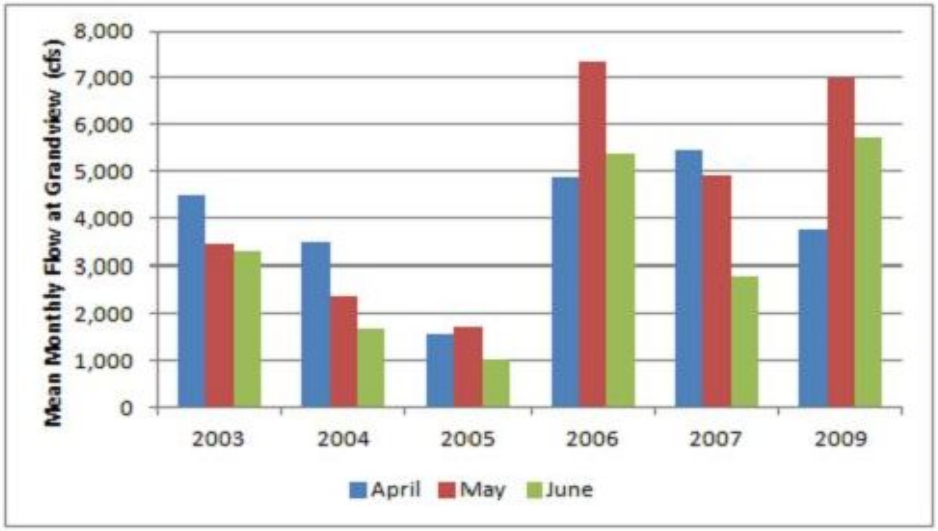
- Prioritize sites for instream structures based on locations with low sediment transport imbalances and where channel migration rates were low
- Potential sites for instream wood structures could be concentrated in the lower half of the Wapato Reach
- Upper Wapato Reach is balanced between braided and meandering based on emperical relationships

Biological Conclusions

- The assessment prioritized the following factors for benefiting salmonids:
  - Reduce Bedload Fine Sediment
  - Reduce Suspended Sediment
  - Provide Thermal Refuge
  - Increase Quantity of Species/Life Stage Key habitat
  - Increase Habitat Diversity
  - Reduce Predation Risk

Piscivory: Birds and Fish





- Pelicans, great blue herons, cormorants, mergansers most common
- Smolt predation rate ~20% annually
- Northern Pikeminnow most important, smolt predation rate ~20% annually
- Combined predation ~40% of smolt moving through the Wapato Reach
- Bird predation negatively related to flow

Restoration Objectives

- Encourage a Meandering Planform by Establishing Vegetated Channel Islands
- Establish or Promote Engagement of Side Channels across a Wide Range of Flows
- Establish or Promote the Engagement of Floodplain Channels across a Wide Range of Flows
- Remove Rip Rap or Bank Hardening
- Increase Quantity Instream Wood
- Enhance Riparian Revegetation

Roughness Elements

Existing Conditions:

- Low flow conditions are split up, shallow, high temperature and low habitat quality
- Exposed gravel banks
- Fine sediment on banks and floodplain transported to stream bed
- Side channels low complexity

Roughness elements

Desired Future Condition

- Low flow conditions deep, single channel
- Vegetated, steep banks
- Fine sediment transported and stored outside channel
- Eventual source of LWD to channel

Project Example: Channel Roughness Elements

Project Example: Channel Roughness Elements

- Project RM 105 to 103: 20 structures, each 26-34 logs
- 15 feet long, 12 inch dbh, 2/3 buried

