ADDRESSING THE DAM PROBLEM:

BALANCING HISTORIC PRESERVATION, ENVIRONMENTALISM,

AND COMMUNITY PLACE ATTACHMENT

by

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THESIS ABSTRACT

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This thesis addresses the growing occurrence of historic dam removals across the United States and the complex balance of interests they entail. Historic dams are often environmentally harmful, but they may also represent significant cultural resources and places of community attachment. In the Pacific Northwest, hydroelectric dams powered the region's growth and development, but today many of these dams are being removed for their negative environmental impacts. This thesis explores hydroelectricity's significance in the Pacific Northwest region, the parallel growth of the modern river restoration movement, the intricate process of dam removal, and the primary regulatory method used to address the loss of historic resources. Through four case study hydroelectric dam removal projects in Oregon and Washington, the effectiveness of balancing interests during the dam removal process and the consequences of removal for community history are assessed. The outcomes of these assessments are several key elements necessary to planning and implementing dam removals that equally address the concerns of preservationists, environmentalists, and the community. This topic is explored at a relevant time and is applicable on a larger scale to other historic resources that carry significance but also have detrimental environmental consequences.

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CHAPTER I. INTRODUCTION

Dams and their associated infrastructure have been essential to the growth of humanity. The dam form can be traced back to ancient civilizations, from the Fertile Crescent to the Far East.[1] Humans have continually captured the power of water and put it to work for their own needs: grinding wheat, turning fish wheels, and sustaining crops. The most revolutionary use of this hydropower, however, occurred quite recently on the scale of human history. When engineers developed technology in the nineteenth century that could transform the power of water into the power of electricity the course of human development was accelerated at a drastic pace. In the United States, hydroelectricity quickly lit up homes not just in large cities but in small towns across the nation. In the Pacific Northwest of the United States, the advent of hydroelectricity was particularly fruitful for the region's development. Criss-crossed with rivers and blessed with a long rainy season, the Pacific Northwest held the highest potential for hydropower of any region in the country.[2]

However, as human society has grown and evolved at an unprecedented rate over the last century, dams have fallen from grace. Once harbingers of community growth, these structures are now technological relics that frequently have serious implications for the biological community at large (a community that includes not just flora and fauna, but humans and entire ecosystems). Since the turn of the twenty first century, dams across the nation have been removed at a steadily increasing rate. These removals can be attributed to many factors: the river restoration movement that has been maturing since the 1960s, an increasing push for clean energy, the implementation

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[1] Stephen Winzenread et al., "The History of Dams," CA History, (1999), accessed May 04, 2019. https://watershed.ucdavis.edu/shed/lund/dams/Dam_History_Page/History.htm.

[2] Russell McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career* (Eugene, Or.: Palimpsest Books, 2012), 1.

of more stringent environmental regulations, the financial infeasibility of operating inefficient dams, human health and safety risks; the list goes on. However, while the principles underlying the growing opposition to dams are hard to refute, the removal of a dam encompasses more than just the interests of environmentalists.

DEFINING THE "DAM PROBLEM"

The removal of a dam is an environmental positive, but when considering other issues and interests the loss of a dam can be detrimental. The majority of the nation's dams have surpassed fifty years in age, the official age after which a resource is considered historic by federal and state governments.[3] Some of these historic dams are significant resources, whether it be for their role in the development of a town or city, their association with a significant event or person, or their design and engineering. There are eighty-four thousand inventoried dams in United States and while certainly not all of them are significant, it is a credible assumption that at least a fraction of them are.[4] A low-head dam that backs up a swimming hole in a private back-yard is not imbued with the same historic significance as the Hoover Dam or a dam that provided water or power to an entire city.[5]

That back-yard swimming hole, however, may be significant to the family who has for generations sought refuge in the hole's cool waters on summer days. Dams, whether or not they are historic, can hold significance for communities or individuals in countless ways. A dam may have irrigated a family's crops, getting them through tough

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[3] Brad Plumer, "The Crisis at Oroville Dam, Explained," Vox.com, February 15, 2017, accessed December 05, 2018, https://www.vox.com/science-and-health/2017/2/13/14598042/oroville-dam-flood-evacuation.

[4] "National Inventory of Dams," National Inventory of Dams (NID), accessed May 4, 2019, https://nid-test.sec.usace.army.mil/ords/f?p=105:113:11509753873265::NO

[5] American Association of State Highway and Transportation Officials, *A Summary of Existing Research on Low-Head Dam Removal Projects*, by ICF Consulting (2005), EX1 – EX2.
A low-head dam is generally considered a dam less than twenty-five feet in height and a small dam is generally considered less than fifty feet height.

drought years; a dam's powerhouse may have employed every generation of a family; a dam's reservoir may have been the place a child took their first hesitant strokes in the water. A community or individual can find significance in a dam itself but is more likely to find significance in the environment the dam has created or in the opportunities the dam has provided.[6] These feelings of significance translate as an attachment to a place, and the loss of the place that grounds that bond can be an emotionally harmful experience for a community or individual.

Dam removal is a polarizing issue that invokes strong emotions and involves a variety of interest groups. Hydrologists, historic preservationists, engineers, biologists, Native American tribes, local governments, and more, are all involved and invested in the dam removal process. This thesis focuses specifically on the interests of environmentalism, historic preservation, and communities in the dam removal process. These groups are not more significant than other involved parties but rather are those that often appear most at-odds with one another's goals. Environmentalists want the dam torn down, preservationists want to preserve its historic significance, and the community wants to retain the places they feel bonded too: how can all of this simultaneously be achieved?

DAMS IN THE PACIFIC NORTHWEST

As aforementioned, the Pacific Northwest was historically one of the major beneficiaries of hydropower [Figure 1.1]. Over the last two decades however, the Pacific Northwest Region has become a frontrunner in the dam removal movement. The region has birthed several high-profile, nationally discussed dam removals and seventy-three dams in total have been removed from the region since 2003.[7] The Pacific Northwest is

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[6] Irwin Altman and Setha M. Low, eds., *Human Behavior and Environment: Advances in Theory and Research*, vol. 12: Place Attachment (New York: Plenum Press, 1992), 9.

[7] Jessie Thomas-Blate, "Dam Good Year for Dam Removal in 2017," American Rivers, February 13, 2018, accessed
December 05, 2018, https://www.americanrivers.org/2018/02/dam-removal-in-2017/.

perhaps the best microcosm of the country for examining the varying interests involved in the removal of historic dams. It has a significant number of dams, a robust history relating to dams, and an almost equally robust opposition movement against dams. This opposition movement can be attributed to the decline in salmon in the region caused by dams inadequately designed to accommodate fish passage.

Although this opposition is not focused specifically on hydroelectric dams, the scope of this thesis is limited to dams with a hydroelectric function. This scope was chosen for several

reasons: hydroelectric dams are significant to the history of the region, they have a specific process for decommissioning, and several well-known dam removals which have already occurred in the region included hydroelectric projects. Additionally, dams are a large topic and limiting the scope allows for a more focused historical context and analysis. While this study is particularly relevant to the region of the Pacific Northwest due to the tailored scope, its findings are applicable on a national level.

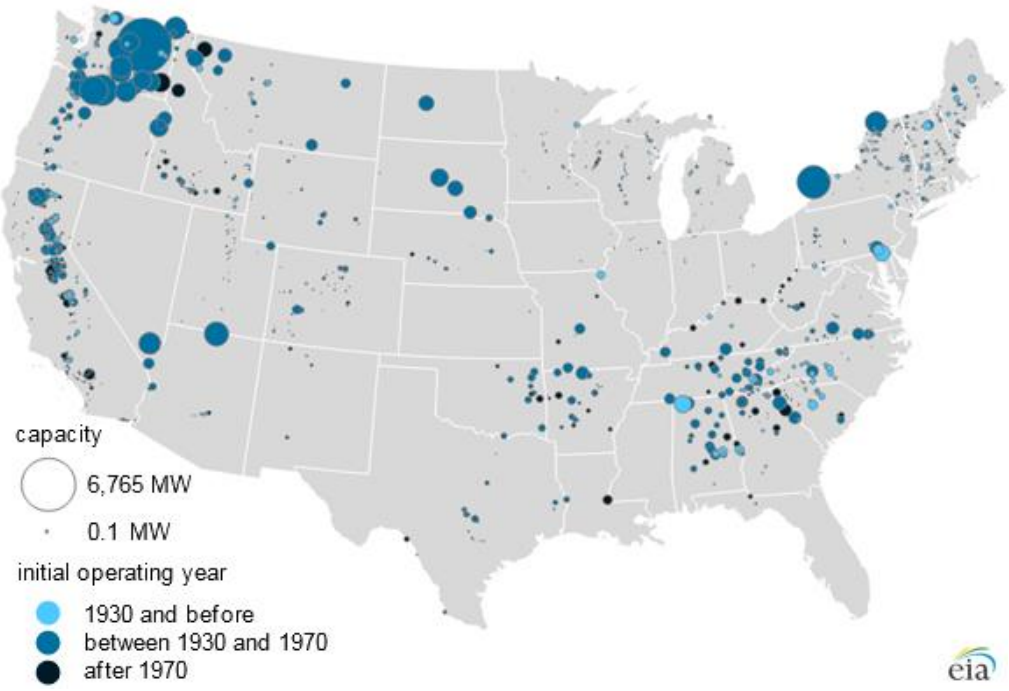

Figure 1.1 Distribution of hydroelectric plants across the United States. Source: U.S. Energy Information Administration.

DAM REMOVAL: A BALANCING ACT

To answer the question that ended the previous section, "how can all of this simultaneously be achieved?" this study proposes one answer: Section 106 of the National Historic Preservation Act (*NHPA*). The NHPA is the primary legislation that guides historic preservation in the United States and Section 106 dictates how federal agencies approach historic resources. It ensures that federal agencies consider the effects of their undertakings on historic resources and that they attempt to mitigate those adverse effects. The process of Section 106 and the resulting mitigation provide the best opportunities during a dam removal project to address issues of historic preservation and community place attachment. Section 106 however is just one of many regulations triggered by a federal dam removal, most of which are concerned with environmental issues. This study seeks to discover if Section 106 is indeed the right tool to balance considerations of historic preservation and community place attachment with environmentalism.

Through four case study hydroelectric dam removal projects in the Pacific Northwest region, the effectiveness of Section 106 for those purposes will be assessed. It will be revealed if Section 106 has been used as the best tool to preserve or interpret historic significance and community place attachment when the demolition of a structure is irrefutable for environmental reasons. The conclusions of this study will include several recommendations for ensuring Section 106 is used effectively during historic dam removals and similar projects. These recommendations can be used to inform future dam removal projects and are applicable to other historic resources that have negative environmental impacts.

ORGANIZATION

The body of this thesis is organized to provide the necessary historic contexts and basic knowledge with which to approach the final chapters of analysis. After this

brief introduction, the study's methodology and relevant literature to the topics discussed herein are presented in Chapter II. Two chapters devoted to providing historic context follow subsequently. Chapter III provides a deeper understanding of the history of hydroelectricity and its specific place in Pacific Northwest history. Chapter VI is a brief presentation of historic moments that defined the river restoration movement and aided in its maturation to a modern formidable dam opposition group.

The following chapters provide an understanding and analysis of the federal regulations triggered by dam removal projects. Chapter V defines the numerous federal and state regulations that direct the process of dam removal and how these regulations attempt to balance varying interests. The following Chapter VI comprises an overview of the primary federal regulation regarding historic preservation, the National Historic Preservation Act, and its function and implementation during dam removal. This chapter also establishes baseline mitigation techniques and provides examples of mitigation that embrace more creative techniques.

Chapter VII introduces the reader to the four case study hydroelectric dam removal projects and the reasoning behind their selection. A brief historic context of each project is provided as well as a summarization of the mitigation techniques employed after the conclusion of the removal. Chapter VIII discusses the process for developing effectiveness criteria and subsequently analyzes each case study's effectiveness in interpreting historic significance and addressing place attachment. Chapter IX concludes the thesis by recommending key elements of a usefully balanced approach to dam removal, the larger applicability of the study, and the future of both Pacific Northwest dams and the field of preservation.

CHAPTER II. METHODOLOGY AND LITERATURE REVIEW

METHODS AND LIMITATIONS

This study and its design are based upon a methodological approach of several accepted qualitative research frameworks in the field of social sciences. These approaches fall into four general frameworks: exploratory research, historical-comparative research, secondary analysis, and case study research.[8] At its core, this study was largely driven by personal curiosity and is exploratory in nature. This study discerns how dams and dam removal have been approached historically and in modern times and questions if the current approach to dam removal mitigation is effective regarding historical significance and community heritage. By means of a wide range of resources and literature, this study delves into the murky relationship of nature and culture studied by notable historians such as William Cronon and Richard White and explores the place of dams and dam removal within this relationship. Additionally, through a review of relevant literature two historic contexts are established and examined using a historical-comparative research approach. The historical and social context of dam construction is juxtaposed with the rise of the environmental and river restoration movements to provide a framework for understanding the current state of dams.

The central methodologies employed in this study are secondary-analysis and case study research. Secondary sources were analyzed to determine the mitigation strategies implemented in the four case study dam removal projects, the key stakeholders in the Section 106 Review process, and the significance of each case study. These resources are all public-record and included Memorandum of Agreement (*MOA*), correspondence, National Register of Historic Places nomination forms, cultural

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[8] Rebekah Luff, Dorothy Byatt, and David Martin, *National Center for Research Methods Report: Review of the Typology of Research Methods within the Social Sciences*, (National Center for Research Methods, 2015). Accessed February 01, 2019. http://eprints.ncrm.ac.uk/3721/1/research_methods_typology_2015.pdf

resource management plans, cultural resource surveys, Federal Energy Regulatory Commission surrender applications, Section 106 Documentation forms, as well as newspaper and journal articles. These documents provided information from which to assemble historic narratives and basic information of several case study dam removal projects for assessment. The case study dam removal projects were determined based on several pre-selected criteria which will be discussed in a subsequent chapter.

To assess the case study removal projects, this study relies on document analysis and snowball-sampling interview techniques. The aforementioned documents, in addition to the language of the National Historic Preservation Act (*NHPA*) and state level preservation policy, are analyzed to ascertain the types of mitigation commonly employed through Section 106 review, the strategies implemented in each individual case study, and the place of the public in Section 106 review consultation. Qualitative unstructured interviews with human subjects are used to supplement this information and to provide insight into the Section 106 process. These interviews were conducted with preservation professionals including State Historic Preservation Office employees, private contractors, and Forest Service employees. In these interviews, participants were asked to provide their own opinion of the successfulness of the mitigation strategies regarding retention and/or interpretation of historic significance and community heritage. In addition to these methods, visual inspection of each case study was performed to ascertain the tangible impacts of dam removal and mitigation.

Several factors presented limitations to the scope of this research, time being perhaps the most obvious. This research was completed over a six-month period between October 2018 and April 2019 and site visits were limited to one to two-day trips. The number of interviews completed were also limited by this short timeframe and could not be held until proper clearance was provided by the University. The accessibility to dam removal sites once traveled to also presented a limitation. Several sites or portions of sites are difficult to reach, dangerous and abandoned, or located on private property. As much information as possible was attempted to be gathered on site while maintaining personal safety and respecting the law.

In addition to these limitations, the wide breadth of dam removal projects presented a significant limitation to the research. Dam removal is an interdisciplinary issue: it involves environmentalists, communities, historians, engineers, tribes, and many other vested parties. Due to the scope of this project and time allotted to complete the research many of these groups and individuals are not represented or adequality discussed in this thesis. In particular, the importance of tribes and Tribal Historic Preservation Offices (*THPO*) during dam removal and Section 106 consultation is under-represented. The author wishes to recognize the negative impacts dams have had on tribes of the Pacific Northwest and the tribal ancestral lands the case study dams were historically constructed on. These include lands of the Lower Elwha Klallam tribe, the Confederated Tribes of Warm Spring, the Confederated Tribes of Grand Ronde, and the Confederated Tribes and Bands of the Yakama Nation.

LITERATURE REVIEW

A significant number of literature resources currently exist concerning the history of dams in in the Western United States and nature and place attachment. Relatively few resources however address the issues of preserving infrastructure and the inclusion of historic preservation in dam removal. There also exists an abundance of primary resources detailing the environmental impacts of dams as well as primary resources outlining specific dam removal projects. These resources show that while the history, impact, and significance of dams have been thoroughly explored, analyses of historic preservations role in dam removal is lacking. The following sections present the most relevant resources for approaching and understanding the complexity of dam removal and the current involvement of historic preservation in dam removals and similar projects.

Historic Significance of Dams in the West

The increasing public interest and opposition to dams in the United States has produced a wide body of literature concerning the subject. Many of these resources are

focused on the Western half of the United States, due to the large irrigation and hydroelectric projects developed in the region during the twentieth century. One of the earliest controversial dams in the country, and the origin of the modern environmental movement, is explored in Robert W. Righter's *The Battle Over Hetch Hetchy: Americas Most Controversial Dam and the Birth of Modern Environmentalism*.[9] Righter depicts the loss of Yosemite's Hetch Hetchy Valley as a battle waged between politicians, lobbyists, and environmentalists. He debunks several misconceptions about the mythic tale, perhaps most notably those surrounding the ultimate goals of the Sierra Club and its opponent, Gifford Pinchot.[10] This resource provides a basis for understanding the early history of environmentalism in the United States as well as the role of dams in powering the growth of Western cities.

Several resources provide a wider historical context of the history of dams in the West. Steph Grace's *Dam Nation: How Water Shaped the West and Will Determine Its Future* analyzes the history of dams in the west critically, framing it as characterized by frequent mismanagement.[11] Grace discusses the massive project of the New Deal era, and the complex web of laws, regulations, and federal incentives that have permitted mismanagement of Western waters. In 2012, Grace argued that a tragedy regarding water in the west was imminent, and today this argument seems well founded. In a similar vein, Donald Worster's *Rivers of Empire: Water, Aridity, and the Growth of the American West*, examines the larger history of dams in the west with a critical lens. Worster presents the desire to dam the West as an extension of manifest destiny and emphasizes the drastic changes made to the Western environment by Americans.

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[9] Robert W. Righter, *The Battle Over Hetch Hetchy: Americas Most Controversial Dam and The Birth of Modern Environmentalism* (New York: Oxford University Press, 2006).

[10] Stephen Grace, *Dam Nation: How Water Shaped the West and Will Determine Its Future* (Guilford, CT: Globe Pequot Press, 2012).

[11] Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (New York: Oxford, 2010).

Relevant specifically to the scope of this study, several resources speak to the history of hydroelectric in the Pacific Northwest. Russell McCormmach's *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, An Era and a Career* describes the systematic hydroelectric development of the Columbia River Basin and the environmental consequences associated with it through the story of the author's father, a hydraulic-design engineer.[12] McCormmach brings the discussion to present day, discussing the modern benefits and disadvantages of hydroelectricity and its place as an alternative "clean" energy. A more human oriented approach to expressing the history of the Columbia River is also evoked by Blaine Harden in *A River Lost: The Life and Death of the Columbia*.[13] Through interviews and personal experience, Harden provides a historic and social context for understanding the damming of the Columbia as well as insight into the polarization of dam removal between urban and rural residents of the Pacific Northwest. Paul Pitzer employs a similar approach in *Grand Coulee: Harnessing a Dream* by framing the history of the dam around the workers who built it and politicians who fought for it.[14] While Pitzer is not critical of the dam, his discussion of the ethos behind building the Grand Coulee provide insight into the attitudes that guided much of the era's large hydroelectric infrastructure.

Societies, Nature, and Place Attachment

There is an extraordinarily large body of work concerning the relationship between humanity and nature and the concept of place attachment. In the development of this study, three resources proved particularly relevant and informative. The selection of essays compiled and edited by William Cronon in *Uncommon Ground:*

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[12] McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*.

[13] Blaine Harden, *A River Lost: The Life and Death of The Columbia* (New York: W.W. Norton, 2012).

[14] Paul C. Pitzer, *Grand Coulee: Harnessing a Dream* (Pullman, WA: Washington State Univ. Press, 1994).

Rethinking the Human Place in Nature present several compelling themes and ideas.[15] While some essays were more applicable than others - notably Richard White's "Are You an Environmentalist or Do you Work For a Living?: Work and Nature", Carolyn Merchant's "Reinventing Eden: Western Culture as a Recovery Narrative", and Giovanna Di Chiro's "Nature as Community: The Convergence of Environment and Social Justice" – the overall body of work raised questions relevant to the issue of dam removal.[16] The authors examined the modern relationship of humans and nature critically and argued for a more wholistic view of the human-nature relationship and an embrace of the inextricable link between humanity and the environment. These themes informed the approach to dam removal emphasized in this study: as interdisciplinary and reflective of the human connection to dams and the environment they have created.

Richard White's *The Organic Machine: The Remaking of The Columbia River* connects the themes presented in *Uncommon Ground* directly to the Pacific Northwest region.[17] White describes the link between the regions physical geography and its social geography, focusing specifically on the Columbia River. He argues that the history of the river cannot be examined separately from the history of the area's humans, and vice versa. The Columbia is presented not just as river but as a mechanized resource that was essential to humanity on both an individual and community level. These notions are

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[15] William Cronon, ed., *Uncommon Ground: Rethinking the Human Place in Nature* (New York: W.W. Norton, 1995).

[16] Richard White, "Are You an Environmentalist or Do You Work For a Living?: Work and Nature." In *Uncommon Ground: Rethinking the Human Place in Nature*, edited by William Cronon, 171-186, (New York: WW Norton & Company, 1996).
Carolyn Merchant, "Reinventing Eden: Western Culture as a Recovery Narrative". In *Uncommon Ground: Rethinking the Human Place in Nature*, edited by William Cronon, 132-171 (New York: WW Norton & Company, 1996).
Giovanna Di Chiro, "Nature as Community: The Convergence of Environment and Social Justice." In *Uncommon Ground: Rethinking the Human Place in Nature*, edited by William Cronon, 298-321 (New York: WW Norton & Company, 1996).

[17] Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York: Hill and Wang, 2001).

essential to approaching the history of dams, as they are inextricably linked to both the physical environment and the communities they existed within and in support of.

The primary basis for understanding this connection between humans and their environment as presented in this study resides upon "Volume 12: Place Attachment" of the series *Human Behavior and Environment: Advances in Theory and Research*.[18] This volume provides a basic understanding of the meaning of place attachment, the evolution of the field, and the many forms place attachment may present as. Robert B. Riley's chapter "Attachment to the Ordinary Landscape" and Clare Cooper Marcus's chapter "Environmental Memories" are particularly prevalent to discussions of dams and community place attachment.[19] The field of place attachment research informed the approach to community place attachment and community involvement emphasized in this study.

Preserving Historic Engineering Resources

While literature exists concerning the preservation of historic engineering resources much of it is directed towards bridges, boats, and roads. While these resources are similar in character to dams (as part of infrastructure and falling outside the normal constraints of assessing architectural style) it is telling that the body of literature is lacking in information concerning dams. For the purposed of this study two resources were informative: the Historic American Engineering Record (*HAER*) and James L. Garvin's article "Education to Preserve Bridges and Dams as Capstones of Out

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[18] Altman and Low, eds., *Human Behavior and Environment: Advances in Theory and Research*, vol. 12: Place Attachment.

