Master's of Environmental Studies Application:

Contextualized Solutions Toward Salmon Enhancement Through Lower Snake River Dam Removal

Mackenzie Kleiva

June 30, 2023

Introduction

Construction of the Lower Snake River Dams (LSRD) was approved by Congress in 1945 as part of a post-WWII effort to provide jobs for returning soldiers. The intended functions of the dams were originally navigation and irrigation, but inclusion of hydropower enabled the approval of the project for the US Army Corps of Engineers (Corps) to undertake (*Lower Snake..,* 2019). Construction of the LSRD occurred between 1957 and 1975. The four dams, Ice Harbor, Lower Monumental, Little Goose, and Lower Granite (referred to from here on as LSRD), create approximately 140 miles of slack water along the Snake River in Southwest Washington. For decades, interest groups have been lobbying against the LSRD in an effort to save salmon and steelhead (*Oncorhynchus sp*), employing a variety of legal and political strategies to mount pressure. Concerns were raised over the accuracy of a 2002 Columbia River System Operations (CRSO) Environmental Impact Statement (EIS) report produced by the Corps, the Bureau of Reclamation, and the Bonneville Power Administration (BPA), who sell the hydropower produced. The 2020 EIS concludes that breaching the LSRD has the highest potential benefit for Snake River salmon & steelhead, and other fish populations, yet an increased spill solution was the chosen strategy (CRSO 2020). Dam maintenance supporters and free flowing river supporters tend to agree that breaching a dam leads to improvement of salmon health and habitat, but other factors of dam removal lead to a split in opinion. If the evidence supports breaching dams to improve salmon populations, why then, do the dams remain? Here, I will provide greater context to the central issues which contribute to this decades long debate.

Saving Our Salmon

Salmon hold great cultural significance for regional tribes, support a robust commercial and recreational fishing industry, and act as keystone species in marine and stream ecosystems. Concern over the impacts of the LSRD on salmon habitat were raised prior to their construction, and have been the central argument for their removal since the 1980's. Scientists have been monitoring declining salmon

populations in the region since construction of the Columbia River Basin dams first began in 1938, but it wasn't until 1988 that Snake River Coho salmon (*Oncorhynchus kisutch*) were declared extinct (Hilbert-Wolf & Gerlak, 2022). Soon after, petitions were filed for several species of Snake & Columbia River salmon and steelhead (*Oncorhynchus sp*) to be listed as threatened or endangered according to the Endangered Species Act (ESA). Currently, 13 species of fish within the Columbia River Basin are ESA-listed (Hilbert-Wolf & Gerlak, 2022). While the evidence abounds that the LSRD have a negative impact on salmon populations (*CRSO EIS*, 2020; *Lower Snake.., 2022; Lower Snake.., 2019;* Myers 2017), proponents of the LSRD argue that ocean warming and commercial fishing also play critical roles in declining salmon health. Commercial fishing on the Snake River began in 1938, when documentation of dwindling salmon populations was first noted (Myers, 2017). Scientists have also correlated warmer ocean years with smaller annual returns of salmon (Petrosky & Schaller, 2010).

Stakeholders in support of and against free flowing Snake River agree that breaching the dams is the best path to restoring salmon habitat and give the endangered and threatened species a chance at survival amidst increasing stressors of climate change. The warm and slow moving slack waters of the Snake create a harsh environment, increase predation rates, and spread disease for the 140 miles they stretch (Myers, 2017). Each of the four dams themselves present an additional challenge for anadromous species to navigate. Low spill volumes during lower rainfall years places even greater stress still on the smolt as they navigate towards the sea. Stakeholders in support of the LSRD maintenance point to over $1 billion which has been invested by BPA into salmon and steelhead conservation efforts since 2008, and the disappearance of those funds should the dams be breached (*Columbia Basin Fish..*, 2008). Those funds, which support fish passage efforts, habitat restoration, and fishery operations, are largely made up of saved litigation fees after an agreement made by the Columbia River Inter-Tribal Fish Comission, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes and Bands of the Yakama Nation, with BPA, the Corps, and

the Bureau of Reclamation, to end legal proceedings in pursuit of LSRD removal (*Columbia Basin Fish..*, 2008). Leaders of the aforementioned Tribes, as well as many others throughout the Pacific Northwest region, including the Nez Perce Tribe, the Squaxin Island Tribe, and the Suquamish Tribe, continue to make public demands for breaching of the dams to save our salmon, which are so intricately tied to their ways of life.