Project maps: Ponds 4 & 5 area

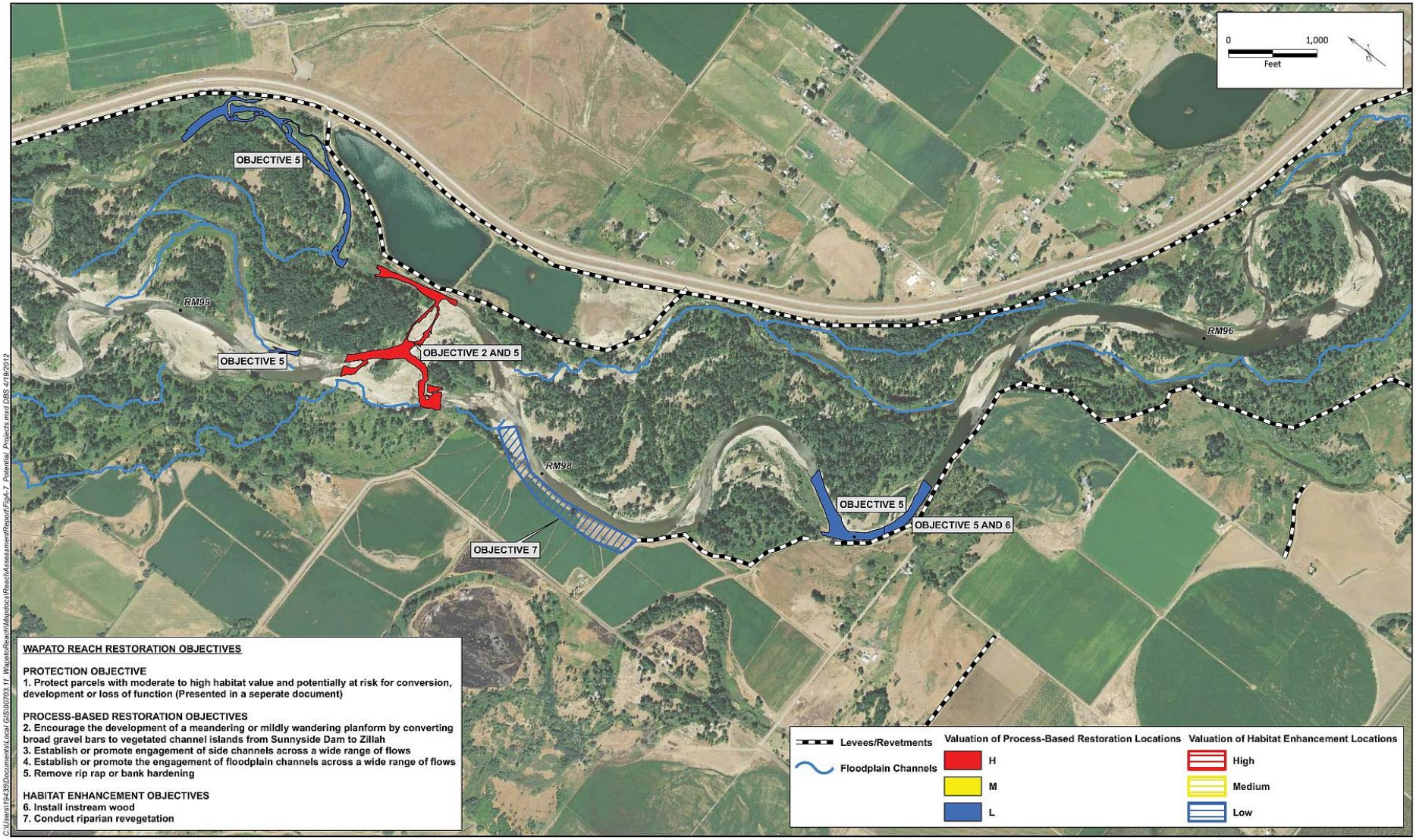


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Figure A-7d
Potential Habitat Restoration Locations
Wapato Reach Assessment - Phase 2

