“Salmon don’t have time for us to fix the climate”: The politics of climate change and dam breaching on the Lower Snake River

Zanna Stutz
Dartmouth College, suzanna.j.gulick-stutz.23@dartmouth.edu

Follow this and additional works at: https://digitalcommons.dartmouth.edu/geography_senior_theses

Part of the Environmental Studies Commons, Geography Commons, and the Public Policy Commons

Recommended Citation
Stutz, Zanna, "“Salmon don't have time for us to fix the climate”: The politics of climate change and dam breaching on the Lower Snake River" (2024). Geography Undergraduate Senior Theses. 10. https://digitalcommons.dartmouth.edu/geography_senior_theses/10

This Thesis (Undergraduate) is brought to you for free and open access by the Geography at Dartmouth Digital Commons. It has been accepted for inclusion in Geography Undergraduate Senior Theses by an authorized administrator of Dartmouth Digital Commons. For more information, please contact dartmouthdigitalcommons@groups.dartmouth.edu.
“Salmon don’t have time for us to fix the climate”:
The politics of climate change and dam breaching on the Lower Snake River

Zanna Stutz

Advised by Coleen Fox
Geography Senior Honors Thesis
Dartmouth College
May 31st 2024
ACKNOWLEDGMENTS

This thesis would not have been possible without the support, guidance, and encouragement of those around me.

To my advisor, Coleen Fox—the patience and insight that you brought to our conversations throughout the entirety of this process provided me with valued assurance and clarity. I am so appreciative for your help in thinking through concepts and making sense of this work. Frank Magilligan, thank you for your endless supply of stories and for the tools to see, approach, and relate to rivers in new and fascinating ways. Chris Sneddon, taking political ecology with you was the first time I could envision for myself an academic path that felt exciting and authentic to my interests. Throughout this project, I have thoroughly enjoyed getting to expand upon and implement those ideas that first introduced me to the oh-so-wonderful world of the Dartmouth Geography Department. In and out of the classroom, I feel so lucky to have been able to learn from each of you.

For me, a highlight of this work was getting to connect with and learn from each and every person that I interviewed. So, thank you to my research participants for taking the time to share with me your thoughts, reflections, and stories, and for allowing me to incorporate them into a new story. Your passion and dedication to this space are what made my work worthwhile.

I would also like to thank the Rockefeller Center Senior Honors Thesis Grant and the Dartmouth Outing Club Andrew W. Mellon Grant for providing me with the funding for this research.

Finally, thank you to my parents for your enthusiastic and unwavering support for my education. To Catie, Kira, Ulla, and Brook—your friendship, understanding, light, and love mean the world to me. Thank you all for being there along the way.
# TABLE OF CONTENTS

I. CONTEXT AND RESEARCH APPROACH.................................................................1
   Introduction...........................................................................................................1
   Methodology.........................................................................................................7
   Overview..............................................................................................................11

II. LITERATURE REVIEW.....................................................................................13
   The Politics of Dam Removal........................................................................13
   The Lower Snake River Dams........................................................................19
   Political Ecology...............................................................................................23
   Science and Technology Studies....................................................................26
   Knowledge Controversies................................................................................29

III. BACKGROUND...............................................................................................32
   The Columbia River Basin: Salmon, Indigenous Tribes, and Development.......32
   The Lower Snake River Dams: History and Services.....................................39
      Navigation.......................................................................................................41
      Irrigation.........................................................................................................43
      Hydropower...................................................................................................47
   Salmon: Population Trends, the Impact of Dams, and Recovery Efforts.........51

IV. CLIMATE IMPACTS.........................................................................................62
   The Relevance of Climate Change....................................................................63
   Pro-Dam Climate Claims..................................................................................67
   Dam Breaching Climate Claims.......................................................................70
   Conflicting Values and Responses to Climate Change..................................73
   Conclusion..........................................................................................................78

V. POLICIES AND POLITICS...............................................................................80
   Cross-Scalar Collaboration................................................................................81
   Federal Executive Power...................................................................................84
   Litigation.............................................................................................................88
   Impact of Congressional Authorization.........................................................93
   State Action.......................................................................................................95
   Conclusion.........................................................................................................97

VI. DISCUSSION...................................................................................................99
   Knowledge Controversies................................................................................100
   Policies and Politics.........................................................................................104
   Conclusion.........................................................................................................108

BIBLIOGRAPHY.................................................................................................112
I. CONTEXT AND RESEARCH APPROACH

Introduction

Humans are deeply connected to rivers. Throughout history, people have settled disproportionately along rivers, building relationships to river systems and reliance upon their interconnected components of channels, floodplains, and subsurfaces (Wohl 2020). The large-scale physical and biological processes that regulate climate and life on this planet shape many characteristics of riverine hydrology, geomorphology, and ecology. But focusing on these patterns and cycles alone tells an incomplete story of how riverscapes function because of the tremendous ways in which people have altered river processes and form.

Through these transformations, the ‘hydrosocial’ cycle or territory modifies the river’s underlying chemical, biological, and morphological properties for the benefit of some and to the detriment of others (Rodríguez-Labajos and Martínez-Alier 2015; Boelens et al. 2016). And this is because rivers are known, understood, and lived with in such a variety of ways: rivers are centers of settlement, trade, and cultural exchange; they are places of economic importance for transportation, agriculture, and energy; as habitats and migration coordinators, rivers teem with life and biodiversity, providing essential environmental services; rivers are spiritual, associated with ceremony and religious practices, understood to some as beings and ancestors; they offer spaces for recreation and leisure; rivers are intertwined with memory. Over time, the technologies developed to alter and control rivers have only deepened human dependency on riverine landscapes, adding complexity to the relationship between people and rivers.

From the mountains of Western Wyoming, the Snake River drains water from six states before emptying into the Columbia River just outside Pasco, Washington. It is the main tributary
of the Columbia River, the dominant river basin which stretches across the landscape of the Pacific Northwest. Between 1962 and 1975, the U.S. Army Corps of Engineers (Corps) constructed four multi-purpose dams on the Lower Snake River: Ice Harbor, Lower Monumental, Little Goose, and Lower Granite. For almost five decades, this interlocking system of locks and dams has supplied the region with hydroelectric power, agricultural irrigation, and barge transportation, providing 140 miles of flat water passage from Pasco, Washington, to Lewiston, Idaho. Figure 1 shows a map of the area and location of the dams.

![Figure 1: The four Lower Snake River dams ("Deep Dive: Snake River Dams," n.d.)](image)

Even before construction on these federal dams was complete, they were embroiled with controversy. The principal opposition to the Lower Snake River dams (LSRD) is rooted in their impact on anadromous fish runs, primarily salmon and steelhead. The building of these dams coincided with dramatic declines in fish populations and by the mid-1990s, all Snake River species salmon and steelhead were protected by the federal Endangered Species Act (ESA)—with the notable exception of Snake River coho which went extinct in 1978. Over the
past three decades, calls to remove or breach¹ the LSRD as a means to recover those fish populations have persisted as an enduring legal, political, and policy conflict stretching from local to national scales. Today, the American Fisheries Society cites that only 1–2 percent of the historic numbers of anadromous wild fish return to the Snake River (Banta Winters 2023), and across the Columbia River Basin, 13 distinct and evolutionarily significant populations of salmon and steelhead are listed as threatened or endangered under the ESA (Mulligan and Upton 2016). Court challenges started in 1992 in response to federal management plans for the basin and its threatened fish, and litigation challenging dam operations has continued in a series of cases for over 30 years (“Timeline: A Long Fight to Restore Snake River Salmon” 2023).

Because the dams are federally owned and operated, conflict around their management consistently reaches scales beyond that of a local or regional issue. In 2000, for example, the Clinton administration weighed in to announce that it would not support dam removal (Holland 2000). More recently, in December of 2023, President Biden committed his administration to a partnership with Oregon, Washington, and four Pacific Northwest Tribes to restore wild salmon populations in the Columbia River Basin and fund studies addressing how the services provided by the four LSRD could be replaced in the case of dam breaching (The White House 2023b). And, ultimately, any path to dam breaching must move through Congress which holds authorization power over the operation of the dams, including dam breach or removal.

¹ The structures of Lower Granite, Little Goose, Lower Monumental, and Ice Harbor each have an earthen portion. Breaching the dams would mean removing this earthen component, eliminating the reservoirs behind each dam to allow normative stream flows but leaving in place the rest of the concrete power structure.

While most of the literature focuses on “dam removal,” the discourse surrounding the LSRD largely refers to “dam breach”—though even in this context, the language of breach and removal are sometimes used interchangeably. Both would eliminate the reservoirs behind the dams along with the hydropower and navigation services that the dams currently provide. The difference between the two is technical and financial. As in the discourse and politics surrounding the LSRD, throughout this thesis, dam breach and removal should be understood as efforts fundamentally seeking the same thing.
The unique complexities of the geography, history, and impacts surrounding these dams has brought them to the forefront of regional and national discussions. The associated discourse encompasses a wide variety of spaces including legal testimony, mediation processes, public debates, and public awareness campaigns. Stakeholders involved include organizations representing the interests of farmers, the transportation industry, public utilities, hydropower, and recreators as well as environmental organizations, Tribes, local residents, politicians, scientists, and state and federal agencies.

Within this complex landscape, this research specifically seeks to answer: How is climate change influencing the environmental politics and conflict surrounding dam removal on the Lower Snake River?

The focus on climate change emerges from the ways in which climate-based claims are consistently wielded as a tool by those both in favor and in opposition to dam breaching. Central Washington Congressman Dan Newhouse, for example, purports that barge transportation “keeps 700,000 semi-trucks off the roads—and their emissions out of the air—each year” (Newhouse 2022). Northwest RiverPartners, a hydropower advocacy organization for electric utilities, similarly argues that if the region is “serious about reaching [its] climate goals, dams on the Lower Snake River must remain operational” (Miller 2022). Others, however, contend that the necessity for climate action in this current moment is precisely what has heightened the urgency for dam breaching. American Rivers states that the productivity of the Snake River basin’s high elevation spawning habitat can only continue without the dams’ impact on increased water temperatures and decreased flow speeds (“Snake River,” n.d.). In the face of climate change exacerbating near-term extinction risks, overwhelming scientific evidence is commonly called upon to support the necessity of removing the LSRD to recover Snake River salmon and
steelhead stocks (NW Energy Coalition 2022b). This perspective emphasizes dam removal as a fundamental component of river restoration to build climate resilience for these species. In direct response, however, others express skepticism as to the legitimacy of dam breaching as a science-backed solution for recovering salmon and reaching species abundance, especially given the impact of anthropogenic climate change on rising ocean temperatures (Northwest RiverPartners 2022).

As such, I ask the following research questions:

1. How is climate change affecting the knowledge controversies that underpin the LSRD environmental conflict?

2. How does climate change intersect with policies and politics around dam breach?

Answering these questions will add to understandings of river restoration and dam removal efforts within the realities of a changing climate. This is of particular importance given dam removal trends, increased attention to river restoration efforts, and climate-driven policy initiatives from state and federal governments. Within a range of future possibilities, climate change inherently requires confronting uncertain norms and shifting environmental conditions. The necessary incorporation of climate change understandings into policy decision-making increases the possible avenues through which science becomes intertwined with contested politics and political agendas. As such, it is critical to interrogate how concerns around climate change are employed to support or oppose certain positions in questions of contested natural resource management.

This thesis contributes to existing scholarship on the social and political impacts of dam removal which have been widely studied across different regions of the U.S. (Gosnell and Kelly 2010; Fox, Magilligan, and Sneddon 2016) and internationally (Jørgensen and Renöfält 2013;
Drapier et al. 2021). Efforts to remove dams are often highly contested, and previous research has emphasized the entanglement of institutional, political, and cultural factors which can drive dam removal conflicts. These include contradictory framings of the environment and the functions it provides (Jørgensen and Renöfält 2013), the intertwined role of history and identity creating attachment to place (Fox, Magilligan, and Sneddon 2016), competing interpretations of science and suspicion of outsider expertise (Sneddon, Magilligan, and Fox 2017), the complexity of managing for novel ecosystems (Magilligan et al. 2016), the multidimensional nature of restoration (Grabowski et al. 2017), interactions across multiscale networks of governance (Sneddon, Magilligan, and Fox 2021; Drapier et al. 2021), and different constructions of the conflict itself (Fox, Magilligan, and Sneddon 2016; Jørgensen and Renöfält 2013). While these studies point to similarities across a range of contexts and spaces, the specificities of place often remain central, highlighting geographically dependent circumstances (Habel et al. 2020; Magilligan, Sneddon, and Fox 2017) or the involvement of particular actors (Fox et al. 2022). As such, this thesis also contributes to scholarship that has specifically focused on the LSRD (Harrington and Cantor 2024; Hilbert-Wolf and Gerlak 2022) and their situated connection to broader conflicts within the Columbia River Basin (Blumm and DeRoy 2019).

Literature on the politics of dam removal has not, however, fully interrogated the role of climate change as a factor driving or influencing the complexity and controversy of these efforts. Researchers “perceive dam removal as a potentially critical tool for enhancing the capacity of important upstream catchments to respond and adapt to regional and global anthropogenic changes (e.g., climate change) in ecologically desirable ways” (Magilligan et al. 2016). At the same time, climate change is often recognized as a seemingly intractable environmental controversy plagued with uncertainty and integrated within antagonistic political disputes
(Magilligan, Sneddon, and Fox 2018). As a result, although the past decades have seen growing support for dam removals, “the spectre of climate change could shift some of that momentum and the associated politics” (Chaffin and Gosnell 2017), forcing a reconsideration of the benefits and vulnerabilities of dams. Addressing this gap in the literature—to answer how and in what ways climate change affects the politics of dam removal—is the aim of this thesis.

To do so, I draw on and advance core concerns of political ecology, science and technology studies (STS), and knowledge controversies. These disciplines provide a mode of analyzing environmental conflicts which centralize society-environment relationships, the social dimensions of producing scientific knowledge, and the ways in which contested knowledge interacts with social structures to produce controversy. Additionally, these approaches are widely used within existing scholarship on environmental knowledge controversies and the politics of dam removal, and will highlight how the intersection between climate change and the LSRD is wrapped up with social values, uncertainty, power dynamics, politics, and particular imaginations of the landscape. My research targets yet unrealized questions both specific to the LSRD and relevant to the broader scholarship on climate knowledge claims and dam removal.

Methodology

To address my research questions, I adopt qualitative methods of human geography which utilize a variety of conceptual frameworks “intended to elucidate human environments, individual experiences, and social processes” (Winchester and Rofe 2010, 3).

Specifically, I use semi-structured interviews to connect with stakeholders actively involved in the discourse and politics surrounding the LSRD to better understand conceptualizations of this conflict and the types of knowledge that actors bring to it. Interviews
are an effective method to investigate complex behaviors and motivations, providing insight into differing opinions or spaces of consensus (Dunn 2010). Using the semi-structured form, which is organized around ordered but flexible questioning, I followed a general outline of predetermined questions but adapted aspects of my approach across each interview to better address particular issues and expand on certain ideas depending on each persons’ knowledge and position. To conduct these interviews, I received IRB exemption from Dartmouth’s Committee for the Protection of Human Subjects. I then reached out to individuals or organizations publicly connected to the LSRD conflict including stakeholders consulted upon or actively involved with collaborative governance initiatives, public awareness and advocacy campaigns, the ongoing lawsuit, and those involved with public events on the issue. These interviews were recorded and the audio transcribed with the aid of Otter.ai. Transcriptions were then manually sorted for recurrent patterns and striking themes. Throughout this thesis, those interviewed will not be identified by name but by their position within the organization or entity from which they were speaking. With each interview, I continued to recruit participants through the snowball method. 

*Table 1* lists the individuals I conducted with 30 individuals from different organizations with a wide range of perspectives and positions on the issue:

<table>
<thead>
<tr>
<th>Organization/Entity</th>
<th>Position</th>
<th>Category</th>
<th>LSRD Breach?</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Rivers</td>
<td>Snake River Director</td>
<td>Environmental</td>
<td>Support</td>
</tr>
<tr>
<td>Nez Perce Tribe Department of Fisheries Resources Management</td>
<td>Director of Biological Services</td>
<td>Tribal government</td>
<td>Support</td>
</tr>
<tr>
<td>Earthjustice</td>
<td>Attorney</td>
<td>Legal</td>
<td>Support</td>
</tr>
<tr>
<td>Swiftwater Films</td>
<td>Director</td>
<td>Media</td>
<td>Support</td>
</tr>
<tr>
<td>Trout Unlimited</td>
<td>Snake River Campaign Manager</td>
<td>Environmental</td>
<td>Support</td>
</tr>
<tr>
<td>The Nature Conservancy</td>
<td>Idaho Conservation Manager</td>
<td>Environmental</td>
<td>Support</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------</td>
<td>---------------</td>
<td>---------</td>
</tr>
<tr>
<td>Nez Perce Tribe</td>
<td>Employee</td>
<td>Tribal government</td>
<td>Support</td>
</tr>
<tr>
<td>Idaho Conservation League</td>
<td>Salmon &amp; Steelhead Grassroots</td>
<td>Environmental</td>
<td>Support</td>
</tr>
<tr>
<td>Save Our Wild Salmon</td>
<td>Executive Director</td>
<td>Environmental</td>
<td>Support</td>
</tr>
<tr>
<td>NW Energy Coalition</td>
<td>Executive Director</td>
<td>Energy</td>
<td>Support</td>
</tr>
<tr>
<td>Northwest Sportfishing Industry Association</td>
<td>Executive Director</td>
<td>Environmental</td>
<td>Support</td>
</tr>
<tr>
<td>Blue Spruce Strategies</td>
<td>Founder and Principal</td>
<td>Consultant</td>
<td>Support</td>
</tr>
<tr>
<td>Solutionary Rails</td>
<td>Campaign Lead</td>
<td>Transportation</td>
<td>Support</td>
</tr>
<tr>
<td>Wild Orca</td>
<td>Biologist</td>
<td>Environmental</td>
<td>Support</td>
</tr>
<tr>
<td>Oregon Department of Environmental Quality</td>
<td>Employee</td>
<td>State government</td>
<td>Support</td>
</tr>
<tr>
<td>The Washington Association of Wheat Growers</td>
<td>Executive Director</td>
<td>Agriculture</td>
<td>Oppose</td>
</tr>
<tr>
<td>The Washington Policy Center</td>
<td>Senior Vice President for Research</td>
<td>Policy</td>
<td>Oppose</td>
</tr>
<tr>
<td>Northwest RiverPartners</td>
<td>Executive Director</td>
<td>Energy</td>
<td>Oppose</td>
</tr>
<tr>
<td>Pacific Northwest Waterways Association</td>
<td>Government Relations Manager</td>
<td>Transportation</td>
<td>Oppose</td>
</tr>
<tr>
<td>Tri City Development Council</td>
<td>President and CEO</td>
<td>Local government</td>
<td>Oppose</td>
</tr>
<tr>
<td>Public Power Council</td>
<td>CEO and Executive Director</td>
<td>Energy</td>
<td>Oppose</td>
</tr>
<tr>
<td>McGregor Company</td>
<td>Chairman, Outreach Coordinator</td>
<td>Agriculture</td>
<td>Oppose</td>
</tr>
<tr>
<td>AgriNorthwest</td>
<td>Farm Manager</td>
<td>Agriculture</td>
<td>Oppose</td>
</tr>
<tr>
<td>Organization</td>
<td>Position</td>
<td>Category</td>
<td>stance</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-------------------------------</td>
<td>---------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Tidewater Transportation and Terminals</td>
<td>Corporate Communications and Marketing Manager</td>
<td>Transportation</td>
<td>Oppose</td>
</tr>
<tr>
<td>Shaver Transportation</td>
<td>Farm Manager</td>
<td>Transportation</td>
<td>Oppose</td>
</tr>
<tr>
<td>Idaho Governor's Office of Species Conservation</td>
<td>Administrator</td>
<td>State government</td>
<td>Oppose</td>
</tr>
<tr>
<td>The Seattle Times</td>
<td>Reporter</td>
<td>Media</td>
<td>Other - no explicit stance</td>
</tr>
<tr>
<td>Columbia Snake River Irrigators Association</td>
<td>Vice President</td>
<td>Irrigators</td>
<td>Other - favors breaching only</td>
</tr>
<tr>
<td>Washington State Department of Transportation</td>
<td>LSRD Transportation Study</td>
<td>State government</td>
<td>Other - no explicit stance</td>
</tr>
<tr>
<td>N/A</td>
<td>Dam Removal Researcher</td>
<td>Scientist</td>
<td>Other - questions remain</td>
</tr>
</tbody>
</table>

Table 1: The organization, position, category, and communicated position on dam breach of each research participant

I was not, of course, able to interview every person or organization involved in this highly complex issue. Of particular note is my lack of direct engagement with anyone from the federal agencies that own and operate the LSRD nor with Tribal governments besides the Nez Perce who are connected to this issue or this land. To supplement the information gathered through interviews, I analyzed this conflict through news articles, documentaries, government reports, informational documents, and other types of textual sources.