Carbon Free Energy

More recently, proponents of the LSRD have veered away from arguing that salmon health is not greatly impacted by the dams. Instead, supporters of the dams bring up the broader context of global climate change, recent policy changes which increase demand for carbon-free energy, and the role that Washington's hydropower plays in reducing fossil fuel consumption (Myers, 2017). Washington state provides over 30% of the nation's hydropower and sells excess power throughout the region from Canada to Mexico, often to places where coal burning is common. 67% of the state's energy produced is hydropower, and 8% of Washington's energy comes from the LSRD alone, which is nearly the total amount of wind power produced, or the total nuclear energy produced in the state (*Washington State Energy Profile*, 2023). Hydropower makes up ~90% of the state's renewable energy profile, with wind and biomass accounting for the rest. Solar power production is less than 1%, mostly produced by small-scale, customer installations. The last remaining coal power plant in Washington will close by 2025. Most of the remaining energy in the state is produced by natural gas. Together, natural gas, hydropower, and coal burning are able to meet fluctuating demands for energy and fill grid stability gaps left by wind power. If the LSRD are removed, natural gas is likely to meet the energy demand and increase carbon emissions (Myers, 2017).

With 21% of the electricity produced in Washington being sold outside of the state, critics highlight overproduction as a crucial factor to consider (Hilbert-Wolf & Gerlak, 2022; *Washington State Energy Profile*, 2023). With this in mind, the removal of the LSRD might mean less energy production,

but would still be able to meet state demands. Fluctuating needs could be met with other higher producing dams along the Columbia river, such as the Grand Coulee Dam, the largest power plant in the nation. The overproduction issue is complicated by the potential energy sources that buyers of the excess would use in place of it. Some states, like Montana, would turn to coal, where places like California or Mexico might be able to increase solar production to replace the supply (Myers, 2017).

Cost-Benefit

Multiple cost benefit analyses have been produced by non-government organizations, consultants, private groups, and government agencies. These analyses tend to vary wildly, based largely on differences in use and non-use values of salmon, recreation, cultural importance, and predicted public perception (Hilbert-Wolf & Gerlak, 2022). Some analyses focus more exclusively on salmon, while others focus more on other economic factors. Predicted costs of removal vary, ranging from $10.3 to $31.3 billion. Costs of maintenance are currently unavailable without important long-term operation and maintenance costs provided by BPA. Without recent data on LSRD maintenance projections, we can only assume that dam removal will be more expensive with the massive infrastructure overhauls required to replace their services (Coalition, 2018; Myers, 2017).

Irrigation

One of the first proposed purposes for the construction of the LSRD was for irrigation. The Lower Snake River region is currently home to over 50,000 acres of irrigated farmland supported by the LSRD system. The region, which primarily supports staples such as apples, onions, and potatoes, produces 7% of the state's grown crops. While irrigation is supplied via both water diversion and groundwater wells, dam removal would drop the groundwater level by up to 100 feet (*Lower Snake..*, 2022). Studies indicate that it would be possible to continue supporting irrigated crops in the region with infrastructure improvements. These improvements would total over $1 billion, and farmers would be responsible for the costs (*CRSO EIS*, 2020; *Lower Snake..*, 2022; *Lower Snake…,* 2019).

Navigation

Navigation by barge of the Lower Snake River primarily serves to transport wheat and other agricultural products through the Columbia River System to global markets. An estimated $542 million to $4.8 billion would be required to replace the transportation benefits (*Lower Snake..,* 2022*).* These shifts would include increased carbon emissions through trucking, and require highway and railway construction. The cost of transporting wheat to global markets without the subsidized barge transport may not be feasible for many farmers.

Conclusion

Salmon have framed the LSRD debate for decades. As populations continue to decline, it is clear that drastic measures must be taken to improve habitat for these keystone species. Removal of the LSRD demonstrates clear benefit to salmon and steelhead, but weighing this issue against the backdrop of a global climate crisis and economic insecurity illuminates the need for some concessions to made in order to achieve dam removal. Reaching certain milestones prior to drawdowns and breaching begins may be the best path forward. For example, an increase in renewable and carbon-free energy production, exceeding the current capacity of the dams, would help keep utilities costs low for customers while supporting a phase out of natural gas and coal burning in other states. Rail construction and improvements for mass transportation and goods transportation would also reduce carbon emissions, reduce energy demand, and provide a reliable way to ship agricultural products to global markets. An additional issue to be resolved before removal would be incorporating infrastructure enhancements to cropland irrigation systems into the dam removal budget, and out of the farmer's wallets. Until these milestones can be reached, increased spill will be a necessary compromise to ensure smolts can survive the dams.

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