Project maps: Wapato Wildlife Area

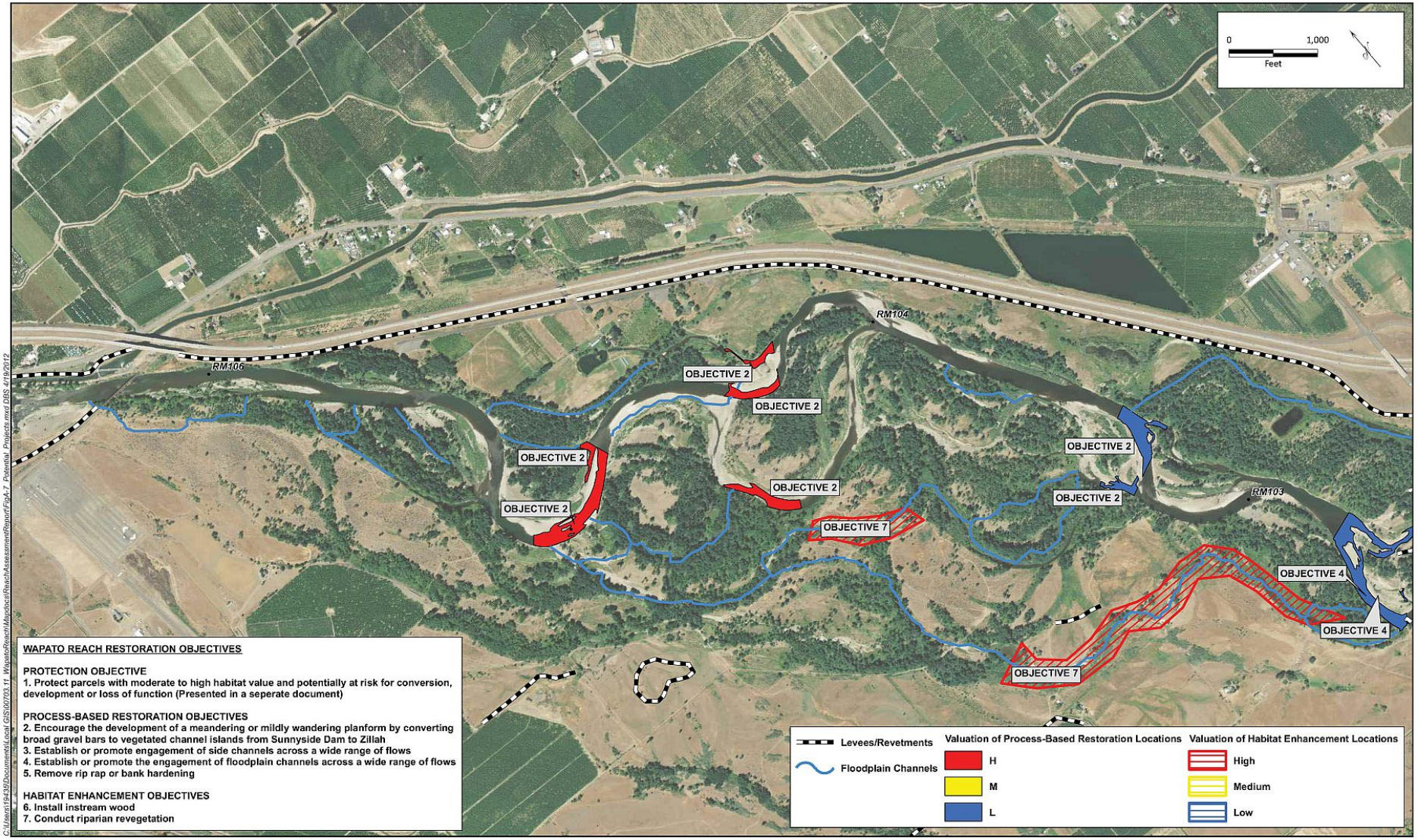

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