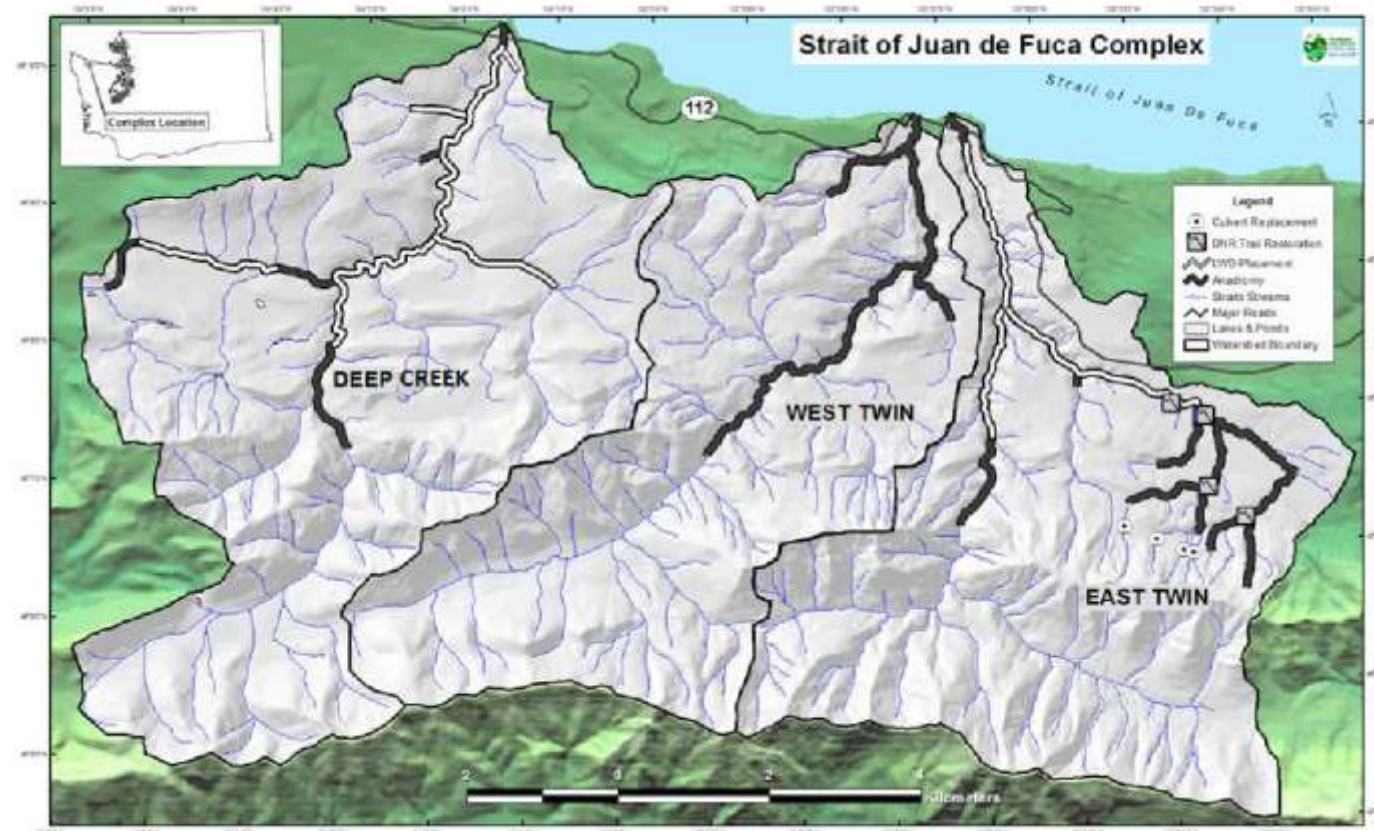




Learning from long-term restoration and monitoring in the Strait of Juan de Fuca IMW



Mike McHenry, Ray Moses, Kirk Krueger, Todd Bennett, Karrie Hanson, Morgan Bond, Martin Liermann, Stuart Munsch, and George Pess