In December 2023, I also conducted field work to connect with individuals in person and better familiarize myself with the Snake River landscape. I toured and spoke with people at
Lower Granite dam, the Nez Perce Tribal Hatchery Complex, Shaver Transportation’s Portland barge facility, and AgriNorthwest’s farm and irrigation facilities.

Finally, over the past year, I virtually observed public events and discussions about the dams. These included the Rise Up Northwest in Unity Convening, an event organized by the Nez Perce Tribe from November 1st - 2nd, 2023 dedicated to connecting voices in the Northwest for the protection and preservation of the region’s water, orca, and salmon, as well as American River’s Snake River Dinner Hour Monthly Webinar Series, a monthly event from February - May 2024 which aimed to provide space to “learn more about saving salmon, honoring treaty obligations, and creating solutions for Northwest communities” (“Snake River Dinner Hour,” n.d.).

Overview

The following chapter reviews the literature most relevant to this thesis. Beginning with the existing scholarship on the politics of dam removal, I also explore academic literature specific to the dynamics and history of the LSRD. This research draws on three main theoretical frameworks: political ecology, STS, and knowledge controversies. As such, I review key concepts that I later apply in my analysis including nature-society relations, scale, resilience, the co-production of knowledge, uncertainty, and the science-policy nexus. I pay particular attention to how research in each field has been applied in the study of rivers, dams, and dam removals. Chapter 3 provides background information on the Columbia and Snake River basins, focusing on the construction, services, and impacts of the LSRD, as well as trends and management strategies for fish populations over time. Scientific information and social dynamics are deeply relevant to the past, present, and future trajectories of the LSRD conflict, and it is critical to
situate this analytical research within the history of the space. Chapter 4 targets the first of my research questions. I emphasize how the relevance of climate change emerged from its interactions with both social and ecological components of the river system. Drawing predominantly from interview data, I then explore the ways in which climate change is framed within this conflict depending on actors’ existing values and positionality on dam breach. This is critical to understanding how climate change adds complexity and urgency to the knowledge controversies that underpin this environmental conflict. Chapter 5 addresses the second of my research questions to reveal how these understandings of climate change intersect with and impact the policies and politics relevant to dam breach. This section brings in more document analysis to highlight the presence of climate change within management initiatives, demonstrating its impact across multiscalar institutional frameworks. Finally, Chapter 6 provides a discussion and conclusion to this work, synthesizing my answers and highlighting my contributions to understandings of the LSRD and the politics of dam removal.
II. LITERATURE REVIEW

This thesis adds to the scholarship on the politics of dam removal which considers how and why efforts to remove dams are often highly contested. Understanding how the LSRD are entangled with the social and ecological implications of climate change is aided by deeper engagement with scholarship dedicated to the analysis of environmental conflicts. This includes political ecology and its attention on environmental restoration and resilience, STS and the production of both knowledge and uncertainty, and environmental knowledge controversies. Although these approaches have been drawn upon in previous scholarship on the politics of dam removal, it is my focus on climate change that adds a new dimension to this body of work.

The Politics of Dam Removal

The Corps National Inventory of Dams (NID) documents over 92,000 dams across the U.S. with an average age of 61 years in 2022 (“National Inventory of Dams” 2022). This points to the influence of the “golden era” of dam building across the country, which refers to the proliferation of large dams during the 50-year flurry of construction that ended around 1980 (Devine 1995). Throughout much of the 20th century, dams retained a symbolic power of unquestioned economic and social good, a physical expression of human ingenuity (Sneddon, Barraud, and Germaine 2017) and the domination of ‘wild water’ long associated with European expansion and colonization (Boelens et al. 2023). In this way, dams can be analyzed as an expression of underlying societal values and access to power; the indirect drivers that underpin economics, politics, culture, and technology—attitudes, values, and beliefs—drive human modification to rivers such as dams (Dunham et al. 2018). More recently, in the face of rising
climate awareness, hydropower dams are also being presented as key solutions to a new ‘green economy’ and ‘clean development,’ often despite the reality of large dams’ negative contribution to climate change (Boelens, Shah, and Bruins 2019). This reveals a central tension in many current discussions of hydropower and dam removal. Is hydropower ‘sustainable’? Is it ‘green’? Is it ‘renewable’? (Lundberg et al. 2017). What happens when climate goals are in conflict with the recovery of freshwater biodiversity and vital ecosystem services that also claim to be a key component of climate resiliency? (Thieme et al. 2021).

Today, the rate of dam removal in the U.S. outpaces dam building—in fact, the decommissioning rate for dams overtook the rate of construction in 1998 (Gosnell and Kelly 2010). According to the American Rivers dam removal database, over 2,000 dams were removed in the United States from 1912 to 2022, with over 40 percent of removals occurring between 2013 and 2022. Small, non-federal dams accounted for most of these removals, though the federal government owns only 3 percent of dams included in the NID (Normand 2024). Notable instances of large dam removals in the Pacific Northwest include two dams on the Elwha River removed between 2011 and 2014, and the ongoing dam removals on the Klamath River—as of May 2024, one dam has been completely removed and the removal of the three others are in progress as part of the world’s largest dam removal project to date(Willis 2024).

Dam removals are considered for a number of reasons including: hazard prevention due to safety concerns as dams age, the presence of stricter environmental regulations, because they no longer serve their original use, and as a form of ecological restoration (Habel et al. 2020; Grabowski et al. 2017; Gosnell and Kelly 2010). With aging infrastructure, the cost of keeping a dam in place can exceed the expense of its removal, especially when understood in conjunction with ecological costs and the potential for river restoration (Bellmore et al. 2017).
Dam removals are increasingly accepted as a powerful tool of river restoration. Dams impact both the water and sediment of rivers, altering the timing and magnitude of stream flows as well as the type of sediment that the river can mobilize (Grant, Schmidt, and Lewis 2003). Ecologically, the impact of dams on the river’s sediment regime and geomorphic processes reduces the quality of fluvial habitat for both resident and migratory species (Magilligan et al. 2016). Poff and Hart (2002) categorize the ecological effects of dams in three ways: the alteration of the downstream water and sediment flux modifying biogeochemical cycles and habitat characteristics; changes to water temperature influencing biological processes; and the upstream-downstream barrier impedes the movement of organisms and nutrients. Dam removals, therefore, are particularly positioned to address issues at the core of river restoration to build river resilience at the watershed scale; this includes addressing habitat fragmentation, lateral connectivity, and longitudinal connectivity (Magilligan et al. 2016).

The social implications of dam removals as a river management strategy interventions must also be considered—this shift holds promise and opportunity for establishing new water-society relationships (Sneddon, Barraud, and Germaine 2017). Dams both “act as obstructions to flowing water and contribute centrally to human modification of landscapes at multiple scales” (Sneddon 2015, 126), exemplifying a human-introduced aspect of the landscape with profound implications for the surrounding ecosystem and society. The proliferation of dam removals is a result of changing societal values toward the ecological trade-offs associated with dammed rivers (Chaffin and Gosnell 2017).

Yet efforts to remove or breach dams can generate contentious and long standing conflicts; key scholarship has focused on interrogating why. Dam removal controversies often include conflicting perceptions and interpretations of scientific knowledge (Fox, Magilligan, and
Sneddon 2016; Magilligan, Sneddon, and Fox 2017; Sneddon, Magilligan, and Fox 2017). In the context of complex environmental conflicts, such as dam removals, scientists are often called upon to rationalize one political decision over another. Their position is supposed to guarantee value-free, depoliticized expertise. But the application of this knowledge to justify controversial actions highlights how it can instead produce confusion or skepticism within the public. How the information is interpreted depends on a range of cultural and historical filters which profoundly impact the public attitude toward expert scientific knowledge (Sneddon, Magilligan, and Fox 2017).

In New England, stalled and halted dam removals studied by Magilligan et al. (2017) found that opponents of dam removal frame scientific experts as ‘outsiders’ unable to understand local values of the community (992). Privileging local knowledge and understandings of the dammed river, expert claims are frequently confronted with surprise, disbelief, and suspicion (Sneddon, Magilligan, and Fox 2017). Fox, Magilligan, and Sneddon (2016) find that these dam removal controversies are linked to different constructions of nature, micropolitics, class conflict, industrial legacies, suspicion of outsiders, and the erosion of a cherished past lifestyle. These findings are not unique to the region—in Sweden, for example, Jørgensen and Renöfält (2013) demonstrate how different understandings and valuations of the landscape and the function that it provides drive public opposition to dam removals. In these instances, resistance to dam removal is not due to a lack of knowledge, but rather how that knowledge is interpreted through existing values such as the underlying mistrust of outsiders or an aesthetic attachment to the landscape. To remove or to not remove is a function of whose history will be heard and whose voices will be respected. Druschke et al. (2017) show how conflicting prioritizations of history can drive support for different types of restoration: that of migratory fish runs or historic mill dams.
Scientific knowledge, therefore, must be recognized as just one component of this larger socio-ecological landscape which is never isolated from other types of knowledge used to evaluate the initiative in public conflicts such as dam removal (Sneddon et al. 2017). The ways in which dams can come to embody historical identity can rebut even the most ecologically reasoned rationale for removal (Magilligan, Sneddon, and Fox 2018).

In the Pacific Northwest, many large dams at the center of dam removal conflicts have been subject to Federal Energy Regulatory Commission (FERC) relicensing. The government agency issues 30-50 year-long operating licenses to non-federal hydropower projects, and given when many of these dams were constructed, the U.S. is now in the midst of many FERC relicensing processes. Chaffin and Gosnell (2017) explore how this venue has emerged as a key, but not necessarily sufficient, site to facilitate dam removals in Oregon, Washington, and California. It provides a ‘window of opportunity’ to renegotiate the social and ecological values associated with rivers and transition towards the adaptive governance of socially and ecologically degraded river landscapes (Chaffin and Gosnell 2017).

This work also draws attention to the ways in which the FERC regulatory structure is intertwined with salmon and steelhead through the Endangered Species Act (ESA) and federal Tribal trust responsibilities. The ESA requires all federal agency actions, including FERC’s issuance of a hydropower license, to consult with National Marine Fisheries Service, also known as NOAA Fisheries, to ensure that the action will not jeopardize ESA-listed species (Chaffin and Gosnell 2017). Between 2008 and 2011, for example, three dam removals in the Columbia River Basin resulted from FERC relicensing influenced by ongoing negotiations over endangered species (Grabowski et al. 2017). Additionally, FERC processes are required to consult with federally recognized Tribes under their treaty rights. Across the country, opportunities for Tribal
leadership are greater when river restoration efforts have a dam removal component, both as a result of FERC requirements and because “the dam itself as an object of intervention focuses attention on river restoration as a decolonizing practice” (Fox et al. 2022, 37). Analysis on the Klamath dams highlights this interplay between the ESA, federal-Tribal trust responsibilities, and the forum spaces provided by FERC relicensing (Gosnell and Kelly 2010).

The dynamics present in these dam removal controversies point to the importance of geographically dependent circumstances in understanding and analyzing dam removal conflicts. Even within a particular region or river system, the location of a dam can play a substantial role in why it is targeted for removal and what types of arguments are mobilized to advocate for its removal (Magilligan, Sneddon, and Fox 2017). This is also true across different countries or regions where politics, economy, and social and cultural awareness can drive different reasons for dam removal (Habel et al. 2020).

Similarly, location can strongly influence or determine the presence of particular actors. In recognition of the key role that Tribes have played in dam removals across the U.S., Fox et al. (2022) highlight how Tribal involvement provides opportunities to insert underacknowledged values and resource claims into dam removal efforts, facilitating new collaborations and alliances. This work is careful not to begin with essentialist tropes about the relationship between Indigenous peoples and river ecosystems. Rather, examples from the Ottaway, Penobscot, and Elwha rivers reveal prominent themes between Tribal involvement in dam removals, including the centrality of culture and identity and a high degree of motivation to pursue and follow through with removal. Historical marginalization and dispossession links river restoration projects to Tribal restoration projects and efforts to restore cultural tradition, sovereignty, and self-reliance (Fox et al. 2022). Sneddon, Magilligan, and Fox (2021) turn to the role of state
power and the ways that dam removals reveal how state power is maintained and contested over biophysical policy interventions. Here, it is important to remember how the politics and governance of river restoration involves a wide range of actors including government officials, property owners, environmental groups, and civil society organizations. State and nonstate actors are embedded across local, state, and federal scales, and efforts to remove dams can often be a multiscalar negotiation between the strategic priorities and desired outcomes of these actors enacted across institutional and political networks (Sneddon, Magilligan, and Fox 2021). Relational and scalar-inspired analysis of dam removals and river restoration engage with the institutional frameworks that shape the horizontal and vertical connections between these actors (Drapier et al. 2021).

Altogether, interactions between historical and geographical contingencies, institutional structure and dynamics, and place-based politics demonstrate “that no two (or three or four) dam removals are alike” (Magilligan, Sneddon, and Fox 2017, 993). As such, even as some themes, actors, and institutions are common to dam removals, it is essential to not equate the influence of different place-based settings and politics. Chapter 3 of this thesis will detail the background and history of the LSRD, but the following section provides an overview of the academic literature focused on the subject.

The Lower Snake River Dams

Research conducted thus far on the LSRD pushes back against notions that binary cost-benefit analyses between economic and environmental tradeoffs are sufficient to understand the dynamics of the conflict over dam breach. Instead, the complexity of policy enactment, the
incompatibility of worldviews, and actor alliances have been explored within this space (Clark 2004; Dorming 2018; Maas 2022; Harrington and Cantor 2024).

The longevity of the conflict over the LSRD becomes clear when considering the timeline and range of literature. Maas (2022) describes the topic as a fight through lawsuits, biological opinions, environmental impact statements, appeals, spills, and press releases, “a cycle that appears never-ending with neither side gaining leverage over the other anytime soon” (113). Despite the emergence of new science and economic analyses throughout the time that the conflict has ensued, the production of new knowledge has not resolved the debate, pointing to the selective use or critique of expertise (Hilbert-Wolf and Gerlak 2022) and the clash between fundamentally incompatible perspectives and worldview (Dorning 2018).

Clark (2004) focuses on how breaching the LSRD became a viable alternative to traditional means of fish restoration in the first place. This is considered through the three ‘streams’ in which agenda items come into practice: the problem, policy, and political streams. Dam breaching rose on the government agenda due to its intimate connection with the problem of recovering once abundant native fish runs on the Lower Snake. In the policy stream, dam breaching was launched and emerged as a viable option, and was considered, but ultimately delayed, by the Clinton administration and NOAA Fisheries in favor of other measures. The 2000 presidential victory of George W. Bush brought the viability of this alternative to an end—during his campaign he stated, “I have consistently said that we should not destroy these dams.” (Clark 2004, 607). This stands in contrast to the campaign promises of Vice-President Gore who proposed the convening of a Salmon Summit (Wegner 2003). The position of president and their political appointees have long been central participants in the debate over the LSRD. Wegner (2003) ultimately concludes that in the 2000 election, “a future vision of a region that
recognizes the importance of salmon was scuttled in the political debate” (438), similar to the takeaway of Clark (2004) that events in the political stream ultimately outweighed the problem stream.

More recently, Hilbert-Wolf and Gerlak (2022) propose the science-economy-stakeholder nexus as an analytical framework through which to study the LSRD. The politicization of scientific and economic knowledge is supported by the sense that “stakeholders may be driven to choose science that aligns with their values, rather than being driven to choose a management option based on scientific facts” (Hilbert-Wolf and Gerlak 2022, 1362). These findings support the understanding that how to manage the dams is not just a scientific or technical decision but, rather, embedded in a complex socio-ecological system. While the courtroom has been the dominant formal venue for the LSRD conflict, other spaces have attempted to foster dialogue and stakeholder engagement (Hilbert-Wolf and Gerlak 2022). Litigation, especially through the ESA, is viewed by some as a critical tool to win legal battles on behalf of salmon, though others see it as an ineffective approach that has yet to provide comprehensive solutions (Harrington and Cantor 2024). To better understand the dynamics of these stakeholders, Harrington and Cantor (2024) draw on political ecology and ‘unlikely alliance’ scholarship to examine why some stakeholders took unexpected positions on a specific dam removal proposal, the Columbia Basin Initiative (CBI) proposed in 2021 by Representative Mike Simpson, a Republican from Idaho. They find that nearly all of their interviewees expressed overwhelming agreement that salmon and steelhead populations need to be ‘saved’ with the disagreement emerging around what strategies and compromises should be used to achieve their survival (Harrington and Cantor 2024). This complicates notions of the conflict defined simply as dams vs. salmon. Additionally, of those interviewed, support for dam removal was not sufficient to ensure support of the CBI or
vice versa—presumed supporters of dam breaching, for example, opposed the CBI due to its legal moratorium and the perceived lack of accountability for industries. This case study illustrates the importance of considering nuance and variety of opinion within the alliances and collaboration necessary to find creative and holistic solutions to the LSRD (Harrington and Cantor 2024).

Harrington and Cantor (2024) also point to the complexity of how this information has been mobilized in opinions and alliances on LSRD removal. One Tribal member and policy analyst that they interviewed, for example, linked the growth of inter-Tribal relationships being built around salmon recovery to the increasing climate crisis. Additionally, in recent years, hydropower representatives opposed to dam removal have couched their opposition in terms of climate policy, utilizing the climate crisis as “the perfect reason to rebrand the need for hydropower and, in doing so, maintain the status quo” (Harrington and Cantor 2024, 13).

This work is an important start for understanding how climate change interacts with shifting values about the river with implications for environmental governance, alliance building, and, ultimately, dam breach. In particular, it has been identified that “climate resilience is an increasingly important topic in conversations and decisions regarding dam removal” and an important site of future research (Chaffin and Gosnell 2017, 835). Further engagement with core concepts from political ecology, STS, and knowledge controversies reveals further insight into the nuances of climate arguments and how they are being mobilized around the LSRD through politics and institutions across scales.
Political Ecology

Political ecology is a discipline that has been applied to a very broad set of concerns but it revolves around the relationship between society and the non-human environment. This “riotously diverse field” (Bridge, McCarthy, and Perreault 2015, 3) draws attention to the social, economic, and political relations connected to environmental problems and knowledge production (Forsyth 2011), highlighting the uneven distribution of costs and benefits associated with environmental change (Neumann 2009). As a field of inquiry and set of approaches, Robbins (2004) describes political ecology as “empirical, research-based explorations to explain linkages in the condition and change of social/environmental systems, with explicit considerations of relations of power” (12).

Defining characteristics of the political ecology framework include the use of spatial and temporal scales to analyze power dynamics present in the society-nature relationship (Neumann 2009). Multiple scales of analysis is foundational in political ecologists’ approach to understanding the driving forces behind environmental change (Meyer and Turner 1992; Nietschmann 1979). Scale has been theorized in its own right with attention to how scalar configurations are produced, undone, and reproduced through political struggle (Purcell and Brown 2005). Political ecology also breaks down the nature-society binary—instead, humans are recognized as part of nature and nature as part of society in “the intimate, sensible and hectic bonds through which people, organisms, machines, and elements make and hold their shape in relation to each other in the business of everyday living” (Whatmore 1999). Such a fluid boundary is necessary for the analysis of this thesis—the river’s flow, afterall, crosses and links physical, political, and cultural domains (Boelens et al. 2023). Because dams are nested within watersheds, the impact of their presence and removal must also be recognized across larger
scales (Magilligan et al. 2016). In fact, as explained by Middleton (2022), large hydropower dams perhaps epitomize the focus of political ecology— they are “major human artifacts that disrupt biophysical processes, rupture nature-society relations, enclose commons, redistribute (or dispossess people of) access to resources and their related benefits, and exist within political economic processes and power relations that almost always privilege elite interests” (251).

Through these core concepts, the political ecology framework helps better understand specific meanings of restoration practices by emphasizing the local, political, and cultural impact on environmental knowledge production (Fox, Magilligan, and Sneddon 2016). Determining that a landscape is in need of restoration, or what the target conditions of such efforts should be, demonstrates how ecological restoration is a value-driven social process (Bliss and Fischer 2011). Understanding restoration choices, therefore, “requires not only a firm foundation of sound ecological science but also a critical understanding of the dynamic interactions and relationships among people and between people and the landscapes they inhabit” (Bliss and Fischer 2011, 144). This critical lens is important in asking for whom, through what institutional practices, and in search of what goals restoration is occurring (Elias, Joshi, and Meinzen-Dick 2021).

To better understand restoration initiatives, this thesis also draws upon ways in which political ecologists have theorized applications of resilience within socio-ecological systems, a conceptualization frequently applied to river systems (Boelens et al. 2023) including the highly managed and regulated Columbia River Basin (Hand et al. 2018; Hirsch 2020). Dam removal as a form of river restoration is cited as “an important strategy for climate mitigation and adaptation” (American Rivers 2022, 4) because “free-flowing rivers are naturally more resilient to the impacts of climate change” (American Rivers 2022, 1). In changing social and ecological
conditions, specifically around climate change, dams are seen as a cause of decreased resilience in systems (Chaffin and Gosnell 2017) with dam removal poised to improve resilience at the watershed scale (Magilligan et al. 2016). In fact, coupled with sustainability, adaptation, and mitigation, resilience arguments are dominant in the discourse and debates over socio-ecological transformations (March and Swyngedouw 2022).