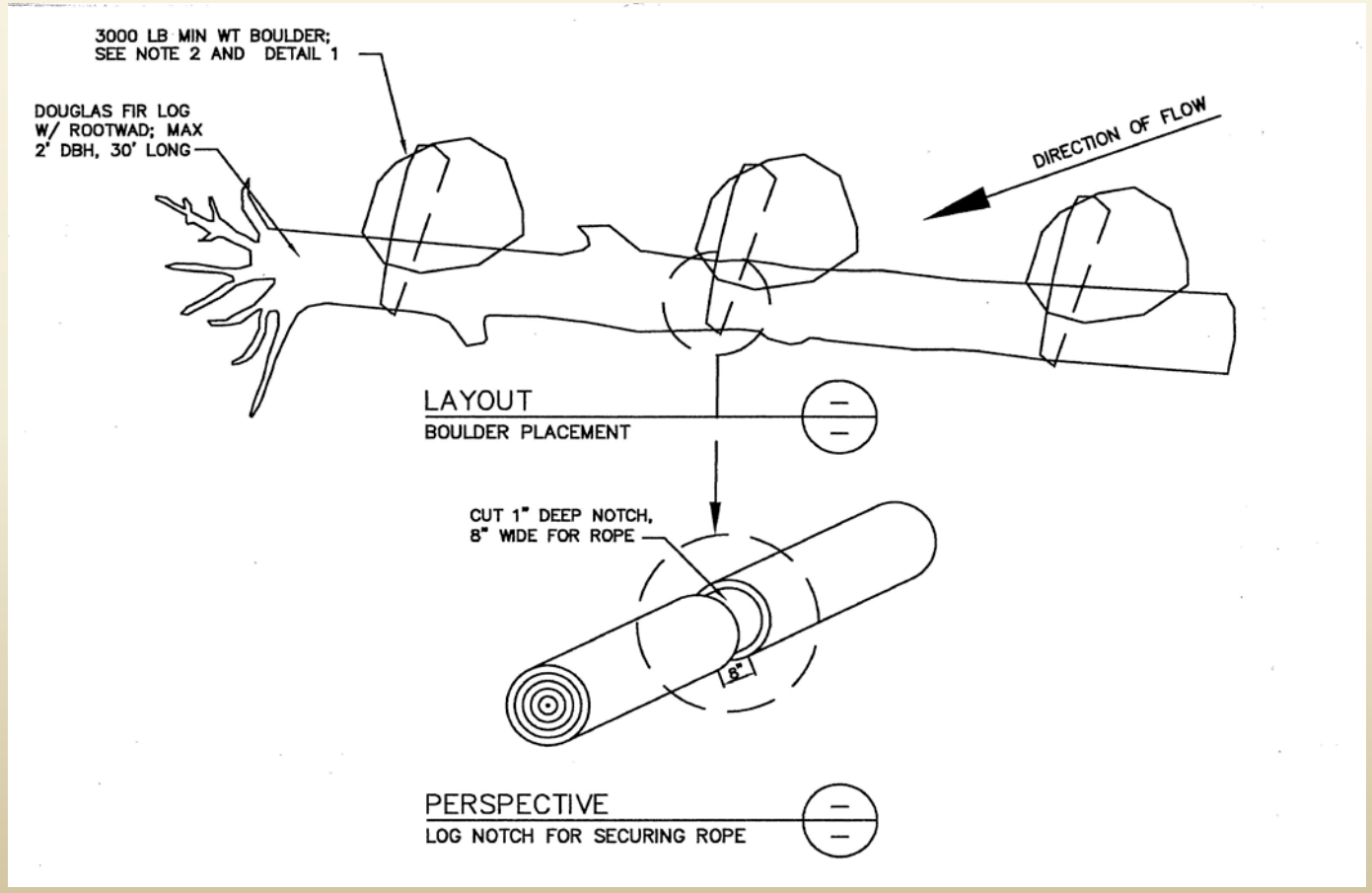
Figure A-7b
Potential Habitat Restoration Locations
Wapato Reach Assessment - Phase 2