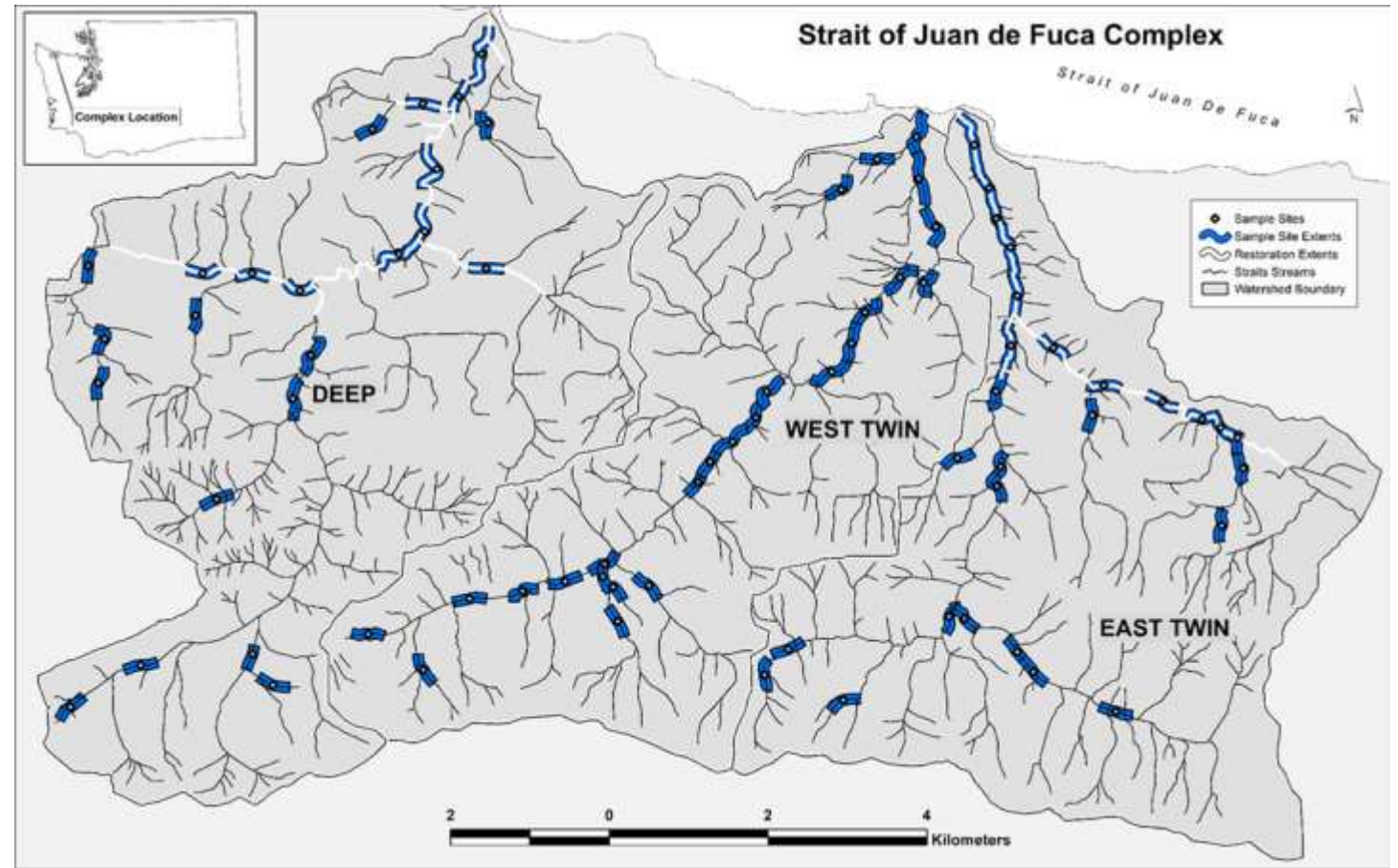
A roadmap to today's talk

- What did we do?
 - Long-term stream and watershed restoration and monitoring (~ 2+ decades) to increase the quality of salmonid habitat to increase salmonid populations.
- What did we find and what does it mean?
 - Adaptive restoration and monitoring over multiple decades is needed.
 - Life history diversity is important to salmonid population response.
 - Restoration actions have to occur over multiple decades to see a response.
- Why does it matter?
 - Funding sources, agencies, partners all think a few actions will reverse what has occurred for over 100 plus years. We actually all want to believe this but it is not true.
- So what?
 - Support, patience, and consistency are critical to the long-term success of IMWs whether it be funding, effort, or actions.
- What is next?

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What did we do?