[19] Robert B. Riley, "Attachment to the Ordinary Landscape" in *Human Behavior and Environment: Advances in Theory and Research*, vol. 12: Place Attachment, ed. By Altman and Low, 13-32, (New York: Plenum Press, 1992).
Clare Cooper Marcus, "Environmental Memories" " in *Human Behavior and Environment: Advances in Theory and Research*, vol. 12: Place Attachment, ed. By Altman and Low, 13-32, (New York: Plenum Press, 1992).

Engineering Legacy" *in Preservation Education & Research*.[20] These resources establish a context for understanding the significance of structures for their engineering and design.

The *HAER* was established in 1969 and initially was used primarily to document bridges. The program has broadened and now documents a wide variety of historic engineering and industrial resources. These sites are described as ubiquitous across the nation and as an illustration of "the American fascination with and dependence on technology and its implementation."[21] Industrial and engineering resources are not necessarily significant for their aesthetic values (like high architecture) but reflect American innovation and can contribute to further technological advances.

Garvin's article depicts bridges and dams specifically as the highest achievements in engineering. He argues that federal projects, like bridges, dams, and railroads, are often the origin of a town and that a full understanding of those engineered structures is necessary to comprehend the larger cultural landscape. Garvin's foremost argument is for the training of preservationists in engineering discourse, and while this is not directly relevant to the study his context for understanding historic engineering resources is one of few resources to specifically address dams.

Historic Preservation and Dam Removal

Although dam removal has generated an immense amount of literature concerning environmental issues since the turn of the twenty first century, very few literature exists regarding dam removal and historic preservation. A report published by

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[20] James L. Garvin, "Education to Preserve Bridges and Dams as Capstones of Our Engineering Legacy," *Preservation Education & Research* 1 (2008):.
National Park Service, *HAER: Historic American Engineering Record*.

[21] National Park Service, *HAER: Historic American Engineering Record*.

the National Park Service and American Rivers (a river restoration organization) titled "Dam Removal and Historic Preservation: Reconciling Dual Objectives" is the only resource found to have addressed the two issues. [22] This report was the impetus for this study as it presents Section 106 as the solution to reconciling the often at-odds desires of environmentalists and historic preservationists. The report provides an overview of the Section 106 review process, examples of mitigation approaches, and eight case studies from across the nation that employ various types of mitigation. While the report provides an excellent foundation for approaching the removal of historic dams, it does not evaluate the mitigation measures implemented in the case studies. Additionally, the report includes avoidance and preservation-in-service as possible solutions to adverse effects. This study relies on the premise that continued operation of a dam should not be considered by preservationists if it causes detrimental environmental impacts. This study hopes to construct a more robust body of knowledge considering dam removal and historic preservation and to provide a context for understanding the significance of dams historically and to communities.

AUDIENCE AND INTENDED OUTCOME

This research was completed in an effort to address a polarizing and increasingly relevant issue not just to preservationists, but to communities, environmentalists, and all those invested in the continued conservation of both the country's heritage and environment. Heritage conservation and environmental conservation share the same core values but are frequently viewed as unrelated and often at odds. The champions of both movements, however, rely on the same embrace of civic responsibility to protect resources that provide largely intangible benefits to the public. These intangible benefits include "that which enriches the intellectual, psychological, emotional, spiritual, cultural

[22] Serena McClain, Stephanie Lindloff, and Katherine Baer, *Dam Removal and Historic Preservation: Reconciling Dual Objectives*, report (American Rivers, 2008).

and/or creative aspects of human existence and wellbeing."[23] Historic preservation and environmentalism may come to different conclusions when addressing the same problem, but both ultimately strive to ensure the conservation of the same values. Dam removal presents an interesting format with which to address and explore the dualities of environmentalism and historic preservation.

Ultimately this research will culminate in a series of recommendations for ensuring effective mitigation after the removal of a historic dam. While the case studies are regionally specific, the final recommendations are applicable across the United States and in some cases to other types of undertakings. In addition to the final recommendations, several examples of effective dam removal projects will be highlighted from other regions of the United States. Within the conclusion of this study, two key themes will be emphasized: the future of Pacific
Northwest dams and the future of preservation. This study is particularly relevant at this time and in this region as environmental groups and citizens increasingly protest for the removal of large dams on the Snake River, Columbia River, and within the Klamath River basin.[24] The futures of many Pacific Northwest dams are unknown but it is logical to conclude – based on the regular increase in dam removals per year since 2000 - that within the next few decades many more of these resources will be removed across the region.[25] This research intends to help inform future decision making regarding the mitigation of lost historic dams and to be a useful tool and guide for preservation professionals and individuals and communities invested in a dam removal project.

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[23] David Harmon, "Intangible Values of Protected Areas: What Are They? Why Do They Matter?" The George Wright Forum 21, no. 2 (June 01, 2004): 9. Accessed February 01, 2019, http://www.georgewright.org/212.pdf.

[24] Amy Souers Kober, "Plan Released for Klamath River Dam Removal," American Rivers, July 02, 2018, accessed
December 7, 2018, https://www.americanrivers.org/2018/06/plan-released-for-klamath-river-dam-removal/.

[25] "American Rivers Dam Removal Database," American Rivers, (December 2018).

Similar to dams in the Pacific Northwest, the future of preservation as a discipline is

currently in question. As the National Historic Preservation Act (NHPA) reached its fiftieth birthday in 2016, many professionals in the field used the occasion as a moment to reflect on the past and question the future of preservation. Publications including *Bending the Future: 50 Ideas for the Next 50 Years of Historic Preservation in the United States*, "Preserving Places: Reflections on the National Historic Preservation Act at Fifty From the Public Historian," and "The National Historic Preservation Program at 50: Priorities and Recommendations for the Future" feature reflections and recommendations for the future of preservation.[26] These preservationist ask "how has preservation been practiced, how will it be practiced, and how can we do more and do it better?" Preservationists are beginning to embrace more interdisciplinary approaches, evidenced by the focus on inclusivity and culture/nature at the most recent National Trust for Historic Preservation conference. Presentations at the conference analyzed complex environmental and cultural issues such as the controversy over Bears Ears National Monument, the balance of environment and history at San Francisco's Presidio, and a co-presented symposium on culture-nature with the International Council on Monuments and Sites.[27] Dam removal presents an interesting opportunity for preservationists to embrace interdisciplinary identities – as preservationists,

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[26] Max Page and Marla R. Miller Miller, *Bending the Future: Fifty Ideas for the next Fifty Years of Historic Preservation in the United States,* (Amherst: University of Massachusetts Press, 2016).
Tamara Gaskell, "Preserving Places: Reflections on the National Historic Preservation Act at Fifty from the Public Historian," National Concil on Public History, October 2016, accessed June 8, 2019, https://ncph.org/wp-content/uploads/2009/12/Preserving_Places.pdf
"The National Historic Preservation Program at 50: Priorities and Recommendations for the Future," The Advisory Council on Historic Preservation, 2016, accessed June 8, 2019, http://preservation50.org/wp-content/uploads/2016/02/Preservation50FinalReport.pdf.

[27] Honor Keeler, "Native Americans and Historic Preservation: Re-Indigenizing Native American Homelands," proceedings of Past Forward 2018, San Francisco.
"Field Study: Watersheds, Forests, and Parades - Nature and Culture at the Presidio of San Francisco," proceedings of Past Forward 2018, San Francisco.
Tim Badman et al., "Forward Together: A Culture-Nature Journey Toward More Effective Conservation in a Changing World," proceedings of Past Forward 2018, San Francisco.

environmentalists, and community advocates – and remain relevant in the twenty-first century. This study will emphasize that preservation issues do not exist in a bubble and that to effectively and adequately perform their jobs, preservationists need to consider all aspects of an issue. All humans are part of a larger community of citizens, inextricably linked and dependent upon the natural environment, and preservationists must embrace this notion to retain relevancy in the modern world.

CHAPTER III. HISTORICAL CONTEXT: HYDRELECTRICITY IN THE PACIFIC NORTHWEST

EARLY ITERATIONS OF HYDROPOWER AND DAMS, PRE 1900

Humans have taken advantage of natural waterways by manipulating and altering their flows for what experts estimate to be as long as six thousand years.[28] The first known dams were a masonry gravity dam constructed by Egyptians between 2950 and 2750 B.C., followed by an earthen gravity dam constructed in 2000 B.C. in Mesopotamia.[29] These early dams were simple in design and served the primary functions of irrigation and flood prevention. One of the first instances of humans harnessing the power of water was the development of the vertical water wheel by the Greeks nearly two thousand years ago for flour production. The vertical water wheel used the natural flow of water, either from the waterway itself or through a penstock, to spin an axle that would in turn drive belts and gears to power various types of machinery, from grinders for flour production to bellows for blacksmithing [Figures 3.2 and 3.2].[30] This relatively simple design was the foundation of hydropower for centuries until the development of the water turbine in the 1700s.

The turbine, whose invention is largely credited to French engineer Benoit Fourneyron, was submerged in water and oriented horizontally but functioned mechanically in the same manner as the water wheel. The design however better optimized the flow of water and therefore could be constructed on a much smaller scale then a water wheel. This early iteration of the turbine was implemented in American

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[28] Stephen Darby and David A. Sear, *River Restoration: Managing the Uncertainty in Restoring Physical Habitat* (Chichester: Wiley, 2008) 1.

[29] Winzenread et al., "The History of Dams," Accessed May 04, 2019. https://watershed.ucdavis.edu/shed/lund/dams/Dam_History_Page/History.htm.

[30] Pierre-Louis Viollet, "From the Water Wheel to Turbines and Hydroelectricity. Technological Evolution and Revolutions," *Comptes Rendus Mécanique* 345, no. 8 (2017): 571-572, doi:10.1016/j.crme.2017.05.016.

textile mills and was a major driver in the American Industrial Revolution.[31] In the 1880s the turbine, which had been altered but remained relatively the same in primary design, was first employed in the United States to create not just hydropower but hydroelectricity. A hydroelectric plant was constructed on the Niagara River in Buffalo, New York, just upstream of the iconic falls, and generators powered by water turbines spun by the falls lit electrical street lighting in 1880.[32] This technological achievement set a new path for power production in America and from that point on all major hydropower projects in the United States were devoted to the production of electricity.[33]

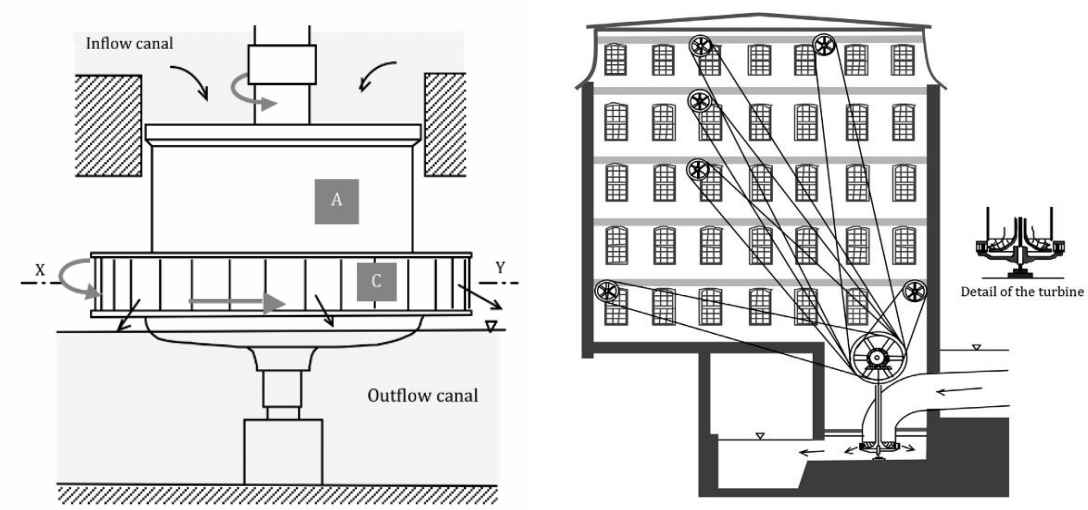

Figure 3.1 (left) Basic diagram of an early Fourneyron water turbine. **Figure 3.1** (right) Diagram of Harmony Mills, Cohoes, New York 1871. Source: Viollet, Pierre-Louis. "From the Water Wheel to Turbines and Hydroelectricity. Technological Evolution and Revolutions." *Comptes Rendus Mécanique* 345, no. 8 (2017): 570-80.

[31] Ibid., 573-574.

[32] McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*, 4.

[33] Viollet, "From the Water Wheel to Turbines and Hydroelectricity. Technological Evolution and Revolutions," *Comptes Rendus Mécanique* 345, no. 8 (2017): 576.

THE AGE OF TECHNOLOGY: HYDROELECTRICITY IN THE EARLY 20th CENTURY, 1900 – 1930

Almost a decade after the power of electricity lit the streets of Buffalo, New York the first hydroelectric power was harnessed in the Pacific Northwest at Willamette Falls, Oregon in 1889. A fourteen-mile transmission line carried the electrical power produced by generators located in the Willamette Falls Station A Power Plant to light the streets of Portland. This feat was a pivotal moment in the advancement of hydroelectricity in the Pacific Northwest but hydropower and dams had long been important to the region.[34] Hydropower spun fish wheels along the region's rivers, powered early grist mills and sawmills, and transported logs downstream.[35] Small scale dams were constructed by private citizens or companies throughout the region for various means, including recreation, the creation of stock or farm ponds, water supply, and log transportation.

These early small-scale dams and the larger hydroelectric projects constructed in the Pacific Northwest Region after the turn of the twentieth century proved detrimental to native fish populations. Many dams in the region did not have fish ladders, and those that did, did not prove to be effective. After some decades of witnessing population declines, state and federal policies were enacted which stipulated the mitigation of these effects through the construction of hatcheries at dams without fish ladders. This

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[34] McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*, 16. The Station A Power Plant is no longer extant but subsequent hydroelectric infrastructure was constructed along Willamette Falls. This infrastructure was protected in 2015 as part of the Willamette Falls Heritage Area, a state heritage corridor.

[35] White, *The Organic Machine: The Remaking of the Columbia River.*

mitigation was enforced at several large hydroelectric dams in Oregon after their construction, including the Gold Ray case study dam.[36]

These large hydroelectric projects could afford the costs associated with mitigation and dam operation in general as dam ownership moved from single individuals to larger companies. Some early hydroelectric dams were constructed for personal benefit, like the Gold Ray Dam which was initially slated to supply power to the owner's mining operations (instead it would power several cities in Southern Oregon). Most hydroelectric dams however found a more profitable purpose in supplying electricity to growing cities in the Pacific Northwest. During the early twentieth century, several major utility companies were formed in the region, including Pacific Power and Light Company and Seattle City Light, that supplied electricity to large and growing cities alike.[37] By the 1920s, hydroelectricity had become so prolific that even most smaller towns were supplied with electricity from dams.[38]

The rapid growth of hydroelectricity across the nation and within the Pacific Northwest during this period created a need for oversight. In 1920 congress enacted the Federal Water Power Act *(FWPA*) which established a licensing body, the Federal Power Commission (*FPC*)(later renamed to the Federal Energy Regulatory Commission, or *FERC*), authorized to license the operation of non-federally owned dams.[39] During his tenure as Secretary of Commerce future President Herbert Hoover described the purpose of the *FWPA* as the "coordinated long-view development of each ricer system to its maximum utilization."[40] The United States saw the raw power of the many wild

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[36] Joseph E. Taylor, *Making Salmon: An Environmental History of the Northwest Fisheries Crisis (*Seattle: University of Washington Press, 2009), 222.

[37] McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*, 16.

[38] *Place and Power: Evolution of the Northwest's Energy System*, Vimeo, March 30, 2016, accessed May 4, 2019, https://vimeo.com/160916364. Rural areas at this time generally did not yet have electrical service.

[39] McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*, 19.

[40] White, *The Organic Machine: The Remaking of the Columbia River*, 54.

rivers of the country and the potential it held for supporting the nation's growing cities. Along with the *FWPA* two organizations were central to the future development of dams in the country: the United States Army Corps of Engineer (*USACE*) and the Bureau of Reclamation (*BR*). While the *USACE* was concerned with navigation, the *BR* with irrigation, and the *FWPA* with hydroelectricity, multipurpose dams were constructed to serve all three purposes.[41]

During this early period of hydroelectric infrastructure, navigation and irrigation needs often dominated conversations about the future of American Rivers. In the decades to come however, hydroelectricity would become the foremost catalyst for dam construction. This earliest period of hydroelectric dam construction in the United States was the age of a new technology that had not yet been stretched to encompass its full potential. The small dams constructed across the Pacific Northwest in the early twentieth century while not as grand or spectacular as the large dams to come, were however, essential to the growth of communities in the region. These early hydroelectric endeavors provided electricity for streets and homes and jobs for community residents. They had unintended negative consequences as well, particularly on migratory fish populations important to regional Native tribes and the larger culture of the Pacific Northwest. Nevertheless, early hydroelectric dams provided not just electrical power but power for economic and physical growth in the Pacific Northwest Region.

THE NEW DEAL, WORLD WAR II AND HYDROELECTRICITY, 1930 – 1950

"What skyscrapers had been to Americans in the 1920s - the Empire State Building, the Chrysler Building - big dams were in the 1930s." – Russell McCormmach

The 1930s and 1940s were perhaps two of the most tumultuous and dark decades of twentieth century America. These decades saw the greatest economic

[41] Pitzer, *Grand Coulee: Harnessing a Dream*, 11.

downturn in American history and the second highest number of American war-time casualties. They were also, however, periods of great hope and great growth due in large part to Franklin D. Roosevelt's New Deal and the revitalization of the economy by wartime industries. Hydroelectric infrastructure boomed during these periods and the Pacific Northwest was the epicenter of dam building fervor. The *USACE*, *BR*, and hydroelectric boosters were drawn to the region by one primary factor: the Columbia River. Described as an unbridled and dangerous force by early explorers, the Columbia River dropped nearly two feet per mile from its headwaters in the Canadian Rockies.[42] A *USACE* survey early in the twentieth century realized the huge hydroelectric potential created by the rivers steep descent and large volume and deemed the Columbia and its tributaries the river system with the most hydroelectric potential in the country.[43]

By the mid-1930s five of the world's largest structures were being built on the rivers of Western America. Two major projects had begun on the Columbia River in the Pacific Northwest: the *USACE* began construction of the Bonneville Dam in Oregon while the *BR* began construction of the Grand Coulee in Washington as part of the larger Columbia Basin Project [Figures 3.3 and 3.4].[44] Both of these projects were made possible by President Roosevelt's New Deal, a series of projects and programs initiated to provide jobs and economic growth during the Great Depression. Accordingly, the primary motivation for construction of the Bonneville and Grand Coulee Dams was temporary unemployment relief and increased access to electricity in rural America. And while these dams were constructed by organizations whose primary purviews were not

[42] White, *The Organic Machine: The Remaking of the Columbia River*.

[43] McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*, 1.

[44] Grace, *Dam Nation: How Water Shaped the West and Will Determine Its Future*, 85.

power, hydroelectricity provided the justification for their costly construction through subsequently generated revenue.[45]

The New Deal Era Columbia River dams came to represent more than just poured concrete and man hours; they were the image of progress and a modicum of hope for Americans. The Bonneville Power Administration (*BPA*), established to administer the Columbia River Dams, hired American folk singer and songwriter Woody Guthrie in the early 1940s to produce a series of songs about the Columbia River dams.[46] His Americana songs are emblematic of the period, expressing optimism, wonder, and national pride in lines like "Well, the world has seven wonders, the travelers always tell / Some gardens and some towers, I guess you know them well / But the greatest wonder is in Uncle Sam's fair land / It's that King Columbia River and the big Grand Coulee Dam".[47] Guthrie's lyrics also served as hydroelectric propaganda, proudly telling Americans, "Uncle Sam needs water and power dams / Uncle Sam needs people and people needs land / Don't like dictators not much, myself / But I think the whole country ought to be run / By electricity!"[48]

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[45] McCormmach, Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career, 20 & 9.

[46] Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West*, 26.

[47] Woody Guthrie, "Grand Coulee Dam," recorded 1941, Woody Guthrie, Bonneville Power Administration, 1988, CD.

[48] Woody Guthrie, "Talking Columbia," recorded 1941, Woody Guthrie, Bonneville Power Administration, 1988, CD.

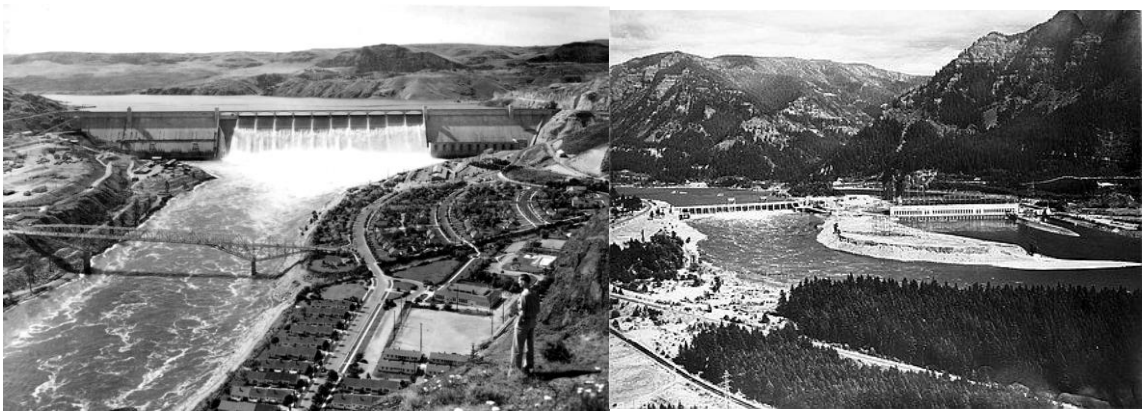

Figure 3.3 (left) The Grand Coulee Dam, 1942. Source: www.usbr.gov.
Figure 3.4 (right) The Bonneville Dam, date unknown. Source: Oregon Historical Society.

The Bonneville Dam and Grand Coulee Dam were feats of engineering and human power that inspired awe and ushered in the heyday of big hydroelectric dam construction. They did not, however, address a predominant problem of Pacific Northwest Dams: migratory fish. The Grand Coulee was initially designed as a lower dam but at the ends of its construction in 1942 it stood five hundred and fifty feet tall. A dam this imposing could not accommodate any sort of fish passage, so it was simply constructed with no intention of allowing migratory salmon to pass. In 1932, at the beginning of construction of the Bonneville and Coulee, it was estimated that salmon spawning grounds on the Columbia had already been reduced by half. The construction of the Grand Coulee blocked migratory species from nearly one thousand upstream miles of the Columbia River.[49] In response to the new large federal dams being constructed in the West, the Mitchell Act was passed in 1938 mandating the *BR* and *USACE* work with the Fish and Wildlife Service to mitigate negative effects on fish populations, through various programs including hatcheries, fishways, and physical relocation.[50]

[49] Taylor, *Making Salmon: An Environmental History of the Northwest Fisheries Crisis*, 175.

[50] Ibid., 228.