Project Example: Levee Removal

- Project RM 89.7, Remove 3,500’ of levee and riprap
- Restores 10 acres floodplain and secondary channels

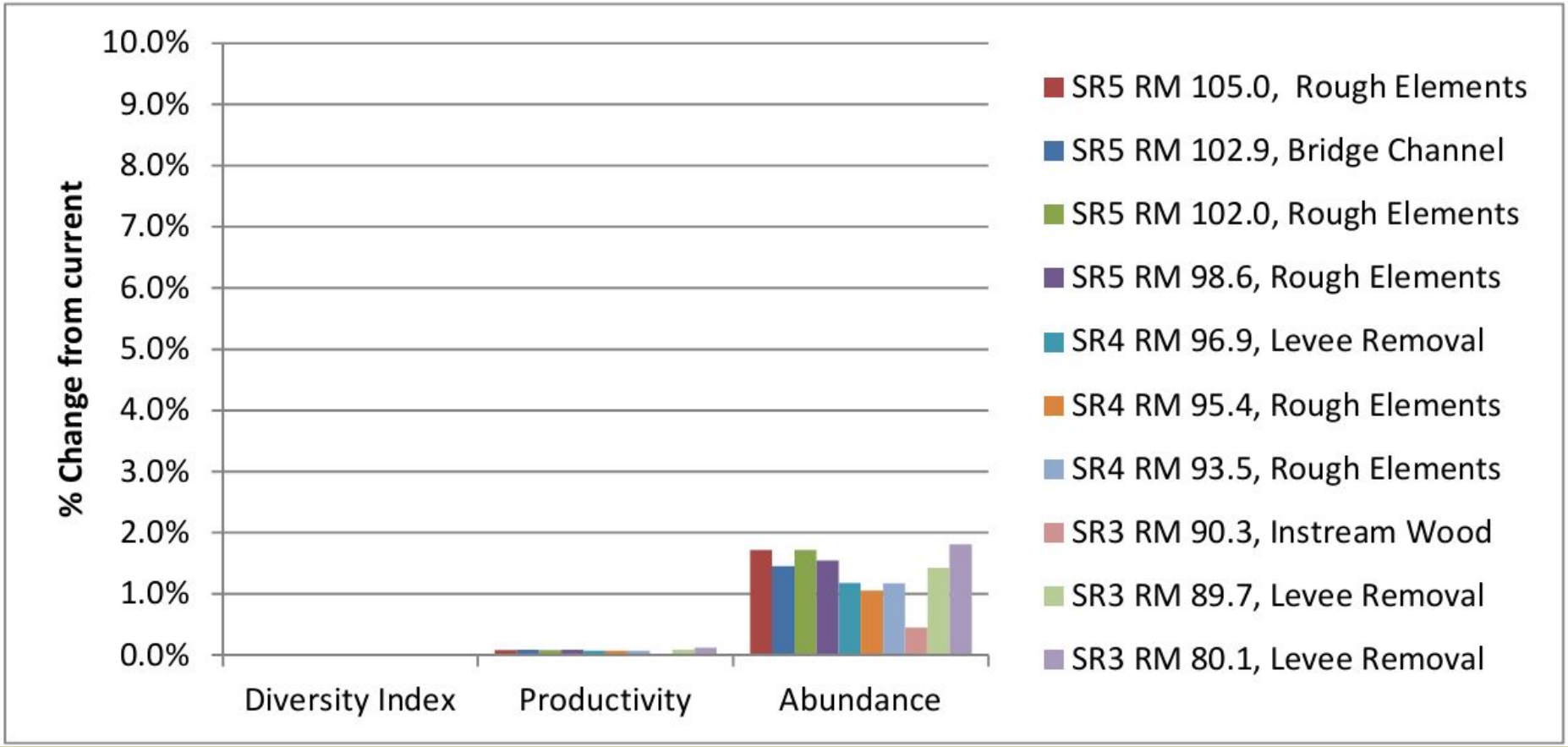
Project Example: Instream Wood

- Project RM 90.3 to 90.1; wood in Touchet Bed pools
- Place 20 individual trees or small clusters of 2 and 3 trees (with root wad and as much of branches as possible) in deep pools
- Includes boulder anchors to sink wood along bottom of pools



