

Reasons for Slow Progress in Puget Sound Salmon Recovery

PSP Salmon Science Advisory Group

R. Bilby

G. Blair

K. Currens

K. Fresh

R. Fuerstenberg

Context

- The White Paper was initiated by SSAG in response to concerns expressed by the salmon recovery community about the less than expected fish response to habitat restoration actions and what this might mean for future funding of salmon recovery.
- Paper answers question “Why aren’t we seeing Recovery”
- Future work: “What is it going to take to get to Recovery”

Issue

- Over two decades of salmon recovery efforts in the PS Region – but fish response has been less than desired
- Only a few populations of Chinook salmon and steelhead have increased in abundance since listing – most have not changed or are decreasing
- Hood Canal/SJF Summer Chum is a success story
- Efforts to date have been beneficial – this report is not a critique of past projects
- But the lack of fish response suggests that modifications in the current approach to salmon recovery could enhance program effectiveness

Five Potential Causes

1. Insufficient time has elapsed for the effects of habitat restoration on the fish to be fully expressed.
2. Not enough restoration has been implemented to cause a detectable change in salmon populations.
3. Projects being implemented are not addressing the key factors constraining salmon (the wrong actions or the wrong locations).
4. Habitat degradation is occurring rapidly enough to offset any benefits associated with restoration efforts.
5. Monitoring of responses to restoration efforts have not been adequate to separate a response in salmon abundance (signal) from the temporal variation (noise) due to factors other than freshwater or estuarine habitat condition, such as variation in ocean conditions.

Not Enough Time has Passed

- Fish response to a habitat restoration action requires time
- Habitat response time varies by project type and response variable
 - Slow responses expected for projects like riparian planting
 - Even direct manipulation of habitat (e.g., wood placement) can require years or longer before habitat benefits are fully realized
 - Estuary projects, like breaching dikes, also often have a long response time
- Once habitat changes have occurred, it may take several generations before salmon fully respond to the improved conditions
- Full expression of fish benefits to a project may take a decade or longer
- Much of the restoration in PS has occurred in the last 20 years; not long enough for benefits to be fully realized