By the end of the 1930s at least one hundred and seventy four dams existed in the Columbia Basin, compared to just ninety-three dams on regional rivers in the early 1930s.[51] While the federal government had constructed several dams as part of the New Deal, the majority of these new dams constructed in the 1930s were privately owned and continued to power the regions cities and growth. This era saw American dreams, of progress and power and flourishment, "made real in concrete and steel" and would prove essential as America entered World War II.[52] A little more than a year after America declared war on Japan, almost all the electricity produced at the Grand Coulee Dam and Bonneville Dam was devoted to wartime production. The Coulee alone produced the power of one million trains, and that power was put to work producing aluminum for the manufacturing of airplanes and later to the production of plutonium for the manufacturing of atomic bombs.[53] In 1948 President Harry Truman conceded that without the power provided by the Bonneville and Grand Coulee Dams, the war may not have been won by the Allied Powers.[54]

The success of the New Deal hydroelectric dams, the growth of private hydroelectric dam construction, and the general economic upturn caused by World War II created the environment necessary for the increase of hydroelectric infrastructure in the following decades. Near the end of the 1940s one additional factor contributed to the impending hydroelectric fervor. In the spring of 1948, the Columbia breached its banks and caused severe flooding throughout the River basin. This had occurred before:

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[51] 175.

[52] Grace, *Dam Nation: How Water Shaped the West and Will Determine Its Future*, 85.

[53] Patrick MacCully, *Silenced Rivers: The Ecology and Politics of Large Dams* (London: Zed Books, 2001), 16. Grace, *Dam Nation: How Water Shaped the West and Will Determine Its Future*, 84. Plutonium production was located at the Hanford Reactor on the Columbia River in Washington. The site was part of the Manhattan Project and is now part of the Manhattan Project Natural Historic Site. The former production site is also a superfund cleanup site and has been called Americas most polluted area.

[54] Harden, *A River Lost: The Life and Death of The Columbia*.

the second worst flood of the Columbia on record, just eight years earlier, wiped out an entire suburb of Portland. While this flood received little attention or aid, likely due to the areas predominantly African American population, the 1948 floods drew swift response. Government and state programs were established to construct flood control and storage dams, which all included turbines to produce hydroelectric energy.[55] All of these occurrences in two short decades – the New Deal, private hydroelectric growth, economic upturn, and catastrophic flooding – allowed hydroelectric infrastructure to swell during the following heyday of big dams.

BIG DAM HEYDAY: 1950 – 1975

Following World War II hydroelectric dam construction peaked in the United States. In the 1950s dams were still regarded as the epitome of human ingenuity by many. The American Society of Engineers selected both the Grand Coulee Dam and the Columbia Basin Project as two of the seven engineering wonders of the United States in 1950, based not on their sheer size but rather on their pioneering designs [Figure 3.5, map of projects].[56] Between 1950 and 1979, 475 dams were constructed in Oregon and 322 were constructed in Washington, compared to one 299 and 180 dams constructed in each state respectively from pre-1900 to 1949.[57] Even as a growing anti-dam movement matured in the 1960s, private power companies and the *USACE* continued to construct hydroelectric dams at a rapid rate.[58]

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[55] Paul W. Hirt, *The Wired Northwest: The History of Electric Power, 1870s-1970s* (Lawrence: University Press of Kansas, 2012), 328-329.

[56] Pitzer, *Grand Coulee: Harnessing a Dream*, i.

[57] "National Inventory of Dams," National Inventory of Dams (NID), accessed May 4, 2019, https://nid-test.sec.usace.army.mil/ords/f?p=105:113:11509753873265::NO:::. These number reflect all dams constructed, not just hydroelectric dams. While data exists of the function of these dams only the primary function is listed. Many dams have numerous functions, so It is not possible to determine the number of dams that included hydroelectric production along with other functions.

[58] Hirt, *The Wired Northwest: The History of Electric Power, 1870s-1970s*, 5.
Taylor, Making Salmon: An Environmental History of the Northwest Fisheries Crisis, 244.

While anti-dam sentiment intensified, Americans also began to question if hydroelectricity could continue to provide enough power for the country.[59] In an effort to appease both schools of thought, those ethically against dams and those concerned for hydroelectricity's future capacity, the *USACE* released a publication in in the mid-1970s ensuring the public it aimed:

> to preserve the unique and important ecological, aesthetic and cultural values of [their] national heritage; to conserve and use wisely natural resources of [the] nation for the benefit of present and future generations; to restore, maintain and **enhance** the natural and man-made environment in terms of **productivity**, variety, spaciousness, beauty and other measures of quality.[60]

Despite this assurance to environmentalists, in 1975 the *USACE* completed the last of a series of dams on the lower Snake River in Washington that would have serious ecological implications. The completion of the Lower Granite Dam connected a "350-mile river highway" from the Pacific Ocean to Lewiston, Idaho and forced Snake River salmon to navigate eight dams to reach upstream spawning ground.[61] In the decades to come, the Snake River dams would become a rallying point for environmentalists.

The Snake River dams, however, were merely a blip on the radar of hydroelectric dam construction in the 1970s. During that decade nearly 500 dams a year, or roughly one and one third a day, were constructed across the world.[62] In the Pacific Northwest alone, the Lower Snake River dams were just four of fifteen major dams constructed on the Columbia and Snake Rivers between the end of the 1950s and the early 1970s.[63]

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[59] *Place and Power: Evolution of the Northwest's Energy System*, Vimeo, https://vimeo.com/160916364.

[60] Edward Goldsmith, *The Social and Environmental Effects of Large Dams* (Wadebridge, Cornwall: Wadebridge Ecological Centre, 1992), 6. Emphasis added by author.

[61] Taylor, *Making Salmon: An Environmental History of the Northwest Fisheries Crisis*, 244.

[62] McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*, 13.

[63] "Columbia Basin Research," Columbia and Snake Rivers Hydroelectric Project Information | Columbia Basin Research, accessed May 05, 2019, http://www.cbr.washington.edu/hydro. The dams constructed on the Snake and Columbia River between the late 1950s and early 1970s include: McNary Dam (1957),

Their completion, however, marked the end of dam construction on the Snake and Columbia Rivers and effectively turned the two rivers into a highly efficient barge corridor completely controlled by man.[64] This period of hydroelectric infrastructure represents the pinnacle of large dam construction and exemplifies the American desire to conquer the land, turning it into a profitable and well-oiled machine. In the mid-1970s the general public opinion of dams began to shift and hydroelectricity fell from vogue, never again to achieve the prominence it was bestowed between the 1950s and 1970s.

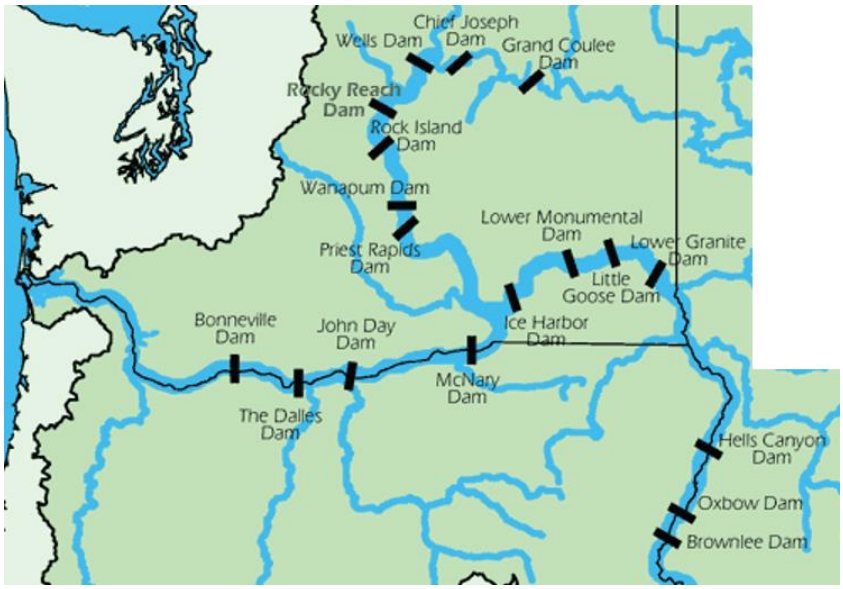

Figure 3.5 The Columbia and Snake River Dams. All but the Bonneville and Grand Coulee Dams were constructed during the heyday of big dam building, between 1950 and 1975. Source: www.researchgate.net

Brownlee Dam (1959), the Dalles Dam (1960), Chief Joseph Dam (1961), Oxbow Dam (1961), Priest Rapids Dam (1961), Rocky Reach Dam (1961), Ice Harbor Dam (1962), Wanapum Dam (1963), Hells Canyon Dam (1967), Wells Dam (1967), Lower Monumental Dam (1969), Little Goose Dam (1970), John Day Dam (1971), and Lower Granite Dam (1975).

[64] Steven Hawley, *Recovering a Lost River: Removing Dams, Rewilding Salmon, Revitalizing Communities* (Boston: Beacon Press, 2012), 44.

THE DEMISE OF THE DAM, 1975 - 2000

By the mid-1970s the American West had become the "greatest hydraulic society ever built in history," due to the Pacific Northwest's web of hydroelectric dams and the arid West's irrigation schemes.[65] The crescendo of hydroelectricity in the Pacific Northwest peaked in 1975 with the completion of the Lower Snake River dams and slowly began its decrescendo, which continues to linger today. The same year of the Lower Granite Dam completion Congress voted to establish the Hells Canyon National Recreation Area, effectively banning the construction of new dams in the Hells Canyon of Snake River.[66] While environmentalists had previously fought and successfully prevented the construction of dams elsewhere in the United States, specifically at Echo Park to be discussed in the following chapter, the success at Hells Canyon was the first major anti-dam victory in the Pacific Northwest. This victory many not have been the impetus for the demise of hydroelectricity, but its occurrence coincides with beginning of the end for America's dams.

Five years after passing the bill that established the Hells Canyon National Recreation Area, Congress dealt another blow to the hydroelectric industry with the passage of the Northwest Power Act (*NWPA*). The *NWPA* authorized Oregon, Washington, Idaho and Montana to develop a regional body concerned with power and environmental needs. The resulting Northwest Power Planning Council (*NWPPC*) was mandated to ensure hydroelectric dam operators gave equal consideration to salmon.[67] That same year the Columbia River Fisheries Development program, established in 1949 to fund mitigation hatcheries, reached a spending level of $85 million.[68] It speaks to the

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[65] Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West*, 276. This book is primarily concerned with irrigation efforts in twentieth century America and is a useful source for further exploration of the larger role of dams in the American West.

[66] Hawley, *Recovering a Lost River: Removing Dams, Rewilding Salmon, Revitalizing Communities*, 97.

[67] Taylor, *Making Salmon: An Environmental History of the Northwest Fisheries Crisis,* 246.

[68] White, *The Organic Machine: The Remaking of the Columbia River*, 97.

gravitas of the state of salmon that despite tens of millions of dollars funding fisheries mitigation efforts over several decades, the creation of the *NWPPC* was still necessary.

In the 1980s regulation similar to the *NWPA* was applied to hydroelectricity nationwide. Congress passed the Electric Consumers Protection Agency Act (*ECPA*) in 1986 and amended the duties of the *FERC* to consider equally power production and fish and wildlife protection, mitigation, and enhancement. The amendment also mandated *FERC* to inform and receive recommendations from local and state natural resource agencies concerning fish and wildlife affected by hydroelectric projects.[69] In Oregon, this amendment was crucial to the first major dam removal proposed in the state. In 1994 the Oregon Water Resources Commission voted to remove the Savage Rapids Dam, a thirty-nine foot high irrigation dam on the Rogue River, due to the expense of building new fish ladders, as required by the *ECPA*. The Savage Rapids Dam was not actually removed until 2009 and initially faced community opposition, but the decision made to remove the dam in 1994 was a result of the *ECPA* and growing scientific knowledge of the negative impact of dams on migratory fish.[70]

The same year the fate of the Savage Rapids Dam was decided in Oregon, former Secretary of the Interior Bruce Babbit made a bold declaration to attendees of a river conservation symposium. He proclaimed that he "would love to be the first secretary of the interior in history to tear down a really large dam." While he would not go on to tear down a large one, he would tear down a small, but symbolically massive, dam in the state of Maine.[71]

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[69] "Laws Governing Hydropower Licensing," Hydropower Reform Coalition, 2019, accessed March 27, 2019, https://www.hydroreform.org/resources/laws.

[70] Taylor*, Making Salmon: An Environmental History of the Northwest Fisheries Crisis,* 244.

[71] McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*, 129.

In 1991 the Edwards dam, on Maine's Kennebec River, was required by *FERC* to install new fish ladders at a cost of $9 million to the owners to be eligible for relicensing the dam. The dam owners and local politicians tried to fight the proposed retrofits, but in 1997 *FERC* reversed its decision and called for the dam to be decommissioned. In 1999 the Edwards Dam came down and the Kennebec ran free for the first time since 1837. The removal of the Edwards Dam was a pivotal moment: it was the first instance *FERC* voted against a dam owners desire to re-license and the first still-functioning hydroelectric dam to be removed in the United States.[72]

The most poignant sign of the end of the era of dams was a proclamation by the Commissioner of the *BR* Dan Beard in the mid-1990s. Beard, who changed the names of the conference rooms at the *BR* headquarters from well-known dams to well-known rivers, stated "The Bureau of Reclamations future isn't dams; the era of dams is over."[73] While one could argue Beard represented an anomaly at the *BR*, his sentiment reverberated across the nation as nearly one hundred and seventy-seven dams came down across the country in the 1990s, compared to three hundred and twenty dam removals recorded over the seventy years prior.[74] This trend of dam removal has continued to grow; 2017 produced the largest number of removals in one year with eighty six dams demolished across the country.[75] The 1990s were the last decade of the downfall of the dam and the twenty first century has been the century of the demolition of the dams.

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[72] Hawley, *Recovering a Lost River: Removing Dams, Rewilding Salmon, Revitalizing Communities*, 175.

[73] *Dam Nation*, dir. Travis Rummel and Ben Knight (United States: Patagonia, 2014).

[74] McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*, 129.
"American Rivers Dam Removal Database," American Rivers, (December 2018).

[75] Jessie Thomas-Blate, "Dam Good Year for Dam Removal in 2017," American Rivers, February 13, 2018, accessed May 06, 2019, https://www.americanrivers.org/2018/02/dam-removal-in-2017/.

CHAPTER IV. HISTORICAL CONTEXT: KEY MOMENTS OF THE RIVER RESTORATION MOVEMENT

As hydroelectric dams appeared across the United States in the early twentieth century a movement was blossoming that would come to be a key factor in the downfall of hydropower and dams in large. While several issues influenced America's turn against hydroelectricity in the twentieth century, the river restoration movement was pivotal to swaying public opinion of dams. The movement's key goal is the removal of dams and other intrusions to a river's natural state for the sake of restoring ecosystems. The river restoration movement is part of a larger environmental movement that emerged at the turn of twentieth century, matured during the counterculture of the 1960s and 1970s, and today is embraced and supported by many. Throughout the twentieth century, the environmental movement came head-to-head with hydroelectricity, opposing environmentally negligent projects, and the river restoration movement was birthed from these clashes. The growth of the environmental movement and its tributary, the river restoration movement, parallels the construction of America's most controversial dams and a growth in knowledge of environmental science.

HETCH HETCHY AND AMERICA'S FIRST ENVIRONMENTALISTS

Anyone who has taken an introductory environmental history class has undoubtedly heard the phrase "Hetch Hetchy". The name is synonymous with the environmental movement as the battle for Hetch Hetchy was the first significant opposition led by American environmentalists. Coincidentally, this battle centered around a dam. Lobbyists from the city of San Francisco had narrowed their gaze on Yosemite's Hetch Hetchy valley and the Tuolumne River that ran through it as the city's new source of water. Prior to the twentieth century, officials determined the city's water source inadequate. In 1906 the horrific earthquake and subsequent fire that leveled much of San Francisco made the need for a larger water source more dire. The Hetch Hetchy valley, however, was situated within the protected boundaries of Yosemite National Park since its establishment in 1890. The valley also held a special

place in the heart of John Muir, founder of the Sierra Club and now iconic environmental preservationist.

Over the next seven years, boosters for damming the Tuolumne River and environmentalists associated with the Sierra Club volleyed back and forth over the fate of Hetch Hetchy valley. The conflict is often portrayed as an intimate disagreement between John Muir, the father of environmental preservation, and Gifford Pinchot, the father of environmental conservation and first chief of the United States Forest Service. Muir's desires to save the valley are depicted as an attempt to preserve pristine wilderness, while Pinchot's desires are depicted as the greedy character of humanity's drive to profit from and control nature. In reality, the conflict was much more nuanced then this depiction, but ultimately it resulted in the formation of a nationwide environmental movement.[76] When Congress finally approved the necessary permits for constructing the O'Shaughnessy Dam in Hetch Hetchy valley in 1913, the Sierra Club had mounted a fierce opposition and had spread the ideals of environmental preservation across the nation.

By 1923, the flow of the Tuolumne came to a stop as construction of the dam was finished, and the Hetch Hetchy reservoir consumed the valley floor [Figure 4.1]. While the Sierra Club lost the battle over the valley, Hetch Hetchy came to represent something larger. It is widely accepted as the beginning of the American Environmental movement and set a precedent for future opposition to the construction of dams. Hetch Hetchy increased membership in the Sierra Club from just three hundred and fifty in 1897 to one thousand in 1908 and raised awareness of the many threats to America's wilderness and natural spaces.[77] The momentum initiated at Hetch Hetchy strengthened

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[76] Robert W. *Righter's The Battle Over Hetch Hetchy : Americas Most Controversial Dam and the Birth of the Environmental Movement* is an excellent in-depth source that explores the now commonly accepted narrative of Hetch Hetchy .

[77] "History: Sierra Club Timeline," Sierra Club History, accessed May 06, 2019, http://vault.sierraclub.org/history/timeline.aspx.

the country's infant environmental movement and carried it to its next defining moment.

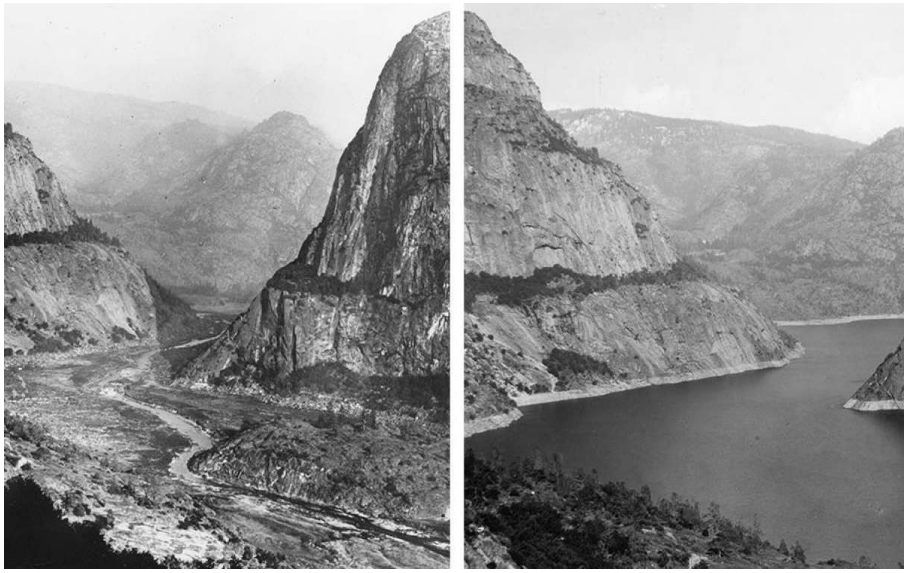

Figure 4.1 Yosemite's Hetch Hetchy valley before and after the completion of construction of the O'Shaughnessy Dam in 1923. Source: www.sfchronicle.com

ECHO PARK AND GLEN CANYON

The next major environmental battle centered around the possible damming of a river occurred under similar circumstances to Hetch Hetchy. Echo Park, located in Colorado's Dinosaur National Monument, was a remote tract of wilderness located at the confluence of the Green and Yampa Rivers. It had been selected as the possible location of a dam as early as the late 17th century, but this plan was not put into motion until the 1950s, under the leadership of the *BR.*[78] The BR pursued Echo Park as part of the larger Colorado River Storage Project (*CRSP*), a series of dams across the western region designed for irrigation, water storage, and hydroelectricity. When the California-based Sierra Club learned of Echo Park's inclusion in the project, it mounted an immediate national campaign to protect the river confluence.[79]

[78] Hank Hassell, "Echo Park and Beyond," in *Rainbow Bridge* (University Press of Colorado, 1999), 100-102.

[79] Ibid., 105.

In 1953 David Brower, head of the Sierra Club, found an error in the *BR*'s calculations of evaporation upon which their argument for the Echo Park dam relied. Brower highlighted these miscalculations and used another proposed dam, the Glen Canyon Dam, as an example of an alternative to the Echo Park Dam; by simply building a taller dam at Glen Canyon the same amount of water could be stored with similar rates of evaporation. While the *CRSP* was approved by the Senate and House in 1955, Echo Park was removed from the project.[80] At first this appeared to be a victory for the Sierra Club; they had prevented the construction of a dam in a National Monument. The savior of Echo Park, however, was soon overshadowed by the loss of Glen Canyon. While the Canyon's beauty was well known it had been overlooked by the Sierra Club until its final hours, when it was simply not possible to prevent the dam. Some even argued the Sierra Club sacrificed Glen Canyon for Echo Park, although a dam in Glen Canyon had been planned in the *CRSP* all along.[81] In 1963, the last concrete of the Glen Canyon Dam was poured and the rising Colorado River drowned the canyon, rising to nearly 3,700 feet above sea level to create Lake Powell. [82]

The loss of Glen Canyon reportedly haunted the dreams of David Brower for decades, and it may have done so to many environmentalists.[83] Although the damming of Glen Canyon was a regrettable occurrence, its loss sparked a national interest in river conservation and environmentalism. Between 1965 and 1970 Sierra Club memberships quadrupled, from 33,000 to 114,000.[84] Glen Canyon's demise also fueled continued

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[80] Ibid.

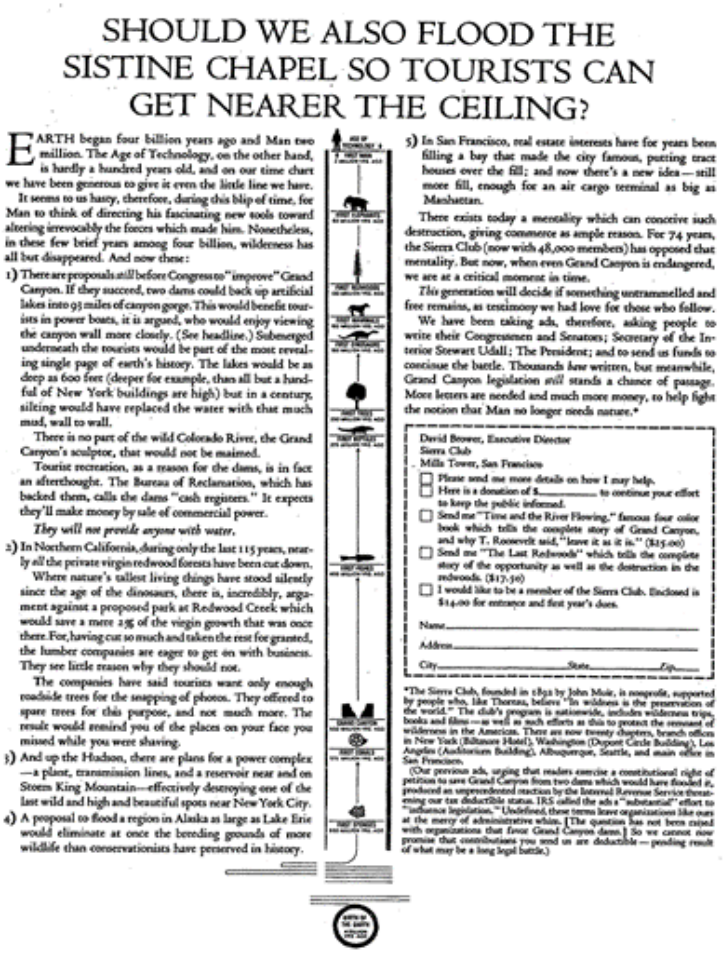
[81] Ibid., 106.