The resilience of socio-ecological systems can be understood as “the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks” (Walker et al. 2004, 1). This is reflective of the origins of the resiliency framework within systems ecology in the 1970s which focused on how systems retain cohesiveness under stressors such as drought (Watts 2015). But the concept of resilience has “rapidly infiltrated vast arenas of the social sciences” (Walker and Cooper 2011, 143) as a buzzword in both academia and public policy. Applied to communities, “socio-ecological resilience refers to the ability of a community to utilize available resources to respond to, withstand, and recover from crises and natural disasters” (Mauer 2020, 612).

Frequently deployed as a risk-management tool for adaptive capacities in a changing climate, resiliency then points to the amount of change a system can undergo while still retaining the same controls on function and structure (Watts 2015).

As a result, political ecologists have critiqued that shifting resilience from an ecological to social application naturalizes its role within socio-ecological processes, disavowing historically contingent power relations that shape vulnerability and exposure to risk (March and Swyngedouw 2022). Mackinnon and Derickson (2012) argue that the concept of resilience “is conservative when applied to the social sphere” (254), similar to the understanding of resiliency adaptation as “technocratic and politically conservative” (Watts 2015, 38). While these
characterizations may seem counter to the ways in which climate resilience is invoked in support of dam removal as a form of river restoration, they provide the critical reminder to ask why, how, and for whom resilience capacity is being built. This is especially true if these efforts seek to overcome ‘bounce back’ resilience approaches and instead enact transformational relationships and responsibilities (Mauer 2020).

**Science and Technology Studies**

The field of STS includes historical, philosophical, and social perspectives on science to examine the politics of scientific knowledge production and the role of uncertainties associated with scientific knowledge claims. As its central premise, STS understands scientific knowledge and expertise to be co-produced with the surrounding political, economic, and cultural arrangements (Sneddon, Magilligan, and Fox 2017). Grounding scientific analysis in social reality, ‘co-production’ proposes that “the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it” (Jasanoff 2004, 2). This conception makes it a natural extension of political ecology which has historically engaged with the application of science in natural resource conflicts. A combined approach, therefore, recognizes the interconnection between the production, circulation, and application of science to produce analysis that better reflects these integrated processes (Lave 2012). Understanding the politics of environmental science highlights just how important the process of knowledge production is to shaping what we understand about environmental systems and, by extension, the steps that are taken to address environmental problems (Forsyth 2011).

How science is practiced fundamentally shapes the knowledge that is generated (Lane 2014). As a result, control over this underlying process produces particular narratives or limits
opposition to the status quo. An example of this can be seen in how the hydropower industry in Laos has limited the collection of facts required to validate the sustainability of hydropower (Middleton 2022). Despite the efforts of scientists to depoliticize scientific knowledge and maintain boundaries around the credibility of this knowledge, conflicts such as dam removals highlight the co-produced nature of science and the pre-existing social order (Sneddon, Magilligan, and Fox 2017). Not only does science inform policy, but its production is also informed by policy (Lane 2014). With regards to dam removal, the integration of politics, finance, environment, society, and technology make it clear that apolitical scientific labor is impossible (Grabowski et al. 2017).

Hirsch (2020) demonstrates this by utilizing an STS approach to examine the scientific practice supporting ecological restoration in the Columbia River Basin, particularly in the adaptive context of a changing climate. The tools of STS look at what scientists are actually doing and examine the structures that support scientific work including scientific practices, institutions, and material spaces. This is critical because “what scientists choose to measure and count, and how they classify those objects of research have material consequences” (Hirsch 2020, 173). Monitoring standards in the Columbia River Basin to meet the requirements of the ESA, for example, elevates those qualities of the ecosystem while others are likely to remain uncounted or invisible. This creates a management structure that facilitates a particular sociotechnical imagination (Hirsch 2020).

An extension of this effect can be seen through FERC relicensing proceedings. This unique policy mechanism includes data and scientific research to consider how a dam impacts suggested and mandatory conditions for licensure (Chaffin and Gosnell 2017). Additionally, understanding that scientific practices are conducted within the context of cultural values,
specific to time and place, highlights the ways in which these practices can shift over time. Management strategies change not, necessarily, because the river or the fish are changing but because of change in the science and institutions constructed to understand them. In the face of climate change, this adaptive ability must be drawn on for the continued development of river restoration practices (Hirsch 2020, 85-86).

Alongside the production of knowledge, STS scholarship also focuses on the production of uncertainty. Uncertainty is an important element to explicate within environmental knowledge controversies because it is a necessary component of a robust scientific practice (Whatmore 2009). The nature of science advances through showing elements of scientific knowledge to be incorrect, formulating questions that motivate new scientific inquiry—in other words, “science proceeds by producing uncertainty and not certainty” (Lane 2014). The entry of these same uncertainties into public discourse, however, can then undermine expertise or catalyze disappointment (Whatmore 2009; Sneddon, Magilligan, and Fox 2017).

Dam removals and the controversies which surround them, must manage this uncertainty associated with the production of scientific knowledge. In fact, some complexity in decisions about dam removal exists because there is scientific uncertainty over the potential environmental benefits of dam removal. Variations across dam and river attributes lead to variations in ecological impacts of dams and the restoration potential of dam removal (Poff and Hart 2002). This is not to say that dam removal isn’t supported by significant scientific expertise underpinning the river’s response (Grant and Lewis 2015). Certain expectations guide the process based on river science and boundary conditions. Yet, compared to other river restoration projects, there is more uncertainty regarding the magnitude and spatial extent of the restoration response because, in some ways, “every dam removal is a singular experiment” (Fox,
Magilligan, and Sneddon 2016, 96). This uncertainty enables greater opportunity for scientific knowledge to be contested by various stakeholders on the basis of their particular normative interpretations of the environment (Fox, Magilligan, and Sneddon 2016).

**Knowledge Controversies**

Key work has focused on dams as manifestations of different knowledge regimes or knowledge controversies (Boelens, Shah, and Bruins 2019; Fox and Sneddon 2019). This starts with the acknowledgement that there are many valid ways of knowing nature, including the ecological sciences as well as the physical experience of being in a place (Jørgensen 2017). Epistemological approaches target these diverse narratives, knowledge systems, and their political implications. Boelens et al. (2019) propose that all mega hydro-technological systems include disputes between different knowledge regimes, by which they mean the deeply rooted values, norms and principles that promote a particular vision. They highlight dominant expert and multiple lay forms of knowledge that interplay in dam development interventions. This is a process of constructing ‘hydrosocial realities,’ whereby different grounds for claiming the truth produce fierce struggles over exclusion and legitimation (Boelens, Shah, and Bruins 2019). The work required to establish a particular way of how things function or how things are is also inherently political and connected to the claiming of legitimate authority (Götz and Middleton 2020). Fox and Sneddon (2019) specifically focus on major hydroelectric dam construction in the Mekong River Basin and highlight this exact process in the interaction between engineering/technical knowledge and scientific/ecological knowledge. In pursuing what knowledge becomes taken as truth vs. what is dismissed, they connect political and
epistemological boundaries, emphasizing the politics of contested knowledge in large dam governance (Fox and Sneddon, 2019).

Knowledge controversies connect the work of political ecology and STS; they can be understood as “those events in which the knowledge claims and technologies of environmental science, and the regulatory and policy practices of government agencies that they inform, become subject to public interrogation and dispute” (Whatmore 2009, 588). This provides a way of understanding the contentious politics that can be generated around environmental conflicts, including those surrounding dam removal. As recognized by Braun (2015), ecological novelty in the face of anthropogenic climate change poses epistemological and political challenges for restoration efforts because “it undermines the basis on which to make normative judgments or prescriptions about the composition of socio-ecological worlds” (Braun 2015, 108). Indeed, within a changing climate, dam removal as a form of river restoration must consider questions about what it means to manage for a novel ecosystem where human-altered systems have fundamentally shifted the ecological reality (Magilligan et al. 2016).

This uncertainty enhances the challenging politicization of environmental controversies that exist at the science-policy nexus (Sarewitz 2004). Sharman and Perkins (2017) describe these instances as “fundamentally about whose evidence, opinions, arguments and framings are influential, and whose politics and science come to have authority within a contested domain” (2283). How conflicting claims are represented and translated into actual policy directly builds off “the question of ‘whose knowledge counts’, and when it counts, [which] constitutes a key element in explicating conflicts over dam removal and working towards more desirable socioecological outcomes” (Sneddon, Magilligan, and Fox 2017, 678). The processes involved in
dam removals can therefore be understood as cooperation or controversy between different types of knowledge embedded into social groups, politics, and environmental activity.

When analyzing climate change, the lens of knowledge controversy is particularly relevant. In what is often a highly divisive public debate, conflicting knowledge claims and valuations of evidence and expertise are assembled to support different points of view through scientific, economic, and values-based rationales. These different knowledge practices are called upon to achieve issue salience in the public domain and strive for potentially contradictory policy outcomes (Sharman and Perkins 2017). The politics of climate change within the context of the LSRD is highly relevant, revealing the value-based claims of stakeholders and the institutional pathways through which they are enacted.
III. BACKGROUND

The following section provides background information on the Columbia and Snake River basins, the construction, services, and impact of the LSRD, and the trends and management of fish populations over time. A wide-range of actors participate in the discourse, politics, litigation, and governance relevant to these dams, each driven by a particular relationship to and imagination of the Snake River and the surrounding landscape. These include Tribes, industries, state and federal agencies, and NGOs. Understanding the geography, ecology, and social history relevant to the conflict over the LSRD is critical to situate the involvement and stances of these actors.

The Columbia River Basin: Salmon, Indigenous Tribes, and Development

The Columbia River Basin is the fourth largest in North America (“Columbia River Basin Dams,” n.d.). Together with the Snake River—its largest tributary by both length and volume—the Columbia River Basin covers 258,000 square miles across seven states and one Canadian province (“Columbia River,” n.d.). Within the basin’s streams and rivers, salmon once occupied nearly 13,000 miles. All species of salmon, along with the Pacific lamprey, are anadromous, meaning that juveniles rear in freshwater streams, migrate to the ocean to grow and mature, and return to their natal streams as adults to deposit their eggs (“Columbia River Salmonids,” n.d.). A Snake River Spring Chinook, for example, could begin life in the mountains of central Idaho, travel more than 900 miles to the sea and, two to three years later, climb thousands of feet in altitude on its return. The fish returning to the headwaters of Idaho’s Salmon
River, the largest tributary of the Snake, spawn at higher elevations than any other salmon and steelhead in the world ("Snake River," n.d.). The majority of salmon die after spawning once.

![Figure 2: The Columbia River Basin ("Columbia River Basin," n.d.)](image)

In the beginning, it was salmon that drew humans to the river (White 1996, 15). Indigenous people of the Pacific Northwest have long inhabited land throughout the Columbia and Snake River Basins shown in Figure 2, building thriving cultures and communities that depended on salmon for subsistence, commerce, and culture. Since the last ice age, Indigenous people have fished the Columbia River Basin for salmon (Hirsch 2020, 43).

Although there are many different Tribes and cultures in the Columbia Basin, salmon have shaped the lives of the people who lived there since time immemorial. Radiocarbon dating of archaeological sites near the confluence of the Snake and Salmon River in western Idaho
indicates that people repeatedly occupied the Columbia River Basin starting between 16,560 and 15,280 years ago (Davis et al. 2019). Some Tribes in the Columbia River Basin self-identify as ‘Salmon People’ for how completely these sacred fish shaped their culture, diets, societies, and religions (“We Are All Salmon People,” n.d.). For example, the creation story of Nimíipuu (Nez Perce people) describes the basis of an ancient covenant to protect salmon: “Before the time of any written law, there were laws written on the land… Salmon was the first [of the animal people] to stand up and take care of us. And then they all became silent. Because of this, we must speak for them, for the benefit of all life. This is our sacred law given to us by the land” (Anderson 2023, 1:06-2:19). Salmon are also celebrated as a way to respect and appreciate the renewal and continuation of life. As one of the traditional “First Foods,” salmon have been honored at Tribal ceremonies for thousands of years (“We Are All Salmon People,” n.d.). They provide a crucial source of nutrients and sustenance because intercepting salmon in their return journey from the ocean captures protein-rich marine-derived nutrients (White 1996, 15). Before colonial settlement, salmon harvests also gave the Native people of the area the highest standard of living of any of the Tribes in North America (Blumm 2022a). Most importantly, the question of salmon is one of spiritual and cultural identity—as described by Jeremy Takala, a member of the Yakama Nation Tribal Council, at the Salmon Orca Summit outside the U.S. Capitol in 2022, “salmon extinction is not an option. This is a cultural damage that we could never repair for our Native nations, and for all citizens across the Pacific Northwest and the United States” (Anderson 2023, 54:33-54:42). Nakia Williamson, director of the Nez Perce Cultural Resources Program similarly characterizes what is at stake: “We wouldn’t be able to replace the salmon with anything else. For us, it would mean our whole lives would change, and a big part of who we are would be gone” (Anderson 2023, 20:35-20:49).
With white settlement, the human landscape of the Columbia River Basin shifted dramatically. Encouraged by the Lewis and Clark expedition of 1803-1805, white settlement accelerated with the Oregon Trail in the 1830s. By the 1850s, settlers had brought diseases like smallpox for which the Native people lacked immunity and Native populations along the Columbia River plummeted by 90 percent (Blumm 2022a). As the number of settlers simultaneously increased, the United States wanted to ensure land continued to be available and entered into a series of key treaties with Tribal nations.

Between 1854 and 1856, Washington Territorial Governor Isaac Stevens negotiated what are now known as the Stevens Treaties: eight treaties with Tribes in what would become the state of Washington. Through these treaties, Tribes ceded some 64 million acres of land to the federal government and secured promises that their hunting, fishing, and gathering practices could continue (Blumm 2022a). Specifically, many treaties contained provisions reserving the Tribe’s right to continue to take fish “at all usual and accustomed grounds and stations,” both on reservation lands and beyond. This type of language appears in the 1855 treaties between the United States and the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes and Bands of the Yakama Nation, and the Nez Perce Tribe—the four Tribes directly involved in the legal dispute over the management of the Columbia River System (“The Founding of CRITFC,” n.d.). This establishes a direct connection between the cession of lands, Treaty guaranteed rights, and the ability of Tribes to continue to fish.

The legal relationship between Tribes and the federal government is a complicated one, defined by the underpinnings of Federal Indian Law. But treaties are, under the Constitution, the “supreme Law of the Land” (“About Treaties,” n.d.), and understood as a contract between
sovereign nations. Key court cases have affirmed that Tribes retain access to traditional fishing locations, however distant from the reservation, and also that there must still be fish there for them to catch.

As early as 1905, in the Supreme Court case *United States v. Winans*, the Supreme Court affirmed that Tribes could not be excluded from fishing on their traditional grounds. It affirms the view that in these treaties, Tribes gave up certain rights—land rights—and reserved other rights to subsist on the landscape through access to accustomed fishing grounds. Treaty based fishing rights were also upheld in the landmark 1974 case *Washington v. United States*, also known as the Boldt decision and the 1979 case *Washington v. Washington State Commercial Fishing Vessel Association*. The court viewed the treaty language as “unambiguous” in securing Tribal rights to a share of each fish run passing through all usual and accustomed grounds and stations,” on or off the reservation. The decision emphatically upholds this treaty right, recognizing it as a contract negotiated between two sovereigns via the intention that the Tribe would have understood, and guarantees the right for Tribes to take up to fifty percent of the available fish for harvest to provide “a moderate living.” More recently, in 2018, the 9th circuit opinion of *Washington v. United States* found that treaty rights for access to fish also includes some level of ecosystem protection to ensure the continued presence of fish. As such, securing treaty rights required restored fish runs and, by extension, a restored river. The migratory nature of salmon is such that these treaty-based fishing rights can be used to compel widespread ecosystem protection outside of Indian country. *Figure 3* shows both the historic and reservation lands of four Tribes as situated within the Columbia River Basin.
Not only did white settlement alter the human geography of this landscape, but it also brought with it a particular imagination of the river and its natural resources. To the Euro-Americans arriving to the region in the mid-1800s, the salmon of the Columbia River represented a kind of “gold-rush” and after the technology of fish canning was introduced in the 1880s, the “fish-rush” really began (Hirsch 2020, 44). Canning was the technology that enabled salmon to be mass-marketed, solving the problems of palatability and transportability. Fish could be processed as fast as they were caught and, as the Oregonian reported in 1881, “a fortune was expected and made each season” (Goble 1999, 235). Fisheries technologies also changed to reflect a cultural imagination that saw salmon as commodities to be exploited for a profit without regards to the future: traps, nets, and wheels fed the canneries demand for fish (Goble 1999).
Similarly, the growth of dams in the Columbia River Basin is a manifestation of how technological optimism and a sense of managerial expertise were imposed upon the ecologically driven system. Under the 1920 Federal Water Power Act, the federal government began building and regulating dams. This accelerated with the New Deal in the 1930s as a response to the Great Depression and World War II, continuing into the 1970s, largely under 1940s authorization (Blumm 2022a). Across the country, the government sought to put nature to work through large-scale investment in infrastructure and regional planning (Hirsch 2020). The immediate federal goal, as stated in 1926 by Secretary of Commerce Herbert Hoover, was the “coordinated long-view development of each river system to its maximum utilization” (White 1996, 54). Managerial expertise, it was argued, could provide the greatest good for the greatest number. Rivers could provide an endless supply of trees, wheat, fish, and electricity allowing lawmakers and administrators to say “yes” to nearly everyone. Through careful machine-like management of the rearranged parts of “nature,” it would be possible to have it all: slack water for shipping, turbines for power production, and fish for fishers (Goble 1999, 232). And even as fish runs declined, managers turned to hatcheries as the answer, relying on engineering solutions to right the imbalance of the system and continue the claim that the region could have both cheap electric power and salmon available for harvest (Blumm 2022a).

Across the Columbia River Basin, there are now around 250 reservoirs and 150 hydroelectric projects, including 18 mainstem dams on the Columbia and the Snake (“Columbia River Basin Dams,” n.d.). Serving the combined interests of navigation, irrigation, and power, 31 hydroelectric projects drive the Federal Columbia River Power System and make the Columbia Basin home to the largest interconnected hydroelectric system in the world (Blumm 2022a). The massive scale of dam-building and irrigation enabled rapid economic growth, propelling the
region forward as a hub for agriculture, manufacturing, and tech. Hydroelectric dams in the Columbia Basin continue to provide over half of the electricity-generation capacity of the Pacific Northwest (Hirsch 2020). Another way to think about this, however, is that the wealth of the river has been transformed into energy production, transportation, and irrigation for the benefit of those users and to the detriment of salmon as well as the communities and Tribes that rely on them (Washington Governor’s Office 2022).

Even as this “Organic Machine” was being built (White 1996), the probable consequences to salmon were known. In 1946, the United States Fish and Wildlife Service recommended an indefinite moratorium on the construction of additional Columbia and Snake River dams based on the cumulative impact of dams on salmon. But these objections were ignored by industry interests, drowned out by the pride of American ingenuity and the exuberance to “tame” and “harness” nature (Goble 1999, 247).

The Lower Snake River Dams: History and Services

It is within this context that four multi-purpose dams were built on the Lower Snake River between 1962 and 1975. Ice Harbor, Lower Monumental, Little Goose, and Lower Granite are four of the 31 dams that collectively drive the Federal Columbia River Power System which is governed collaboratively by three U.S. government ‘action agencies’—Bonneville Power Administration (BPA), the Corps, and Bureau of Reclamation.

In 1938, the Army Corps of Engineers shifted its attention from the mainstem Columbia River to the Lower Snake River. The revised Columbia Basin plan marked a change from emphasizing hydropower generation to the interests of navigation. This was in recognition of the lack of an apparent market for the hydropower being generated by the Bonneville Dam and the
soon to come Grand Coulee project. It was also in direct response to shipping and agricultural lobbying seeking a navigation channel to Lewiston, ID (Blumm 2022b).

These efforts proved successful when Congress almost casually authorized “such dams as are necessary” on the Lower Snake in the River and Harbor Act of 1945. Without even mentioning the dams by name, their express purposes were for “providing slack water navigation and irrigation” and “surplus electric energy generated” was to be governed according to the existing laws concerning Bonneville Dam. Authorization, funding, construction, and operation of the four LSRD proceeded despite the Corps’ own cost-benefit ratio of fifteen cents on the dollar. In addition to the services that the dams would provide, Congress also viewed them as beneficial make-work projects for soldiers returning from World War II to combat fear of a post-war recession (Blumm 2022b).