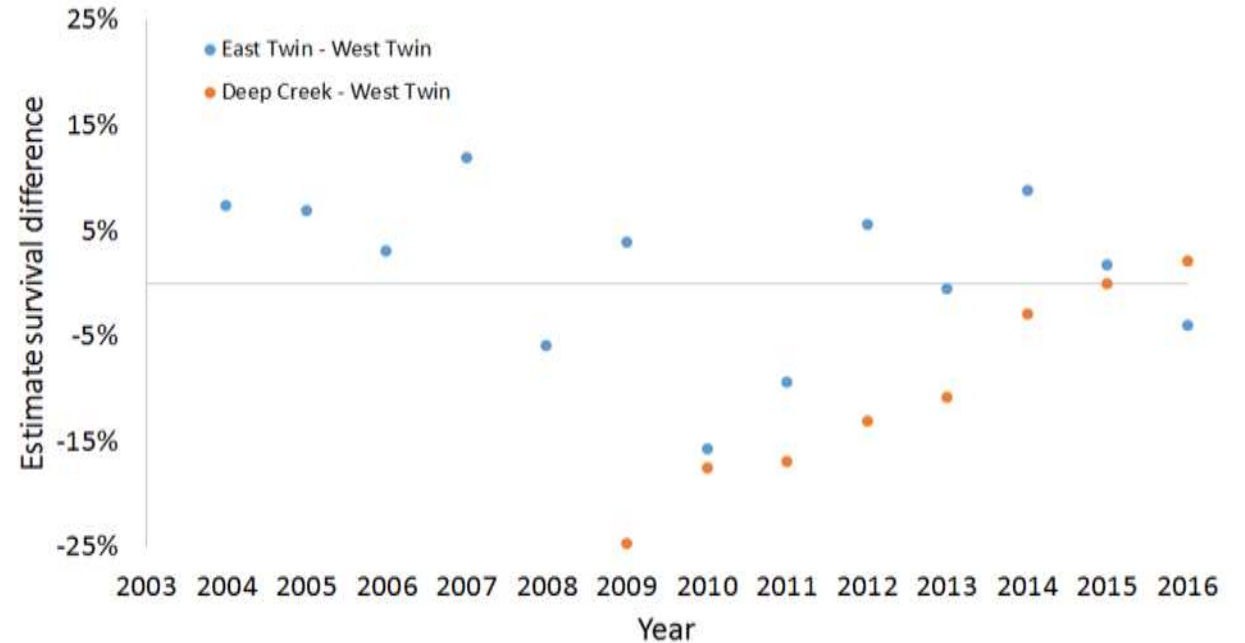
- How do site-specific restoration actions lead to watershed-scale response to salmon habitat and salmon populations?
- We identified “control” (West Twin) and “treatment” (Deep Creek and East Twin) to conduct restoration actions and monitoring fish in (adults) and fish out (parr and smolts).



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What did we find and what does it mean?

- Juvenile coho salmon survival in one treatment watershed has steadily increased relative to our control stream.
- There is a fall emigration of juvenile coho salmon that survive and contribute to the adult returns.
- Steelhead life history diversity is plentiful (i.e. over 18 strategies) even with population levels of 100 to 300 adult steelhead returns per year.
- Continual and improved wood placement can result in large key pieces that are stable and contribute to stream habitat recovery at the watershed scale.



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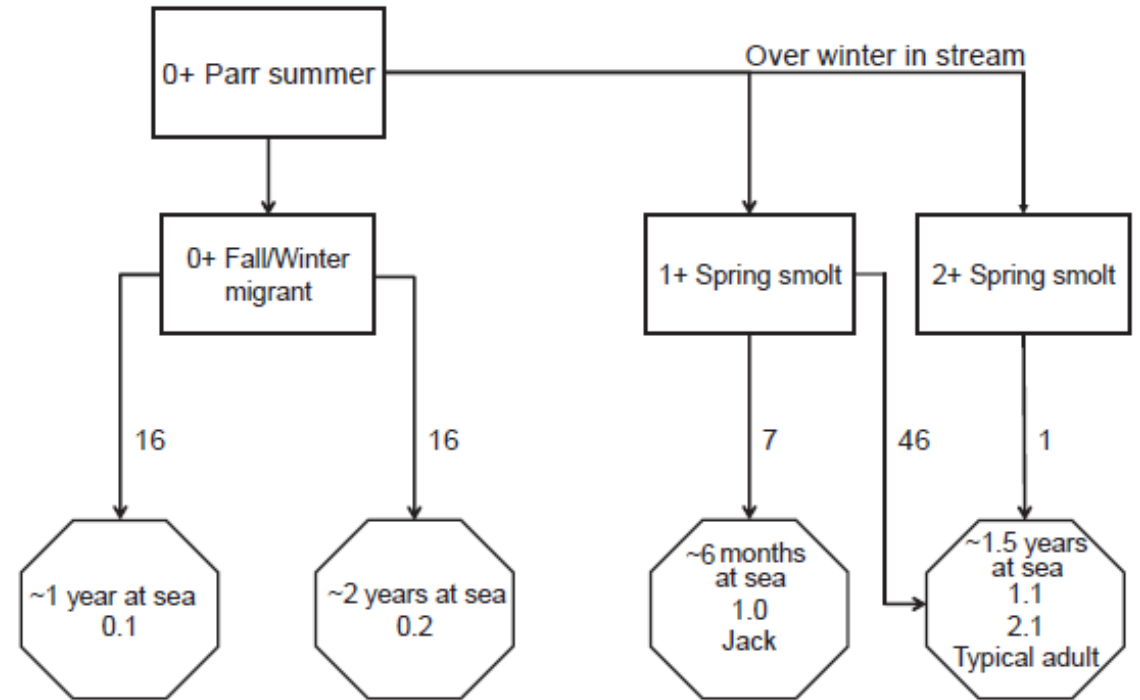