[82] Brandon Loomis, "50 Years Later, Glen Canyon Dam Still Controversial," USA Today, October 14, 2013, , accessed December 07, 2018, https://www.usatoday.com/story/news/nation/2013/10/14/glen-canyon-dam-50-years/2981273/.

[83] Hassell, "Echo Park and Beyond," in Rainbow Bridge, 113.

[84] "History of the River Restoration Movement," Glen Canyon Institute, , accessed May 06, 2019, https://www.glencanyon.org/history-of-the-river-restoration-movement/.

efforts in preventing the damming of scenic Western Rivers, most notably in the Grand Canyon (Figure 4.4 is the most well-known ad of a series of ads produced by the Sierra Club to prevent dams in the Grand Canyon). American author Edward Abbey added to the sensationalism of Glen Canyon and the growth of the environmental movement with his novel *The Monkey Wrench Gang* in 1974. Abbey's fictional story depicted four misfits banding together to sabotage, or monkey wrench, environmentally unsound infrastructure, with the ultimate goal of destroying the Glen Canyon Dam.[85]



SHOULD WE ALSO FLOOD THE SISTINE CHAPEL SO TOURISTS CAN GET NEARER THE CEILING?

EARTH began four billion years ago and Man two million. The Age of Technology, on the other hand, is hardly a hundred years old, and on our time chart we have been generous to give it even the little line we have.

It seems to us hasty, therefore, during this blip of time, for Man to think of directing his fascinating new tools toward altering irrevocably the forces which made him. Nonetheless, in these few brief years among four billion, wilderness has all but disappeared. And now these:

1) There are proposals still before Congress to "improve" Grand Canyon. If they succeed, two dams could back up artificial lakes into 93 miles of canyon gorge. This would benefit tourists in power boats, it is argued, who would enjoy viewing the canyon wall more closely. (See headline.) Submerged underneath the tourists would be part of the most revealing single page of earth's history. The lakes would be as deep as 600 feet (deeper for example, than all but a handful of New York buildings are high) but in a century, silting would have replaced the water with that much mud, wall to wall.

There is no part of the wild Colorado River, the Grand Canyon's sculptor, that would not be maimed.

Tourist recreation, as a reason for the dams, is in fact an afterthought. The Bureau of Reclamation, which has backed them, calls the dams "cash registers." It expects they'll make money by sale of commercial power.

They will not provide anyone with water.

2) In Northern California, during only the last 115 years, nearly *all* the private virgin redwood forests have been cut down.

Where nature's tallest living things have stood silently since the age of the dinosaurs, there is, incredibly, argument against a proposed park at Redwood Creek which would save a mere 25% of the virgin growth that was once there. For, having cut so much and taken the rest for granted, the lumber companies are eager to get on with business. They see little reason why they should not.

The companies have said tourists want only enough roadside trees for the snapping of photos. They offered to spare trees for this purpose, and not much more. The result would remind you of the places on your face you missed while you were shaving.

3) And up the Hudson, there are plans for a power complex —a plant, transmission lines, and a reservoir near and on Storm King Mountain—effectively destroying one of the last wild and high and beautiful spots near New York City.

4) A proposal to flood a region in Alaska as large as Lake Erie would eliminate at once the breeding grounds of more wildlife than conservationists have preserved in history.

5) In San Francisco, real estate interests have for years been filling a bay that made the city famous, putting tract houses over the fill; and now there's a new idea—still more fill, enough for an air cargo terminal as big as Manhattan.

There exists today a mentality which can conceive such destruction, giving commerce as ample reason. For 74 years, the Sierra Club (now with 48,000 members) has opposed that mentality. But now, when even Grand Canyon is endangered, we are at a critical moment in time.

This generation will decide if something unstrammelled and free remains, as testimony we had love for those who follow.

We have been taking ads, therefore, asking people to write their Congressmen and Senators; Secretary of the Interior Stewart Udall; The President; and to send us funds to continue the battle. Thousands *have* written, but meanwhile, Grand Canyon legislation *still* stands a chance of passage. More letters are needed and much more money, to help fight the notion that Man no longer needs nature.*

David Brower, Executive Director
Sierra Club
Mills Tower, San Francisco

☐ Please send me more details on how I may help.
☐ Here is a donation of $_____ to continue your effort to keep the public informed.
☐ Send me "Time and the River Flowing," famous four color book which tells the complete story of Grand Canyon, and why T. Roosevelt said, "leave it as it is." ($25.00)
☐ Send me "The Last Redwoods" which tells the complete story of the opportunity as well as the destruction in the redwoods. ($17.50)
☐ I would like to be a member of the Sierra Club. Enclosed is $14.00 for entrance and first year's dues.

Name_____
Address_____
City_____ State_____ Zip_____

*The Sierra Club, founded in 1892 by John Muir, is nonprofit, supported by people who, like Thoreau, believe "In wildness is the preservation of the world." The club's program is nationwide, includes wilderness trips, books and films—as well as such efforts as this to protect the remnant of wilderness in the American. There are now twenty chapters, branch offices in New York (Biltmore Hotel); Washington (Dupont Circle Building); Los Angeles (Auditorium Building); Albuquerque, Seattle, and main office in San Francisco.

(Our previous ads, urging that readers exercise a constitutional right of petition to save Grand Canyon from two dams which would have flooded it, produced an unprecedented reaction by the Internal Revenue Service threatening our tax deductible status. IRS called the ads a "substantial" effort to "influence legislation." Undefined, these terms leave organizations like ours at the mercy of administrative whim. [The question has not been raised with organizations that favor Grand Canyon dams.] So we cannot now promise that contributions you send us are deductible—pending result of what may be a long legal battle.)

Figure 4.4 "Should We Also Flood the Sistine Chapel so Tourists Can Get Nearer to the Ceiling" Sierra Club full-page ad, 1966. Source: vault.sierraclub.org

[85] Edward Abbey, *The Monkey Wrench Gang* (Salt Lake City: Dream Garden Press, 1999).

Echo Park's preservation, the inundation of Glen Canyon, and the subsequent fight against dams in the Grand Canyon were essential moments in the formalization of the river restoration movement. These battles, those both won and lost, strengthened awareness of the environmental movement and set river restoration and preservation apart from other nuances of environmentalism. The events in Colorado in the 1950s and 1960s opened the American public's eyes to what was at stake as dams continued to be constructed en-masse across the country. Glen Canyon proved to be the rallying point, and arguably the martyr, necessary to fuel growing anti-dam sentiment in the latter half of the twentieth century.

FEDERAL ENVIRONMENTAL REGULATIONS

Shortly after the debacle at Glen Canyon, the American environmental movement was reinforced by a series of federal regulations. Between 1969 and 1974, four landmark acts were passed that would tremendously reduce the concerns of environmentalists and enhance protections for the environment. These Acts were the National Environmental Policy Act (*NEPA*) of 1969, the Federal Water Pollution Control Act (*FWPA*) of 1972, the Endangered Species Act (*ESA*) of 1973, and the Clean Water Act (*CWA*) of 1977. Most of the regulatory functions of these acts and their relations to dam removal will be discussed in the subsequent chapter "Dam Removal: Process and Regulations".

The passage of this series of environmental acts reflected a growing environmental consciousness in America. After decades of blissful ignorance, Americans and the United States government were beginning to realize their environmental negligence. Popular literature from the 1960s like Abbey's *The Monkey Wrench Gang* and Rachel Carson's 1962 classic, *Silent Spring*, had made environmentalism a dinner table topic. The 1969 Santa Barbara Oil Spill sparked outrage across the country and led to rallies, pickets, and demonstrations against the unregulated power of oil companies. The first Earth Day was organized a year later in 1970 in reaction to the emotions

spurred by the Santa Barbara Spill. [86] In 1973 Americans were forced to face their unhealthy dependence on fossil fuels during the Energy Crisis.[87] All of these occurrences helped bring the environmental movement to the forefront of American politics in the 1970s and motivated federal policy development and changes. In turn, these changes provided more protections to the environment and created integral regulatory checks that bolstered the growing river restoration movement as dam removals began in earnest at the turn of the twenty first century.

CONCLUSION

These three key moments in the development of the river restoration movement illustrate the growing social challenge to hydroelectricity in the United States. While hydroelectric projects were growing larger and being constructed rapidly across the country, these events were simultaneously shaping a movement which today successfully rallies for the removal of dams. The iconic battle over Hetch-Hetchy, the devastating loss of Glen Canyon, the rally to save Echo Park, and the increasing environmental literacy and regulation during the 1970s have culminated in the modern river restoration movement. Although not all dam removals can be attributed to this movement, river restoration organizations have been vocal in the increasing calls for dam removal since the turn of the twenty first century. This movement and its development also demonstrate the controversial nature of hydroelectricity that has been present since its earliest uses in the United States.

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[86] Adam Rome, *The Genius of Earth Day: How a 1970 Teach-in Unexpectedly Made the First Green Generation* (North Point Press, 2014), 42-43.

[87] Hirt, *The Wired Northwest: The History of Electric Power, 1870s-1970s*, 351.

CHAPTER V. DAM REMOVAL: PROCESS & REGULATIONS

THE REASONS FOR REMOVAL

The opposition against dams led by the river restoration movement has been the most publicized motivation for removal projects. This can be attributed to the movement's politicized character, its tactics like information campaigns and protests, and the now nearly common knowledge of the environmental impacts of dams. However, every dam removal is unique and may be instigated by a variety of underlying issues. Often a combination of factors leads to a dam's ultimate demise. The most common reasons a dam is removed can be narrowed to three general categories: safety, economic, and environmental.

Safety

According to the National Inventory of Dams (*NID*), updated annually by the *USACE*, the average dam in the United States is fifty-seven years old.[88] Of the approximately 95,000 dams nationwide compiled in the *NID* database, nearly 44% are over the age of fifty.[89] This percentage is expected to jump to nearly 70% by the year 2025.[90] The presumed lifespan of a dam at construction is just fifty years, meaning that almost half of the dams in the nation have met or significantly passed their presumed life expectancy [Figures 5.1 and 5.2]. Additionally, nearly 17% of dams listed in the *NID* database are identified as high hazard potential, a designation reserved for dams that are likely to result in loss of life if failure occurs, while 11% are listed as significant hazard potential, which entails no loss of life if failure occurs but other serious

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[88] "National Inventory of Dams," National Inventory of Dams (NID), accessed February 01, 2019, https://nid-test.sec.usace.army.mil/ords/f?p=105:113:11509753873265::NO:::.

[89] Ibid.

[90] "Infrastructure Report Card: Dams," American Society of Civil Engineers, 2017, accessed February 01, 2019, https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/Dams-Final.pdf.

impacts.[91] As the nation's dams age and more become designated as having a high hazard or significant hazard potential, private owners and federal agencies are faced with a serious decision: finance extensive upgrades to ensure safety or tear down the dam to ensure safety?

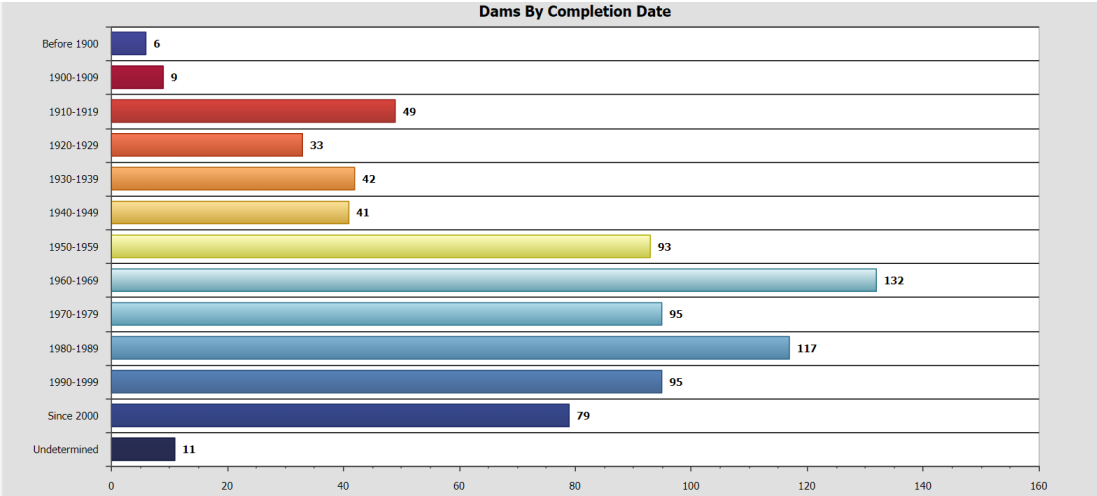

Figure 5.1 Dams by Date of Completion, Washington. 405 of Washington's 802 dams are over the age of fifty years. Source: National Inventory of Dams.

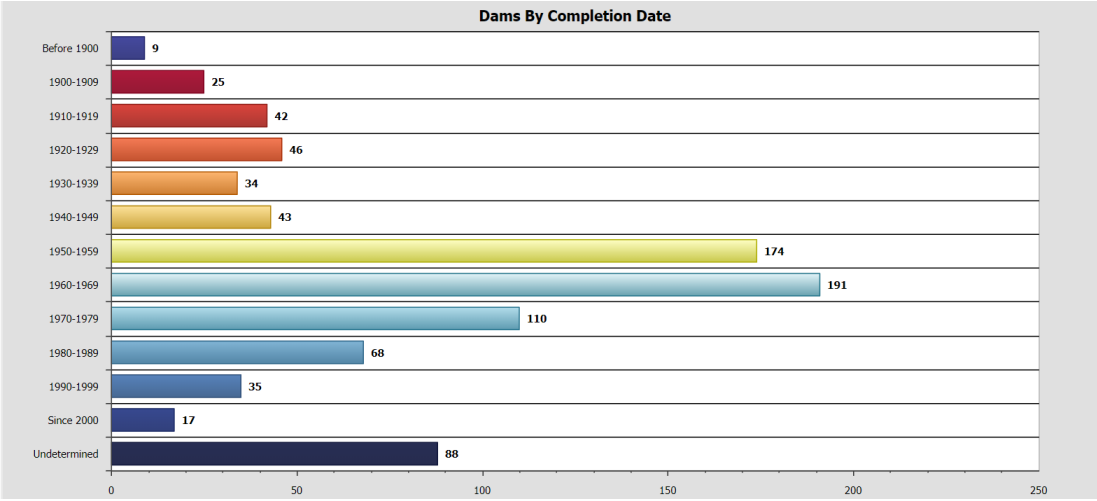

Figure 5.2 Dams by Date of Completion, Oregon. 564 of Oregon's 882 dams are over the age of fifty years old. Source: National Inventory of Dams.

[91] "Infrastructure Report Card: Dams," https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/Dams-Final.pdf.

Concerns of dam safety are well-grounded anxieties: throughout American history dam failures have wreaked havoc on communities. The largest loss of life from a dam failure occurred in 1889 in Johnstown, Pennsylvania when over two thousand residents of the town perished.[92] While no data exists of the total number of dam failures within the United States, between January 2005 and June 2013 one hundred and seventy-three dam failures were reported across the country in addition to 587 incidents which would have likely resulted in dam failure without intervention.[93] In 2017 two Western dams sparked fear of failure within just weeks of one another. The Twentyone Mile dam, located in Northeastern Nevada, failed causing flooding and property damage, but no loss of human life. The much larger Oroville Dam, located in Northern California, threatened to breach an emergency spillway and led to the evacuation of 180,000 downstream residents. The spillway held, avoiding a serious disaster and possible loss of life, but was a stark reminder of the possibly deadly event of dam failure.[94]

With these past tragedies and near-misses in mind, America's aging dams are more likely to face removal. As climate change fueled super-storms become more prevalent, like Hurricanes Katrina and Sandy, these safety issues become even more dire.[95] In Oregon and Washington alone, there are 263 high-hazard dams, defined as

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[92] Federal Emergency Management Agency, Dam Safety in the United States: A Progress Report on the National Dam Safety Program, report (U.S. Department of Homeland Security, 2014): v. Accessed February 02, 2019. https://www.fema.gov/media-library-data/1467048771223-c5323440700a175565a2c0c9d604f9e3/DamSafetyUnitedStatesAug2014.pdf

[93] Ibid.

[94] Troy Griggs, Gregor Aisch, and Sarah Almukhtar, "America's Aging Dams Are in Need of Repair," The New York Times, February 23, 2017, accessed February 02, 2019, https://www.nytimes.com/interactive/2017/02/23/us/americas-aging-dams-are-in-need-of-repair.html.

[95] Jessie Thomas-Bates, "Removing Dams Can Save Lives," American Rivers, June 28, 2017, accessed February 07, 2019, https://www.americanrivers.org/2016/10/removing-dams-can-save-lives/. In 2016 Hurricane Matthew caused 20 dam failures in North and South Carolina and in 2015 another storm caused the failure of one out of every 50 state regulated dams in South Carolina.

dams that could cause a loss of human life if breached due to neglect or inclement weather.[96] The pressing issue of dam safety, along with the other issues to be discussed subsequently, has been a major contributor to the increasing number of dam removals since the turn of the twenty-first century.

Economic

Hand in hand with the safety issues of dams are economic issues. As former Secretary of the Interior Sally Jewel observed in 2016, "the cost of repairing and maintaining obsolete structures can be significant – often more expensive than dam removal itself."[97] That same year the Association of State Dam Safety Officials released their estimates of the funding needed for maintenance of the nation's dams. Their estimates were as follows: $60.70 billion for non-federal dams, $18.71 billion for non-federal high hazard dams, $4.20 billion for federal dams, and $2.93 billion for federal high hazard dams.[98] In total, it was determined $86.54 billion would be necessary for federal and private dam maintenance. For comparison, the entire proposed 2019 fiscal budget of the Federal Highway Administration, which is tasked with maintaining the nation's 146,000 miles of the national highway system, is just $46 billion.[99]

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[96] "National Inventory of Dams", https://nid-test.sec.usace.army.mil/ords/f?p=105:113:11509753873265::NO:::.

[97] Sally Jewell, "Obsolete Dams Are a Hazard to People and Wildlife. We're Working Together to Remove Them.," U.S. Department of the Interior, July 05, 2017, accessed February 09, 2019, https://www.doi.gov/blog/obsolete-dams-are-hazard-people-and-wildlife-were-working-together-remove-them.

[98] Task Committee of the Association of State Dam Safety Officials, *The Cost of Rehabilitating Our Nations Dams: A Methodology, Estimate & Proposed Funding Mechanisms*, December 2002. https://damsafety.s3.amazonaws.com/s3fs-public/Cost%20of%20Rehab%20Report-2016%20Update_1.pdf

[99] "Highway Finance Data Collection," U.S. Department of Transportation/Federal Highway Administration, 2011, accessed February 09, 2019, https://www.fhwa.dot.gov/policyinformation/pubs/hf/pl11028/chapter1.cfm.
FHWA FY 2019 Budget, report (Federal Highway Administration, 2019). https://www.fhwa.dot.gov/cfo/fhwa-fy-2019-cj-final.pdf

The high cost of regular maintenance is not the only economic issue dams face. Retrofits to meet new environmental and safety requirements can also prove to be costly endeavors. Utility company PacifiCorp chose to delicense the Condit Dam on the White Salmon River in Washington due to the high cost of retrofits to be completed before relicensing by the Federal Energy Regulatory Commission. Installing a fish passage on the nearly centuries old dam would have cost at least $30.0 million dollars, making the continued use of the dam financially unfeasible.[100] A recent study has found that all dam removals between 2018 and 2050, estimated to be between 4,000 and 36,000, will likely cost just $25.1 billion to $50.5 billion.[101] Compared to the estimated $86.54 billion needed for maintenance of the nation's existing dams, removal represents significant savings to federal and private dam owners.

Environmental

Environmental issues are perhaps the most well-known and oft-cited reasons for the removal of a dam [Figure 5.3]. Beginning in the 1970s, during the latter end of the heyday of dam building between the 1950s and 1980s, public knowledge of the environmental impact of dams was greatly expanded.[102] The scientific community began to focus on dam research after the river restoration movement materialized from the controversial construction of the Glen Canyon Dam in the late 1960s. Prior to that moment, dams were generally viewed with utopian environmental hopes - they were

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[100] Michael C. Blumm and Andy B. Erickson, "Dam Removal in the Pacific Northwest: Lessons for the Nation," SSRN Electronic Journal, 2012, 1063.

[101] Zbigniew J. Grabowski, Heejun Chang, and Elise F. Granek, "Fracturing Dams, Fractured Data: Empirical Trends and Characteristics of Existing and Removed Dams in the United States," River Research and Applications 34, no. 6 (2018): pg 532, doi:10.1002/rra.3283.

[102] Stephen Higgs, "The Ecology of Dam Removal: A Summary of Benefits and Impacts," ed. Elizabeth Maclin and Margaret Bowman, *American Rivers*, February 2002, 1, https://www.michigan.gov/documents/dnr/ecodamrmvl_513770_7.pdf.

cleaner than coal and gas, safer than nuclear, and could coexist within nature better than other energy infrastructure.[103] This early research, and continued research today, has informed scientists and Americans of the numerous negative environmental impacts of dams. These impacts fall into three general categories: species declines, pollution, and far reaching ecological implications.

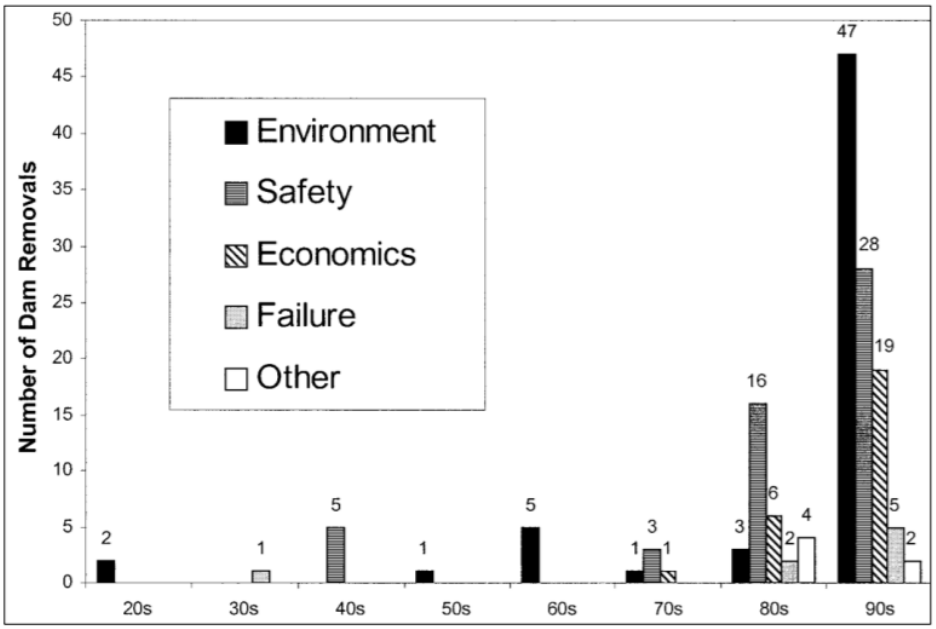

Figure 5.3 Reasons for dam removal by decade. Source: United States Society on Dams. *Guidelines for Dam Decommissioning Projects.* 2015.