The four dams transformed the Lower Snake into an environment suited for slack-water navigation, adding 140 extra miles of barge access from Pasco, WA through the lock and dam system to Lewiston, ID. 465 miles from the Pacific Ocean, Lewiston functions as a deep-water sea port and is the furthest inland sea port in the country. Distinct from the storage reservoir dams that also exist within the Columbia River Basin, the LSRD are run-of-river dams: they provide hydraulic head for hydropower generation and give sufficient water depth over rapids to permit barge navigation, but have limited capacity for water storage with reservoir water levels varying only three to five feet in normal operations (Bonneville Power Administration, U.S. Bureau of Reclamation, and U.S. Army Corps of Engineers 2001). Today, the LSRD continue to provide three industry services: navigation, irrigation, and hydropower.
Navigation

The LSRD make up part of the larger Columbia Snake River System, designated as part of the nation’s “Marine Highway” (“Columbia Snake River System,” n.d.). The System includes eight dams and navigation locks, four on the Columbia—Bonneville, The Dalles, John Day and McNary—and the four projects on the Lower Snake. Barge transportation enabled by the LSRD provides a reliable, cost-effective, and carbon-efficient shipping method. From 2002 to 2020, an average of 4.2 million short tons of commodities were transported each year on the Lower Snake River system, including upriver and downriver traffic (Washington Governor’s Office, 40). Upriver shipments represent a smaller proportion by weight and volume and are primarily chemicals, fertilizers, and wood chips. Fuel and other petroleum products are included in analysis of commodities shipped upriver by the Corps; however, transport of these goods terminates at a fuel facility at the Port of Pasco on the Lower Snake but below Ice Harbor dam, not passing through any of the LSRD. Petroleum products have not been transported through Ice Harbor or any of the LSRD since 2011. Infrequently, the barge system is also used to transport oversize cargo destined for the interior U.S., but the predominant downriver commodity shipped by barge is wheat (Washington Governor’s Office 2022).

The Columbia Snake River System is the nation’s single largest gateway for wheat exports, transporting 60 percent of all U.S. wheat bound for markets overseas (Pacific Northwest Waterways Association, n.d.). Of the total wheat exported from the Pacific Northwest, from 2002-2020, 37 percent moved by barge through the Columbia River and 22 percent was shipped on the Lower Snake River (Washington Governor’s Office, 40). The wheat that uses the bargeing system is from the inland Northwest, with the exception of one rail to barge transfer station in Boardman, OR on the Columbia below the confluence with the Snake. 

---

2 Interview with Vice President, Shaver Transportation, November 20th, 2023
For growers in the Snake River region, wheat producers use trucks to send their product to nearby storage facilities. These facilities are either associated with a rail line or with the river. Accordingly, wheat is then loaded onto barges or railcars destined for exporters on the lower Columbia River. There are 13 grain elevators on the lower Snake that receive wheat from trucks and enable transfer to barge. There are only two tugboat companies on the Columbia Snake River System that barge wheat: Shaver Transportation and Tidewater Barge Lines. For each of them, about 45 percent of the wheat that they transport comes out of the Snake.³

The cost of shipping wheat and other commodities by barge is, in part, subsidized by federal funding for the LSRD that covers the operation, maintenance, and capital costs of the lock and dam system. With these subsidies, bargeing is the lowest-cost option per ton-mile for wheat shipping that allows Pacific Northwest growers to connect to global agricultural markets. In 2020, the cost to transport wheat via rail was estimated at a rate between 50 cents and 75 cents per bushel while barge rates were estimated between 30 cents and 45 cents per bushel (Washington Governor’s Office 2022, 41). The competition that bargeing provides against rail lines is pointed to as a key benefit that enables the livelihoods of wheat growers across the region (Mapes 2013). Those who rely on the bargeing system also point to the system’s responsiveness, high capacity, and safety ratings.

Even so, Figure 4 shows that bargeing usage has decreased over time. This is demonstrated by looking at the number of barges passing through the Ice Harbor locks, the lowest of the LSRD through which any barge utilizing the Lower Snake River must pass:

---

³ Interview with Vice President, Shaver Transportation.
Figure 4: Barge usage through Ice Harbor Lock, 1993-2020, (U.S. Army Corps of Engineers 2021)

In 1998, Lower Snake River freight volume was 9.14 million tons. The average tonnage between 2014-2017, however, was only 2.64 million tons, representing an average volume decline of 71 percent. Today, grain makes up about 90 percent of all freight transported through the LSRD locks, largely because this section of the barge system no longer transports logs, lumber, pulp, paper, pulse or petroleum (Laughy 2018).

**Irrigation**

The reservoirs created by the LSRD support around 50,000 acres of irrigated farmland in southeast Washington. As shown in *Figure 5*, about 97 percent of these acres are irrigated with water from Lake Sacajawea, the reservoir created behind Ice Harbor Dam (Washington Governor’s Office 2022, 58). Irrigators use surface water pumps that divert water directly from
the reservoir as well as groundwater wells that rely on the heightened water table resulting from the reservoir.

![Figure 5: Irrigated farmland behind Ice Harbor Dam (Mapes 2021)](image)

Importantly, farmers who draw from the Lower Snake for irrigation are a completely separate group of stakeholders from growers shipping wheat through the LSRD lock system; each use the river in different ways and have distinct interests in the services provided by the dams. Of those irrigating from the Ice Harbor pool, the single largest landowner is the Church of Jesus Christ of Latter-day Saints in Salt Lake City. Other prominent owners include the Hancock Natural Resource Group based in Boston; the Ontario Teachers’ Pension Plan from Toronto; International Farming based in Raleigh, North Carolina; and Nuveen Alternatives Advisors LLC, from Champaign, Illinois (Mapes 2021).
The Columbia Basin holds some of the nation’s most productive farmland due to the combination of fertile soil, a long growing season, and reliable access to high quality water for irrigation. The sandy loam soil also enables easy growing of root crops and efficient harvesting.\textsuperscript{4} By acreage, irrigated farmland is valued much higher than dryland farming. It can be up to 30 times more profitable and employ 15 times the number of full-time staff throughout the year with thousands of seasonal workers during harvest. This makes irrigated agricultural products of the Lower Snake an important component of the Washington economy; in 2021, the production of all irrigated crops along the Snake River was estimated at $327.9 million (Washington Governor’s Office 2022, 57).

Within the 50,000 acres of land irrigated behind Ice Harbor, the predominant irrigated crops are apples, onions, and potatoes as well as grapes, sugar beets, corn, wheat, and carrots (Washington Governor’s Office 2022, 57). These food crops directly connect the activities of the region to the food that shows up on people’s plates across the U.S. and the world. For example, annually, these acres produce enough apples to feed 18.5 million people alongside enough sweet corn for 19 million people, and potatoes to feed 6.5 million (“Hear from Columbia Basin Farmer Blaine Meek” 2023). Irrigation is pointed to as necessary for reliable, quality food crop production, and the use of center-pivot irrigation machines by large farms in the region creates a highly efficient irrigation system.\textsuperscript{5}

If the LSRD were to be breached, the water is expected to lower up to 100 feet. Both wells and direct water withdrawals for agricultural use would be impacted by the drawdown of Lake Sacajawea (Washington Governor’s Office 2022, 58). In the case of breaching, the expectation is that the infrastructure could be updated and engineering solutions could be

\textsuperscript{4} Interview with farm manager, AgriNorthwest, December 21st 2023.
\textsuperscript{5} Ibid.
implemented such that the current needs of irrigators would continue to be met. This would include longer pipes to reach the new water level, additional pumps, and deepened wells—essentially, “extend the straws” to reach the new water level and allow irrigation to continue along the Lower Snake.  

A question remains, however, about how these needs would be addressed during the process of drawdown itself due to the increased turbulence and sediment transport of the unstable river bed in that period of transition. Nevertheless, these irrigators have secure water rights, and the Washington State Department of Ecology has indicated that there is sufficient water in the river for their needs, even in late summer.

In the breach scenario, more pumps transporting water over increased distances will create a higher demand for energy. Today, the LSRD provide that reliable source of energy, ensuring the continuous operation of irrigation equipment. The experience of one farm during the June 2021 extreme “Heat-Dome” event clearly demonstrates the potential consequences of blackouts during high-load periods. AgriNorthwest experienced a mechanical issue that caused the irrigation system of one field to be down for 8 hours. During such an extreme weather event, when the load demands on the energy system were highest, even that short of a disturbance ultimately resulted in a 20 percent decrease in that field’s yield. Dependence on a reliable grid means that irrigation interests are linked very strongly to energy interests and the hydropower capacity of the dams as well.

---

7 Interview with Founder and Principal, Blue Spruce Strategies, December 13th 2023.
8 Direct communication from the Washington State Department of Ecology in Ibid.
9 Interview with farm manager, AgriNorthwest.
**Hydropower**

The LSRD are part of an integrated system of hydropower facilities on the Columbia and its major tributaries, a network shown in *Figure 6*. Although the four dams are operated and maintained by the Corps, the energy that they generate is sold and marketed by BPA, primarily to utilities within the Pacific Northwest region. This territory is defined by the 1980 Northwest Power Act and includes the entirety of the U.S. Columbia River Basin plus a few adjacent areas stretching across Idaho, Oregon, Washington, western Montana, and small parts of California, Nevada, Utah and Wyoming. BPA is a self-funding, nonprofit federal power marketing administration within the Department of Energy and covers its costs by selling power and transmission services. It markets wholesale electrical power from 31 federal dams as well as the power from one non-federal nuclear plant and several small non-federal power plants.

*Figure 6: Federal hydropower network of Bonneville Power Administration (Bernton 2019)*
The hourly generation of the LSRD varies based on the season and grid and market conditions. On average, however, the dams produce 900 average Megawatts (aMW) of energy, with one aMW defined as one million watts of energy delivered continuously 24-hours a day for a year. This output represents 4.3 percent of all generation within the Pacific Northwest energy system and about 11 percent of BPA’s total generation (Washington Governor’s Office 2022, 66).

As demonstrated in Figure 7, generation from the dams fluctuates significantly month to month in response to variation in river flows so their contribution to BPA’s system fluctuates from 5-13 percent of total output depending on the time of year (Malarkey 2019).

![Chart showing Lower Snake River Dam generation]

Lower Snake River Dam average generation and generation range from FY 2013 – 2019 (Washington Governor's Office 2022, 67).

In addition to their annual production, the LSRD provide grid transmission reliability, operational flexibility, and variable peaking capacity. The dams provide approximately 3,500 megawatts (MW) of total energy capacity and approximately 2,300 MW of firm peaking capability, which refers to their sustained peaking output during reliably strained conditions (Olson et al. 2022, 6). Different types of electricity generating resources vary in how quickly
they can respond to meet demand. A key benefit of the LSRD, and hydropower more broadly, is the ability for energy output to quickly change to help meet regional demands as a dispatchable resource. This responsiveness to generation losses in other parts of the grid or increases in demand from extreme weather events enhances overall system reliability (Washington Governor’s Office 2022, 67). The output of any dispatchable resource is controlled by its operator and depends on the availability of the fuel source; in the case of hydropower, energy generation depends on water availability. Because the LSRD are run-of-river dams, they have limited storage capacity relative to other Columbia Basin projects, and their energy generation is more reliant on seasonal variations in streamflow.

As a result, it is critical to consider the relationship between the river’s hydrograph and energy demands because most of the LSRD annual generation occurs during the spring runoff period. Peaking capacity, however, is most needed in winter and summer months when energy demand is high and weather extremes such as heat waves and cold snaps are most frequent. The LSRD do have important peaking capacity abilities—Northwest RiverPartners highlights an example from March 2019 when demand increased by 4,000 MWs within an eight hour time period and the LSRD met 27 percent of that increase (Northwest RiverPartners 2019). Overall, however, there is a temporal mismatch between their generation capacity and peak demand with seasonal variability determining their ability to provide multi-hour peaking capacity (NW Energy Coalition 2022a).

The role of energy generated at the LSRD is also important to consider within the context of currency changes to the overall energy system. At the end of 2021, Governor Jay Inslee and U.S. Senator Patty Murray of Washington announced a process to study whether there are reasonable means to replace the benefits provided by the LSRD. The resulting Murray-Inslee
report describes “a major paradigm shift occurring in the Pacific Northwest Energy System” driven by regulatory and policy changes to enhance renewable sources of generation (Washington Governor’s Office 2022, 70). Specifically, the major states within BPA’s service territory have adopted ambitious carbon-free energy laws and policies: the Washington Clean Energy Transformation Act commits the state to an electricity supply free of greenhouse gas emissions by 2045 (“Clean Energy Transformation Act,” n.d.); Oregon’s Clean Energy Targets bill requires utilities to reduce emissions from electricity sold in the state to 100 percent below a baseline level by 2040 (“Oregon Clean Energy Targets,” n.d.); Idaho Power Company, Idaho’s largest energy provider, has also made a commitment to provide “100 percent clean energy” by 2045 (“Clean Today. Cleaner Tomorrow.®,” n.d.); and NorthWestern Energy in Montana committed to reduce their carbon portfolio to 90 percent of what it was in 2010 by 2045 (Washington Governor’s Office 2022, 71). Decarbonization efforts outside of energy generation, such as electrification trends in the transportation and building sectors, also mean that the power system must expand to accommodate substantial growth in demand (Olson et al. 2022, 7).

Within this context, multiple studies have been conducted on the feasibility of potential LSRD replacement portfolios including, for example, the “BPA Lower Snake River Dams Power Replacement Study.” Released in July 2022, the report finds that replacing the LSRD while meeting clean energy goals and system reliability is possible but expensive, with costs driven by the need for firm energy capacity and zero-carbon energy (Olson et al. 2022, 43). The Murray-Inslee report highlights that this process would take “time, funding, planning, and collaboration across all stakeholders to ensure that the region’s future clean energy goals are met, the region maintains a reliable system, and customers, especially the most vulnerable, are not overly burdened by increased electricity rates” (Washington Governor’s Office 2022, 65).
Salmon: Population Trends, the Impact of Dams, and Recovery Efforts

Within the family *Salmonidae*—also known as salmonids—Pacific salmon are categorized under the genus *Oncorhynchus*. Evolutionarily, Pacific salmon split from the genera *Salmo*, which includes Atlantic salmon and species of trout, 15 to 20 million years ago. By 6 million years ago, even the most closely related species of Pacific salmon are distinguishable in the fossil record (Waples, Pess, and Beechie 2008). The dynamic and harsh ecosystem under which Pacific salmon evolved included episodes of glaciation, ‘megafloods’, volcanic eruptions, and landslides, all of which impacted the life history strategies and population structures that the species ultimately developed (Waples, Pess, and Beechie 2008).

Salmonids have a diversity of life history strategies, which refers to the duration and timing of life stages exhibited by each population. Ranging from residency (remaining in freshwater) to different variations of anadromy (migrating between fresh- and salt-water), these life histories reflect the dynamic environment in which they evolved (Caldwell 2022). Three life history traits of Pacific salmon—anadromy, returning to natal streams to spawn, and dying after spawning—mean that these fish play a critical role in the surrounding ecosystem. Of the body mass of Pacific salmon, more than 95 percent is accumulated in the marine environment. Their bodies transport and deposit these marine-derived nutrients, providing an important subsidy to oligotrophic, low nutrient riparian ecosystems throughout the Pacific Northwest (Naiman et al. 2002). The specific timing of their migration patterns evolved in response to historically typical flows characterized by high flows in spring due to snowmelt and runoff, decreasing summer and fall flows, and lower winter flows (Washington Governor’s Office 2019, 3).
Based on accounts and cannery records from the late 19th century, it is estimated that prior to 1850, the Columbia River Basin produced 10 to 16 million salmon annually (“Salmon and Steelhead,” n.d.). An account written in 1881 by a missionary living in the Dalles wrote of salmon:

Doubtless there are rivers in the world which afford a greater variety of fish, than this [Columbia], but perhaps there are none that supply greater quantities… Salmon is the principal fish… They literally fill the rivers of Oregon, in their season. And at all the falls and cascades in the various rivers of the country, the quantities taken and that might be taken, are beyond calculation. As they penetrate far into the interior, they afford almost inexhaustible supplies to the Indian tribes of the country, as well as the whites, many of whom depend almost entirely upon such supplies, for the first year, after settling in the country (Hines 1881, 331).

The Snake River in particular provides habitat for five species of anadromous fish: spring/summer Chinook, fall Chinook, coho, sockeye, steelhead, and Pacific lamprey (Washington Governor’s Office 2022, 3). The seasonal designation of Chinook salmon refers to the timing of when the adult ‘run’ enters the Columbia estuary on their migration from the ocean to their natal freshwater stream (“Spring/Summer-Run Chinook Salmon – Snake River ESU,” n.d.). In fact, the Snake Basin once contained the most productive salmon spawning areas of the region—its principal tributary, the Salmon River, historically produced 39 to 45 percent of all spring/summer Chinook salmon in the entire Columbia Basin (Blumm et al. 1998).

Starting in the late 1800s, these iconic fish populations declined dramatically across the Basin due to industrial-scale overharvest (Storch et al. 2022). As previously mentioned, in the decades following the opening of the first cannery on the Columbia in 1866 (White 1996), fisheries technologies evolved in scale to meet the increased capacity for processing and exporting fish. Gillnets, for example, were extended across and below the surface of the river, forming a vast floating barrier that salmon could swim into but not extricate themselves without
being caught by the gills and drowned. By the late 1880s, the gillnetters covered the river below Portland from May to August such that their nets, if connected and stretched end to end, formed a barrier 545 miles long (White 1996). At the turn of the century, more than forty fish wheels also operated, literally pumping fish out of the river (White 1996). Total production reached a maximum in 1911, with 50 million pounds of salmon packed in the year. By the 1970s, however, this unsustainable fishery collapsed alongside the annihilated fish runs upon which it had depended (Hirsch 2020).

Throughout this time period, land-use changes also contributed significantly to the decline of native fish species, including effects from mining, dredging, overgrazing, logging, agricultural development, large-scale irrigation projects, and hydropower development, the last of which often went hand in hand (Hirsch 2020). In Idaho’s Snake River valley, the dream of an “Irrigated Eden” transformed much of the desert into cultivated farmland. The dams and reservoirs required to do so produced new environments with warm, deoxygenated, and muddy water that stifled cold-water species like salmon and trout. Dams slowed currents and raised water temperatures, creating warm reservoirs suffused with nitrogen and phosphates from agricultural runoff. These conditions promoted algae growth that consumed the oxygen fish needed to survive (Fiege 1999). By the 1920s, the Bureau of Reclamation had built hundreds of miles of canals, straightening complex streams, introducing channels where fish could get trapped, and drastically changing the hydrology of the rivers (Hirsch 2020). Across the basin, other stressors contributing to the decline of native fish have included urbanization, development in wetlands and floodplains, water pollution, invasive species introduction, riparian erosion, hatchery-produced fish, and adverse ocean conditions (U.S. Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration 2020).
Between 2000 to 2019, approximately 2 million salmon and steelhead returned to the Columbia Basin on average each year, a mere fraction of their historic runs. Of these, hatchery-origin fish account for two thirds of the average return (Columbia Basin Partnership Task Force and of the Marine Fisheries Advisory Committee 2020, 42). Table 2 highlights the historic, current, and hatchery abundance levels for the four ESA-listed SNake River species of salmon and steelhead. While debate continues surrounding relative impacts of the many factors driving population declines, the construction and operation of dams throughout the basin has been a significant cause of vastly diminishing the region’s once-abundant anadromous fish runs (U.S. Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration 2020; Goble 1999). Ocean conditions and the overall climate regime also plays a strong role in regulating population dynamics (Crozier et al. 2021).

<table>
<thead>
<tr>
<th>Species</th>
<th>Historic Abundance</th>
<th>2019 Wild Abundance</th>
<th>2019 Total Abundance (Wild &amp; Hatchery Origin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring/summer Chinook</td>
<td>1,000,000</td>
<td>6,130</td>
<td>31,831</td>
</tr>
<tr>
<td>Fall Chinook</td>
<td>500,000</td>
<td>5,435</td>
<td>15,451</td>
</tr>
<tr>
<td>Sockeye</td>
<td>84,000</td>
<td>43</td>
<td>129</td>
</tr>
<tr>
<td>Steelhead</td>
<td>114,800</td>
<td>17,614</td>
<td>60,700</td>
</tr>
</tbody>
</table>

Table 2: Historic and 2019 abundance levels for ESA-listed Lower Snake River salmonids provided by NOAA and Idaho Department of Fish and Game (Washington Governor’s Office 2019, 26).

Dams on the Columbia and Snake rivers affect fish in a number of ways. Some dams do not include fish passage and have permanently closed off thousands of miles of spawning and rearing habitat. Over 40 percent of habitat once available to salmon and steelhead in the Columbia River Basin is permanently blocked by such dams (“Dams: Impacts on Salmon and Steelhead,” n.d.). Upstream of the LSRD, fish passage ends at Hells Canyon Dam on the
mainstream of the Snake and at Dworshak Dam on the north fork of the Clearwater River. The Idaho Power Company, who owns the Hells Canyon Complex, has an agreement with the Federal Power Commission to ‘compensate’ for the loss of upstream salmon and steelhead spawning habitat upstream by producing fish at hatcheries downstream of the dams (“Fish Passage at Dams,” n.d.). The Corps similarly constructed a hatchery just downstream of Dworshak to mitigate for the fish losses as a result of that dam, a facility now managed by the Nez Perce Tribe (“Dworshak National Fish Hatchery,” n.d.).