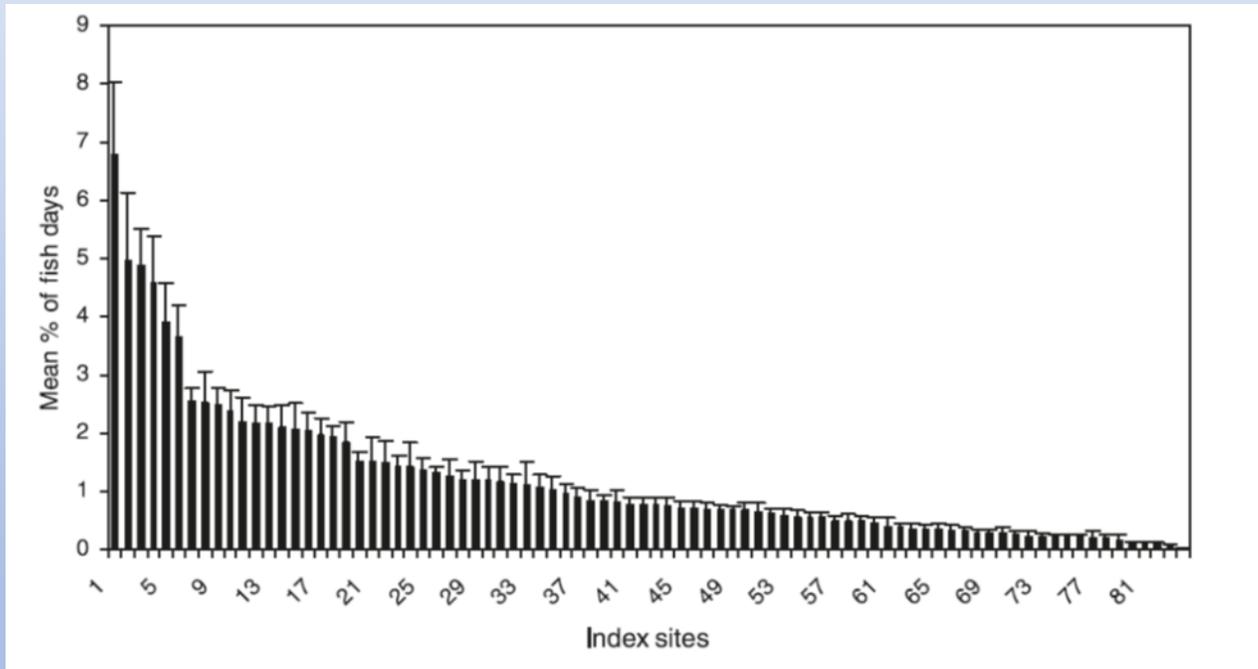
Not Enough Restoration has Been Done

- A substantial proportion of the habitat in a watershed may need to be treated to cause a detectable response in fish
- Roni et al. (2010) suggested that restoration of 20% of floodplain and instream habitat was required to generate a 25% increase in Coho and Steelhead smolt production
- Very few (if any) PS watersheds have received this much restoration
- Availability of resources to implement restoration is a key impediment to salmon recovery

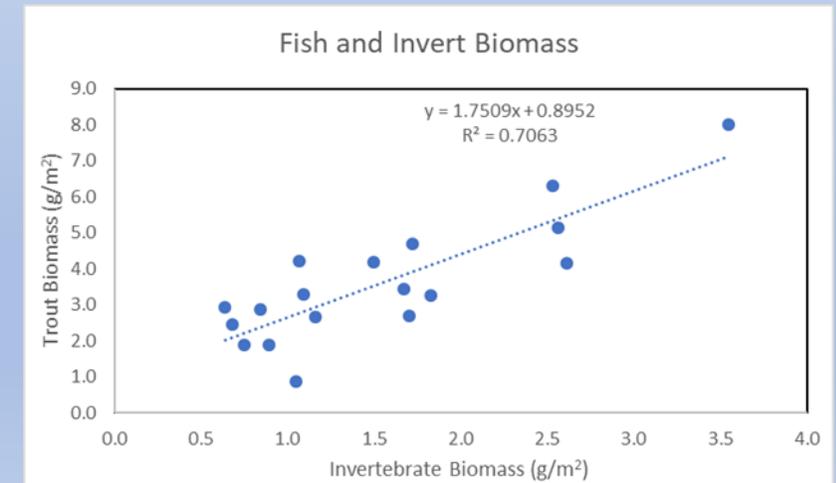
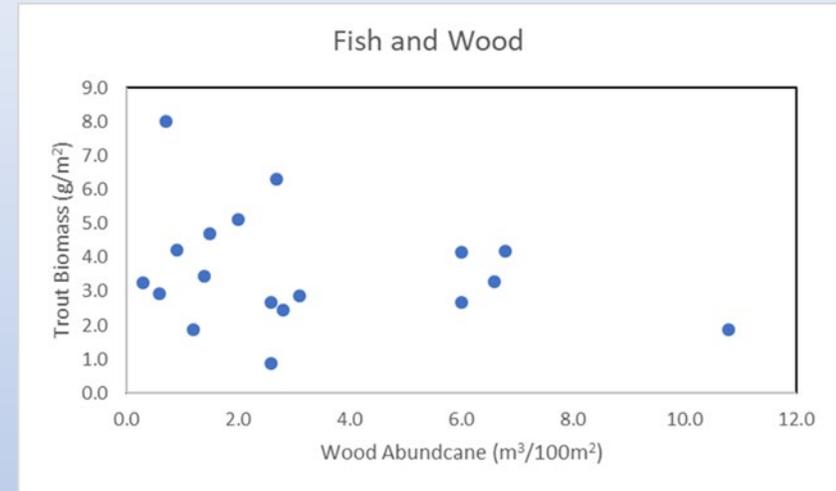
We Are Not Doing The Right Things In The Right Places

- Existing watershed plans provide some of the information required to prioritize projects – but they do not provide the detail required;
 - Sometimes not spatially explicit
 - Limiting factors identified without strong evidence that these factors are constraining fish production
 - Plans are infrequently updated – conditions and science changes over time
- Can enhance restoration effectiveness by improving identification of restoration projects with the highest potential;
 - Project location is often more important than project type
 - Focus projects on sites with the underlying conditions required to support high fish productivity
- Are we missing important limiting factors?
 - Focus on physical characteristics (channel form, sediment, etc.)
 - Very little restoration emphasis is placed on some key factors (e.g., food web dynamics)
- Current approach generally opportunistic – focused on willing landowners or ease of access; need to be more strategic