The construction of a dam drastically changes the ecosystem of a riverine habitat. Dams have the potential to "disrupt a river's natural course and flow, alter water temperatures in the stream, redirect river channels, transform floodplains, and disrupt river continuity."[104] All of these ecosystem changes in turn affect both native plant and native wildlife populations. The unnatural flow imposed by dams - through the

[103] Richard White, ""Are You an Environmentalist or Do You Work for a Living?": Work and Nature," in *Uncommon Ground: Rethinking the Human Place in Nature* (New York: WW Norton &, 1996), 182.

[104] Higgs, "The Ecology of Dam Removal: A Summary of Benefits and Impacts," *American Rivers*, 1.

rising and lowering of the river for navigation, recreation, or power production - creates a limited aquatic community. Shoreline and river fauna die off and organisms are left stranded on dry banks or are rapidly inundated with waters. The transformation of a river's swift-moving waters to lake-like conditions (think of the Columbia River, transformed from a dangerously swift river to a series of wide and slow-moving lakes by the *BR*), similarly impacts native populations. Slower-moving aquatic species are favored in the river's new environment and often outcompete other species more adept to the river's natural flow, like Salmon.[105] The restoration of natural flow to a river through dam removal has been proven to increase population densities of native fauna and organisms, effectively undoing some of the damage done.[106]

Dams also directly affect native fish populations by blocking or lessening the chance of passage for anadromous species, those which are born in freshwater but mature in saltwater. This issue is the most well-known and relevant in the Pacific Northwest as dams have decimated native Salmon populations. This negative consequence of dams is well documented and was addressed early in the history of dams through the implementation of fish ladders [Figure 5.4]. In 1840, after accounts of Salmon "knocking themselves senseless" trying to jump impassible dams, Oregon passed legislation to require the construction of fishways on all dams.[107] Fish ladders, however, are not an effective means to restore migratory patterns. A study in the Northeastern United States found that just 3% of one native species, American Shad, made it past the numerous fish ladders to their spawning grounds in three major

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[105] Ibid., 2-3.

[106] Ibid., 2.

[107] Hirt, *The Wired Northwest: The History of Electric Power, 1870s-1970s*, 158.
Taylor, *Making Salmon: An Environmental History of the Northwest Fisheries Crisis*, 169. This dam is not the dam removed in the Elwha Restoration Project; it was an early dam located on the Elwha River.

rivers.[108] In California, Salmon caches in 1990 were recorded at a 90% decrease, an occurrence attributed largely to dams.[109] Even when fish ladders are effective, dams still present several threats to migratory fish. Fish ladders and turbines can seriously injure or prove fatal to passing fish and predation is often increased in the area below fish ladders. Additionally, fish ladders to do not cater to all species: many smaller fish simply cannot pass the same ladder that larger species can. When a dam is removed these challenges to reaching spawning grounds are significantly reduced and the reproductive success of migratory fish species increases.[110]

A less publicized but equally harmful effect of dams is pollution they directly and indirectly cause. Once thought of as clean energy, recent studies have illuminated the massive carbon footprint of hydroelectric dams. A study led by Washington State University found that vegetation die-offs created by dams, due to changing river ecosystems and less oxygenated water, emit on average one billion tons of greenhouse gases a year. Additionally, higher amounts of algae, encouraged by slower moving water surfaces downstream of dams, produce increased methane. The total amount of greenhouse gasses emitted by dams is 25% higher than previous estimates.[111]

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[108] John Waldman, "Blocked Migration: Fish Ladders On U.S. Dams Are Not Effective," Yale Environment 360, April 4, 2013, accessed March 24, 2019, https://e360.yale.edu/features/blocked_migration_fish_ladders_on_us_dams_are_not_effective.

[109] Goldsmith, *The Social and Environmental Effects of Large Dams*, 93.

[110] Higgs, "The Ecology of Dam Removal: A Summary of Benefits and Impacts," *American Rivers*, 9.

[111] Bridget R. Deemer et al., "Greenhouse Gas Emissions from Reservoir Water Surfaces: A New Global Synthesis," *BioScience* 66, no. 11 (November 2016): 952.

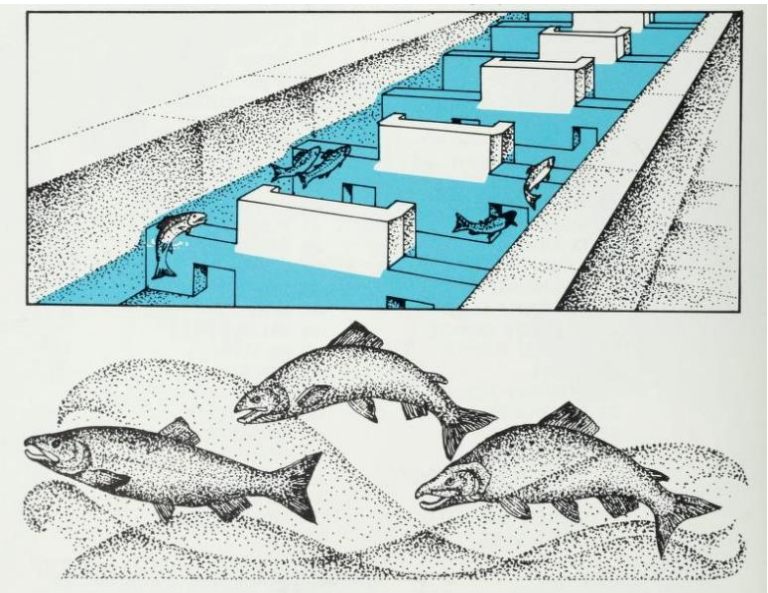

Figure 5.3 Illustration of a fish ladder. Source: *Multipurpose Dams of the Pacific Northwest*. Washington, D.C.: U.S. Dept. of Energy, Bonneville Power Administration, 1978.

In the Pacific Northwest specifically, dams have also led to water pollution through oil spills and chronic leaks at hydroelectric facilities. A recent lawsuit against the *USACE* cited dozens of spills and leaks at hydroelectric dams on the Columbia and Snake Rivers. One referenced spill, at the Ice Harbor Dam on the Snake River in Washington, released nearly 1,500 gallons of oil laced with carcinogens into the water.[112]

On a larger scale, dams have negative implications for entire ecosystems. Floodplains are essential parts of a river ecosystem; they accommodate changing water levels and prevent major flooding events from causing serious damage. Dams often drown out floodplains, by raising water levels, or settle floodplains, by lowering water levels.[113] Both of these actions prevent floodplains from performing their function and present increased risks to property and people in the event of flooding. Additionally, the

[112] Nigel Duara, "Army Corps Agrees to Disclose Oil Pollution from Dams in Historic Settlement," U.S. News & World Report, August 4, 2014, accessed March 27, 2019, https://www.usnews.com/news/us/articles/2014/08/04/apnewsbreak-corps-agrees-to-monitor-dam-pollution?preview=true&preview_id=12304&preview_nonce=4467851722.

[113] Ibid., 4.

creation of reservoirs by the damming of rivers destroys wildlife habitat, forest, and agricultural lands.[114] For example, Lake Mead, created by the Hoover Dam, is the largest reservoir in the United States and covers roughly 247 square miles of land.[115] This equates to a loss of land slightly bigger than one fifth of the state of Rhode Island.

Despite these many negative environmental consequences, dams are not inherently harmful. Properly and ethically built, managed, and maintained, dams can coexist within a river ecosystem, and can even provide certain environmental benefits. When located upriver from a spawning ground a dam can prevent reproductive losses by regulating water flow. And although dams raise surface water temperature, releases of cold water from lower depths can regulate summer river temperatures.[116] The nation's aging dams, however, were not constructed considering what is now known today of the negative environmental impacts of dams. No matter how responsibly managed a dam is, if it's construction and operation cause the many impacts previously mentioned, there are few options to remedy the situation: expensive retrofits and upgrades or demolition. Many environmentalists seek demolition, frequently citing the negative impacts of dams on migratory fish and the ineffectiveness of fish ladders and hatcheries.

FEDERAL ENERGY REGULATORY COMMISSION RE-LICENSING

Despite pressure from groups calling for the removal of a dam for safety or environmental reasons, the true impetus for hydroelectric dam removal is often relicensing by the *FERC*. The first iteration of *FERC*, the *FPC*, was established by the 1920

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[114] "Environmental Impacts of Hydroelectric Power," Union of Concerned Scientists, accessed March 27, 2019, https://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/environmental-impacts-hydroelectric-power.html.

[115] "Largest U.S. Reservoirs," National Performance of Dams Program, accessed March 27, 2019, https://npdp.stanford.edu/node/63.

[116] White, *The Organic Machine: The Remaking of the Columbia River*, 92.

FWPA.[117] The *FPC* was given several functions: to investigate and collect data regarding hydropower, to determine the cost and net investment of projects, to provide public information, and to issue permits and licenses for the operation of non-federally owned hydropower facilities.[118] In the 1970s, these powers were transferred to *FERC*, established through the 1977 Department of Energy Organization Act.[119] *FERC* is an independent federal agency tasked with regulating and overseeing the nation's non-federal energy industries, including hydropower.[120]

After the establishment of the *FPC* in 1920, new hydropower dams on navigable waterways were required to apply for licensing. In 1935 the *FWPA* was incorporated as the first part of the Federal Power Act (*FPA*) and re-licensing was expanded to increase jurisdiction over non-navigable waters.[121] Since the passages of the *FPA,* several subsequent statutes have amended the act including the Electric Consumers Protection Act of 1986 and Energy Policy Act of 1992.[122] The former act amended the *FPA* in two

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[117] Federal Water Power Act of 1920, 16 USCS § 791a.

[118] Ibid., § 792.

[119] Jon Wellinghoff, "Energy Regulatory Commission: FY 2014 Congressional Performance Budget Request," Federal Energy Regulatory Commission (2013), 5. https://www.ferc.gov/about/strat-docs/fy14-budg.pdf

[120] "Hydropower Licensing - Get Involved: A Guide For the Public," Federal Energy Regulatory Commission Office of Energy Projects, 4. https://www.ferc.gov/resources/guides/hydropower/hydro-guide.pdf

[121] Elizabeth Molloy, "Federal Energy Regulatory Commission and the Federal Power Act" United States Office of General Counsel, (2015), 17. https://www.fws.gov/northeast/ecologicalservices/pdf/hydro/Molloy_What_is_FERC_24_Feb_15.pdf

Blumm and Erickson, "Dam Removal in the Pacific Northwest: Lessons for the Nation, " *SSRN Electronic Journal*.
In 1968 the US Supreme Court ruled to interpret the 1935 FPA as applicable to non-navigable tributaries of navigable rivers.

[122] Wellinghoff, "Energy Regulatory Commission: FY 2014 Congressional Performance Budget Request," Federal Energy Regulatory Commission, 8.

key ways: it required *FERC* to relicense projects for at least a 30-year period, and *FERC* to give "equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality."[123] Additionally, the amendment required *FERC* to solicit recommendations from local and state natural resource agencies addressing recommendations to benefit fish and wildlife.[124]

These environmental standards introduced to the *FPA* in 1992 laid the foundation for the dramatic increase of dam removals at the turn of the twenty first century. At the same time *FERC* was beginning to consider the wider impacts of dams, many hydroelectric projects were reaching the end of their first licenses.[125] Environmentalists used these two events as a catalyst to push for the development of a *FERC* decommissioning policy and one was subsequently adopted in 1994.[126] The environmental considerations mandated under the Electric Consumers Protection Act, high number of dams up for re-licensing, and the creation of a formal *FERC* decommissioning process created the perfect conditions for the era of dam removal to begin.

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[123] "Laws Governing Hydropower Licensing," Hydropower Reform Coalition, 2019, accessed March 27, 2019, https://www.hydroreform.org/resources/laws.

[124] Ibid. Unfortunately, this balance of environmental and power interests was eroded in 2005 by the Energy Policy Act. Under the FPA agencies had the power to impose mandatory licensing conditions to provide migratory fish passage or to protect federal reservations, like national forest. The 2005 amendment provided any party in the licensing process the right to challenge the facts those conditions are based upon, allowing them to argue for more financially feasible or higher power-producing alternative conditions.

[125] McCormmach, *Power Lines,* 129.

[126] "3.1.3 Decommissioning as a Result of License Surrender," Hydropower Reform Coalition, accessed March 27, 2019,https://www.hydroreform.org/hydroguide/hydropower-licensing/3-1-3-decommissioning-as-a-result-of-license-surrender.

Relicensing Process

Currently three different *FERC* relicensing processes are available to dam owners: the Integrated License Process (*ILP*), Traditional License Process (*TLP*), or Alternative Licensing Process (*ALP*). The ILP is the default process for filing for relicensing and applications using the TLP or ALP must be pre-approved by the commission.[127] The following paragraphs will briefly outline the major steps of the default ILP and the stakeholders involved.

Five years before the termination of their license an existing licensee must submit a Notice of Intent (*NOI*) to *FERC* stating their intent to either apply for re-licensing or not to.[128] The licensee must simultaneously file a Pre-Application Document (*PAD*) that includes descriptions of "the existing and proposed (if any) project facilities and operations, information on the existing environment, and existing data or studies relevant to the existing environment, and any known and potential impacts of the proposed project on the specified resources."[129] Additionally, the *PAD* outlines a timeline for the project and includes a list of preliminary studies and issues. Within 30 days of filing the *NOI* and *PAD*, the applicant must meet with any tribes affected by the potential license application.[130] Within 60 days of filing the license, *FERC* must issue a notice of commencement of proceedings and a scoping document. This document identifies relevant issues, includes comments solicited from the public (the public is notified through listing in a local newspaper and/or tribal newspaper), and observations gathered during a site visit.[131]

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[127] Conservation of Power and Water Resources, 18 CFR § 5.1.

[128] Ibid., § 5.5.

[129] Ibid., § 5.6.

[130] Ibid., § 5.7.

[131] Ibid., § 5.8.

The next step in *ILP* is the collection of comments and study requests. In addition to notifying the public for the scoping document, *FERC* notifies Federal, state, and interstate resource agencies, tribes, state water quality and coastal zone agencies, and non-governmental agencies.[132] These stakeholders are granted 60 days to file comments on the applicant's *PAD* or *FERC*s scoping document and to request studies to be undertaken prior to relicensing. Commission staff may also make study requests, and these should take into consideration Section 7 of the Endangered Species Act and Section 401 of the Clean Water Act.[133] The public is welcome to submit written comments and provide oral comments at scoping meetings.

Following these requests and comments, *FERC* issues an updated scoping document and within 45 days the applicant must file a proposed study plan outlining the studies they will undertake.[134] Shortly after filing, a study plan meeting is held between the applicant and project stakeholders to informally resolve any study disagreements and revise the plan as necessary. The public can attend this meeting to submit comments or submit written study requests. *FERC* then issues a Study Plan Determination (*SPD*) outlining any changes to be made to the plan or giving it approval.[135] Formal disputes - filed by any agency with authority to provide mandatory conditions to a license regarding the use of public lands or reservations, fishways, and water quality - are then submitted and a dispute resolution panel is held.[136] Agencies

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[132] Ibid.

[133] These Acts and their impact on the relicensing and decommissioning process will be defined in the following section.

[134] Ibid., § 5.10 & 5.11.

[135] Ibid., § 5.11 to 5.13.

[136] Ibid., § 5.14.

with mandatory conditioning authority include the *USACE*, Secretary of the Army, Secretary of the Interior, Secretary of Commerce, and Tribes.[137]

Once all study disputes have been resolved, the applicant conducts the studies determined. Throughout the study process, the applicant must submit progress reports to the Commission and stakeholders. Within two years of the Commission's approval of the study plan, the applicant must submit an up to date plan explaining any deviation from the approved plan or schedule.[138] One hundred and fifty days and two years before the expiration of the original license, the applicant must file a preliminary licensing proposal. This proposal includes a description of the project and its facilities and draft environmental analysis and may also include a draft Biological Assessment, draft Essential Fish Habitat Assessment, and draft Historic Properties Management Plan.[139] Two years before the expiration of their license the applicant files their application for re-licensing. The submission of the application must be posted twice in a local newspaper for public notice and within fourteen days, the Commission will issue a public schedule for review of the application. This schedule includes the filing of fishway prescriptions and the issuance of a draft and subsequent final Environmental Impact Statement and National Environmental Policy Act document.[140] After the completion of all studies, solicitation of comment from stakeholders and the public, and the issuance of the final environmental statements and documents, the commission will issue its decision.

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[137] This list is not completely inclusive and was compiled using 16 U.S. Code § 797, 16 U.S. Code § 811, and 33 U.S. Code § 1341.

[138] Ibid., § 5.15.

[139] Ibid., § 5.16.

[140] Ibid., § 5.18 & 5.19.

Surrender of License & Decommissioning Process

During the re-licensing process or at any time during the operation of a hydropower dam the licensee may submit an application for a surrender of license. The application must include the reason for surrender and a copy of the original license.[141] For existing projects on private land the Commission will determine the conditions for the removal or maintenance in-place of the facilities. For projects on lands of the United States the applicant is required to restore the land to a state satisfactory to whichever department controls the land.[142] Major projects, i.e. an entire dam and its associated infrastructure, must submit applications for surrender in the same manner and form as an application for licensing. This includes involving relevant stakeholders, considering comments and study requests, performing studies, and producing an Environmental Impact Statement. All applications must include a plan for decommissioning that addresses issues such as public safety and environmental concerns and identifies all physical aspects of the project. It should be determined if the project will be removed and the site restored or if the project will be left in place to facilitate other uses (for example recreation on a reservoir). Public notice is given for comment and after a ninety day period the Commission issues its decision.[143]

FEDERAL REGULATIONS AND THE DECOMMISSIONING PROCESS

The decommissioning of hydropower dams is a lengthy process that involves stakeholders at the federal, state, and local level. Dam removal projects must obtain permits under numerous federal acts. The following acts are those most commonly involved in the decommissioning process. Often, the regulations of several acts overlap and can be met through simultaneous consultation. Other federal agencies, laws,

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[141] Conservation of Power and Water Resources, 18 CFR § 6.1

[142] Ibid., § 6.2.

[143] "Hydropower - How to Surrender a License or Exemption," FERC, July 11, 2017, accessed March 28, 2019, https://www.ferc.gov/industries/hydropower/gen-info/comp-admin/surrender.asp.

regulations, and executive orders may become involved in the process however, including various sections of the United States Code of Regulations, the Native American Graves Protection and Reparations Act, the Marine Mammal Protection Act, the Coastal Zone Management Act, the Bald and Golden Eagle Protection Act, the Safe Drinking Water Act, and the Migratory Bird Act.

Federal Power Act, 1920

As aforementioned the 1920 *FPA* established *FERC* and the process for managing non-federal hydroelectric dams in the United States. The *FPA* is involved in all non-federal hydroelectric decommissioning projects as well as decommissioning projects that will affect a *FERC* licensed structure and projects that have a *FERC* license exemption.[144]

National Environmental Policy Act, 1970

The National Environmental Policy Act (*NEPA*) requires federal agencies to analyze the impact of any major actions on the environment and to present alternatives to the proposed action. A major federal action is defined by *NEPA* as any action that may be major and potentially is subject to federal control. This includes activities either entirely or partially funded, conducted, regulated, or approved by a federal agency in addition to projects that involve federal approval of only specific components.[145] *FERC* licensed hydropower dam decommissioning is considered a major federal action under these provisions and requires the completion of an Environmental Impact Statement

[144] United States Society on Dams, *Guidelines for Dam Decommissioning Projects,* 2015, 32-33, https://www.ussdams.org/wp-content/uploads/2016/05/15Decommissioning.pdf
Projects that receive an exemption from FEC fall into two general categories: (1) small projects producing 10 megawatts or less built at an existing facility or projects that will utilize a natural feature, and (2) 40 megawatt or less conduit expansion projects.

[145] Ibid., 24.

(*EIS*).[146] For the purposes of *NEPA* review, a federal lead agency is identified as well as cooperating agencies, any agencies other than the lead agency that have jurisdiction over or expertise of any environmental impact relevant to the *EIS*.

The *EIS* considers all environmental impacts of the proposed action and reasonable alternatives to avoid or minimize the impacts. Environmental impacts under *NEPA* are not limited to impacts to the immediate landscape or ecosystem; historic and socioeconomic impacts are also considered.[147] The first step in the process of completing an *EIS* is scoping. This process includes relevant federal agencies as well the public and is used to determine the scope of the issues to be addressed within the *EIS*. Each resource evaluated in the *EIS* is assigned one of four impact values: significant impact, less than significant impact, beneficial impact, or cumulative impact. Alternative actions including mitigation measures should be determined for resources affected significantly, less than significantly, or cumulatively. Mitigation measures may include avoiding the impact completely, minimizing the impact, rectifying the impact, reducing or eliminating the impact over time, or compensating for the impact by addressing other issues.[148]

After completing several draft *EIS* and providing periods for review and comment, the final document is filed with the Environmental Protection Agency (*EPA*). The *EPA* then files a Federal Record of Decision (*FRD*) approving or denying the proposed actions and alternatives in the *EIS*. Ultimately, the project stakeholders implement the actions presented through the approval or appropriation of funding.[149]

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[146] Particularly small dams slated for removal do not necessarily require a formal EIS or Environmental Assessment.

[147] National Environmental Policy, 42 U.S. Code § 4370m–4.

[148] United States Society on Dams, *Guidelines for Dam Decommissioning,* 25-26.

[149] Ibid., 27.

Often during dam decommissioning projects, *NEPA* reviews and Section 106 review under the *NHPA* are coordinated as they encompass many of the same steps.

Endangered Species Act, 1973

The Endangered Species Act (*ESA*) requires federal agencies to analyze and subsequently mitigate the effects of an undertaking on endangered or threatened species.[150] Prior to the removal of a dam, *FERC* designates a non-federal representative, generally the operator of the dam, who must request information from the United States Fish and Wildlife Service (*USFWS*) and National Marine Fisheries Service (*NMFS*) to ascertain the presence of endangered or threatened species, or species proposed for listing in either category, within the proposed project area. The representative then prepares a Biological Assessment listing the species determined to exist in the project area and if they are likely to be affected. If adverse effects on species are foreseeable, the representative enters into a formal consultation with the *USFWS* and *NMFS* who in turn produce Biological Opinions. If either agency finds an adverse effect to a species' critical habitat it recommends reasonable alternatives to avoid the impacts and the lead agency, *FERC,* and its representative must adjust the project as necessary.[151] On the West Coast, twenty-eight species of salmon and steelhead are listed as threatened and endangered and an additional three species are monitored by the National Oceanic and Atmospheric Administration.[152] The Endangered Species Act is therefore often triggered by hydroelectric dam removal in Oregon and Washington.