Although the four lower Columbia dams and the LSRD have fish passage, these formerly dynamic, flowing sections of the river have been transformed into a series of slow-moving reservoir lakes. Dams broadly have three categories of physical and geomorphic effects: the flow regime is ‘flattened’ reducing the magnitude of floods and minimizing the occurrence of low flow events; the downstream movement of sediment is impounded behind dams instead of forming gravel bars and beaches; and temperature regimes are increased, with higher temperatures in the summer and delayed reservoir cooling in the fall (Caldwell 2022). Shallower reservoirs, like those behind the LSRD, increase downstream water temperatures because insolation across the increased water surface area makes the reservoir act as a heat trap (NOAA National Marine Fisheries Service 2022, 9).

These physical changes to the river environment have profound biological and ecological implications. For juvenile anadromous salmonids, the freshwater environment provides two key functions. The first of these can be understood as a nursery, with high-quality freshwater habitat characterized as “cold, clean, clear, complex, connected” (Caldwell 2022, 97). Additionally, the freshwater environment provides a migration corridor, “a flowing highway” to access the marine environment (Caldwell 2022, 97).
The LSRD disrupt both these processes. While most spawning and rearing occurs in smaller tributaries, the main river also provides habitat for fall Chinook. These areas were inundated by the LSRD and currently, less than 50 percent of the mainstem Snake River once used as spawning habitat remains accessible (Washington Governor’s Office 2019, 25). During seaward migration, dams decrease survival rates for juvenile salmon by reducing water velocity, increasing temperatures and migration times, fluctuating oxygen levels, and inflicting stressors or mortality through contact with the infrastructure (Storch et al. 2022; Hirsch 2020). The low velocity environment also supports predators that feed on vulnerable migrating salmon and steelhead juveniles. This includes native northern pikeminnow that have reached unnaturally high abundance, other non-native predatory fish species, and avian predators such as gulls, cormorants, and terns (NOAA National Marine Fisheries Service 2022, 27-31). Indirect effects of this freshwater environment can also ‘carryover’ and impact survival in the estuary, ocean, and adult upstream migration life stages (Gosselin, Van Holmes, and Anderson 2018).

Federal efforts to integrate fish and wildlife considerations into the planning of water development projects began in 1934 when Congress passed the Fish and Wildlife Coordination Act (Veiluva 1981). In 1938, the Mitchell Act was the first major legislation aimed at addressing declining salmon populations specifically due to dams. The Mitchell Act is also emblematic of how technological fixes dominated solution strategies: funding was dedicated toward building, sustaining, and researching hatchery production, and habitat improvement focused only on building fish ladders and developing screens across irrigation canals (Hirsch 2020). Environmental laws passed during the 1970s—particularly the National Environmental Policy Act of 1970 and the Endangered Species Act (ESA) of 1973—have also been critical in driving the science and management interventions of the Columbia River Basin (Hirsch 2020).
Throughout the 1970s, the decline of Snake River salmon exacerbated tensions over the effects of hydropower and contributed to the passage of the 1980 Northwest Power and Planning Act (“Northwest Power Act,” n.d.). Provisions in the statute call for fish and wildlife restoration “to the extent affected” by the federal system of Columbia Basin dams and authorizes the interstate Northwest Power and Conservation Council (Council). The Council remains one of the main agencies driving the restoration of salmon and their habitat by recommending where BPA should spend money to mitigate effects of the hydrosystem, (Blumm 2022b) facilitating a structure whereby the system most responsible for harming fish has also invested billions of dollars toward them (Bonneville Power Administration 2019). Across the region, it is estimated that $300 million is spent per year on salmon recovery efforts with the Council alone allocating $274.2 million to recovery in 2016 (Hirsch 2020). BPA delivers most of the funding for habitat restoration and habitat monitoring across the Columbia River Basin with important implications for the type and spatial distribution of knowledge that is produced (Hirsch 2020). Despite these advances in salmon science and funds dedicated toward restoration, the Northwest Power Act proved unable to significantly restructure the dam operations that favored hydropower production over salmon (Blumm 2022b).

In 1990, the Shoshone-Bannock Tribe petitioned NOAA Fisheries to list Snake River sockeye as an endangered species. The same year, a coalition of organizations petitioned for the listing of Snake River spring/summer and fall Chinook as a threatened species (“Endangered Species Act, Columbia River Salmon and Steelhead, and the Biological Opinion,” n.d.). In response, the Oregon Department of Fish and Wildlife and NOAA Fisheries found that Salmon River Chinook were only at six percent of their run-size just thirty years before (Blumm 2022b). In 1991, Snake River sockeye became the first Pacific salmon stock identified as endangered
under the ESA. The ESA listings soon followed and throughout the 1990s, 12 Columbia River Basin salmon and steelhead species were listed, including all four species of the Snake River (“Endangered Species Act, Columbia River Salmon and Steelhead, and the Biological Opinion,” n.d.). Notably, wild Snake River coho went extinct in 1978 and the current population of coho in the Snake River is produced by hatcheries (Washington Governor’s Office 2019, 3). The salmon crisis revealed at this time extended beyond the Columbia and Snake Rivers; in 1991, the American Fisheries Society’s Endangered Species Committee published a coastwide status report showing 101 species of salmon at “a high rate of extinction” (Blumm 2022b, 15).

The ESA-listings in the Columbia Basin triggered consultation procedures and standards for the federal agencies of the Federal Columbia River Power System to ensure that their actions were not jeopardizing the listed species. NOAA Fisheries is responsible for implementing the ESA for anadromous species, and it works with other federal agencies, relevant states, Tribes, and other stakeholders to recover listed species (“Recovery of Endangered and Threatened Species,” n.d.). Under Section 7 of the ESA, federal agencies must consult with NOAA Fisheries on activities that may impact ESA-listed species. The outcome of this consultation is a biological opinion (BiOp), a report required under the ESA to assess and direct the actions of federal agencies to avoid jeopardizing the listed species. It also identifies “reasonable and prudent” actions to reverse population declines (“Endangered Species Act Section 7 Consultations,” n.d.).

The subsequent history of the ESA and the Federal Columbia River Power System has been long and litigious with the action agencies consistently struggling to manage the system without unlawfully jeopardizing salmon (The Harvard Law Review Association 2012). At this point in time, NOAA Fisheries has issued eight BiOps regarding the Federal Columbia River Power System in 1993, 1995, 2000, 2004, 2008, 2010, 2014, and 2020. Six of these have been
declared illegal by three different federal judges in a continuous litigious cycle: NOAA Fisheries issues a BiOp; the BiOp is challenged on the basis of the ESA and, starting in 2014, the National Environmental Policy Act; the judge finds the BiOp to be “arbitrary and capricious” and orders revisions to address the deficiencies; years later, the cycle begins again.

The current ongoing litigation, *National Wildlife Federation et al v. National Marine Fisheries Service et al*, began in 2001 when a coalition of 12 environmental and fishing organizations filed a lawsuit over the 2000 BiOp and implementation plan. The State of Oregon and four Columbia River Treaty Tribes joined the plaintiffs shortly after, represented by Earthjustice. The coalition of plaintiffs argued that the federal government was violating the ESA by allowing federal dams on the Columbia and Snake rivers to decimate threatened and endangered salmon and steelhead populations. Additionally, separate rulings in 2005 by Judge Redden and 2017 by Judge Simon have granted injunctive relief requiring increased summer and spring spill past the LSRD and the Lower Columbia River dams to facilitate downstream salmon passage (“Timeline: A Long Fight to Restore Snake River Salmon” 2023). To this day, the ESA continues to drive management interventions and scientific work to support mitigation practices, with some restorationists in the Columbia River Basin describing their work as an “ESA-centric science” (Hirsch 2020, 138).

Over the past decades, the scale and cost of restoration efforts for Columbia Basin salmon and steelhead have grown to become among the largest in the world (Jaeger and Scheuerell 2023). Strategies to increase juvenile survival and adult returns have included hatchery production, advancements to fish ladders, increased water spilled over the top of the dams, gas concentration regulations, improved turbine technology, spillway weirs, and surface bypass channels. Another central strategy, perhaps epitomizing how mechanical approaches have
dominated these efforts, has been the transportation of juvenile fish to bypass the dams. The program involves collecting juvenile fish at the Lower Granite, Little Goose, and Lower Monumental bypass facilities, loading them onto barges or trucks, and transporting them to below Bonneville Dam (Keefer et al. 2008).

Despite these longstanding and wide ranging efforts, the action agencies have been unable to manage the Federal Columbia River Power System in a way that legally fulfills their commitments through the ESA. The continuing decline in salmon populations is the main driver for the calls to remove the LSRD, fueled by the sense that the status-quo of management strategies is not working. Existing federal initiatives, it is argued, are not fulfilling obligations to recover salmon populations under the ESA, the Northwest Power Act, and Tribal treaties, and larger changes are necessary to do so.

The idea of breaching the LSRD is not a new one—removing the earthen portions of the LSRD as “permanent reservoir drawdowns” to allow for natural river flows was proposed in a 1995 restoration plan by the Nez Perce, Warm Springs, Umatilla, and Yakama Tribes (Blumm 1998, 1003). In 1998, the Idaho Department of Fish and Game concluded that a drawdown to natural river flows would be the best biological choice for recovering Snake River salmon (Blumm 1998). In fact, in 2002, the Corps considered dam breaching as an alternative management plan. The report concluded that breaching had the maximum negative economic impacts to current system users—meaning power, navigation, and irrigation interests—and was not necessary to recover listed salmon and steelhead stocks (U.S. Army Corps of Engineers Walla Walla District 2002), although this was based on the NOAA Fisheries 2000 BiOp ultimately rejected by the courts because its mitigation measures were deemed too uncertain and inadequate to protect salmon (“Timeline: A Long Fight to Restore Snake River Salmon” 2023).
Since then, calls to breach the LSRD have continued from scientists, Tribes, and politicians with the action considered, but never implemented, within a number of management collaboratives and initiatives.
IV. CLIMATE IMPACTS

Knowledge controversies around climate change are common and often highly politicized. In contrast to now commonplace controversy over the existence and importance of climate change, in the conflict and debate over the LSRD, climate change is broadly understood as a critical factor. Across the interviews conducted, in response to the question of whether climate impacts were relevant to the conversation surrounding the LSRD, stakeholders from wide ranging positions on this topic resoundingly agreed. “Oh, absolutely,”\textsuperscript{10} replied a staunch supporter of dam breaching with the same enthusiasm as a vocal and passionate opponent who answered, “100 percent. I think it’s one of the most important factors.”\textsuperscript{11} Consistently, climate impacts are relied upon as a foundational claim for stakeholders advocating both for and against breaching the dams such that climate perceived to be “the undercurrent to this entire conversation”\textsuperscript{12} and a bigger driver here relative to other conflicts surrounding dam removals.\textsuperscript{13} Yet, how can stakeholders reaching opposing conclusions about dam breaching draw support from the same source? What does this reveal about the nature of climate change and its interaction with dams? What are stakeholders \textit{really} saying when they call upon the relevance of climate impacts within this conflict?

This chapter addresses the question: How is climate change affecting the knowledge controversies that underpin the LSRD environmental conflict? Drawing upon concepts central to the literature on knowledge controversies, climate change seems to be widening the degree of contestation between knowledge claims, further entrenching the positions of stakeholders in

\textsuperscript{10} Interview with Executive Director, Northwest Sportfishing Industry Association, October 5th 2023.
\textsuperscript{11} Interview with Government Relations Manager, Pacific Northwest Waterways Association, October 27th 2023.
\textsuperscript{12} Interview with Founder and Principal, Blue Spruce Strategies.
\textsuperscript{13} Interview with attorney, Earthjustice, September 19th 2023.
ways that deepen this conflict. Climate change introduces even more opportunities for stakeholders to insert conflicting value-based claims, introducing further sources of uncertainty and enhancing the urgency of this inherently future-oriented issue.

The Relevance of Climate Change

Salmon recovery remains at the forefront of arguments calling for the LSRD to be breached, making it unsurprising that climatic conditions are relevant to this controversy. “If salmon were doing really well,” remarked the Executive Director of a hydropower advocacy organization, “then there probably wouldn’t be a debate. And climate change is a big reason why salmon aren’t doing very well.”

Over the past century, analyses show a strong relationship between the performance of salmon and climate indices, pointing to anthropogenic climate change as an overriding threat to salmon across freshwater and marine habitats in addition to land use and freshwater changes (Healey 2011; Crozier et al. 2021). The year of 2015 epitomized the threat presented by extreme weather conditions on returning adult salmon populations: the Pacific marine heat wave, low river flows, and record high water temperatures in the Columbia River Basin contributed to a near-complete failure of Snake River sockeye runs. Given climate change, however, the high temperatures and low flows of 2015 more closely align with projections of the “new normal,” threatening survival rates, particularly for sockeye and also, somewhat, for spring/summer Chinook (Crozier et al. 2020, 14).

Downscaled global climate models (GCMs) for the 2040s project a 1-3º C increase in water temperature for the mainstem Columbia and Snake Rivers and up to 30 percent reductions in water flow, depending on the location and season (Crozier et al 2020). Temporally, projected

---

14 Interview with Executive Director, Northwest RiverPartners, September 20th 2023.
warming is greatest in the summer and precipitation is expected to increase during the winter and
decrease during the summer with an overall net increase in annual precipitation (Marshall and
Lute 2022). Compared to the historical climate from 1929–1998, the low flows of 2015 occurred
in less than 6 percent of simulation years. Looking forward, however, years at least as dry as
2015 are predicted to occur in 50-64 percent of future scenarios (Crozier et al 2020). In general,
climate projections in the Pacific Northwest suggest substantially warmer and slightly wetter
conditions with increased precipitation intensity expected in the region. By the end of the
twenty-first century, climate projections from thirty-five GCMs found that air temperatures were
likely to be 2.8°C to 5.0°C warmer with annual precipitation 5-8 percent greater than the
1979–1990 average. These projections are under the Representative Concentration Pathway
(RCP) 4.5 and RCP 8.5 scenarios, respectively, which represent the range of future actions taken
to reduce greenhouse gas emissions (Marshall and Lute 2022).

Under such climatic conditions, salmon habitat conditions are also expected to decline.
Warmer temperatures lead to a higher proportion of precipitation falling as rain with two major
effects: higher winter peak flows scour streambeds and destroy salmon eggs, and less snowpack
results in lower and warmer flows in the summer and fall (Battin et al. 2007). Additionally, as
demonstrated by Crozier et al. (2021), climate effects are important across the full life cycle of
these fish. Their research, which targets eight distinct spring/summer Chinook salmon
populations from natal headwaters upstream of the LSRD, indicates that rising sea surface
temperatures (SSTs) put all study populations at high risk of extinction, despite actions within
the hydrosystem to speed juvenile salmon travel and increase in-river survival (Croizier et al.
2021). Nevertheless, management actions to try and mitigate these effects remain important.
Anthropogenic factors can increase species vulnerability to climate change, limiting adaptive
capacity, and urging the imperative of conservation efforts to overcome this “handicap” (Crozier et al. 2020, 23). Marshall and Lute (2022) also provide an overview of how climate variability and climate change exert fundamental controls on the hydrology and management of the Columbia River System. The warmer, wetter conditions with seasonal variations will have significant impacts on the hydrology of the Columbia River Basin: shifting the snowpack amount and the timing of snowmelt runoff creates changes with implications for the management of the LSRD (Marshall and Lute 2022).

Ultimately, the knowledge controversy at the heart of the LSRD is a dispute over the regulatory practices of government agencies informed by this science. But science does not easily translate into policy to solve environmental problems; differing bodies of scientific evidence can provide justification for competing views such that experts possess discrete bodies of contextually validated knowledge (Sarewitz 2004). Can salmon be recovered without breaching the LSRD? What is the cost, in terms of sustainability, economics, and resilience, of breaching or not breaching the dams? What is the impact of climate change? Uncertainty, complexity, symbolic meaning, and competing values undergird different answers to these questions, creating an environment whereby contradictory certainties engage in multidimensional “trials of strength” (Sharman and Perkins 2017). Nevertheless, certain clear connections exist and are widely affirmed including the fact that “climate changes are always going to be a part of the conversation because they affect fish returns.”

But the ways in which these climatic impacts are interpreted, or made to be relevant, depends on the values, agenda, and position of stakeholders. It is in this space where contradictory stances emerge, positioning dam breach as a necessary opportunity or misguided devastation.

---

15 Interview with Corporate Communications and Marketing Manager, Tidewater Transportation and Terminals, November 17th 2023.
Additionally, climate change has not always played such a central role in this conversation, suggesting a more complicated connection between the existence of climatic impacts and the utilization of stakeholder claims which center those impacts. Pushback to the LSRD dams existed long before the impacts of climate change were well-known and climate rhetoric played an established role in public policy. “Nobody talked about this in the 90s,” reflects a reporter from the Seattle Times, “they didn’t even talk about it in the early 2000s.” A writer and researcher at the Washington Policy Center agrees, recognizing that “people have been calling for the Snake River dams to be removed for 30 years. 30 years ago, the impacts of climate change weren’t the driving force.” This aligns with other scholarship on the LSRD which finds widespread stakeholder acknowledgement that “times have changed,” ecologically and socio-politically, in the context of coupled climate and species extinction crises (Harrington and Cantor 2024, 12).

While climate change may not be the driving factor in this conflict, it plays a decisive role precisely because of the ways it exacerbates all of the other things that “people have been complaining about for 30 years.” The recovery of fish; reliance on hydropower and barging; economic opportunity; the resiliency of ecosystems, infrastructure, and communities—climate change impacts it all. The scientific literature documenting these impacts, as well as the increased public awareness of climate change and its characterization as a crisis, has shifted the nature of the controversy surrounding the LSRD. A Seattle Times reporter who has consistently covered this issue describes climate change as “a drumbeat,” intensifying the conversation that was already there. In this way, climate change can be understood as an amplifying force which

---

16 Interview with reporter, The Seattle Times.
17 Interview with Senior Vice President for Research, Washington Policy Center, September 7th 2023.
18 Interview with Senior Vice President for Research, Washington Policy Center.
19 Interview with reporter, The Seattle Times.
adds complexity to a preexisting management challenge. As one of the biggest, longest running litigation cases in the Northwest, bringing the scale of climate into the picture just makes it even more urgent and harder, adding new sources of skepticism regarding the appropriate policy action. This makes “policymakers… conflicted, because, you know, they certainly want healthy salmon populations, as do we all. And, at the same time, they want to decarbonize the grid, to fight climate change, which ultimately would be good for salmon.”

Certain characteristics about climate change—including the uncertainty it introduces, its future orientation, and the “plasticity” of its ideological application (Hulme 2009)—interacts with the existing controversy to bring long standing aspects of this debate into conflict once again.

**Pro-Dam Climate Claims**

Many climate arguments called upon in support of the LSRD rely on the carbon efficiency of the energy and transportation services that the dams provide. This perspective promotes carbon-free hydropower as a necessary means to fight climate change. As such, removing the LSRD, which provide carbon-free electricity, is actively moving the region and society at large in the “wrong direction,” away from infrastructure key to the overall strategy of decarbonization.

“Ultimately, the best way to fight climate change is to decarbonize,” argues the Executive Director at Northwest RiverPartners, “and getting rid of the dams doesn’t help that effort.” The Vice President at Shaver Transportation also points to the lifetime carbon impacts of different forms of electricity generation; when hydropower generators wear out, they only

---

20 Interview with Executive Director, Northwest RiverPartners.
21 Interview with Corporate Communications and Marketing Manager, Tidewater Transportation and Terminals.
22 Interview with Executive Director, Northwest RiverPartners.
need to have their copper wiring and bearings replaced as opposed to wind turbine blades and solar panels destined for the landfill.\textsuperscript{23}

Some see the base load energy provided by the dams as what enables the integration of intermittent renewable energy sources like wind and solar.\textsuperscript{24} This perspective not only values the carbon-free energy provided by the dams but also views the reliability of their services as crucial to the continued and large-scale transformation of a decarbonized grid. Climate models, which predict more hydropower production in the winter and less in the summer, support the potential for future hydropower generation to be especially important in the winter when wind power and solar power produce the least amount of energy in the region.\textsuperscript{25}

The emphasis on carbon efficiency is supported by state decarbonization laws in Oregon and Washington, requiring the elimination of all fossil-fueled energy generation by 2040 and 2045, respectively. These commitments represent a massive undertaking, and in a moment when we are talking about “electrifying everything,” there is widespread sentiment that the region might want to hold onto every possible non-carbon-emitting kilowatt, not tear them down.\textsuperscript{26} These state commitments to decarbonization are pointed to as key reasons why the dams will be even more important in the future.

Carbon efficiency is also relied upon to support barging as a means of transporting goods. “If we’re serious about climate change,” says the Vice President of Shaver Transportation, “if we are the governors of the state of Oregon and Washington and climate change and beyond fossil fuels are the cornerstones of our administrations, you would be shifting from truck, shifting from rail to barge, because it uses the least amount of carbon until we come up with a better way to

\textsuperscript{23} Interview with Vice President, Shaver Transportation.
\textsuperscript{24} Interview with Executive Director, Northwest RiverPartners.
\textsuperscript{25} Email correspondence with Executive Director, Northwest RiverPartners, September 20th 2023.
\textsuperscript{26} Interview with reporter, The Seattle Times.
The Chairman at the National Waterways Foundation cites the carbon outputs for comparable transportation methods, highlighting the difference in ton-miles traveled per gallon of fuel: 675 for barge compared to 472 and 151 for rail and truck, respectively (Woodruff 2022). Here, climate change is called upon as a key reason to invest in barging infrastructure instead of the necessary shift away from it that would occur with breaching.