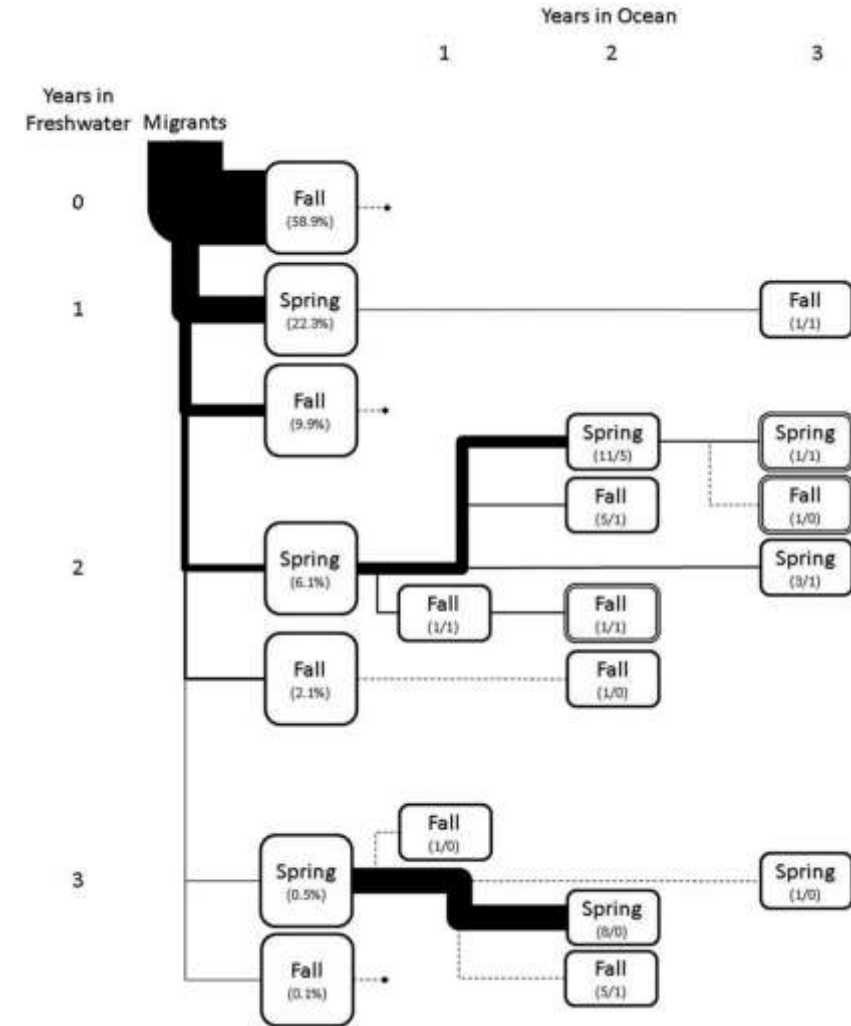
Fig. 2. Life history pathways exhibited by coho salmon in the East Twin River, West Twin River and Deep Creek. $N = 86$.

Bennett, T.R., Roni, P., Denton, K., McHenry, M. and Moses, R., 2015. Nomads no more: early juvenile coho salmon migrants contribute to the adult return. *Ecology of Freshwater Fish*, 24(2), pp.264-275.

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Hall, J., Roni, P., Bennett, T., McMillan, J., Hanson, K., Moses, R., McHenry, M., Pess, G. and Ehinger, W., 2016. Life history diversity of steelhead in two coastal Washington watersheds. *Transactions of the American Fisheries Society*, 145(5), pp.990-1005.