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[150] Endangered Species Act, 16 U.S. Code § 1536.

[151] United States Society on Dams, *Guidelines for Dam Decommissioning,* 31-32.

[152] "West Coast Salmon & Steelhead Listings," NOAA Fisheries, September 06, 2012, accessed March 29, 2019, https://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead_listings/salmon_and_steelhead_listings.html.

Clean Water Act, 1972

The removal of a dam has the potential to release several types of pollutants into waterways including fill from the dam itself and sediment backed up behind the dam's walls. These discharges can temporarily alter river ecosystems and affect spawning grounds, habitat, and potentially release contaminants downstream.[153] The possibility of these impacts triggers Sections 401, 402, and 404 of the Clean Water Act (*CWA*). Section 401 requires that proposed actions undertaken by a federal agency which result in a discharge of pollutants into United States waters do not violate state or federal water quality standards. Additionally, it requires a federal agency to obtain a state water quality certification to conduct any activity that may result in discharge into navigable waters. For dam removal a waiver may be granted to the water quality certification as sediment release will likely be short-term and outweighed by the restoration of natural river flows. Section 402 requires that all sources that discharge pollutants into United States navigable waterways obtain a National Pollutant Discharge Elimination System (*NPDES*) permit issued by the state the point is located within. The *NPDES* permit includes established limits to pollutants in waterways and establishes reporting and monitoring requirements. Section 404 requires the obtainment of a permit from the *USACE* when dredge or fill materials will be discharged into United States waters. This section is widely applied to wetlands, lakes, ponds, and seasonal and intermittent streams. To receive a Section 404 permit the compliance of the proposed project with other *EPA* guidelines is assessed, impacts are evaluated to comply with *NEPA*, and consideration is given to public interest. Consultation for the Section 404 permit often coincides with Section 401 of the *CWA*, *ESA* reviews, and Section 106 of the *NHPA* review. [154]

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[153] Higgs, "The Ecology of Dam Removal: A Summary of Benefits and Impacts," *American Rivers*, 8.

[154] United States Society on Dams, *Guidelines for Dam Decommissioning,* 30-31.

Magnuson-Stevens Fishery Conservation and Management Act, 1976

The Magnuson-Stevens Act is the primary law that governs marine fisheries management within the United States. Under the act any action undertaken by a federal agency that may adversely affect essential fish habitat for protected and anadromous fish species requires consultation with the *NMFS*. This is primarily to conserve the habitats of commercially fished species, like spawning grounds located below dams and therefore affected by sediment release during removal. Consultation for the Magnuson-Stevens Act often coincides with *ESA* consultation.[155]

Fish and Wildlife Coordination Act, 1934

The Fish and Wildlife Coordination Act (*FWCA*) mandates consultation with the *USFWS*, *NMFS*, and state fish and wildlife agencies prior to any federal action that will impact surface water. This is to ensure the preservation of wildlife by minimizing or avoiding adverse impacts. Under the act the *USFWS* reports to the federal agency undertaking the proposed action and recommends methods for mitigating adverse effects. The agency must consider these recommendations from the *USFWS* and other environmental agencies and include measures to reduce possible wildlife impacts in the project plan.[156]

Rivers and Harbors Act, 1899

The Rivers and Harbors Act generally regulates construction and obstruction in navigable United States waterways. Section 10 of the act, however, is applicable to the removal of structures in or over waterways. This section prohibits the creation of any obstruction of a navigable waterway and any alteration to the course, location, condition, capacity, or channel of a navigable waterway. Dam removal drastically alters

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[155] Ibid., 32.

[156] Ibid., 33.

river channels and courses and must obtain a Section 10 permit from the *USACE* before commencing the project.[157]

National Historic Preservation Act, 1960

The *NHPA* protects historic resources by requiring federal agencies to evaluate the effects of their undertakings on significant historic and cultural resource. Section 106 of the *NHPA* requires federal agencies to coordinate with the State Historic Preservation Office (*SHPO*) of the state where the undertaking is proposed and in certain circumstances with the Advisory Council on Historic Preservation (*ACHP*). Chapter VI will discuss the Section 106 review process, the key stakeholders in consultation, and its role in dam removal.

STATE REGULATIONS AND THE DECOMMISSIONING PROCESS

State regulations accompany the many federal regulations that are triggered by the planned decommissioning and removal of a dam. These regulations vary between states but often reflect federal laws and parallel federal permits and processes relevant to dam removal. Some states have several stringent laws triggered by removal, like the state of California's Environmental Quality Act, Endangered Species Act, and Clean Air Act. Other states have very few relevant laws, like Connecticut, which requires only one state permit to remove a non-federally owned dam.[158] The following sections briefly outline the state regulations relevant to the case study dam removal projects used in this research.

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[157] Rivers and Harbors Act, 33 U.S. Code § 403.

[158] United States Society on Dams, *Guidelines for Dam Decommissioning,* 35.

Oregon Regulations

In the state of Oregon, several state permits through the Department of Environmental Quality (*DEQ*) and Department of State Lands (*DSL*) must be obtained prior to undertaking the removal of a dam. These permits correspond with federal permits. Under the state, Removal-Fill Law agencies or individuals removing a dam with more than fifty cubic yards of material must obtain a Removal-Fill Permit from the *DSL*, which utilizes a joint application with the *USACE*. The *USACE*, *DEQ*, and *DSL* also have a joint application for meeting water quality standards under Section 401 of the *CWA*. Additionally, the *DEQ* require a 1200-C Construction Stormwater permit regulating stormwater runoff from construction activities that disturb at least one acre of land. This permit corresponds to the *NPDES* permit necessary under the *CWA*. Additional state permits may be necessary dependent on the specific project. For example, if explosives are to be used in the removal of a dam, an In-Water Blasting Permit must be obtained from the Oregon Department of Fish and Wildlife.[159]

Washington Regulations

In the state of Washington, one primary regulation must be addressed during dam removal: the Washington State Environmental Policy Act (*SEPA*). *SEPA* aligns with the *NEPA* and is required to determine and analyze the environmental impacts of a government project. It requires applicants to evaluate impacts and propose alternative and mitigation measures. The act also includes the solicitation of public comment and encourages public involvement throughout the consultation process. The end result of *SEPA* consultation is an *EIS* which can be used to change the proposed actions or adopt mitigation measures to minimize impacts.[160]

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[159] Denise Hoffert-Hay, *Small Dam Removal in Oregon: A Guide for Project Managers* (2008: Oregon Watershed Enhancement Board), 39, https://digital.osl.state.or.us/islandora/object/osl:16500/datastream/OBJ/view.

[160] "Environmental Impact Statement Process," Washington State Department of Ecology - Environmental Impact Statements, accessed March 29, 2019, https://ecology.wa.gov/Regulations-

CONCLUSION

After obtaining approval from the *FERC*, ensuring all federal, state, and local regulations have been met, and all permits have been obtained, the removal of a non-federal hydroelectric dam can begin. As evidenced by the sheer number of regulations and permits triggered by a planned dam removal, the process is lengthy and complex. The involvement of numerous agencies at varying levels of the government can also lead to prohibitive delays. In the case of the Condit Hydroelectric Project dam removal, it took the operator, PacifiCorp, twelve years to satisfy all state and federal regulations and receive all permits.[161]

The majority of these permits and regulations relate to environmental issues, understandably so as dam removal presents massive environmental implications. Those regulations that consider historic resource are quite limited, including only *NEPA* and Section 106 of the *NHPA.* While it is logical to consider the ecological impacts of dam removal more carefully than the historic and cultural impacts, the function of Section 106 dramatically unbalances the scale. Section 106 is an act with no teeth: it can only ask federal agencies to consider their impacts to historic resources, not to actually address those impacts. The numerous environmental acts and laws triggered by dam removal do not merely make recommendations, they set requirements for the federal agency in question. This basic overview of the various laws and regulations involved in dam removal illustrates an ingrained imbalance between consideration of the environment and historic preservation. The following chapter will discuss Section 106 of the *NHPA* specifically and its implementation best-practices that can counter this entrenched imbalance.

Permits/SEPA/Environmental-review/SEPA-guidance/Guide-for-lead-agencies/Environmental-impact-statements.

[161] Blumm and Erickson, "Dam Removal in the Pacific Northwest: Lessons for the Nation," SSRN Electronic Journal (2012), 1065.

CHAPTER VI. SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

THE NATIONAL HISTORIC PRESERVATION ACT

The passage of the *NHPA* in 1966 established measures to safeguard the nation's historic and cultural resources. The early preservation movement's manifesto, *With Heritage So Rich*, laid the foundation for the creation of the act.[162] The publication made recommendations for protecting the nation's rich heritage at a pivotal moment in American history: preservationists had lost the battle to save New York City's Pennsylvania Station in 1963 and by 1966 nearly half of the structures listed in the National Park Service's Historic American Building Survey had been demolished. The roots of the act can be traced back even farther in history to the 1906 American Antiquities Act (established to protect archaeological sites and artifacts), the *WPA* era Historic American Building Survey, and the 1935 Historic Sites Act (which declared a national policy to preserve historic sites and buildings for the public).[163] Through the establishment of the *ACHP*, a network of *SHPO*s, a program of Certified Local Government's (*CLG*), the *NRHP*, and the Section 106 review process, the N*HPA* sought to prevent futures losses of the country's historic fabric [Table 6.1].

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[162] United States Conference of Mayors. *With Heritage so Rich*. 1966.
With Heritage So Rich was a report compiled by the United States Conference of Mayors. It has been re-published numerous times.

[163] Max Page and Marla R. Miller, *Bending the Future: Fifty Ideas for the next Fifty Years of Historic Preservation in the United States*(Amherst: University of Massachusetts Press, 2016), 1-2.

TITLE	FUNCTION & DUTIES
ACHP	- Advise the President and Congress on matters relating to historic preservation. - Encourage public interest and participation. - Advise state and local governments in drafting legislation. - Encourage training and education. - Review the policies and programs of Federal agencies. - Inform and educate Federal agencies, State and local governments, tribes, and international organizations. *54 U.S. Code § 304102*
SHPO's	- Direct and conduct a statewide survey of historic properties and maintain inventory of such properties. - Prepare and implement a statewide historic preservation plan. - Advise and assist Federal, state, and local agencies, private organizations, and individuals. - Provide public information, training, and technical assistance. - Cooperate with CLG's and assist in CLG certification. - Consult with Federal agencies in the event of an undertaking with adverse effects to historic resources. - Advise and assist rehabilitation projects that may qualify for Federal funding. *54 U.S. Code § 302303*
CLG's	- Enforce appropriate state and local legislations. - Maintain a survey and inventory of historic resources. - Assist in the nomination of resources to the NRHP. *54 U.S. Code § 302503*

Table 6.1 Federal, State, and Local Functions and Duties under the *NHPA*. Created by author.

SECTION 106 REVIEW

Section 106 of the *NHPA* is one of the most frequently used tools to protect historic resources established by the act. The wording of Section 106 as established in the *NHPA* is concise:

> The head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department or independent agency having authority to license any undertaking, prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, **shall take into account the effect of the undertaking on any historic property**. The head of the Federal agency shall afford the Council a reasonable opportunity to comment with regard to the undertaking.[164]

Section 106 review is therefore triggered by any federal undertaking, whether or not it is presumed to have an effect on historic or cultural resources. The act defines an undertaking as, "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency".[165] Federal undertakings may be as small as the construction of a dock on a navigable river requiring a *USACE* permit, or as complex as the construction of new highway by the Federal Highway Administration. Additionally, federal involvement in a project is not always overt, as in the case of the *USACE* permit needed for the construction of a dock. Although Section 106 does not mandate that a Federal agency cannot negatively impact historic and cultural resources, it assures that Federal agencies at least consider the impacts of their undertakings. Prior to passage of the *NHPA* Federal agencies operated with no oversight regarding historic and cultural resources. Code of Federal Regulations Title 36, Part 800 codified the language of Section 106 and established the regulatory process of review. It provides much greater detail of the purpose of Section 106 as well as the process for undertaking section 106 review.

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[164] Effect of undertaking on historic property, 54 U.S. Code § 306108. Emphasis added by author.

[165] Undertaking, 54 U.S. Code § 300320.

Stakeholders

The Section 106 review process mandates consultation between numerous stakeholders, from the federal level to the local level. At its most basic form, consultation must include an Agency Official and consulting parties including the *SHPO* and Indian tribes and Native Hawaiian Organizations impacted by the undertaking who may be represented by a *THPO* or tribal individual. Other stakeholders may include the *ACHP* when their involvement is deemed necessary, representatives of local governments, and the public.[166] Consultation seeks to balance the needs of federal agencies with historic preservation concerns and has three primary steps: the identification of historic properties potentially affected by a federal undertaking, the assessment of the effect of the undertaking and methods of avoidance, and the minimization or mitigation of adverse effects.[167]

For the purposes of Section 106 consultation, an Agency Official is defined as a representative of the federal agency who has been delegated legal responsibility for compliance during review. This representative may be from the federal agency performing the undertaking or may be a state, local, or tribal government official. If more than one Federal agency is involved in the undertaking, which is common in larger projects, a lead Federal agency is elected who then identifies the Agency Official. Those Federal agencies that are not designated as the lead Federal agency remain in the consultation process and are individually responsible for meeting their compliance requirements. It is the responsibility of the Agency Official to initiate consultation and involve the other stakeholders as appropriate.[168]

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[166] Protections of Historic Properties, 36 CFR § 800.2 Participants in the Section 106 process.

[167] Protections of Historic Properties, 36 CFR § 800.1 Purposes.

[168] 36 CFR § 800.2 Participants.

Under the *NHPA*, *SHPO*s are tasked with assisting Federal Agencies in carrying out their historic preservation responsibilities.[169] Section 106 review is one of these responsibilities, therefore *SHPO*s are always a consulting party during review. *SHPO*s are also responsible for cooperating with local governments, organizations, and individuals "to ensure that historic properties are taken into consideration at all levels of planning and development."[170] When the Federal undertaking under review is to occur on tribal lands, the *THPO* takes on the role generally assigned to the *SHPO*. The *SHPO* may remain in the consultation process, however, if the undertaking may affect historic or cultural resources outside of tribal lands. If an undertaking is to occur on land or affect cultural and historic resources of a tribe (regardless of their location) without a *THPO*, a tribal representative will assume the responsibilities generally assigned to the *THPO*. Consultation between the Agency Official and *THPO* or tribal representative during Section 106 review must recognize the unique government-to-government relationship between the United States Government and Indian tribes. It is also the responsibility of the Agency Official to identify tribes which may be impacted by the undertaking.[171]

The *ACHP*'s direct involvement in Section 106 consultation is not required and is only initiated by the *ACHP* itself under four certain circumstances. (1) If a resource with recognized or potential national significance, an unusual or noteworthy resource, or rare resource is to be impacted by an undertaking the Council is likely to enter the consultation process. (2) If consultation presents questions of interpretation of regulations or will set a precedent for future policies then the Council will likely enter the consultation process. (3) If there is substantial public controversy, disputes between stakeholders that cannot be resolved, or the possibility of non-compliance based on past performance, the Council is likely to enter the consultation process. (4) Lastly, the

[169] 54 U.S. Code § 302303, Responsibilities of State Historic Preservation Officer.

[170] 36 CFR § 800.2 Participants.

[171] Ibid.

Council will likely enter consultation if issues are presented that concern tribes or Native Hawaiian organizations, including when a tribe or organization has specifically requested council involvement, or when there are questions concerning the relation of Section 106 to other regulations relevant to tribal historic and cultural resource. It is the discretion of the council when and why to enter consultation, and even if one or all of the above scenarios occur the Council may not elect to enter.[172]

On the local level, representatives of local governments are entitled to a role in the consultation process and public organizations or individuals may enter the consultation process as additional consulting parties. If the Federal undertaking is to occur in an area under the jurisdiction of a local government then the local government may elect to have a representative in the consultation process. Local organizations or individuals with a demonstrated interest in the undertaking, due in part to their legal or economic relation to the project or their concern with the possible impacts on historic or cultural resources, may participate. Public participation is considered "essential to informed Federal decision making in the Section 106 process" and it is mandated that the Agency Official seeks and considers public input through providing public notice and comment. The level of public involvement in the consultation process is at the discretion of the Agency Official however, and there is no requirement to actually implement any suggestions made by the public or to address public concerns. Additionally, the requirement for public involvement in Section 106 can be substituted for public involvement in the *NEPA* review process, further removing the public from meaningfully participating in consultation and decision making regarding historic and cultural resources.[173]

The stakeholders that are legally required to be involved in consultation - the Agency official, *SHPO*, and *THPO* or other tribal organization - along with consulting

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[172] Criteria for Council Involvement in Reviewing Individual section 106 Cases, Appendix A to 36 CFR Part 800.

[173] 36 CFR § 800.2 Participants.

parties and any additional consulting parties work together, from initiation to the creation of an *MOA* or Programmatic Agreement (*PA*) (the difference between these two documents will be discussed in the subsection *Outcomes*). During hydroelectric dam removals, stakeholders often include the *FERC*, the *USACE*, Fish and Wildlife Services, the *NMFS*, the Forest Service, *SHPO*s, and *THPO*s.[174] In certain cases other stakeholders are also involved, like the National Park Service during the removal of the Elwha and Glines Canyon Dam due to the Elwha's location in Olympic National Park. While the public is involved in all dam removal projects that trigger Section 106, due to the public notice mandated in the process, in the four case studies examined in this research no pubic organization or individual was included as an invited signatory in the project *MOA*.

Process

Countless steps are involved in the Section 106 consultation process, but these steps fit within five major categories: initiation of consultation, identification of historic and cultural resources, assessment of adverse effects, resolution of adverse effects, and lastly, implementation. Additional steps may be necessary or become necessary dependent on the individual project, such as undertakings with adverse effects to National Historic Landmarks or discoveries made after the initiation of the undertaking.[175] All five major categories of the consultation process occur prior to carrying out the proposed undertaking and the entire process varies in length, from as short as a few months to as long as a year.[176]

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[174] McClain et al., *Dam Removal and Historic Preservation: Reconciling Dual Objectives*, 10-11.

[175] Protections of Historic Properties, 36 CFR § 800.10 Special requirements for protecting National Historic Landmarks.
Protections of Historic Properties, 36 CFR § 800.13 Post-review discoveries.

[176] "Frequently Asked Questions about Section 106 of the National Historic Preservation Act," National Endowment for the Humanities (NEH), accessed March 30, 2019, https://www.neh.gov/grants/manage/frequently-asked-questions-about-section-106-the-national-historic-preservation-act.

Section 106 consultation is initiated by the appointed Agency Official prior to the beginning of the undertaking or the approval of the expenditure of any federal funding, permit, or license.[177] After identifying the proposed action as an undertaking, as previously defined, and its potential to impact historic resources if present, the Agency Official begins outreach to other agencies and stakeholders. It is essential that this is initiated early on in the planning of the undertaking to ensure that a "broad range of alternatives may be considered during the planning process for the undertaking".[178] The Agency Official must identify any *SHPO*, *THPO* or tribal organization, and other Federal agencies involved and invite them to the consultation process. Once identified, the *SHPO* and Agency Official jointly decide when to involve the public. Frequently the Section 106 consultation process is coordinated with other reviews, such as *NEPA* review, which also include public notice and comment.

Once all stakeholders have been given notice of initiation of consultation, the Agency Official and *SHPO*/*THPO* determine the Area of Potential Effects (*APE*) of the project. A proposed projects *APE* is the geographic area that may be directly or indirectly altered due to the undertaking and is dependent on project scale and the type of undertaking.[179] For example, the *APE* for a dam removal is likely to include the projected water level rise from below the dam to a determined confluence and the area where machinery will be brought to the site, while the *APE* of a natural gas pipeline is likely to follow the pipeline, extending a certain distance out. Once the *APE* has been determined, the Agency Official and *SHPO*/*THPO* research possible historic and cultural resources in the *APE* and consult with other stakeholders. The National Park Service's *Secretary of the Interior's Standards for Identification* provide in-depth guidance on the

[177] 36 CFR § 800.1 Purposes.

[178] Ibid.

[179] Protections of Historic Properties, 36 CFR § § 800.16 Definitions.

steps necessary for an agency to undertake a good-faith effort to identify historic and cultural resources.[180]

Identified historic or cultural resources within the *APE* of the proposed project are then evaluated by the Agency Official and *SHPO*/*THPO* using the criteria for the National Register of Historic Places. The Agency Official must make its findings of the resources, as either eligible or ineligible, available to the other Section 106 consulting parties. If the Agency Official reports no affected historic or cultural resources are present in the *APE,* the *SHPO*/*THPO* or Council have thirty days to challenge the findings. If neither stakeholder responds within that time frame, the Federal agency has fulfilled its responsibilities and the undertaking can commence. If the Agency Official reports that historic and cultural resources will be affected, the stakeholders begin the process of assessing the nature of the effects.

The criteria for determining adverse effect are based upon the seven criteria of integrity established by the Secretary of the Interior: location, design, setting, materials, workmanship, feeling, and association. An adverse effect occurs when an undertaking alters any of those seven aspects of integrity of a resource that qualifies it fit inclusion in the NRHP. The adverse alteration may be immediate, foreseeable, or cumulative. Examples of adverse effects are destruction, damage, alterations inconsistent with the Secretary of Interior's Standards for the Treatment of Historic Properties, removal from original location and setting, change in use, introduction of new features, neglect, and transfer, lease, or sale of a property from Federal ownership.[181] If the Agency Official reports no findings of adverse effects to the consulting parties, the *SHPO*/*THPO* has thirty days to agree or object to the finding. If an objection is made, the Council may enter the consultation process to determine an opinion. A finding of adverse effect by

[180] Protections of Historic Properties, 36 CFR § 800.4 Identification of historic properties.

[181] Protections of Historic Properties, 36 CFR § 800.5 Assessment of Adverse Effects.

the Agency Official, or a finding of adverse effect by the Council after further consideration, begins consultation to resolve the adverse effect.

The resolution of an adverse effect occurs through avoidance, minimization, or mitigation. Once an adverse effect has been determined, the Agency Official notifies the Council (and invites them to participate under certain circumstances outlined in 36 CFR § 800.6) and the other consulting parties. At this point, additional consulting parties who will presumably act as signatories on the *MOA* can be invited. Prior to determining resolutions to the adverse effect, the Agency Official supplies the other stakeholders with documentation of the findings. This documentation must contain certain information, including: a description of the undertaking and its *APE*, a description of the methods used to identify historic resources, a description of their significance, a description of the adverse effects founds, and an explanation of how the adverse effects were determined. This documentation is also made available to the public and an opportunity is provided for public comment. After consulting, if the *SHPO*/*THPO* and Agency Official concur on the methods determined to resolve adverse effects a document is drawn up outlining the stipulations of the agreement.[182]

Outcomes

If Section 106 consultation concludes and an avoidance of adverse effects cannot be reached, two outcomes are possible: the signing of a MOA or the signing of a PA.[183] These documents are the culmination of the process and reflect the efforts of the involved stakeholders in identifying and addressing adverse effects. They lay out the specific steps to be followed by the Federal agency performing the undertaking, and it is the Agency Official's responsibility to ensure those steps are implemented. The MOA is the standard document used to implement resolutions to adverse effects. A PA may be

[182] Protections of Historic Properties, 36 CFR § 800.6 Resolution of adverse effects.