Focusing on the carbon efficiency of barging and hydropower moves beyond the specific geography of the Lower Snake River, bringing attention to the decline of Snake River salmon and steelhead as part of a much larger issue. In shifting attention to climate change as a global phenomenon, addressing warming SSTs through decarbonization is emphasized as the most critical means to help salmon. This is based on the understanding that “ocean conditions—the condition of the ocean when these fish enter the oceans, and the condition over the time period where they rear in the ocean—is the number one driver of the numbers of fish that return.” Reducing carbon emissions will, in the long run, prevent further warming to ocean waters and the deterioration of marine waters where salmon spend years of their life.

In addition to its carbon emissions, the emphasis on these services also connects to the central importance of resilience—resiliency of the underlying energy grid to respond to population needs and increasingly drastic weather conditions. But resiliency is also called upon by those in the transportation and irrigation industries. When asked about conceptual links between climate resilience and river restoration, the Government Relations Manager at Pacific Northwest Waterways Association felt that dam breaching “makes us even less resilient to climate change… Resiliency isn’t cutting off another form of transportation… intensifying the two most carbon intensive ones.” This interpretation of resilience connects a carbon-based

---

27 Interview with Vice President, Shaver Transportation.
28 Interview with administrator, Idaho Governor's Office of Species Conservation, January 31st 2024.
29 Interview with Government Relations Manager, Pacific Northwest Waterways.
argument to economic-based optionality, relying on the strength of that connection to add validity to the entirety of the position—put simply “climate resilience really involves more electricity and less carbon.”

Representing the perspective of irrigators, the Outreach Director of McGregor company highlights that “we need more water available, not less. And there would be a lot less water available if the Lower Snake River dams were removed.” Disruption to the reliability of water sources has direct impacts on the production of these food crops which go on to the plates of people around the world. The connection between climate change, intense long-duration storms, and peak power consumption, means that climate impacts bring resilient electrical infrastructure to the forefront of the conflict as a form of health and human safety.

Overall, climate change has provided new opportunities for stakeholders to defend hydropower and barging for the sake of decarbonization efforts and system resilience. Opposition to dam removal is no longer inherently contradictory to an ‘environmental approach,’ it just depends at what scale the phenomenon is being addressed.

**Dam Breaching Climate Claims**

For those advocating to breach the LSRD, climate resilience also plays an important role but the concept is understood in a completely different way. Breaching the LSRD, it is argued, builds climate resilience for Snake River salmon and steelhead by enhancing the presently tenuous connection with the Upper Snake Basin. Faced with the reality of warming stream temperatures from increased air temperatures and the loss of snowpack, the Director of Biological Services for the Nez Perce Tribe cites breaching the LSRD as “part of the necessary

---

30 Interview with Vice President, Shaver Transportation.
31 Interview with Outreach Coordinator, McGregor Company, November 6th 2023.
32 Interview with CEO and Executive Director, Public Power Council, December 20th 2023.
action to ensure that suitable habitats… under a climate change scenario remain viable.”

Snake River Campaign Manager of Trout Unlimited explains this perspective best:

“This [dam removal] is just so much bigger [than other dam removal campaigns]: 30,000 accessible coldwater stream miles for salmon and steelhead. It is massive, massive, massive. And… in our view at Trout Unlimited, this is the thing that we can do, not just for Snake River salmon and steelhead, but for salmon and steelhead in the lower 48. Because, you know, in a changing climate, many of the lower elevation streams that have historically been important to lower 48 Pacific salmon and steelhead, those streams are warming just because of their elevation. So the Snake Basin, because of its extremely high elevation, and also because of its wilderness and roadless characteristics—it is the last best place for salmon and steelhead in the lower 48.”

This is a common characterization of the Snake River Basin which is described “like the Noah’s Arc for these fish,” the “Mother River” from which salmon can repopulate in times of extreme climate, the place where fish “have the highest potential for survival in a warming climate” compared to any salmon in the country.

Other climate-based arguments are then utilized as pushback to the climate-related claims mobilized by advocates of the dams and the services that they provide. With regards to their hydropower generation, there is a strong sentiment that climate change has prompted a time of massive change for energy production, grid management, and distribution anyway. As a result, the pace of clean energy development has increased dramatically, and the ability to replace the energy provided by the LSRD with renewables is enhanced by the degree to which change is already occurring. Onboarding low carbon energy generation technologies, in addition to the increased demand for electricity, has prompted fundamental changes to power generation,

33 Interview with the Director of Biological Services, Nez Perce Fisheries Resources Management, September 19th 2023.
34 Interview with Snake River Campaign Manager, Trout Unlimited, September 25th 2023.
35 Interview with Executive Director, Northwest Sportfishing Industry Association.
36 Interview with Founder and Principal, Blue Spruce Strategies.
37 Interview with Executive Director, NW Energy Coalition, October 12th 2023.
38 Ibid.
regardless of the conversation about fish or the LSRD. Dam breaching advocates then argue that given the inevitability of this change to power generation, it is vital to ensure “that it changes in a way that actually is adequate for salmon.”\(^\text{39}\)

With regards to the energy system, dam breaching advocates often point to aspects of the hydrosystem that will become less reliable and less resilient, under altered climatic conditions. Because the LSRD are run-of-river dams without storage capacity, they can only generate power with the water that flows down the river, but according to an Earthjustice attorney, “the profile of the energy they generate is mismatched to the profile of when we need energy.”\(^\text{40}\) The spring is when the dams generate the most from snowpack runoff, but it’s also a time of low-power demand. During early- or mid-winter cold snaps and late-summer heat waves, when household energy demand is driven up by heat and air conditioning usage, the dams generate the least amount of power. While this “doesn’t mean [the dams are] irrelevant… the profile is wrong, and because of climate, that mismatch is only going to get worse”—more precipitation coming down as rain instead of snow means less water available in the late summer “which is really the crunch time for power in the Northwest.”\(^\text{41}\) The benefits of the dams are contingent upon underlying environmental and climatic conditions, and those conditions are changing, bringing into question just how cheap and reliable the hydropower system is and will be in the future.\(^\text{42}\) Perhaps, then, it is argued, it would actually be in the best interest of energy reliability to diversify the Northwest energy portfolio with hydropower remaining in the mix but less central to the overall system.\(^\text{43}\)

\(^{39}\) Interview with the Director of Biological Services, Nez Perce Fisheries Resources Management.  
\(^{40}\) Interview with attorney, Earthjustice.  
\(^{41}\) Ibid.  
\(^{42}\) Interview with reporter, The Seattle Times.  
\(^{43}\) Interview with Executive Director, Save Our Wild Salmon, October 13th 2023.
The message underpinning these claims is clear: climate change is undermining the benefits provided by the LSRD while simultaneously increasing threats to fish, an interaction which expands the urgency and necessity of dam breach.

Conflicting Values and Responses to Climate Change

Among those involved in the discourse surrounding these dams, there are widely agreed upon aspects of climate change, regardless of what action is being advocated. These include its importance, increased future uncertainty, and aspects of actual manifestations of climatic change such as increased temperatures. The ways in which each of these characteristics are interpreted, however, is largely determined by the positionality of each actor, and key dimensions remain contested sources of additional controversy. As such, the exact same things—salmon recovery, water temperatures, precipitation regimes, zero-carbon commitments, resiliency, and community well-being—are called upon to demonstrate exactly why the dams must, or cannot, be removed.

The opposing climate-based claims used in the conversation over the LSRD reveals the ‘plasticity’ of the term climate change, a characteristic which allows it to be easily appropriated in support of a wide range of ideological projects (Hulme 2009). Depending on one’s vantage point, the idea of climate change—which exists not only as a physical phenomenon but also a social one—carries different meanings and implies different courses of action (Hulme 2009). As such, climate change functions as a space that brings competing values and worldviews into conflict.

The ways in which climate change is mobilized by both proponents and opponents of the LSRD can be understood as a conflict between response practices that target different scales and priorities of this issue. Both mitigation and adaptation have been highlighted as crucial responses
to climate change. Mitigation is longer-term intervention reducing the magnitude of change while adaptation is concerned with reducing the harmful effects of change (Abbass et al. 2022). One aspect of the controversy over dam breach is how mitigation and adaptation at different scales can lead to conflicting courses of action.

Mitigation is commonly defined as steps to reduce the emissions of greenhouse gases. Advocacy for the maintenance of LSRD’s hydropower generation and barge transportation, therefore, is offered as a climate mitigation strategy for salmon by investing in large-scale shifts of the energy and transportation sectors. This directly leads to the understanding that removing these dams is actually “bad for the climate” and, by extension, “bad for fish.” Breaching the dams doesn’t address the root cause of what is harming salmon and, therefore, is perceived as an unnecessary disruption to the social benefit provided by the dams’ services. Instead, this interpretation argues that what we need to do is gain a greater understanding of how salmon life cycles are being impacted by changing ocean conditions, particularly warming SSTs, and implement action which targets the space where salmon spend the majority of their lives.

Alternatively, dam breaching is proposed as a form of adaptation, recognizing that certain climatic changes are inevitable and that change must occur on a more local or targeted scale to address such a reality. “Salmon don’t have time for us to fix the climate right now,” urges the Executive Director from Northwest Sportfishing Industry Association, “we have to fix the river.” This interpretation doesn’t ignore the importance of oceanic conditions. Rather, it recognizes that “there’s so much we can’t control there for salmon” and proposes breaching as a top option of something which we can, actually, do. As hydrological conditions change, the

---

44 Interview with Government Relations Manager, Pacific Northwest Waterways Association.
45 Interview with Executive Director, Northwest Sportfishing Industry Association.
46 Interview with director, Swiftwater Films, September 19th 2023.
response of fish is an adaptive process where physiological changes to individuals within the population translate to intergenerational evolutionary changes (Columbia Basin Partnership Task Force and of the Marine Fisheries Advisory Committee 2020). This includes the phenology of migration and reproduction traits, and evidence in many salmonid populations shows that recent phenological shifts and genetic changes have occurred in response to climate-driven warming (Keefer et al. 2018). But this process takes time and, according to the Director of Biological Services at the Nez Perce Tribe, “salmon can’t respond fast enough to all of that other stuff.”

This prompts questions as to how humans can create conditions to help salmon adapt to the rapidly changing climate, complicated by the fact that some species, like Snake River sockeye, have lost their adaptive capacity through the loss of the wild population (Crozier et al. 2020). Those in favor of dam breaching see dam operations and other human influenced land uses as places where “dials” can be turned to tangibly influence the life stages of fish where possible. Looking at the same scientific data that highlights the widespread decline of salmon, breaching the dams targets an improvement to smolt survival rates and is argued to give salmon the best chance of overall survival given other pressures and vulnerabilities facing the species in a changing climate.

The opposing roles of climate-based claims in this discussion reveals divisions within the ‘climate movement’ whereby climate change policy at the state level comes into conflict with restoration efforts around a specific species vulnerable to the impacts of a changing climate. Climate change intersects with the environmental politics of the Lower Snake, highlighting opposing priorities between big picture decarbonization efforts and on the ground impacts. Support or opposition to dam breach promotes a particular values-based version of the future that

48 Interview with Director of Biological Services, Nez Perce Fisheries Resources Management.
49 Interview with reporter, The Seattle Times.
centralizes the resilience of human infrastructure—in its current state—or salmon by strengthening their capacity to adapt.

Opposing stakeholders, already involved in this issue with a specific agenda and worldview, interpret the scientific understanding of declining salmon runs in a particular way that pushes them towards different outcomes. In the normative question of what is the appropriate response to climate change, stakeholders become further entrenched in their position regarding dam breach. Because, while everyone appears to agree that climate change is threatening the survival of salmon, different stakeholders accept different degrees of disruption to the existing services relative to the success of restoration efforts. A strong advocate of hydropower, for example, only supports dams which provide a societal benefit, listed as hydropower, flood intervention, irrigation, or transportation, highlighting the ways in which the position on dam removal is intimately connected to a particular understanding of societal goods and benefits. This relationship with the river as defined by its development history can also be seen through the continued reliance on techno-optimism that has undergirded the management of this system for so long. Senior Vice President for Research at the Washington Policy Center, for example, hopes that “we continue to improve the technology of the dams, to the point where the impact on salmon is so small, that we get the benefits of [the dams] but we functionally eliminate the impact on salmon.” Accordingly, “we can have our cake and eat it too, thanks to technology.”

Others, however, see climate change introducing a mechanism for a fundamental reshaping of that imagination. An activist and Campaign Lead from Solutionary Rails makes a more expansive and cultural connection between salmon and climate:

---

50 Interview with Executive Director, Northwest RiverPartners.
51 Interview with Senior Vice President for Research, Washington Policy Center.
Connecting the dots between climate and salmon, is more of a dot around, what kind of culture do we want to be a part of? What kind of culture can we afford to be part of if we want to sustain life, a livable planet? To me, I can’t imagine a society that solves the issue of climate without being a society that stops mass extinctions and does not learn how to allow salmon to be abundant.\textsuperscript{52}

This perspective builds a connection between the human-nature relationship that is required to address climate change and the human-river relationship required to solve the issues at the heart of this conflict. According to an employee of the Nez Perce Tribe, “this is another opportunity where we’re gonna have to change and adapt, and it can absolutely be for the better. We can build a stronger, more resilient Northwest” by getting “back in balance” with “the salmon and the other creatures that depend on salmon and water” but currently “are not being made a priority.”\textsuperscript{53} Support for dam removal, therefore, is premised on the failures of prosperity promised by the dams and furthers the optimism for something new. These two perspectives oppose one another on the potential for changing the status quo; disruption to the existing system is negative or positive depending on pre-existing values, worldviews, and relationship to the riverscape.

These differences are also present in the ways in which stakeholders navigate the uncertainty introduced to this discourse about the true impact of the dams and what would happen if the dams were to be removed. Some of this is inherent to dam removal as an all-or-nothing action interacting with the uncertainties of a spatiotemporally complex socio-ecological system. What is clear, however, is that climate change is enhancing the uncertainty perpetuating the LSRD controversy, specifically with regards to the recovery of salmon and steelhead.

\textsuperscript{52} Interview with Campaign Lead, Solutionary Rail, December 6th 2023.
\textsuperscript{53} Interview with employee, Nez Perce Tribe.
There is no lab of the Columbia River in which scientists can conduct studies and determine, conclusively, what will happen with dam removal. Questions asked by President and CEO of the Tri-Cities Development Council demonstrate how climate change drives uncertainty to undermine dam breach as a potential option for addressing the decline of salmon: “So let’s say you take out the Lower Snake River dams, we lose the power, we lose the shipping, we lose the irrigation. And the fish don’t come back in the numbers that you’re predicting they will, then what do you do?”54 Meanwhile, the Executive Director of the NW Energy Coalition utilizes that uncertainty as motivation: “Do we have certainty that dam removal is going to save the fish in the face of climate change? No, but scientists seem to think this is the last effort that we can make.”55 This existence of uncertainty is generative of politics and possibilities strategically mobilized by social movements for very different outcomes (Senanayake and King 2021). Even as climate models provide clear insight into the changes occurring to the region, climate change still expands the cone of uncertainty into the future (Kiparsky, Milman, and Vicuña 2012), increasing the complexity of the potential interactions between variables in the socio-ecological system of this river.

Conclusion

Overall, the twin problems of declining salmon numbers and climate change are intertwined in ways that complicate efforts to address each of them, with the LSRD present at the junction between the two. Climate change has added to the scientific and temporal uncertainty between the competing needs and resilience of salmon and human infrastructure. This additional layer of complexity offers another means to entrench existing positions with a characterization of

54 Interview with President and CEO, Tri-City Development Council, November 14th 2023.
55 Interview with Executive Director, NW Energy Coalition.
moral urgency. Given the ways in which this conflict is wrapped up with pre-existing values and uncertainty, science has failed to provide a clear answer on the policy question of whether or not the dams should be breached, and climate change has only exacerbated this dynamic. Within this conflict, it is critical to not only analyze what stakeholders are saying but how their claims interact with power relations to enhance or diminish their value and their application to the policy process.
V. POLICIES AND POLITICS

While the previous section covered the way in which climate change has impacted the discourse surrounding the LSRD, this chapter will address the ways in which climate change is affecting the actual policies and politics governing this river. That is to say, instead of asking how climate change has become relevant to what people are saying about the LSRD, this chapter analyzes policy outcomes and the politics through which they are enacted. This analysis draws upon the tools of political ecology to bring to light the social and political dimensions of what might otherwise be characterized as a scientific or technical intervention (Linton 2021). The political ecology framework helps conceptualize how the politics and cultural dynamics of a particular location translates into the practices of river governance and ecological restoration (Fox et al. 2017). It also recognizes the link between discourse and policy; through the institutional arrangements that guide access to and use of environmental resources, actors with access to legal, financial, and political power resources are able to advance their interests in particular ways (Bixler and Shmelev 2015). Insights from STS are also drawn upon to highlight how knowledge is produced and what influence that context has on its perception and application within this conflict.

This chapter is guided by the question: How does climate change intersect with policies and politics around dam breach? It finds that the ways climate change is made relevant within the LSRD conflict has to do with complex historically and geographically defined power relations at multiple scales and the priorities of those holding political office. There are a number of different pathways through which operation and management strategies of the Columbia River Basin are being contested, renegotiated, and pursued. These efforts operate through different branches of
government across federal, state, and Tribal scales. The historic establishment of the LSRD as federally owned, operated, and authorized infrastructure remains fundamental to the ways in which governance processes continue to function. It also “means a lot more people get to have an opinion [about the dams] than they would otherwise,” establishing the multitude of actors and venues through which this conflict operates. Analyzing these spaces and initiatives reveals the pathways through which climate change comes to influence policy and management decisions, as well as dynamics about who holds power and how their power is expressed on this landscape.

Cross-Scalar Collaboration

The multitude of actors and the scales at which they operate in this conflict can be understood through the “hydrosocial territory,” or the actively constructed and historically produced interactions between the hydrological cycle of the river’s water flows, the associated ecological processes, and the social and political institutions that influence these spaces (Boelens et al. 2016). One process of redefining management goals occurred through the Columbia Basin Collaborative (CBC). Formed in 2020 by the respective governors of Washington, Oregon, Idaho, and Montana, the CBC is a collaboration of states, Tribes, federal agencies and stakeholders. It aims to advance the quantitative and qualitative goals of the Columbia Basin Partnership Task Force (Task Force) as specified in their Phase 1 and 2 reports. The Task Force included a broad group of sovereign entities and stakeholders, and it was convened by NOAA Marine Fisheries to establish a common comprehensive vision for achieving abundant and harvestable salmon and steelhead across the Basin. This effort was motivated by the broad understanding that the status quo is unacceptable. The foreword of the Phase 2 report from Barry Thom, Regional Administrator of NOAA Fisheries West Coast Region, sets the tone that when it

56 Interview with Snake River Director, American Rivers, September 5th 2023.
comes to rebuilding and sustaining Columbia River salmon and steelhead runs, the current “web of laws, regulations, plans, groups and funding has not been enough to get us where we need to go” (Columbia Basin Partnership Task Force 2020, 3). On working with the Task Force Work Groups, a participant from McGregor Company commented that it facilitated a very “accepting conversation,” and “while slow, it is far more conducive to allowing all parties a voice” than other avenues.57

Throughout the report, acknowledging and addressing the impacts of climate change remains central to future management plans. The first of the Task Force’s qualitative goals—to restore salmon and steelhead in the Columbia Basin to healthy and harvestable levels—includes the sub-goal of rebuilding salmon and steelhead runs that are adaptive and resilient to climate change (Columbia Basin Partnership Task Force 2020, 32). The Task Force identifies a number of future potential scenarios that apply a range of approaches to achieve the identified goals. Among these, “improved planning for climate change adaptation” recurs as a common theme promoting overall agreement among Partnership members (Columbia Basin Partnership Task Force 2020, 134). Agreement also persists over the idea that “hydropower operations need to benefit fish as well as humans, particularly in the face of climate change and the need to transition away from coal and gas” (Columbia Basin Partnership Task Force 2020, 134). What exactly this means for management strategies, however, then becomes unclear. As explored in the previous chapter, social, cultural, economic, and ecological priorities create different understandings of the interaction between hydropower operations and climate change. While scientific questions remain as to the impact of enhanced spill operations relative to dam breaching, no clear consensus has emerged on the appropriate path for reducing hydropower threats (Columbia Basin Partnership Task Force 2020, 137).