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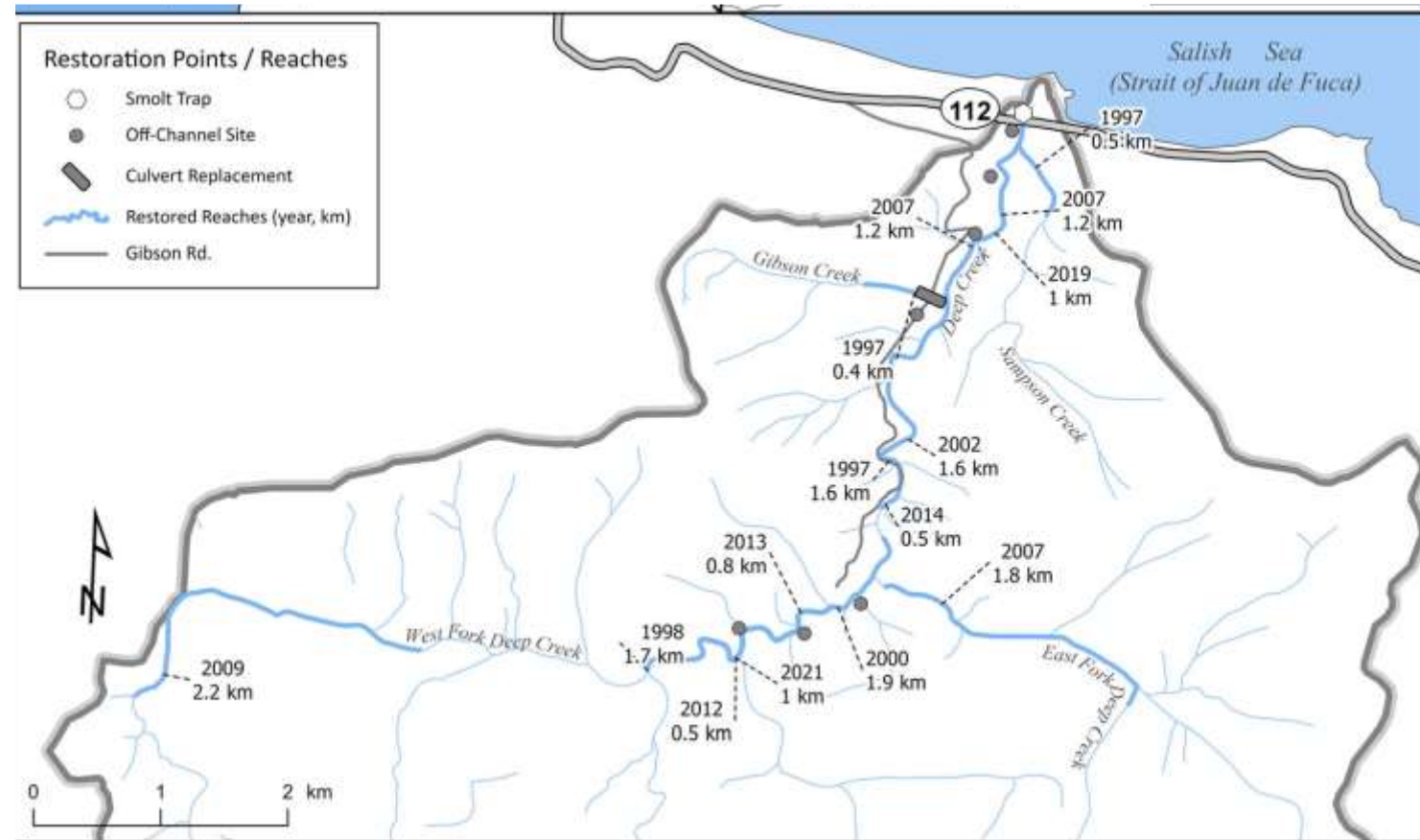


Pess, G.R., McHenry, M.L., Liermann, M.C., Hanson, K.M. and Beechie, T.J., 2023. How does over two decades of active wood reintroduction result in changes to stream channel features and aquatic habitats of a forested river system?. *Earth Surface Processes and Landforms*, 48(4), pp.817-829.

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Why does it matter?

