**Supplement S1. Prior Return on Investment Analyses for Salmon Conservation Planning**

|  |  |
| --- | --- |
| Study | Approach |
| Ettinger et al. (2021) | Prioritized areas for conservation in the Puget Sound region of Washington, USA in order to reduce pre-spawn mortality in salmon caused by urban runoff. Used an urbanization index as a proxy for the effort required to attain or maintain water quality above the toxicity threshold in place of a monetary measure of costs.  |
| Fullerton et al. (2010) | Employed scenario analysis to compare the ROI of habitat restoration planning approaches in the Lewis River basin, Washington, USA. |
| Halsing and Moore (2008) | Evaluated the cost effectiveness of several recovery actions, including transporting juveniles around dams, dam removal, harvest reduction, and predator management, for conserving endangered salmon in the Snake River basin, USA. |
| Newbold and Siikamäki (2009) | Spatially prioritized watershed restoration for recovery of endangered Upper Columbia River spring Chinook (*O. twshawytscha*) in Upper Columbia river sub-basin, Washington, USA. |
| Null and Lund (2012) | Developed an optimization model for selecting restoration interventions to maximize the out-migration of coho (*O. kisutch*) salmon smolts from the Shasta River in California, USA. |
| Ogston et al. (2015) | Used mark-recapture data to estimate the effect of habitat restoration on smolt production, and compare the ROI of producing smolts through restoration versus the ROI of hatchery production, in a British Columbia, Canada watershed. |
| O’hanley and Tomberlin (2005) | Developed an optimization framework for prioritizing removals of small fish passage barriers and applied the framework to removing culverts to expand salmon habitat in western Washington State, USA. |
| Paulsen and Wernstedt (1995) | Evaluated the relative ROI of combinations of habitat restoration, modifying hydroelectric dam operations, predator control and other interventions undertaken to recover multiple salmon stocks in the Columbia River Basin. |
| Speir et al. (2015) | Developed a real options approach for evaluating the optimal timing of large-scale habitat restoration actions in the presence of stochastic and irreversible ecological costs (e.g. species extinction) and operationalized the model in the context of dam removal for salmon recovery. |
| Watanabe et al. (2005) | Evaluated riparian restoration alternatives for reducing stream temperatures, a limiting factor for salmon in the Upper Grande Ronde River basin, Oregon, USA. |

**References**

Ettinger, A., Buhle, E., Feist, B., Howe, E., Spromberg, J., Scholz, N., Levin, P., 2021. Prioritizing conservation actions in urbanizing landscapes. Scientific reports 11, 1-13.

Fullerton, A.H., Steel, E.A., Lange, I., Caras, Y., 2010. Effects of spatial pattern and economic uncertainties on freshwater habitat restoration planning: a simulation exercise. Restoration Ecology 18, 354-369.

Halsing, D.L., Moore, M.R., 2008. Cost‐Effective Management Alternatives for Snake River Chinook Salmon: a Biological‐Economic Synthesis. Conservation Biology 22, 338-350.

Newbold, S.C., Siikamäki, J., 2009. Prioritizing conservation activities using reserve site selection methods and population viability analysis. Ecological Applications 19, 1774-1790.

Null, S.E., Lund, J., 2012. Fish habitat optimization to prioritize river restoration decisions. River research and applications 28, 1378-1393.

O’hanley, J.R., Tomberlin, D., 2005. Optimizing the removal of small fish passage barriers. Environmental Modeling & Assessment 10, 85-98.

Ogston, L., Gidora, S., Foy, M., Rosenfeld, J., 2015. Watershed-scale effectiveness of floodplain habitat restoration for juvenile coho salmon in the Chilliwack River, British Columbia. Canadian Journal of Fisheries and Aquatic Sciences 72, 479-490.

Paulsen, C.M., Wernstedt, K., 1995. Cost-effectiveness analysis for complex managed hydrosystems: an application to the Columbia River basin. Journal of Environmental Economics and Management 28, 388-400.

Speir, C., Pittman, S., Tomberlin, D., 2015. Uncertainty, Irreversibility and the Optimal Timing of Large-Scale Investments in Protected Species Habitat Restoration. Frontiers in Marine Science 2, 101.

Watanabe, M., Adams, R.M., Wu, J., Bolte, J.P., Cox, M.M., Johnson, S.L., Liss, W.J., Boggess, W.G., Ebersole, J.L., 2005. Toward efficient riparian restoration: integrating economic, physical, and biological models. Journal of Environmental Management 75, 93-104.