57 Interview with Outreach Coordinator, McGregor Company.
Notably, one of the scenarios compiled in the report centralizes climate change, beginning with the concept that the future is uncertain and “we cannot accurately forecast the future, especially in the 25-50-100 year time frames within which the CBP Task Force has determined to achieve its goals” (Columbia Basin Partnership Task Force 2020, 292). Instead, the scenario establishes a number of plausible futures through which it is possible to establish corresponding regimes of strategy and action. In response to climate effects of hydrology, salmon could adapt rapidly or slowly. Likewise, humans could embrace change or remain resistant to it, determining the resilience of the entire socio-ecological system when faced with climatic shifts. The purpose of this scenario is to prompt actors to consider the interactions between physical, fish, and human dynamics, and then develop a range of strategies to support salmon recovery under that range of conditions (Columbia Basin Partnership Task Force 2020, 294). This initiative clearly demonstrates the foundational role that climate change plays in determining future paths.

The role of the CBC is to develop recommendations based on the Task Force Goals for decision-makers to then consider for implementation. Although part of the strategy process, the group does not decide upon or implement policy decisions. Their recommendations targeting hydropower do not currently address the question of LSRD breaching, reflecting the disagreement that persists around the urgency, necessity, and impacts of the action. Instead, the CBC advocates for increasing fish detection at mainstem facilities to better assess run timing, mainstem reach survival estimates, and Smolt to Adult Return (SAR) data (“Recommendation Tracker,” n.d.).
Federal Executive Power

Four executive agencies in the federal government are involved in the direct management of the LSRD: the U.S. Army Corps of Engineers under the Department of the Army in the Department of Defense; Bureau of Reclamation under the Department of the Interior; Bonneville Power Association within the Department of Energy; and NOAA Fisheries under the Department of Commerce. These agencies are all sited within the executive branch of the federal government. Under the Biden administration in particular, it has been made clear just how much power the President has to direct the goals and priorities of these agencies and shape the LSRD conflict.

Launched in October 2021, the White House Council on Environmental Quality (CEQ) has engaged in federal interagency efforts to restore salmon and steelhead populations in the Columbia River Basin and “identify a durable path forward” that supports clean energy, local economies, ecosystem function, and longstanding commitments to Tribal Nations (The White House 2022). Meeting state and federal clean energy goals are explicit within this endeavor as are the priorities of environmental justice, respect for Tribal treaty rights, and accountability for the harm inflicted upon the ecology and Tribes of the river by the U.S. government (The White House 2022). More broadly, rhetoric and actions from this administration demonstrate a commitment to climate action, particularly through decarbonization, and investments into the resilience of Tribal communities in the face of climate change (U.S. Department of the Interior 2024). A representative from the Nez Perce Tribe describes the broad sense that the Tribes are leading this initiative, a sentiment reciprocated by other stakeholders who describe “a significant seat at the table now they didn’t have before,” and how the Tribes are “hitting their

58 Interview with employee, Nez Perce Tribe.
59 Interview with employee, Oregon Department of Environmental Quality, February 5th 2024.
stride and being heard and listened to, finally by the United States government.”\textsuperscript{60} Although the legal authority of these Tribes stems from their treaty rights as sovereign nations, not from the priorities of the presidential administration, Biden has cemented the strength of the Nation-to-Nation relationship across a broad range of policy issues (“Fact Sheet: Building A New Era of Nation-to-Nation Engagement” 2021), demonstrating how the values of federal leadership can define the dynamics of particular issues.

In 2022, two reports were released as the results of these interagency efforts: NOAA Fisheries’ “Rebuilding Interior Columbia Basin Salmon and Steelhead” (Rebuilding Report) and the “Lower Snake River Dams Power Replacement Study” contracted by BPA. The Rebuilding Report in particular is upfront about the Biden-Harris Administration leading this effort (NOAA National Marine Fisheries Service 2022, 1), providing insight into how the influence of such a role is perceived. The report outlines actions deemed necessary by NOAA Fisheries to achieve healthy and harvestable salmon and steelhead stocks as previously defined by the goals of the Task Force. The necessity of “climate-smart” information and actions underpins its entirety; by demonstrating how the effects of climate change are already evident, it logically follows that initiatives to rebuild salmon and steelhead must directly confront the challenges climate change poses to both freshwater and marine environments, as well as the heterogeneity of these impacts across life stages and stocks. The report uses this as motivation for further action:

The increasing role of deteriorating ocean or freshwater conditions from climate change on the health of salmon and steelhead stocks does not diminish the importance or necessity of taking meaningful actions in areas society has more direct influence over. In fact, the importance and necessity of meaningful actions is heightened, not diminished because of the impacts of climate change. For example, as the frequency of drought, low snowpack, elevated water temperature, and poor marine conditions increase, managers must do more, not less, to restore properly functioning tributary habitats and mainstem migration corridors currently degraded by human uses… These changes counteract the

\textsuperscript{60} Interview with Outreach Coordinator, McGregor Company.
less-manageable deficits created by climate change in marine habitats (NOAA National Marine Fisheries Service 2022, 10).

The idea that climate change exacerbates manageable threats while also magnifying less-manageable threats (NOAA National Marine Fisheries Service 2022, 15) goes on to support a suite of recommended management actions, including the center-piece action for Snake River stocks—restoring the Lower Snake River by dam breaching (NOAA National Marine Fisheries Service 2022, 16).

Demonstrating the impact of this report, an attorney from EarthJustice summarized this exact takeaway: “the NOAA Rebuilding Report… said if we want to stop generational salmon declines toward extinction and rebuild them to healthy populations in the Snake River basin, we need to breach the dams on the Lower Snake River. And this is especially true as climate change advances.”61 Throughout the rest of the report, the urgency of dam breaching continues to be accentuated by ongoing climate change and it is offered as a means to buffer climate change impacts (NOAA National Marine Fisheries Service 2022, 17). Beyond the effects of breaching just on salmon and steelhead, the potential benefits of restored riverscapes—improved floodplain connectivity, sediment distribution, and riparian habitat conditions—are also emphasized as a rich form of both climate mitigation and adaptation work (NOAA National Marine Fisheries Service 2022, 26).

Structured around providing “a high-level response to ten common questions about the science surrounding Columbia River basin salmon and steelhead rebuilding efforts [emphasis added],” the Rebuilding Report is framed to focus only on biological effects, distancing itself from “questions related to socio-political science evaluations” about these actions (NOAA National Marine Fisheries Service 2022, 2). Here, however, it becomes important to recognize

---

61 Interview with attorney, Earthjustice.
that the knowledge produced through these endeavors is not socially neutral; the science produced at a particular time is often what is deemed useful within particular ideological paradigms, reflecting the priorities of the institutions involved (Hirsch 2020, 72). In this case, the report draws together peer-reviewed literature and scientific resources to build greater understandings of salmon and steelhead, clean energy, and the interaction between the two. Although the report makes clear that it “does not supersede or modify existing analyses” conducted by NOAA Fisheries (NOAA National Marine Fisheries Service 2022, 1), the Rebuilding Report advocates for dam breaching to a degree not previously seen by the agency. NOAA’s 2017 Recovery Plan for Snake River Spring/Summer Chinook Salmon and Snake River Basin Steelhead, for example, recognizes the benefits to fish that would occur in the case of dam breaching but also highlights the potential for negative impacts during the breaching action itself, taking no definitive stance on the overall response of the system (NOAA National Marine Fisheries Service 2017).

For those who opposed the findings of the Rebuilding Report, the political nature of NOAA Fisheries as an federal executive agency was called upon as a means to question its recommendations: “The NOAA report that recommended [dam breach] completely did a 180 from a few years back… so, you know, that was clearly also some political moves too by some people being appointed through the Biden Administration in NOAA Marine Fisheries and also CEQ.”62 The focus of this analysis is not to question the validity of the Rebuilding Report or changes in the approach taken by NOAA Fisheries across time, but rather to draw attention to the focus and reception of the information that they produce. The very fact that the science and approach recommended by NOAA is perceived to shift based on who holds office demonstrates the impact of presidential leadership and politics on this issue.

62 Interview with Government Relations Manager, Pacific Northwest Waterways Association.
Finally, in a memo released by Biden on September 27th, 2023, President Biden once again specifies two priorities of the Administration with regards to salmon and steelhead in the Columbia River Basin: honor federal trust and treaty responsibilities to Tribal Nations, and regulate the Columbia River System to adequately protect, mitigate, and enhance fish and wildlife affected by the federal dams. These priorities, it follows, will drive the policy to restore salmon, secure a clean and resilient energy future, support local agriculture, and enhance community resilience to operational changes of the Columbia River System, including those necessary to address changing conditions due to climate change. The memo goes on to direct all federal departments and agencies with applicable responsibilities to advance this established policy (The White House 2023c).

Reflecting on the importance of this directive, the Executive Director of Northwest Sportfishing Industry Association remarked, “the President just showed he has a lot of [power], which has never happened, right?” And it’s true—setting the tone for problem solving around this conflict, the Biden administration has centralized tribal rights, climate change, and environmental justice in ways that have not been done before, fundamentally shifting the trajectory of the federal approach taken toward these dams. This shift in priorities is also apparent in how the Biden Administration has interacted with the longstanding litigation surrounding the federal agencies’ management of the dams.

**Litigation**

The longstanding litigation surrounding the LSRD has operated as a tool through which environmental and fishing organizations, states, and Tribes have opposed the federal agencies’ management strategies of this system. This pathway centralizes the substantial role that the ESA

---

63 Interview with Executive Director, Northwest Sportfishing Industry Association.
has played in establishing the procedures and requirements of Columbia River Basin governance, highlighting distinct ways in which climate change has been considered throughout the policy process.

Within the current ongoing litigation, *National Wildlife Federation et al v. National Marine Fisheries Service et al* (2001), the 2014 BiOp was the last report to be rejected by the courts, and both climate change and dam breaching played key roles in the dynamics of why the case was sent back to federal agencies. To begin, the 2014 BiOp was the first report challenged on the basis of NEPA as well as the ESA. The relevant outcome of this was that not only did NOAA Fisheries have to develop a new plan in compliance with the ESA, but in accordance with NEPA, the action agencies also had to prepare the Columbia River System Operations (CRSO) Environmental Impact Statement (EIS) for the considered actions. In his 2016 opinion and order, Judge Simon cites how the EIS “requires the action agencies to consider all reasonable alternatives, regardless of whether there currently is a funding source or whether any particular alternative is reasonably likely to occur” (Simon 2016, 10.) This broad evaluation of alternatives, which specifically includes the option of dam breaching, is recognized as an opportunity to “finally break the decades-long cycle of court-invalidated biological opinions that identify essentially the same narrow approach” (Simon 2016, 11).

With regards to the 2014 BiOp, one of the main reasons cited for its rejection is the lack of consideration that the plan has given to the impacts of climate change. Using “the same well-worn and legally insufficient path taken during the last 20 years,” Judge Simon finds that the 2014 BiOp “fails adequately to consider the effects of climate change and relies on a recovery standard that ignores the dangerously low abundance levels of many of the populations of the listed species” (Simon 2016, 30). The analysis of NOAA Fisheries, he argues, does not
appear to consider or analyze their own scientific information regarding the effectiveness of habitat mitigation efforts under changing climatic conditions (Simon 2016, 30).

In 2020, federal defendants released the Final EIS (FEIS), a new BiOp, and a Final Record of Decision (ROD) approving the FEIS and BiOp. Out of all the alternative actions considered, the alternative which includes dam breaching “predicts the highest benefits among all of the alternatives for ESA-listed salmon in the Snake River” with “major long-term beneficial effects to resident fish in the Snake River due to improved rearing and migration conditions” (U.S. Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration 2020, 29–30). This scenario also, however, undermines the objectives “Provide a Reliable and Economic Power Supply” and “Minimize GHG Emissions,” citing the challenges of a replacement portfolio that provides regional peaking resources and reduces reliance on carbon-fueled resources in line with state legislation (U.S. Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration 2020, 30-32). As such, the Preferred Alternative recommendation does not include breaching the LSRD. This conclusion once again prompted a challenge from Earthjustice and the previous collection of litigants as a failure “to actually account for critical and credible scientific information, especially regarding the advancing effects of climate change” (Simon 2021, 3).

Just a year later, however, in October 2021, this long-standing litigious cycle shifted when the parties agreed to a pause in the litigation. Earthjustice, on behalf of the fishing and conservation groups, along with federal agencies, the State of Oregon, and the Nez Perce Tribe committed to use the stay to develop a comprehensive, long-term solution to the long-running litigation. An employee of the Oregon Department of Environmental Quality describes this shift in action as arising, once again, from the politics of who held office at the federal level:
This last lawsuit we filed during the Trump administration, we got absolutely zero interest in negotiating under that administration. It was, ‘let’s go to court.’ Number one, they didn’t support that climate change was even real so, ‘what’s the problem?’ And, second of all… we weren’t getting a lot of sense that they were overly concerned about evaporating salmon. So there was no conversation. When Biden came into office, within months, we got a phone call saying: ‘Would you be interested in engaging in settlement discussions—confidential, court sponsored settlement discussions?’ And we said, ‘absolutely.’

This same employee describes how the parties “never had conversation like this before with the federal government” because new elements were being brought to the table, namely the commitment to salmon, the transition to clean energy, and rectifying wrongs inflicted upon the Tribes of the region. From the perspective of defendant intervenor groups, however, this mediation process was a divisive, politically motivated effort that “essentially locked out” those groups from the negotiating process. In a joint statement, Northwest RiverPartners, the Public Power Council, and the Pacific Northwest Waterways Association expressed that “by purposely excluding our respective organizations from the negotiations literally millions of Northwest residents were deprived of fair representation in this process (Terry and Lucia 2023).”

The most recent and significant outcome of this process, titled the Columbia Basin Restoration Initiative (CBRI), was released in December 2023 by the “Six Sovereigns”: the States of Oregon and Washington, and the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes (Confederated Tribes and Bands of the Yakama Nation et al. 2023). The United States Government Commitments in support of the CBRI was then signed into effect in February 2024, marking a 10-year plan with a set of commitments made between the U.S. Government and the Six Sovereigns. It includes a $300 million federal investment in fish restoration throughout the Columbia River Basin (The White House 2023a). Additionally, one of its objectives is explicitly

64 Interview with employee, Oregon Department of Environmental Quality.
65 Ibid.
66 Interview with Vice President, Shaver Transportation.
to “secure continuity of services associated with Lower Snake River (LSR) restoration prior to 
LSR dam breaching” (The Biden-Harris Administration 2023, 4). This marks the first time that 
direct federal support is going towards work to replace the LSRD services and prepare for a 
decision to breach them (Earthjustice, n.d.). Additional objectives to advance climate goals 
include community investment that is consistent with decarbonization and the integration of 
renewables.

The cornerstone of these commitments is the Pacific Northwest Tribal Energy Program 
whereby the Department of Energy will support the development of 1-3 gigawatts of Tribally 
sponsored clean energy projects (The Biden-Harris Administration 2023, 5). Characterized as 
“replacement power,” this energy is offered as a means to further enable dam breach while still 
meeting energy resilience imperatives; however, importantly, “replacing” the energy provided by 
the dams is only possible should Congress authorize dam breach (The Biden-Harris 
Administration 2023, 22), a reminder of the limits inherent to this initiative because of the 
historically seated site of decision-making authority. Nevertheless, this agreement exists at the 
nexus between salmon, climate change, environmental justice, and Tribal rights, with this 
collection of priorities and considerations coalescing into a specific policy outcome. Although 
the Six Sovereigns get no guarantee of dam breach, the agreement has broadly been 
characterized as a “road map” to get there (Breda 2024).

This timeline also highlights the ways in which future political change has the potential to 
shift the dynamics of the conflict once again. “Does the Biden administration stick around?” asks 
a reporter from the Seattle Times. “Does all this evaporate in a year? And in that case, probably 
they could just go right back to court.”67 Indeed, although a stay of litigation is in place for 5-10 
years, Plaintiffs retain their ability to go back to court at any time (Breda 2024). Recognizing the

67 Interview with reporter, The Seattle Times.
influence of the Biden Administration on executive agencies and the trajectory of this lawsuit also leaves open the question of how and by whom that influence will be yielded in the future.

Impact of Congressional Authorization

Congress holds the ultimate decision-making authority on dam breach, which thereby opens up the process to the influence of lobbyists, points of view represented by elected officials, and the voting power of the constituents who elect them. This dynamic changes who gets a say and how organizations involved in policy advocacy shape their efforts.

In particular, Representatives Cathy McMorris Rodgers (R-WA) and Dan Newhouse (R-WA) have been especially vocal about their continued support for the dams and opposition to dam breaching—the LSRD, they argue, “have made us a leader in reducing carbon emissions” (McMorris Rogers 2024) and are “the lifeblood of Central Washington and the Pacific Northwest” (Newhouse 2023). The positionality of these representatives, and the particular narratives through which they intertwine climate impacts with the resilience of the local economy and energy system, is especially important to consider given the need for Congress to authorize significant changes to the operations of the LSRD.

Congressional authority over breaching the LSRD has also led to a conscious nationalization of the issue by NGO organizations such as American Rivers, the Nature Conservancy, and Trout Unlimited. “I don’t think we’ll get to an act of Congress without a little bit more public support for the issue,” says the Snake River Director of American Rivers. “So that’s really where we’re focusing our efforts.”68 The Idaho Conservation League pursues a similar strategy:

68 Interview with Snake River Director, American Rivers.
I mean, I think, from a strategy point of view, nationalizing this issue, getting more people to pay attention to the Lower Snake River across the nation is important. It’s very important, especially, like, a path to dam removal has to move through Congress. And that’s going to require Congress members from the East Coast who have never visited or maybe heard of the Snake River… But I think as we see dam removal becoming more and more popular across the country, it’s becoming… an easier pill to swallow of like: ‘Oh, I see that this infrastructure is not actually serving us anymore. And that getting rid of it is actually a step towards combating climate change or restoring this habitat or whatever it might be.’

This demonstrates the ways in which federal congressional power dictates the political dynamics surrounding the LSRD conflict. Recognition of the processes governing the dams, and what would be required to remove them, actively changes how these stakeholders approach the issue, shifting their efforts to the national scale because that is where the ultimate decision authority lies.

It is also possible to see how climate change is mobilized as a tool to make this happen. When the path to policy change must involve those who are not directly affected by the landscape, certain strategies are utilized to give claims legitimacy at a larger scale. The intent is to compel others to care by using phenomena, values, and characterizations that are less about the particular details of this conflict. As a result, the national scale has “a less sophisticated understanding of what the issue is,” relying on campaigns that hold broad symbolic value. Connecting dam removal on the LSRD to efforts to combat climate change has become one means to do that, drawing on the social and political capital of climate claims. It is important to recognize that there is nothing inevitable about the ubiquity of this argument. Yes, climatic shifts impact temperature and precipitation regimes that negatively impact the well-being of salmon, strengthening the connection between climate change and dam breach as a strategy for salmon.

69 Interview with Salmon & Steelhead Grassroots Associate, Idaho Conservation League, October 5th 2023.
70 Interview with Snake River Campaign Manager, Trout Unlimited.
recovery efforts. But NGOs are intentionally using these claims to nationalize the issue, illuminating historically and socially produced sites of federal power.

These same efforts, however, lead to distrust and pushback from more localized actors who resent the ways in which the conflict is depicted at the national scale. In the national discussion, there is a sense that the LSRD have become a symbol of larger environmental arguments: “And when something becomes a symbol, all of the sort of specifics and details and facts sort of blend alway. Because you want to sharpen the power of a symbol, and uncertainty, compromise, discrepancies, all of those things sort of soften, make an image less clear and less useful as a symbol.”71 Appeals on the national scale are viewed by NGOs as critical to reaching the degree of support necessary for dam removal authorization to become possible. But this same strategy leaves critics with the perception that the environmental community engages with people who don’t even know what the dams look like,72 and “aren’t from here, aren’t aware of the issues,” intentionally scaring them to fulfill fundraising efforts.73

**State Action**

Although management of the LSRD and the Columbia River System is executed by federal agencies, state governments also function as relevant actors within the policy-making process. The clearest example of this is the 2022 Murray-Inslee Report.

Similar to previous reports, climate change is recognized as generally exacerbating threats and limiting factors impairing salmon and steelhead survival and productivity. The report draws on the insights of the NOAA Rebuilding Report that climate change heightens the necessity of meaningful action and that “breaching the LSRD represents an action that is within

---

71 Interview with Senior Vice President for Research, Washington Policy Center.
72 Interview with Vice President, Shaver Transportation.
73 Interview with President and CEO, Tri-City Development Council.
societal control [and] supports climate resilience” (Washington Governor’s Office 2022, 26). Additionally, the report takes seriously the commitments made by the State of Washington to “building a carbon-free future and clean energy economy in recognition of the urgent need to take action to combat climate change” (Washington Governor’s Office 2022, 52). In addressing how breaching the LSRD would impact greenhouse gas emissions, the process is placed in the context of the “dynamic changes” occurring in both the energy and transportation systems to meet the state’s climate commitments (Washington Governor’s Office 2022, 55).