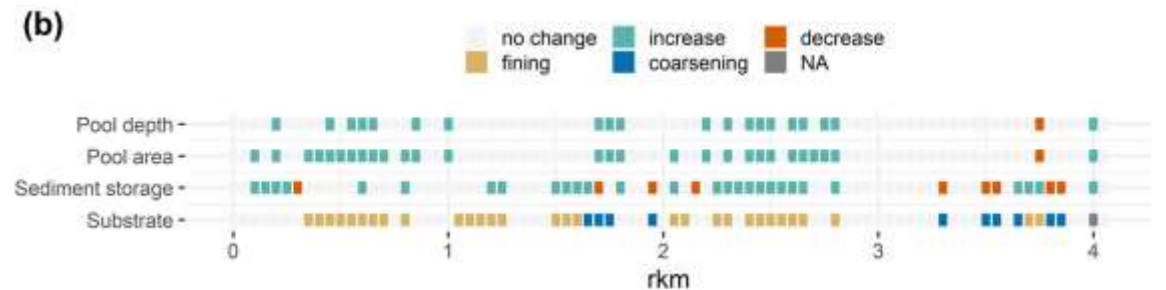
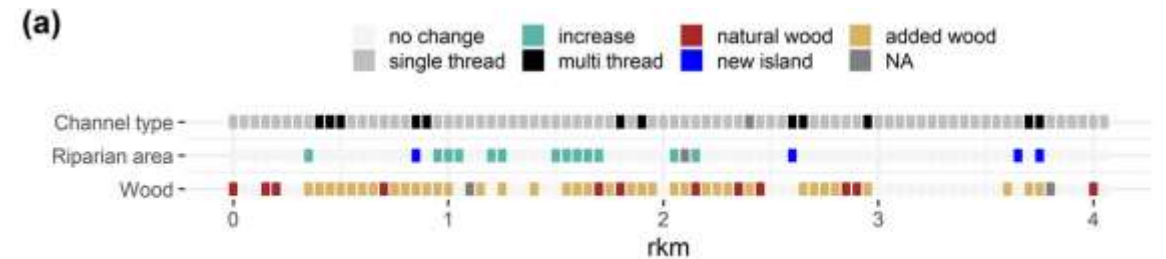
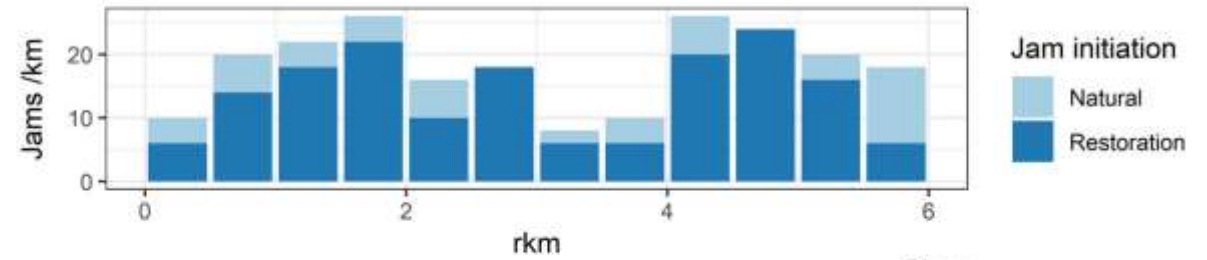
- “A few actions will reverse what has occurred for over 100 plus years.”
- Not the case
- Restoration from 1998 to 2021
- 15 projects over 24 years
- Initial treatments – ground based, static treatments, smaller and lower profile
- New treatments – helicopter based, large-scale logjams, larger profile



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Why does it matter?

- The lack of wood was symptomatic of larger watershed processes being disrupted and the result was a simplified stream channel
- This occurred over decades
- Decades of improving restorative actions were necessary due to the magnitude of wood loss over time
- The scale of wood introduction was at the watershed-scale, similar to natural processes of wood recruitment



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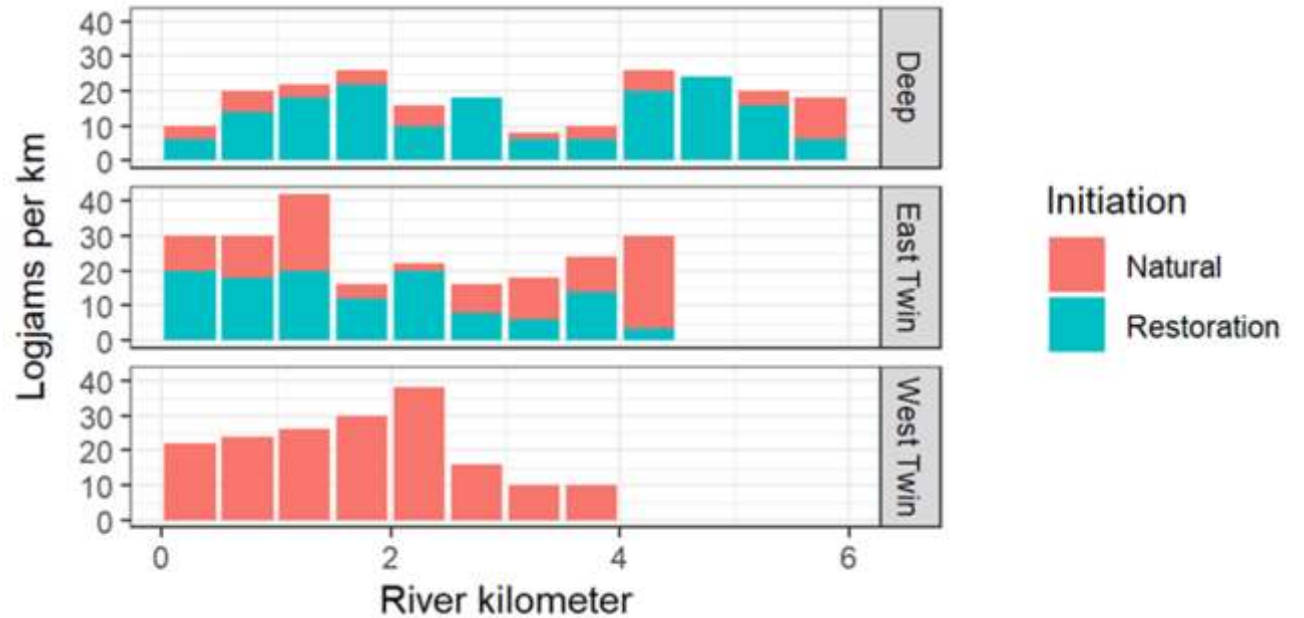
So what?