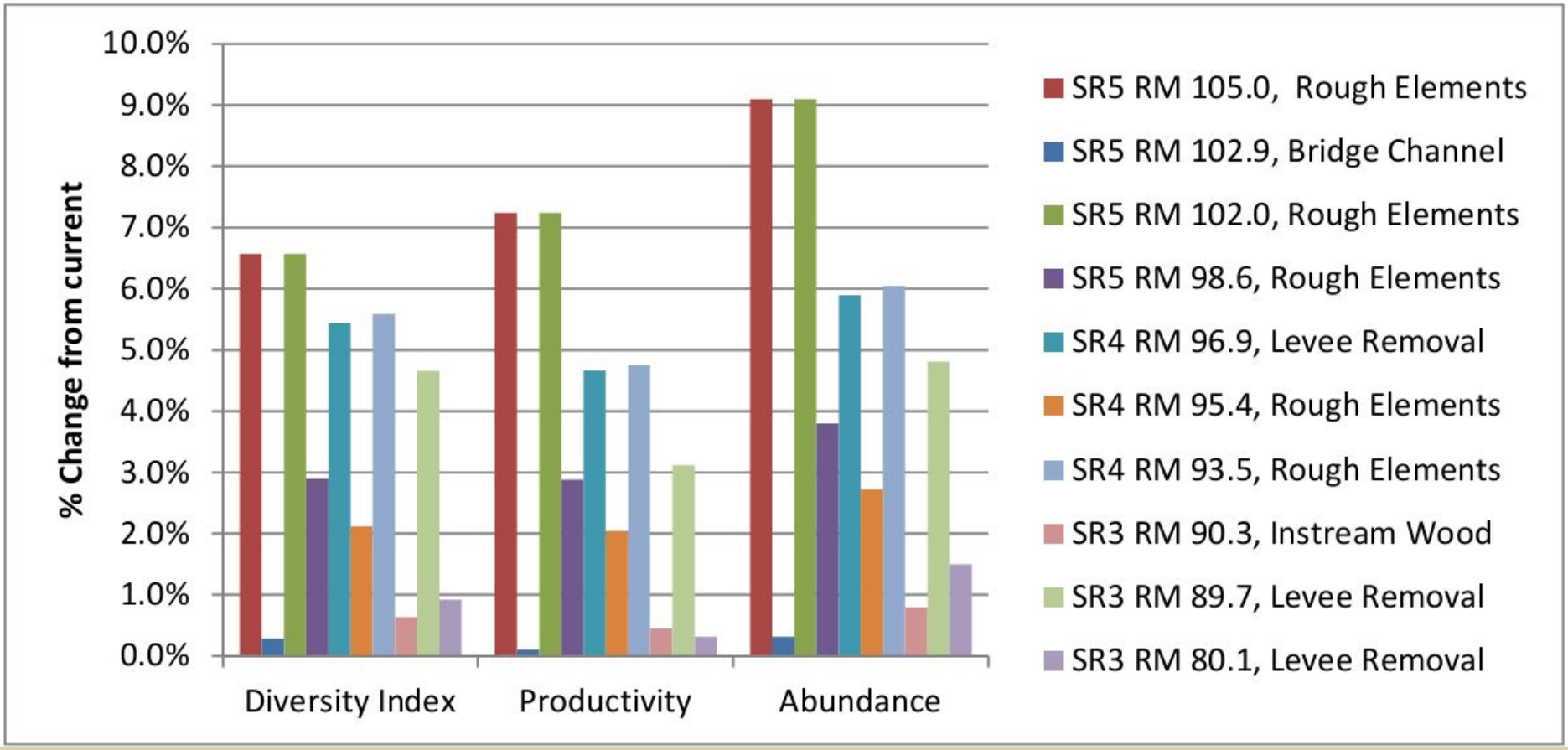
Overall Benefits-Steelhead

Figure 6-4. EDT Modeled Effect of Recommended Projects on Summer Steelhead Population Performance Parameters (Top) and Benefit Scores (Bottom)

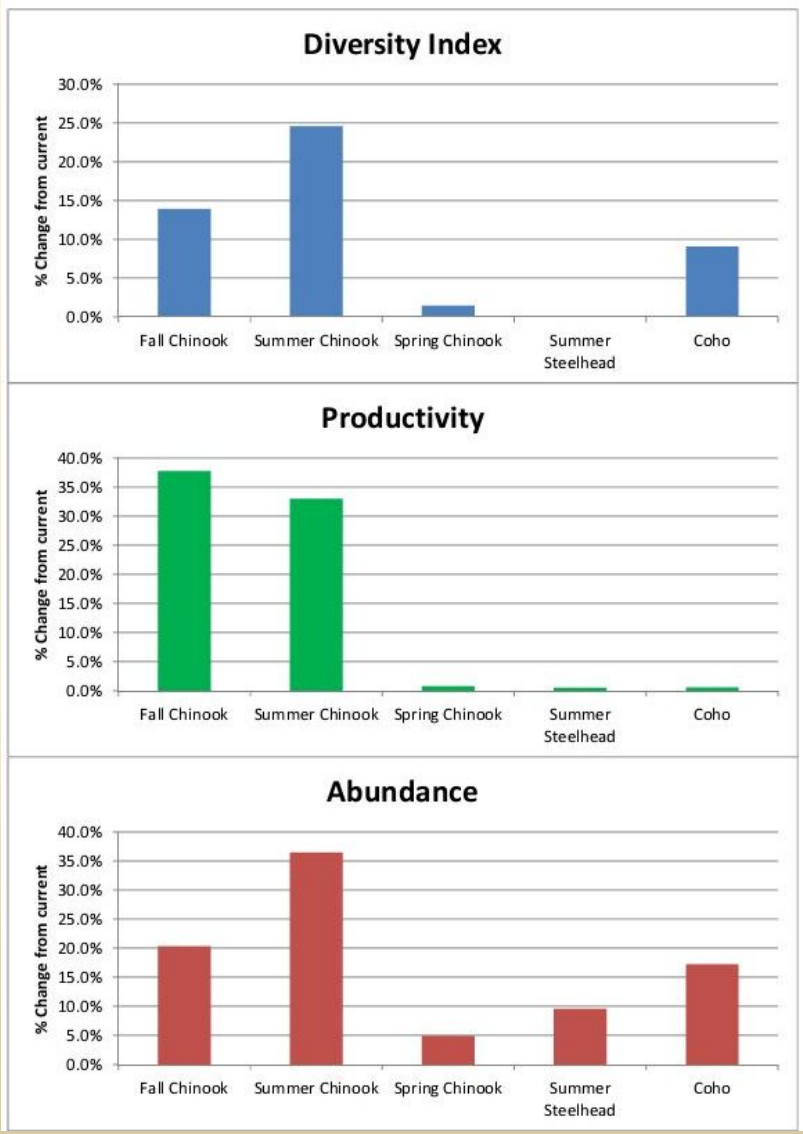


Overall Benefits-Summer Chinook

Figure 6-2. EDT Modeled Effect of Recommended Projects on Summer Chinook Population Performance Parameters (Top) and Benefit Scores (Bottom)



Overall Benefits-All Life Histories




Questions?