[183] The Section 106 review process can also be terminated by the Agency Official, SHPO/THPO, or Council.

substituted for the MOA when the undertaking is more complex, when effects to properties are to occur on a state or regional scale, when effects cannot be fully determined prior to approval of the undertaking, when non-Federal stakeholders are given major decision-making power, or where routine management activities are "undertaken at Federal installations, facilities, or other land management units".[184] In format and scope, the PA and MOA are nearly identical; the only major difference is in which type of project they are used for.

Both MOAs and PAs must be signed by the Agency Official and SHPO/THPO to take effect. PAs must additionally be signed by the Council. Other signatories, such as additional consulting parties and invited signatories, may sign but are not necessary to implement the document; if they choose not to sign, the document is still effective.[185] The primary signatories may choose to include provisions for reporting on the implementation of the document or provisions for terminating and reconsidering the document if the undertaking has not occurred after a certain period. Additionally, the primary signatories may choose to include provisions for subsequent discoveries of historic or cultural resources within the APE. A MOA or PA can be amended or terminated to re-consult by the primary signatories.

COMMON MITIGATION STRATEGIES

Mitigation strategies implemented through *MOA*s and *PA*s are measures that attempt to alleviate or reduce the severity of an adverse effect on historic and cultural resources. These mitigation strategies reached through the Section 106 consultation process vary depending on what type of resource is being affected and the extent of the adverse effect. For the purposes of this research, mitigation measures are divided based on their applicability regarding two general categories: above-ground resources and

[184] Protections of Historic Properties, 36 CFR § 800.14 Federal agency program alternatives.

[185] 36 CFR § 800.6 Resolution of adverse effects.

archaeological resources. The different nature of these resources makes certain mitigation measures uncommon or inappropriate to apply to both categories.

Above-Ground Resources

When Section 106 review considers adverse effects to above-ground resources, several mitigation measures are commonly implemented. These include transfer, lease, or sale of a property, marketing and redevelopment, documentation, interpretation, salvage, and the creation of management plans. Although the transfer of a historic property from federal to private ownership can be an adverse effect, the sale of a historic resource can also be a mitigation strategy. When adequate stipulations are included to ensure continued maintenance and preservation, the sale or lease of property, federally owned or managed, can be a means to mitigate other adverse effects. Specific wording should be used in a *MOA* or *PA* to ensure that the management of the property aligns with Secretary of the Interior's standards.[186] When an historic property is retained but no sale or lease has been predetermined, a *MOA* or *PA* may include a stipulation for marketing and redeveloping the property. This stimulates historic preservation interests in the community and provides an alternative to demolition. Often, a preservation covenant is stipulated along with the property sale to ensure that the property is continually maintained and managed. Additionally, the *MOA* or *PA* may specify a deadline for the sale of the property, and if not met the property will be offered with no preservation easement.[187]

Documentation is the most often used method of mitigation and is frequently paired with other measures. This strategy can be achieved through several different kinds of documentation or a combination of multiple kinds including photographs,

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[186] *Preparing Agreement Documents: How to Write Determinations of No Adverse Effect, Memorandum of Agreement, and Programmatic Agreements Under 36 CFR Part 800*, (Advisory Council on Historic Preservation, 1989), 29-32.

[187] Ibid., 33-34.

drawings, maps, and written descriptions. Documentation is often the most basic level of mitigation required by *SHPO*s. For particularly significant properties, documentation in the Historic American Building Survey (*HABS*), *HAER*, or Historic American Landscape Survey (*HALS*) may be stipulated in a *MOA* or *PA*. These are types of National Park Service documentation that are more in depth than basic documentation including added elements like measured drawings. This documentation is also archived by the Library of Congress and available online to the public, while basic documentation is often significantly less accessible.[188] Unfortunately, documentation is often employed to mitigate the complete loss of an historic resource and the strategy has acquired the unpleasant moniker "document and destroy."

Interpretation is another commonly used strategy employed to mitigate the complete loss of a structure or significant alterations. Like documentation, interpretation can manifest in many different forms. Something as small and simple as a brochure placed at a trailhead can partially mitigate the removal of an historic cabin, while a series of large permanent interpretive panels could serve the same means elsewhere. Interpretation using modern means, like websites and phone apps, is also becoming more common.[189] All methods of interpretation, large or small, physical or intangible, aim to educate the public of what was lost as the result of an undertaking's adverse effect.

In scenarios where demolition of a structure is unavoidable, salvage is another accepted method of mitigation. Salvage entails deconstructing a property and retaining all or parts of its physical structure. This is generally employed when the structure lost features significant architectural elements, like ornate decorative elements or unique construction techniques. The use of these salvaged elements can be stipulated in the

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[188] Oregon Parks & Recreation Department: Oregon Heritage: State Historic Preservation Office Example Mitigation for Adverse Effects, accessed March 31, 2019, https://www.oregon.gov/oprd/HCD/SHPO/Pages/preservation_106_examplemitigation.aspx.

[189] Ibid.

undertaking's *MOA* or *PA*. Often salvaged elements are given to the *SHPO*, who in turn offers them for curation to museums. In other projects it may be appropriate for the *MOA* or *PA* to stipulate the re-use of the architectural elements by the lead agency or a developer if new construction on the site is planned. An additional benefit of deconstruction and salvage as a mitigation measure is its sustainability when compared to normal demolition.[190]

When the *APE* of a proposed undertaking includes several structures owned by the same agency, an Historic Property Management Plan (*HPMP*) is a common mitigation measure. The creation of an *HPMP* can be stipulated in a *MOA* or *PA* and establishes plans for the continued use and maintenance of resources. *HPMPs* can allow for changes to resources and establish guidelines to ensure the integrity of the structures are retained. This strategy is not exclusively used for collections of structures; it can also be employed for the preservation of singular buildings particularly when rehabilitation or redevelopment is planned. An *HPMP* can be written to accommodate planned change and can prevent repetitive consultation with the *SHPO*.[191]

Archeological Resources

Archaeological or below-ground resources share some similar mitigation methods as above-ground resources but more often require different approaches. These types of resources are also subject to different regulations, such as the 1974 Archaeological and Historic Preservation Act and the 1979 Archeological Resources Protection Act. To mitigate the loss, removal, or damage of archaeological resources strategies include in-place preservation, data recovery, curation, reburial of remains,

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[190] *Preparing Agreement Documents*, (Advisory Council on Historic Preservation, 1989), 42.
In 2016 the City of Portland became the first City in the United States to require deconstruction and salvage of historic structures. This law applies to recognized historic resources as well as buildings built before 1916.

[191] Oregon Parks & Recreation Department: Oregon Heritage: State Historic Preservation Office Example Mitigation for Adverse Effects, https://www.oregon.gov/oprd/HCD/SHPO/Pages/preservation_106_examplemitigation.aspx.

controlled grading, and disturbance monitoring. In-place preservation is as its name implies: the resource is left in place and the undertaking is planned in a manner so as to minimize possible impacts to the resource. This could include diverting construction or development from the site, placing additional fill over the resource, or stipulating that construction be placed on pillars or platforms. While this is a common mitigation strategy it presents complications considering accessibility to the site and the potential of discovery and subsequent looting.[192]

Data recovery is to archaeological resources as documentation is to above-ground resources: it is generally employed when the loss or significant alteration of an archaeological site is imminent and unavoidable. In practice data recovery entails the excavation of a site, mapping of the site, storing and labelling artifacts, processing and analyzing the artifacts, and the creation of a data report.[193] An *MOA* or *PA* may stipulate for the creation of a data recovery plan, or if one has already been created, the data recovery measures themselves.

Plans for the storage and curation of archaeological artifacts retrieved during data recovery may be included in a data recovery plan. If not within the data recovery plan, storage and curation is included as a stipulation in the undertaking *MOA* or *PA*. This ensures the proper storage of archaeological surveys and data in archives as well as the dissemination of information for education.[194] Additionally, the curation of artifacts themselves is generally stipulated to align with the guidelines established in 36 C.F.R. Part 79, *Curation of Federally-Owned and Administered Archaeological Collections*. Curation of archaeological artifacts and data is similar to interpretation of above-ground resources, as its primary means of mitigation is public education and awareness.

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[192] *Preparing Agreement Documents*, (Advisory Council on Historic Preservation, 1989), 43.

[193] "NPS Archaeology Program," National Parks Service, accessed March 31, 2019, https://www.nps.gov/archeology/afori/whdo_discov3.htm.

[194] *Preparing Agreement Documents*, (Advisory Council on Historic Preservation, 1989), 46.

Stipulations for the reburial of recovered archaeological human remains should also generally be included in a data recovery plan, but if absent, can be a mitigation measure stipulated in a *MOA* or *PA*. If a *THPO* or tribal organization is involved in the Section 106 consultation processs, this matter should be consulted with them directly. The presence of archaeological human remains within an *APE* requires cooperation with the Native American Graves Protection and Repatriation Act (*NAGPRA*).[195]

Although grading is often considered a destructive activity regarding archaeological resource, planned and careful controlled grading can be a mitigation measure to protect resources. This type of grading still has the potential to create adverse effects but is decidedly less destructive than construction or other development on the site. Within a *MOA* or *PA* specific requirements are established to minimize damage, including the type of equipment to be used and the depth of the grading.[196] Perhaps the most commonly specified mitigation measure regarding archaeological resources is disturbance monitoring. Monitoring is employed as a safeguard, to prevent possible damage to sites in proximity to the *APE*, sites discovered in the *APE* after the signing of a *MOA* or *PA*, or sites known of but previously too difficult to access.[197]

State Documentation Standards

As set forth in 54 U.S. Code § 302303, it is the duty and responsibility of *SHPO*s to advise and assist federal agencies in carrying out their historic preservation responsibilities. Accordingly, *SHPO*s establish documentation standards to be followed in *MOA*s and *PA*s resulting from Section 106 consultation. These documentation standards set the basic requirements to be met by mitigation achieved through documentation, as it is the most common mitigation strategy and is often coupled with

[195] Ibid., 47.

[196] Ibid., 48.

[197] Ibid., 49.

other strategies. Some states establish one simple basis for documentation while others provide a scale of documentation options corresponding to the significance of the resource impacted.

Oregon's *SHPO* documentation standards follow the former format. The state has one basic set of guidelines for documentation and provides references to *HABS* and *HAER* documentation when applicable. The guidelines established by the *SHPO* require eight items to meet the guidelines for state level documentation: an architectural description of the resource, a history of the resource, a bibliography of all sources, a site map, a scale site plan, scale floor plans, photographs, and archival material if available.[198]

The Washington State Department of Archeology and Historic Preservation (*DAHP*) provides slightly more in-depth standards. Their standards are divided into three levels corresponding to significance. The highest, Level I, corresponds to the standards of documentation for *HABS* and *HAER*. Level II applies to resources with less significance and standards include a historic report, historical background information, a site plan drawing, floor plan sketches, historic photographs if available, a site map, updated Statewide Historic Property Inventory Form, and current photographs. Level III applies to resources with the lowest level of significance and standards include an updated Statewide Historic Property Inventory Form and current photographs.[199]

CREATIVE MITIGATION STRATEGIES

Creative mitigation strategies are those that go above and beyond the common measures or the basic requirements established by a *SHPO*. They represent more than a

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[198] "Oregon SHPO Documentation Standards," (Oregon State Historic Preservation Office, 2014). https://www.oregon.gov/oprd/HCD/SHPO/docs/oregonshpodocumentationstandards.pdf

[199] "DAHP Mitigation Options and Documentation Standards,"(Washington Department of Archaeology and Historic Preservation, 2010), http://www.dahp.wa.gov/sites/default/files/MitigationDocumentationStandards.pdf

good-faith effort to mitigate adverse effects. Often, they are outside of the box, require increased collaboration between stakeholders, and are formats that won't sit on a shelf, like documentation or data recovery. Creative mitigation strategies generally better serve the public than traditional strategies and embrace new technologies more frequently.[200] Although they are not the status-quo, creative mitigation measures should be employed by preservationists more frequently. No exact definition of creative mitigation exists, and the possible examples are nearly endless. To illustrate this type of mitigation and its effectiveness, three examples of creative mitigation recognized by the *ACHP* are presented below.

Example #1: Broad River Bridge, South Carolina

When Chester County, South Carolina needed a new bridge to span the Broad River, a site was chosen to avoid recognized historic resources, including a Revolutionary War battleground and historic fish weir [Figures 6.1 and 6.2] . Further archaeological investigation, however, discovered a portion of the historic battleground intact beneath the river's surface within the *APE* of the proposed project. Initially, the Federal Highway Administration (lead agency) and the Section 106 consulting parties (South Carolina *SHPO* and South Carolina Department of Transportation) planned to undertake archaeological data recovery on thirty acres of land. This proved to be a costly undertaking, and the consulting parties developed an alternative plan to purchase the entire one hundred and forty-three acre historic battlefield. The site was purchased by the South Carolina Department of Transportation, and the South Carolina Department of Natural Resources and US Forest Service (*USFS*) agreed to jointly manage the land. This alternative saved taxpayers' money, protected the historic battlefield, created a

[200] "Reaching Agreement on Appropriate Treatment," The Advisory Council on Historic Preservation, accessed March 31, 2019, https://www.achp.gov/index.php/Section_106_Archaeology_Guidance/Questions and Answers/Reaching agreement on Appropriate Treatment.

new tourist attraction, and allowed for construction of a new, safe, bridge.[201] This mitigation strategy exhibited collaboration between stakeholders, the fostering of new partnerships, and going above and beyond the current status-quo mitigation strategies.

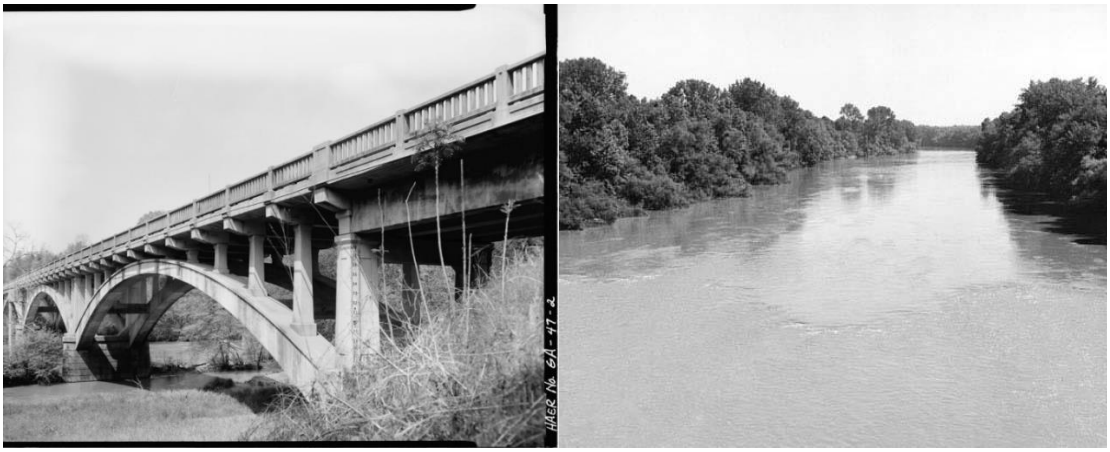

Figure 6.1 (left) Historic Broad River Bridge, constructed 1935, decommissioned 2003. Source: Library of Congress. **Figure 6.2** (right) Historic Fish Weir on Broad River. Source: South Carolina Department of Archives and History.

Example #2: New Fork River Park, Wyoming

The California National Historic Trail includes the 256 mile Lander Trail, a wagon road that aided Americans emigrating to the West and was the first federally funded road West of the Mississippi. In 2008, the Bureau of Land Management (*BLM*) determined that two separate undertakings would adversely affect the setting of the road - a transmission line would cross the road twice and run alongside it for nearly sixteen miles. To mitigate this affect, *BLM* sought to protect and enhance a different section of the historic trail through the acquisition of a privately-owned historic river crossing located next to a *BLM* campground. Ten additional consulting parties were invited to participate in the Section 106 process and the river crossing, and eighty-two

[201] "106 Success Story: Routine Bridge Replacement Saves Revolutionary War Battlefield," (The Advisory Council on Historic Preservation, 2018). https://www.achp.gov/sites/default/files/2018-12/Broad%20River2.pdf

acres of land were acquired by the power companies planning to operate the proposed project as the Lander Trail New Fork River Crossing Historical Park. That land was later expanded to over one hundred acres and now includes trails, an overlook, and river access [Figure 6.3]. This mitigation strategy exhibited extreme collaboration, with twenty parties involved in the consulting process, and provided a public benefit that more common measures would not have been able to.[202]

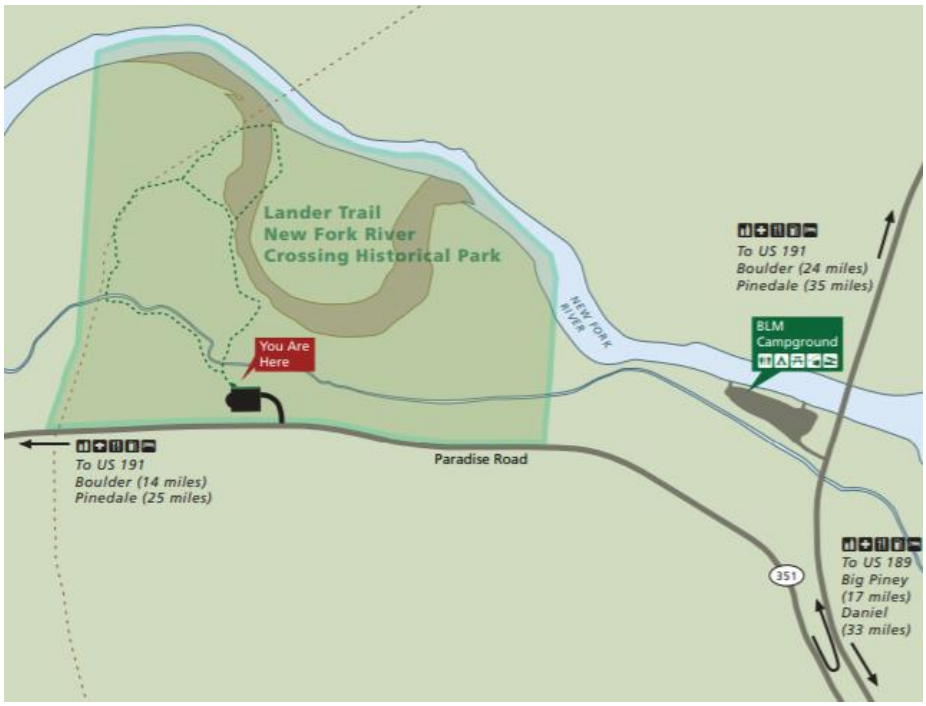

Figure 6.3 Lander Trail new Fork River Crossing Historical park map. Source: museumofthemountainman.com

Example #3: Milton-Madison Bridge Replacement, Indiana

Although located on opposites banks of the Ohio River, the cities of Milton, Kentucky and Madison, Indiana have been connected economically since the 1930s. The historic Milton-Madison bridge allowed both cities to grow and prosper and provided a

[202] "106 Success Story: Strong Public-Private Coalition Leads to Establishment of Park," (The Advisory Council on Historic Preservation, 2018). https://www.achp.gov/sites/default/files/2018-06/New%20Fork%20River%20Park.pdf

connection for residents. In 2009 the Federal Highway Administration (*FHWA*) proposed demolishing the historic bridge due to structural issues and constructing a new bridge between the two cities. The proposal entailed a one-year period where transportation between the cities would be provided only be ferry. Residents and business owners were concerned over this plan so the *FHWA* went back to the drawing board, created a better plan for the citizens of the cities, and amended the project's *MOA*. This new plan shutdown automobile travel for only ten days by stabilizing the existing bridge and retained measures from the previous MOA stipulating funding for preservation and heritage tourism, funding to employ a two-year historic preservation officer in Madison, and financial assistance to the Madison Main Street Program. This mitigation strategy exhibited innovative thinking and a commitment to communities affected by the undertaking.[203]

Figure 6.4 (left) Madison, Indiana, National Historic Landmark District. Source: The National Park Service.
Figure 6.5 (right) Replacing the trusses on the Milton-Madison bridge. Source: IN.gov

CONCLUSION

Section 106 of the *NHPA* is one of the most significant historic preservation laws but is primarily based on good-faith. While the entire process of consultation must be carried out as set forth by the codification of the law, the outcome of the consultation

[203] "106 Success Story: Creative Mitigation Heralded as Success for Local Economy," (The Advisory Council on Historic Preservation, 2018). https://www.achp.gov/sites/default/files/2018-07/Milton%20Madison2.pdf

relies on the willingness of the Lead Agency official to accept mitigation terms. Additionally, the level of public involvement is decided largely by the Lead Agency official. Section 106 is still, however, the primary tool for holding federal agencies accountable for their actions when an undertaking is proposed. If consultants and the Lead Agency official are invested in exceeding the basic requirement, Section 106 can aid in achieving a fair balance of interests regarding historic preservation.

To balance historic preservation and community place attachment with environmentalism during historic dam removal, Section 106 should be employed with certain best-practices in mind. The basic documentation set forth by *SHPO*s should not be the level of mitigation implemented; rather, consulting parties should aim to include creative mitigation strategies in their *MOA* or *PA*. Creative mitigation can not only help retain or interpret the historic significance of the site but can be implemented to better serve the community than other more common forms of mitigation. Consultants should also aim to include the community in a more meaningful way than the basic requirements of public notice stipulated in Section 106. While notice is necessary, involving and collaborating with the public will ensure their concerns are heard and can lead to more creative and collaborative mitigation measures.[204] Ultimately, however, these decisions must be accepted by the Lead Agency Official and can be limited by time and budget constraints.[205]

[204] Oregon SHPO Interview #1, "Interview OR SHPO," interview by author, May 3, 2019.

[205] Oregon SHPO Interview #2, “Interview with Oregon SHPO,” interview by author, May 3, 2019.

CHAPTER VII. CASE STUDY DAM REMOVAL PROJECTS

CASE STUDY CRITERIA

In Oregon, fifty-three dam removals have been recorded since 1912; in Washington thirty-one have been recorded.[206] There is therefore a large field of dam removals from which to draw possible case studies from. Prior to determining the dam removal projects to be analyzed in this research, several parameters had to be established. To narrow down the possible case studies, four criteria were applied to the eighty-four dam removal projects in Oregon and Washington: (1) the removal occurred after 1999, (2) an adverse effect was determined and Section 106 review was completed, (3) the dam was located within proximity to a community center, and (4) the dam was hydroelectric in use. These parameters limited the possible case studies to substantially fewer contenders. From those remaining, two case studies were chosen from each state based on their geographic location and availability of relevant information.