- Support, patience, and consistency are critical to the long-term success of IMWs whether it be funding, effort, or actions
- Restoration treatments
 - Restoration action funding has been intermittent thus actions took decades
 - The result was **learning** to do such actions “better”
- Monitoring
 - Long-term monitoring of fish in and fish out allowed us to **learn** about the quantitative value of life history diversity
 - Life history diversity leads to population resilience which is critical for populations dealing with a changing climate
- Methods
 - Including other methods, such as a wood budget, allowed us to **learn** how to link restoration actions to changes in habitat conditions

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What is next?

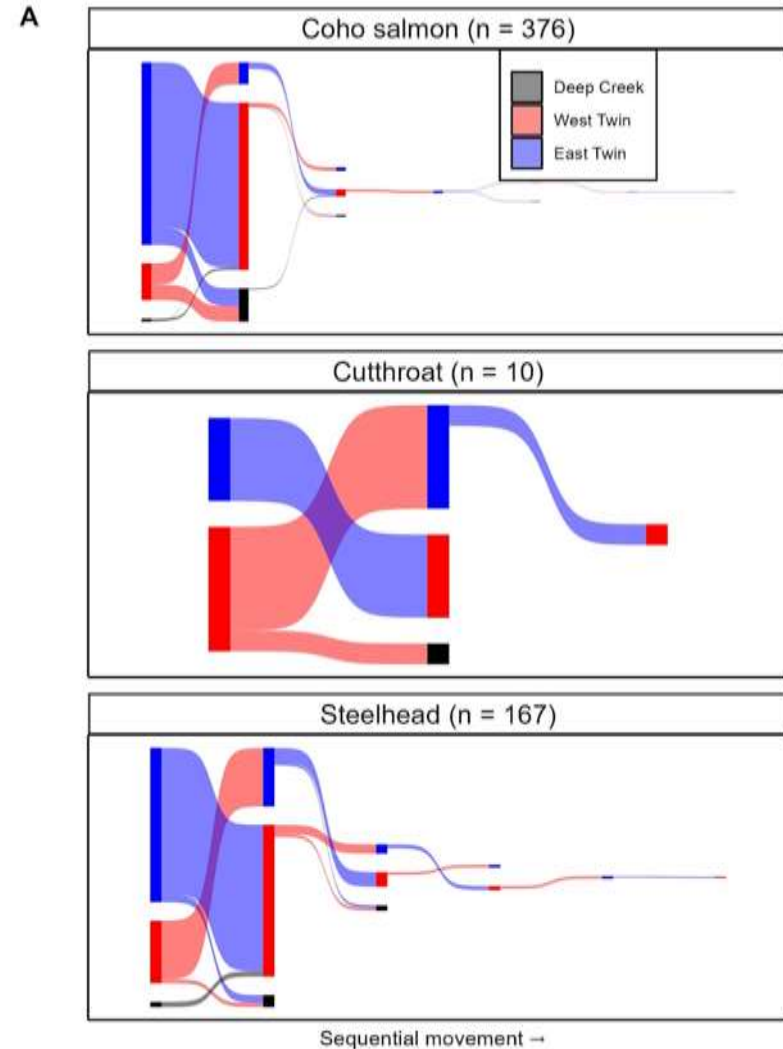
- Continue wood budget comparison of control and treatment watersheds
- Examine juvenile movement between watersheds
- Examining juvenile size and survival
- Examine factors beyond habitat including harvest