We Are Not Doing The Right Things In The Right Places



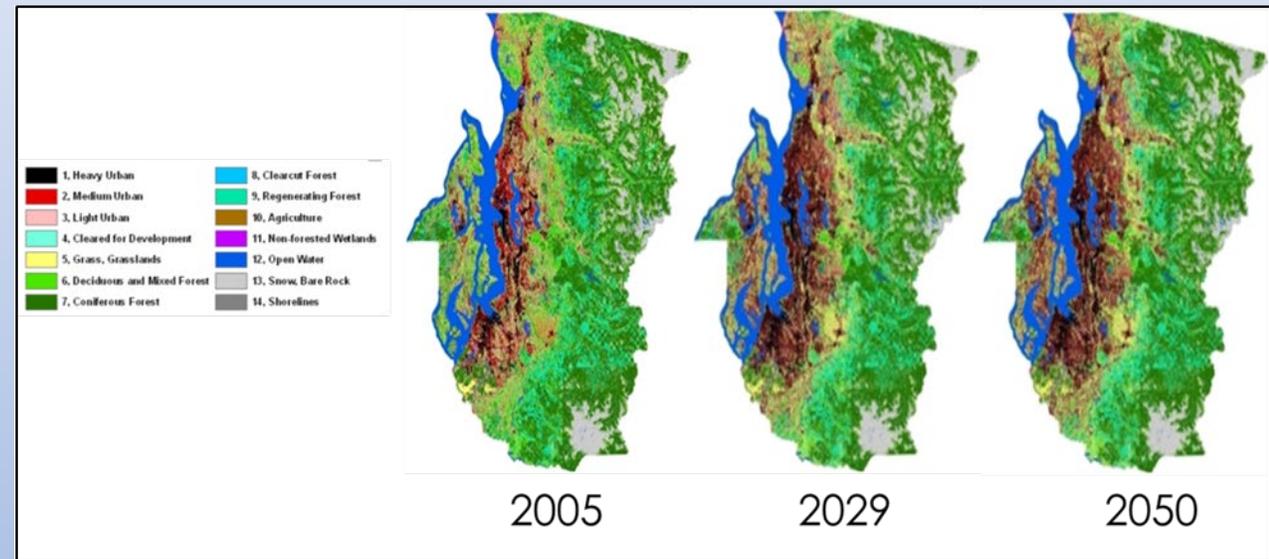
(Bilby and Mollot 2008)



(Kaylor and Warren 2017)

Habitat Degradation Is Masking Beneficial Effects Of Restoration Actions

- Despite improved regulatory programs, habitat impacts continue
- Driven by increasing human population
- Climate change is an important factor and will become worse
- Cannot assess the relative balance of habitat impacts versus habitat restoration
- Significance of this factor is unknown but likely significant



(Marsik and Alberti 2010)

Monitoring Has Been Unable to Separate Signal From Noise.

- Fish populations are highly variable; detecting a change in abundance requires monitoring
- Monitoring programs in PS have expanded over the last 2 decades but still unclear if the information being gathered is sufficient to answer 3 relevant questions:
 1. How has the habitat changed: What is the rate of degradation? To what extent is restoration offsetting these changes?
 2. What are demographic changes in salmon population?
 3. Can we link habitat changes to salmon population changes?

Conclusions

- Be patient. Many restoration actions will require many years/decades to be fully functional. The full response of salmon to restoration actions taken over the last two decades has not yet been fully expressed. Set expectations - estimate time to response during project design
- Not enough has been accomplished. Ideally, additional resources for restoration will be forthcoming. May be able to stretch available resources by better coordinating actions from restoration actors (agencies, tribes, lead entities, etc.)
- Identify locations where restoration actions have the greatest potential to generate a fish response
 - Information and tools are available to guide identification of these sites
 - Once a set of priority locations is established, identify the specific factors that are constraining fish production at these sites
- Current rate of habitat degradation unclear – but likely significant, given regional population growth; comprehensive habitat monitoring required to determine significance of this factor

Conclusions

- Where possible, focus on restoring processes rather than creating habitat features. Where human development precludes the restoration of natural processes, accept that periodic actions to maintain desired habitat conditions will be required.
- Apply established principles of ecosystem recovery to guide the development of watershed restoration priorities. Implementing actions that contribute to salmon population resilience will be key as uncertainties associated with climate change, development and other pressures will continue to impact watersheds
- Adjust monitoring programs to address existing information gaps
 - Comprehensive habitat monitoring is required to determine if the current level of restoration is sufficient to offset ongoing habitat degradation.
 - Coordinate fish monitoring with of restoration project effectiveness evaluations to enable assessments of VSP parameter responses to habitat restoration.
 - Use models or meta-analyses to begin investigating the linkages between restoration, habitat change, and fish response; can we answer key questions with the data on-hand?

Questions, Comments & Discussion