Overall, the biggest takeaway of the Murray-Inslee Report is the commitment to taking replacement actions such that there would be “no loss of benefits” in the case of dam breach (Washington Governor’s Office 2022, 2). For some, this conclusion makes it “kind of a big nothing burger” due to the scope of the services that they provide—“good luck,” remarked the Government Relations Manager at Pacific Northwest Waterways Association sarcastically at the realistic prospects of replacing everything the dams provide.74 Others, however, see it as a reason to have hope for problem-solving moving forward, as an acknowledgement that the “dams do provide valuable resources, especially to certain communities,” and there are ways to change the infrastructure while still “trying to set folks up for success.”75 This commitment to replace the services provided by the dams before dam breaching has been solidified in other actions taken regarding the dams, including the U.S. Government Commitments in support of the CBRI. The Murray-Inslee Report is cited as providing important guidance for this work and supports the strategy of deploying interim actions such as Tribally-owned clean energy projects. The message of the Murray-Inslee report provides the basis for deploying large-scale “clean energy infrastructure necessary to confront the climate crisis regardless of whether Congress authorizes

74 Interview with Government Relations Manager, Pacific Northwest Waterways Association.
75 Interview with Salmon and Steelhead Grassroots Associate, Idaho Conservation League.
the breaching of the Lower Snake River dams” (The Biden-Harris Administration 2023, 3). Simultaneously, however, these same actions would also make dam breaching more feasible.

Additionally, the Washington State Legislature passed a proviso for the 2023-25 budget providing the Washington Department of Transportation $5 million to study the transportation impacts of breaching the LSRD. The intent of this study is to address outstanding infrastructure and operations questions regarding highway, road, and freight rail transportation needs in the case of dam breaching including an assessment of financial costs and a holistic carbon analysis of the project. Another $2 million was also appropriated to the Department of Commerce to analyze new electrical generation and transmission for LSRD removal as well as $500,000 to the Department of Ecology in funding for an analysis of irrigation availability during the reservoir drawdown period that would happen during dam breach (Earthjustice 2023). “When the legislature gives the department money,” explained the state’s LSRD Transportation Study Project Manager, “sometimes they declare exactly what that money should be used for.”

Similar to processes occurring at the federal level, the priorities of the State also become evident by where funds are allocated and directly influence the understanding and implications of certain actions. The omnipresent background of Washington and Oregon’s decarbonization legislation also demonstrate the power and influence of state priorities.

Conclusion

The policies and politics governing the Columbia River System and the LSRD is an incredibly complex web of jurisdictions with involvement from Tribal, state, and federal governments interacting across pathways determined by judicial, legislative, and executive

76 Interview with LSRD Transportation Study Project Manager, Washington Department of Transportation, November 14th 2023.
processes. The plethora of initiatives, reports, and engagement on the issue demonstrates the broad consensus that the status quo does not sufficiently meet the needs of the human and non-human actors affected by the system.

Within the strategies through which actors support or oppose dam breach, the pressure that climate change places on both salmon and infrastructure systems is evident, as is the way in which actors understand and prioritize the management of its impacts. Perceptions of climate change contribute both to stakeholder frustration and validation about these ongoing processes. Considerations of how these stakeholders interact—who’s voice is heard and when—must be understood within the historically and geographically defined context surrounding these dams, structuring the basis of federal leadership as well as state, tribal, and NGO contestation.
VI. DISCUSSION

There are some who assert that “climate impacts are… one of the largest reasons why breaching should be a top option” on the Lower Snake.\textsuperscript{77} Others agree that “climate change is impacting this debate,” but view this same phenomenon from a different perspective, finding that its influence is “probably in favor of the Lower Snake River dams.”\textsuperscript{78} Both of these framings are representative of commonplace perspectives in the discourse and politics surrounding the LSRD and the competing narratives which emerge from climate change knowledge. Although dam removal is an increasingly common practice for the sake of river ecosystem restoration, these efforts often cause controversy. Previous analysis demonstrates how public opposition to dam removals is not necessarily a case of knowledge deficiency but can be due to different understandings and valuations of the environment and its function (Jørgensen and Renöfält 2013). As such, despite the fact that these understandings of climate impacts for the LSRD are in complete opposition to each other, it would be careless to simply dismiss one characterization or another as uniformly wrong or misinformed.

Drawing on interview data, textual analysis, event observation, and fieldwork, I find that climate change is impacting the underlying drivers of this conflict, adding complexity and urgency, and furthering opportunities for stakeholders to insert conflicting values and worldviews. Additionally, climate change is embedded into the governance structures of this system, such that the conflicting ways in which it is understood are negotiated across multi-scalar institutional networks. Focusing on climate change in this landscape reveals dynamics about who holds power and how their power is expressed. Dam removals offer the

\textsuperscript{77} Interview with employee, Nez Perce Tribe.
\textsuperscript{78} Interview with Executive Director, Northwest RiverPartners.

99
opportunity to establish new relationships between rivers and societies (Sneddon, Barraud, and Germaine 2017). This research demonstrates the value of considering how climate change is challenging or aiding the potential for this reimagination. Central concepts from political ecology, STS, and knowledge controversies inform this analysis, contributing to a better understanding of the dynamics of the LSRD conflict and the politics of dam removal efforts within a changing climate.

**Knowledge Controversies**

The first of my research questions targets the ways in which climate change is affecting the knowledge controversies that underpin the LSRD environmental conflict. In this context, knowledge controversies are defined as “those events in which the knowledge claims and technologies of environmental science, and the regulatory and policy practices of government agencies that they inform, become subject to public interrogation and dispute” (Whatmore 2009, 588). This definition brings attention to the challenges that exist at the science-policy interface, a dynamic previously explored for both climate change (Sarewitz 2004, Sharman and Perkins 2017) and dam removals more broadly (Sneddon, Magilligan, and Fox 2017, Grabowski et al 2017).

While this research has targeted the impact of knowledge controversy on climate policy decision making (Sharman and Perkins 2017), this thesis connects politicized understandings of climate change to the complex space of dam removal controversies. I build upon the recognition that different types of knowledge lead to different constructions of nature, an overall dynamic which precipitates conflicts over dam removals (Fox, Magilligan, and Sneddon 2016). Previous attention has not, however, acknowledged and explored the intersection between dam removal
conflicts and the knowledge controversy of climate change, making this research an important contribution to better understand the interactions between river restoration and climate change.

Throughout history, fundamental shifts in the predominant imagination of the Columbia River Basin have vastly changed how the salmon and the river in which they inhabit are viewed—for the Nez Perce, for example, the protection and celebration of salmon is a sacred law given by the land; white settlers, however, saw these same fish as a mass-marketable commodity, and throughout the 19th and 20th centuries, the riverscape was transformed into an ‘Organic Machine’ (White 1996) and an ‘Irrigated Eden’ (Fiege 1999). In response to the dramatic decline of salmon and steelhead runs, tension over these contested constructions and imaginations have continued. Dam breaching has long been proposed as a management solution that would restore normative flow conditions to the river instead of only relying on technological solutions like fish hatcheries and barge transportation for out-migrating juveniles. But dam breaching has and continues to be opposed precisely because of the ways in which it challenges the historically dominant human-river relationship and economic valuations of the river for the sake of irrigation, navigation, and hydroelectric services.

In recent years, climate change has added yet another dimension to the controversies embedded into the management of the river system. According to Sharman and Perkins (2017), “the lens of knowledge controversy is particularly apt in the case of climate change. Conflicting knowledge claims and valuations of evidence and expertise are assembled to support different points of view” (2283). Through this mechanism, the values of different stakeholders involved in the LSRD controversy become relevant because of how the same information is interpreted and utilized to support conflicting stances on dam breach. For example, research highlighting how rising SSTs are linked to heightened extinction risks for Snake River spring/summer Chinook
salmon (Crozier et al. 2021) mobilizes two very different claims. The first is that breaching the dams is an ineffective way to address the declining fish runs because the problem is elsewhere. Proponents of dam removal, however, see changing ocean conditions as motivation to take action in the system where possible.

There is also broad recognition of the uncertainty that climate change introduces—not necessarily in terms of what future climatic conditions will look like (Maas 2022), but in how these changes will prompt shifts in the use, management, and understanding of this complex socio-ecological system. Especially in the energy sector, this region is experiencing overarching change in the push to decarbonize. Once again, what this change means for future-oriented initiatives is ambiguous, a dynamic that lends itself to distinct interpretations of the underlying facts depending on one’s pre-existing position. This moment of transition is viewed by some as “proof of concept that we have to take the dams out because we’re committed to stopping the impacts of climate change.”79 Through this lens, climate change undermines the hydrologic cycle upon which the dams’ energy generation depends and has actually created the space to ask, “how really cheap and reliable is this whole big hydro thing that we’ve built anyway?”80 At the same time, characteristics of hydropower make it potentially “necessary as a way to fight climate change” because it does not directly emit carbon and its stability enables the wider integration of intermittent renewables like wind and solar, “to balance them out.”81

When pondering the question, “What if we do remove the dams and the salmon don’t return to the extent that we thought they would?” the Grassroots Associate for Idaho Conservation League reasons that it would “probably be due to climate change.” Even so, for them, this only builds motivation for the continuation of this work because “salmon are

79 Interview with Snake River Director, American Rivers.
80 Interview with reporter, The Seattle Times.
81 Interview with Executive Director, Northwest RiverPartners.
incredibly resilient, and giving them like half a shot, they tend to come back no matter what.”

This question of resilience also, however, comes up as a key determining factor with regards to the “resilient infrastructure that provides competition and economic opportunity for the communities that currently depend upon the dam system.”

The political ecology of resilience provides tools to analyze the range of ways in which this concept of climate resilience is utilized by different actors within this space. Those who invoke claims about the resilience of salmon as a reason to breach the dams more closely align with a purely ecological framing of the concept. Better access to the cold, clean, high-elevation habitat beyond the LSRD is seen as crucial for the long-term survival of these cold-water fish species, an assessment which aligns with the expected capacity of dam removal as a beneficial ecological intervention to enhance resilience at the watershed scale (Magilligan et al. 2016).

When applied to communities and the social sphere, it must be recognized that resilience is not socially neutral; in fact, resiliency encapsulates the ability of a socio-ecological system to withstand crisis while maintaining the same functions of control (Watts 2015). As such, while focusing on the resilience of salmon may offer a transformative approach to the management of the LSRD and the Columbia River System, maintaining the resilience of the current infrastructure privileges the status quo. Moving forward, it is critical to recognize what kind of resilience is being built into this system. As climate change and the social response to it exerts pressure on this system, will it change in ways that are adequate for both the salmon and the people who rely on them? Can change occur in ways that build adaptive capacity for both the social and ecological components of this highly intertwined system? In order to improve the socio-ecological conditions surrounding the LSRD and better understand the dynamics of this

---

82 Interview with Salmon and Steelhead Grassroots Associate, Idaho Conservation League.
83 Interview with Campaign Lead, Solutionary Rails.
longstanding conflict, these are the questions which must be asked of claims of climate resilience.

**Policies and Politics**

A political ecology approach also allows for the analysis of power relations at multiple scales, dynamics which help to explain why dams are removed or not and the characterization of the controversies which can surround such efforts. “Hydrosocial territories,” articulated as a political ecology approach for exploring water conflicts (Boelens et al. 2016), provides a fundamental basis for framing and contextualizing the structures that mediate the interactions and power relations between relevant stakeholders to the LSRD. The dams interact with and shape governance associated with ecological services, recreation, energy, agriculture, and transportation—as well as the cultural values associated with each of these—at local, state, Tribal, and federal scales. Mediated by the legal and governance structures into which they are embedded, these venues through which stakeholders engage define who, why, and with what authority policy decisions are made about the dams. Political ecology supports this expansive understanding of territory as the space in which struggles over meaning, norms, knowledge, identity, authority, and discourses occur (Boelens et al. 2016). This situated, relational, and scalar approach also acknowledges how efforts to remove dams are often multiscalar negotiations across institutional frameworks and political networks (Sneddon, Magilligan, and Fox 2021; Drapier et al. 2021).

This is especially critical for federal dams like the LSRD, because the federal scale of dam operation and ownership remains understudied in the existing literature on the politics of dam removal. Much of this existing scholarship focuses on the removal of small run-of-river
structures in New England (Fox, Magilligan, and Sneddon 2016) or larger dams subjected to FERC relicensing arrangements in the Pacific Northwest (Chaffin and Gosnell 2017). The LSRD, however, are large, federally owned dams, not subject to FERC licensing. This research, therefore, contributes to different takeaways about the stakeholder interactions and power dynamics governing a dam removal conflict (Hilbert-Wolf and Gerlak 2022; Harrington and Cantor 2024). Without equating historical and geographical contingencies, this work integrates research from other landscapes to better understand the LSRD and the politics which surround the decision-making process for federally owned and operated dams.

The multiple narratives and framings that drive this knowledge controversy intersect with the institutional arrangements integral to the formation and implementation of policy decisions about the LSRD. As such, my second research question asks how climate change is intersecting with the policies and politics around dam breach. The longevity of this conflict has led to the common perception that the status quo of the management of the LSRD and the Columbia River System is unacceptable. As such, this analysis explores the multitude of venues through which actors contest and reimagine the management policy of the system and the ways in which climate change intersects with these efforts including: the Columbia Basin Collaborative, CEQ’s interagency efforts to restore salmon and steelhead populations under the Biden Administration, the long standing litigation over federal agency compliance with the ESA and NEPA, nationalized public awareness campaigns from NGOs, and state involvement to direct priorities.

A dominant takeaway of this analysis is that climate change is not ignored within the management of this system. Throughout reports, initiatives, and litigation, climate change is embedded into considerations and contestations over future paths and recommendations for the LSRD. An STS approach reveals how climate knowledge is co-produced within the surrounding
political, economic, and cultural environment. This is critical to recognizing how shifting values and priorities change the questions that have been asked about this landscape, with implications on the type and focus of knowledge that is produced. Recent efforts at the state and federal levels, the 2022 Murray-Inslee Report and the 2020 NOAA Rebuilding Report both recognize the global scale of climate change and see dam breaching as an action that can benefit salmon and steelhead at the basin scale; this demonstrates how a particular narrative of climate impacts has become interwoven into institutionalized governance efforts. Tracing the pathways through which climate change intersects with negotiations over the management of this system reveals dynamics about the amount of power held by different actors and how their approach and understanding of the impact of climate change influences the policy initiatives that emerge.

The Murray-Inslee Report also sets the tone for the necessity of replacing the services of the dams before they are breached, and doing so in a ways that supports the region’s climate resilience. State decarbonization goals also demonstrate a foundational commitment to industry sustainability, priorities that must be considered moving forward. But, states do not have the power to directly change the management policy of the LSRD because they are federally owned and operated.

The courts, therefore, have been a longstanding venue used to challenge the operational approach of the federal action agencies building an alliance between the states of Oregon and Washington, four Columbia River treaty Tribes, and a collection of environmental NGOs. The last Bi-Op to be rejected by the courts was done so precisely because Judge Simon deemed the plan to not adequately consider the future effects of climate change, prompting a continuation of the litigious cycle. The most recent outcome of this process, the CBRI and the United States Government Commitments in support of the CBRI, provides a concrete example of how the
rhetoric priorities of the Biden Administration—salmon, climate change, environmental justice, Tribal rights—coalesced into a specific policy outcome.

The overall involvement of the Biden Administration with this issue has demonstrated the impact of federal leadership within the LSRD conflict—“the Biden administration’s recent presidential memorandum has shifted the conversation,” reflects an administrator from the Idaho Governor’s Office of Species Conservation.84 The fact that the president and political appointees of the president are central actors in the LSRD conflict is not new (Wegner 2003)—but the characterization of the impact of climate change coming from the federal level certainly is. Even though the CRBI has been characterized as a road map to dam breach, Congress still holds the ultimate decision-making authority over the dams. This dynamic has led environmental NGO to strategize nationalizing the conflict as a means to build broader support and national public awareness about what is happening on the Lower Snake. Within these efforts, climate change is being mobilized as a symbolic tool to give legitimacy to a policy that supports dam breaching and have it appeal to a broader audience. The scale of this effort must be placed within the historically situated institutions of power on this issue.

These frameworks have consequences on the dynamics and perceptions of this conflict. The increased involvement of the Biden Administration in directing the priorities of federal agencies, for example, has increased the skepticism and pushback in response to the work of NOAA Fisheries. This highlights the political and social influence on the research undertaken and knowledge produced, a key takeaway of the STS concept of co-production. As previously mentioned, the well-being of salmon populations are connected to the state of climate. But this has been true in the past even when research had not yet illuminated the degree of that influence and connection. As such, the relevance of climate change in the LSRD controversy cannot be

84 Interview with administrator, Idaho Governor’s Office of Species Conservation.
taken as inevitable—rather, it is an expression of the types of questions that are now being asked and the subsequent knowledge that is being produced. These contexts matter and fundamentally shape the opinions creating or contesting the policy governing this space.

Conclusion

The theoretical approach employed in this research aids in the identification of dominant framings utilized by actors in support of and in opposition to the LSRD. Controversy over these dams has existed for a long time—they received pushback before construction on the first dam began in 1956 and they have been embroiled within controversial, litigious management plans since Snake River sockeye were listed through the ESA in 1991. This controversy is about many things: Tribal sovereignty and treaty rights; economic opportunity; opposing understandings of value, function, and role of this landscape; competing visions of the future. It is only recently that climate change has become broadly incorporated into the public consciousness, embedded into the discourse, politics, and policy initiatives surrounding the LSRD. As such, it would be a mistake to identify climate change or claims about climate impacts as an overarching driver of the LSRD conflict. But it would also be an oversight to ignore the ways in which it affects, intersects with, and influences these preexisting and longstanding dimensions of the conflict.

Ultimately, central concepts of political ecology, STS, and knowledge controversies come together to help explain the positionality of particular actors as opponents or proponents of LSRD dam breach. Central concepts to these approaches include power dynamics, cross-scalar influence, resilience, co-production of knowledge, management of uncertainty. Together, these frameworks highlight the social, cultural, political dynamics that mediate the interactions between actors, knowledge, and the implementation of policy about these dams. Despite existing
as solid, unmoving infrastructure projects, different stakeholders come to know these dams in vastly different ways. The ways in which climate change is interwoven into distinct narratives highlights two dominant relationships that shifts the meaning of the LSRD and the interpretation of underlying knowledge for different actors. Different worldviews, priorities, attachment to this landscape, and types and interpretations of knowledge are incorporated throughout these framings.

Supporters of the dams generally emphasize the idea that salmon and the LSRD can coexist. The benefits of the dams are central to this stance including their contributions to electric grid management and the carbon efficiency of both hydropower production and barge transportation. While declining salmon populations are recognized as an important problem that must be addressed, this perspective questions the framing of the dams as the primary culprit driving these declines, finding fault in the notion that dam removal is a scientifically-sound and cost-effective means for salmon recovery. Instead, attention is placed on the dominant influence of climate change in the ocean and the range of salmon restoration efforts that might be supported using the same funds required to breach the dams.

Those who advocate for dam removal, however, approach the dams from a different starting place, viewing the promises of the infrastructure as largely unrealized and the ecological costs in this location as too great. Here, the dams are seen as the key drivers pushing iconic species of salmon, steelhead, and orca to extinction. Breaching the dams is proposed as the only action that has not already been tried that could make a significant difference in improving these populations. Their removal presents an opportunity to address ecological dysfunction, right historic injustices, and institute process-based rather than technological restoration. This approach disconnects the services provided by the dams from their physical structures
—sustainable electricity, irrigation of food crops, goods transportation are important but the ways that they are provided can be reimagined to do right by the salmon and the people connected to salmon.

The overarching question to this thesis asks: How is climate change influencing the environmental politics and conflict surrounding dam removal river restoration on the Snake River? Climate change adds complexity, urgency, and new dimensions to the preexisting knowledge controversies surrounding the LSRD. Climate change enables opportunities to both transform or re-entrench the human-river imaginaries driving relationships to this river and, by extension, management approaches to the entire socio-ecological system. Climate change is operationalized through the complex, multiscalar institutional frameworks in which negotiations over the LSRD are situated.

The Snake River Campaign Manager from Trout Unlimited remarked that “these dams will come down… the only question is how long it takes.” And it’s true—they are a piece of infrastructure with a finite lifespan. But the question of how long it takes also invokes questions about what dynamics, values, and relationships will drive that process, and what will be created afterwards. According to Magilligan, Sneddon, and Fox (2018), “dam removal, although trying to achieve something biophysical, is at its core a social process where realization requires a constellation of historically contingent institutional, political, and economic forces to align within a particular location (262-263). This research takes seriously the social processes connected to the LSRD and climate change while also centralizing the ecological processes that they concern. Adding visibility to the ways in which climate change interacts with the institutional, political, and economic forces on the Lower Snake leads to a better understanding of how particular actors come to support, oppose, and influence the potential for dam breach, the

85 Interview with Snake River Campaign Manager, Trout Unlimited.
challenges embedded into dam removal processes writ large, and human-river relations moving into the future.


Bonneville Power Administration. 2019. “BPA Invests in Fish and Wildlife.”
“A Vision for Salmon and Steelhead: Goals to Restore Thriving Salmon and Steelhead to the Columbia River Basin.” Phase 2.


Magilligan, Frank, Christopher Sneddon, and Coleen Fox. 2018. “The Sociogeomorphology of


119


NW Energy Coalition. 2022a. “Addressing the Lower Snake River Dams’ Peaking Capacity.”


Willis, Ann. 2024. “Four Things To Know About the Impacts of Dam Removal on the Klamath River.” May 17, 2024.