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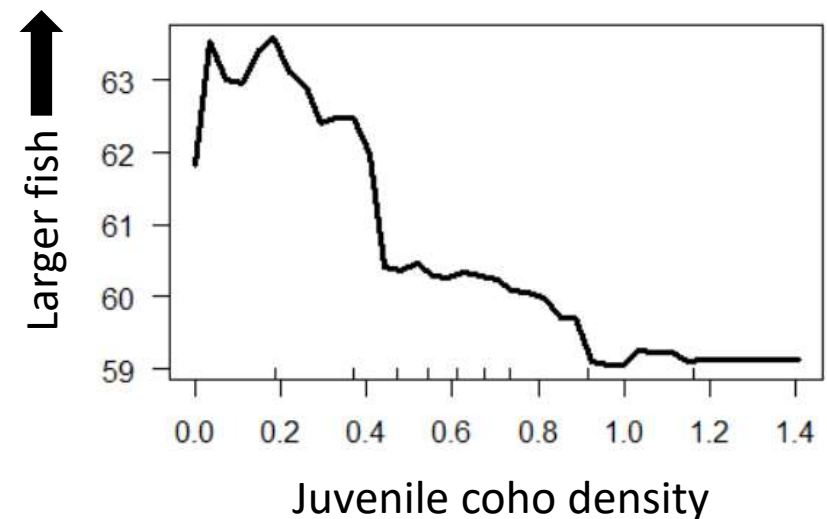
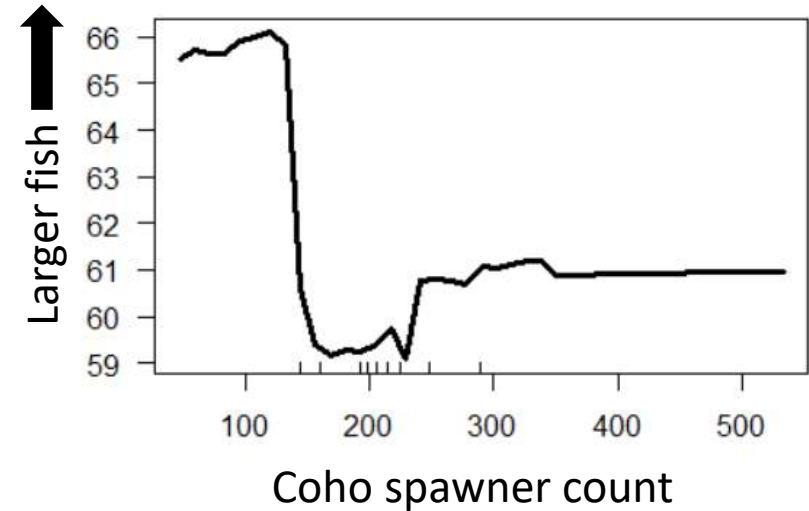
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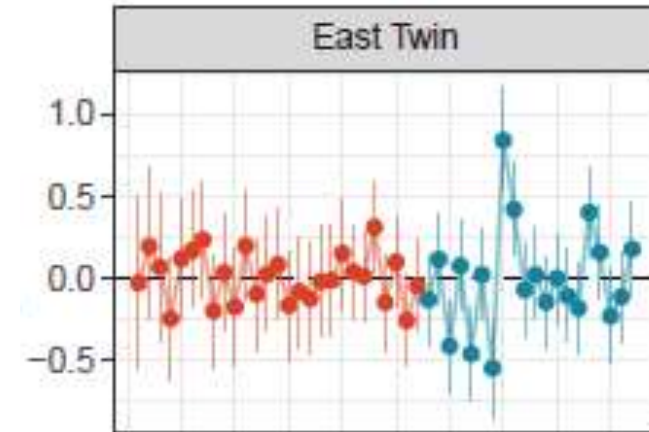
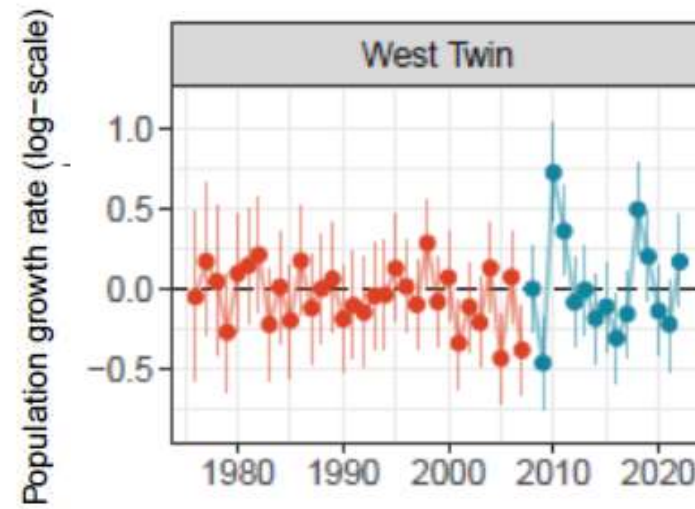
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Red = Steelhead fishing

Blue = No steelhead fishing

Thank you!



Photo by John McMillan