The parameters employed to narrow the field of possible dam removal case studies were established for specific reasons. Projects were limited to those occurring after 1999 due to the increased frequency of dam removals after the turn of the twenty-first century and to increase the chance of accessibility to relevant documents in online databases. Projects were limited to those with determined adverse effects as no mitigation would be stipulated for the removal of the dam project if no adverse effect was found. Additionally, projects were limited to those with completed and implemented Section 106 review to ensure accessibility to all relevant documents and to allow site visits to visually inspect on-site mitigation measures. Projects were limited to those geographically located in proximity to population centers as to more accurately assess community heritage significance. Dams located in remote areas would not be suitable case studies as they would have no community significance. Lastly, projects

[206] "American Rivers Dam Removal Database," American Rivers, (December 2018).

were limited to hydroelectric dam removals due to the essential role hydroelectric dams played in the development of the Pacific Northwest as a whole as well as in individual communities. Limiting the scope of the project to just one type of dam also allowed for a more focused historic context and lessened the number of differing variables that could make comparative analysis of the case studies challenging.

From the application of these criteria the four dam case studies include: (1) the Gold Ray Hydroelectric Project, OR, (2) the Bull Run Hydroelectric Project, OR, (3) The Condit Hydroelectric Project, WA, and (4) the Elwha and Glines Canyon Dams, WA.

Figure 7.1 Dam removal case study locations. Created by author. Base Map Source: Google Maps.

CASE STUDY CONTEXTS

The following sections describe the historic context of each case study project. The process of Section 106 Consultation is also described (where applicable) and the mitigation measures implemented through the project *MOA* or *PA*. This information was garnered through associated project documents, literature published regarding the according hydroelectric project, and interviews. Each section is followed by a summary of the mitigation measures visible at the site as of the writing of this study and as visible to the author**.**

Gold Ray Hydroelectric Project

The Goldray Hydroelectric Project was located in Jackson County, Oregon on the Rogue River approximately six miles northwest of the city of Medford. Two brothers, Dr. C.R. Ray and Colonel Frank H. Ray, owned several mines in the Medford, Oregon area and in 1902 began buying up land along the river for the construction of a dam. Between 1902 and 1904, the Ray brothers, along with engineer and influential Medford resident J.S. Howard, constructed a log crib dam and concrete powerhouse on the Rogue. The Ray brothers' company, Condor Water and Power Company, was initially formed simply to power their own mining operations. A more lucrative option was found, however, in powering the entire city of Medford. The city's existing steam-run plant could not provide the generating capacity needed for the growing community. The Ray brothers submitted a bid to the city and Condor was chosen to act as the next power provider. Shortly after, power lines were constructed throughout the city. By 1906, the company had extended lines to the cities of Ashland, Central Point, and Jacksonville.

Between 1906 and 1912 the company operating the hydroelectric facility changed three times, but in name only. in 1908 the Condor company reorganized and changed names to the Rogue River Electric Company; in 1911 the Ray Brothers consolidated with other utilities companies in to the Siskiyou Electric Power and Light; in 1912 the company rebranded as the California-Oregon Power Company, better known

as *COPCO*. Between this period and the 1930s, relatively few changes occurred at the Gold Ray facility, albeit the installation of new fish ladders in 1912 and 1931. In 1940 however, major change was initiated: *COPCO* announced that the thirty-six year old log crib dam was beyond repair and would be replaced. This new dam, a thirty-eight foot high concrete buttress, was constructed slightly downstream from the original dam within a year [Figure 7.2]. Upon completion, the remnants of the original log crib dam still above water were burned.

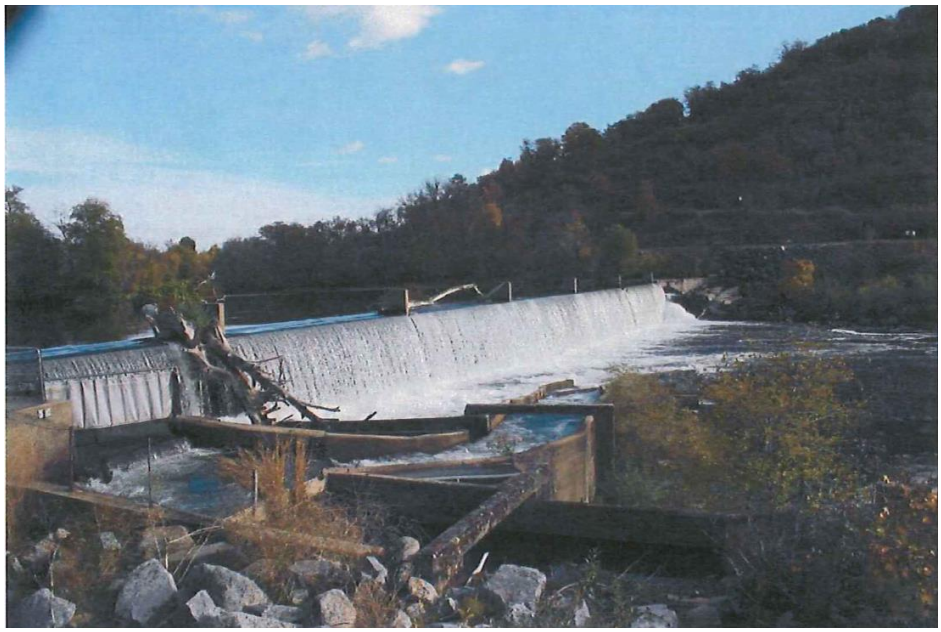

Figure 7.2 Gold Ray Dam, 2009. Source: Kramer and Company. "Oregon Inventory of Historic Properties Section 106: Supplemental Maps and Photographs: NMFS (Jackson County Parks), Gold Ray Dam Removal Project." 2009.

In the 1950s, *COPCO* considered enlarging the Gold Ray facility to meet statewide increased demand. The notion was deemed financially infeasible, and although revisited several times in the following decades, never came to fruition. The only change undertaken at the facility was again the construction of a new fish ladder in the 1960s. In 1972, PacifiCorp, the operator of the facility at that time, ended operation of Gold Ray and donated the facilities structures and land to Jackson County. Later that year PacifiCorp applied to surrender its license under the *FERC*, stating that the dam had

become obsolete and financially infeasible to continue running. FERC approved the application.[207]

From 1972 until 2009, the hydroelectric facility remained vacant and under ownership of Jackson County. In 2009, the County applied for and was awarded a National Oceanic and Atmospheric Administration (*NOAA*) Coastal and Marine Habitat Restoration Project Grant under the American Recovery and Reinvestment Act. to remove the Gold Ray Dam and restore fish habitat and passage. At that time the condition of the dam presented serious issues to the community and health of the Rogue River. The circa 1961 fish ladder did not meet modern fish passage standards and was ineffective. Leaks in the ladder and dam also created false attraction flows, confusing fish and causing increased mortality. Additionally, the leaks in the dam along with the general state of deterioration of the facility presented life and safety issues.[208]

Although the dam was no longer federally licensed by the *FERC*, the federal aid awarded to the county by *NOAA* made the proposal of dam removal a federal undertaking. Section 106 consultation was initiated, and *NOAA*/*NMFS* occupied the role of lead agency and appointed two Agency Officials. The Oregon *SHPO* acted as a consulting party, and Jackson County was invited to act as an additional consulting party.[209] After the initiation of consultation, the identification of historic and cultural resources was contracted to Kramer & Company Historic Preservation Consultants (*K.*

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[207] Kramer & Company, "Oregon Inventory of Historic Properties Section 106 Documentation Form: Jackson County Parks/Gold Ray Hydroelectric Project", December 2009.

[208] "Environmental Assessment for the Arra Rouge River Restoration - Gold Ray Project", (National Oceanic and Atmospheric Administration, June 2010).

[209] "Memorandum of Agreement Among National Marine Fisheries Service an Oregon State Historic Preservation Officer Regarding Historic Properties Affected by a Proposed Undertaking," (Advisory Council on Historic Preservation, 2010), 6.

CO.)., pursuant to 36 C.F.R. § 800.2. *K. CO.* identified the following remaining physical features of the hydroelectric project [Figure 7.3]:[210]

- Gold Ray Log Dam (1904): portions of the original log crib dam extant under water.
- Gold Ray Dam (1941): 368 foot high and 36 foot long concrete buttress dam.
- Gold Ray Powerhouse (1904): Concrete building with stucco exterior.
- Fish Ladder & Counting Station (1942, 1961, 1968): Concrete fish ladder constructed in 1942 and altered in 1961. Concrete Oregon Department of Fish and Wildlife (ODFW) counting station constructed 1968.
- Headgates (1904): Concrete with steel trash racks. Modified by addition of overhead walkway to Fish Ladder & Counting Station.
- Forebay (1904): Canal blasted from bedrock that diverts water to turbines.

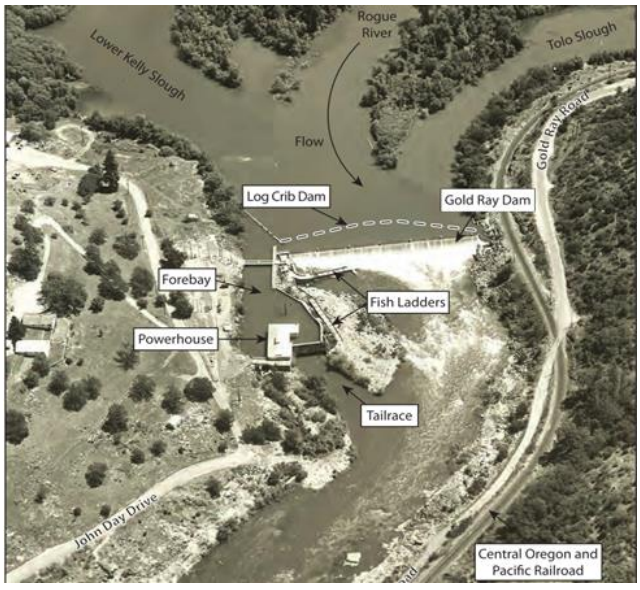

Figure 7.3 Gold Ray Dam and related structures. Source: "Environmental Assessment for the Rogue River Restoration - Gold Ray Project." National Oceanic and Atmospheric Administration, June 2010.

[210] Kramer & Company, "Oregon Inventory of Historic Properties Section 106: Level of Effect: NMFS (Jackson County Parks), Gold Ray Dam Removal Project," 2010, 2.

These resources were determined to be eligible for listing in the *NRHP* under criterion A and C: association with events that have made a significant contribution to the broad patterns of our history and embodiment of the "distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction," respectively.[211]

After determining the significance of the existing features of the hydroelectric Project, *K. CO.* produced a finding of effect based on three possible scenarios: (1) removal of the dam and associated features, (2) rehabilitation or reconstruction of the dam, (3) or no action. Considering the goal of the project, to improve fishway passage, option three was found to be infeasible. Option two also found unfeasible; rehabilitation or reconstruction was estimated to cost nearly $69.7 million, significantly more than removal. Option one, removal of the dam, was therefore found to be the only feasible option for moving forward. Accordingly, a finding of adverse effect was found as this option entailed the removal of the *NRHP* eligible dam and its associated structures.[212]

After consultation between the Agency Official, *SHPO*, and Jackson County, an *MOA* was signed in 2010. The *MOA* stipulated four mitigation measures: documentation, salvage and reuse, interpretation, and archaeological survey and data-recovery. Documentation of the site was specified to meet the standards of *HAER* Level II and copies were to be submitted to the *SHPO*, the University of Oregon College of

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[211] "Section II: How to Apply the National Register Criteria for Evaluation, National Register of Historic Places Bulletin (NRB 15)," National Parks Service, accessed March 31, 2019, https://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_2.htm.

[212] "Oregon Inventory of Historic Properties Section 106: Level of Effect: NMFS (Jackson County Parks), Gold Ray Dam Removal Project," (Kramer & Co., 2010), 3-4.

Design library, and the Southern Oregon Historical Society.[213] Additionally, Jackson County agreed to submit copies of relevant building plans to the same repositories and original plans if available to the University of Oregon College of Design Library. Salvage and reuse were stipulated to preserve elements of the project that reflected a "representative sample of the development" of the Gold Ray Hydroelectric Facility for later interpretation. Elements specifically listed in the *MOA* included portions of the generator system, the *ODFW* fish counting station, and the Powerhouse Monitor. The salvage of cut stone and other elements was also specified to be used in future landscape designs for the site.[214]

The interpretation stipulations of the Gold Ray *MOA* included specific instructions for the creation of an interpretive park on site by Jackson County. At a minimum, the county had to implement multiple interpretive panels, constructed of durable material and of a certain size, and including "photos, maps or other graphic content in addition to text to create an attractive, accessible and historically accurate record of the Gold Ray project's history and significance in Jackson County".[215] Additionally, the *MOA* stipulated the incorporation of salvaged items with appropriate signage as interpretation, specifically the powerhouse monitor, generation equipment, the fish counting station, and pieces of the original 1904 log crib dam. Funding for the creation of the panels was to be provided through the *NOAA* grant and salvaged elements from the project.[216] Regarding archaeological resources, the *MOA* stipulated the implementation of archaeological survey and data recovery as necessary. It

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[213] Guidelines for HAER Levels I - IV can be found at: "Secretary's Standards--Architectural and Engineering Documentation." National Parks Service. https://www.nps.gov/history/local-law/arch_stnds_6.htm.

[214] "Memorandum of Agreement Among National Marine Fisheries Service an Oregon State Historic Preservation Officer Regarding Historic Properties Affected by a Proposed Undertaking," (Advisory Council on Historic Preservation, 2010), 2-3.

[215] Ibid., 3.

[216] Ibid.

accounted for discoveries of archaeological material on site by ensuring appropriate data recovery and accounted for the uncovering of artifacts in the riverbed by stipulating archeological survey. Additionally, the *MOA* stipulated that future plans for development of the site as an interpretive park would include plans to minimize or mitigate impacts on archaeological resources.[217]

Removal of the dam and other features of the Gold Ray Hydroelectric Project began immediately after the completion of Section 106 consultation in June 2010. In September 2010, the dam came down and by December 2011, the proposed interpretive park had been established, featuring interpretive signage and salvaged elements from the facilities.[218]

Gold Ray Site Visit

Photographs of the Gold Ray Hydroelectric project site can be found in Appendix C, figures C-8 through C-19. The former Gold Ray Hydroelectric project site is now the Gold Ray Nature Park, a county and state park, with an outdoor interpretive installation devoted to the history of the dam and its associated structures. The park is accessible via a rural road and parking is limited to a few spaces on the side of the road. Upon entering the park, a wood kiosk displays a basic map and park regulations [Figure C-8]. The trail splits in several directions at this point, with one path leading down to the Rogue River and another up to the interpretive park. The path to the Rogue River ends at the bank, and the remains of the southern abutment of the dam on the opposite bank are visible [Figure C-11]. The trail to the interpretive park is marked with a simple sign and is up the hillside after a short hike [Figure C-9]. The installation is composed of several large pieces of machinery salvaged from the Powerhouse before demolition, including a turbine, generator, control panel, and rope drive [Figures C-15 through C-

[217] Ibid., 3-4.

[218] "Gold Ray Dam Interpretive Display," John Vial to Ian Johnson, December 22, 2011.

18]. The salvaged materials are accompanied by interpretive signage [Figures C-13 and C-14]. Above the trail, at the precipice of the hill, the original water tank of the operation is visible [Figure C-19].

Bull Run Hydroelectric Project

The Bull Run Hydroelectric Project was located in Sandy, Oregon, near the no longer extant unincorporated community of Bull Run. The project encompassed a powerhouse located on the Bull Run River, the Little Sandy and Marmot Dams located on the Little Sandy River and Sandy River respectively, Roslyn Lake, and a system of canals, funnels, and flumes.[219] In the late 1800s, Portland based developers and entrepreneurs looked to the nearby Bull Run to bring both drinking water and electricity to the growing city. In 1906, the Mt. Hood Railway and Power Company began construction of a powerhouse on the Bull Run river and an accompanying diversion dam on a tributary of the river, the Little Sandy. The powerhouse, composed of two separate two-story early modern style concrete buildings, was completed in 1912 [Figure 7.3].[220] The Little Sandy Dam was completed the same year, and although it was small at just sixteen feet high, it had major implications for the Little Sandy and Bull Run Rivers. The dam completely blocked the flow of the Little Sandy River almost seven miles before its confluence with the Bull Run River and diverted it through a wooden flume to the Lake Rosalyn forebay for supply to the powerhouse. No method for fish passage was constructed, such as a ladder, meaning salmon could not reach spawning grounds farther up the river.[221]

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[219] "Portland General Electric Company, Project No. 477-024: Order Granting Surrender Application, Adopting Proposed Terms, and Denying Application to Amend License," (U.S. Federal Energy Regulatory Commission, 2004), 3.

[220] Koler/Morrison, "Clackamas County Historic Resources Inventory 1989-1992: Bull Run Hydroelectric Plant," (SHPO NO. 1193, 1990), 7.

[221] Blumm and Erickson, "Dam Removal in the Pacific Northwest, " *SSRN Electronic Journal*, 2012, 1067.

The Mt. Hood Railway and Power Company, which later renamed to Pacific Gas Electric (*PGE*), found great success in their new facilities and expanded just one year after finishing construction. The Marmot Dam was constructed on the Sandy River and an elaborate system of diversion channels transferred water from the dam to just above the Little Sandy Dam. The second dam of the hydroelectric project was significantly larger: it rose thirty feet high and spanned the Sandy River at one hundred and ninety-five feet. The Marmot was originally planned to be constructed of concrete but was instead constructed of log crib with rock-fill.[222] This dam did, however, include a wooden fish ladder that allowed salmon to pass upstream to spawning grounds [Figure 7.4].[223]

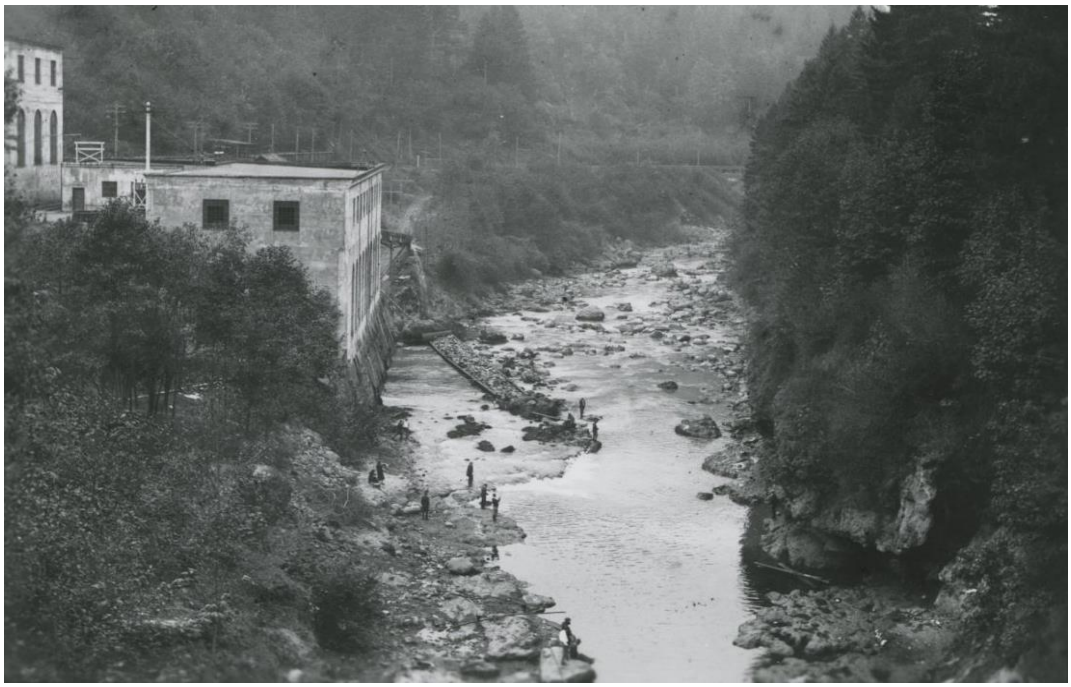

Figure 7.4 Bull Run Powerhouse on the Bull Run River, 1928. Source: Oregon Historical Society Research Library, DB310, photo file 905B

[222] Koler/Morrison, "Clackamas County Historic Resources Inventory 1989-1992: Bull Run Hydroelectric Plant," 9.

[223] Blumm and Erickson, "Dam Removal in the Pacific Northwest, " *SSRN Electronic Journal*, 2012, 1067.

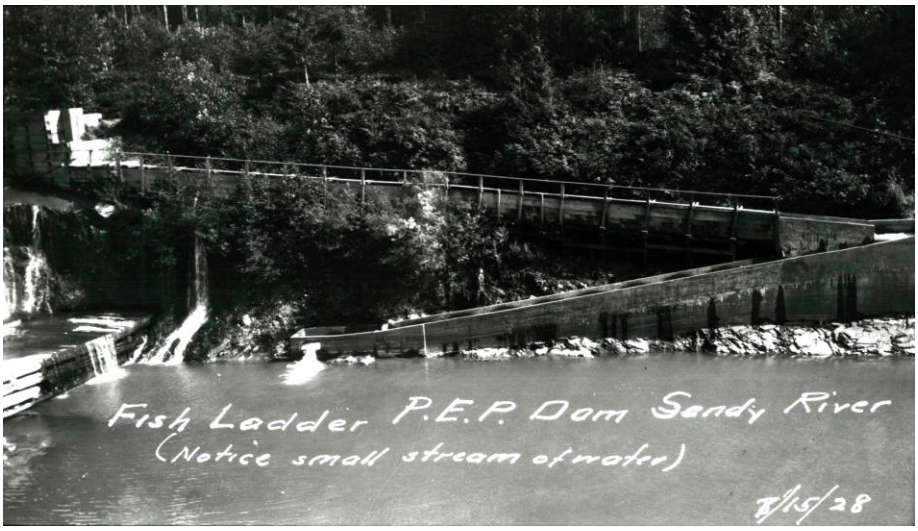

Figure 7.5 Marmot Dam fish ladder, 1928. Source: Oregon Historical Society Research Library, Org. Lot. 889, Orhi6861.

Significant changes to the original facilities of the Bull Run Hydroelectric Project occurred in the 1940s, 1950s, and 1980s. In 1946, the project's entire wooden flume system was replaced with pressure-treated lumber to improve its capacity. The original flume had been expanded upon and destroyed and replaced in sections several times prior to this replacement.[224] In 1954 an outdoor electrical switching station was constructed near the historic powerhouse along with related infrastructure.[225] After relicensing in 1956, *PGE* was required to better manage its various projects to promote natural resources and recreation. At Bull Run, *PGE* achieved this by establishing a park at the Rosalyn Lake Forebay which included picnic areas and facilitates and eventually even a concession stand. The park was a popular recreation area for locals and visitors alike; in 1966 the park's visitation peaked at roughly one hundred thousand visitors a summer.[226]

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[224] Borgde/Pinger, "Clackamas County Cultural Resource Survey Form: Bull Run Flume," (SHPO NO. 1191, 1984), 9.

[225] Koler/Morrison, "Clackamas County Historic Resources Inventory 1989-1992: Bull Run Hydroelectric Plant," 10.

[226] Powerhouse Re Gen LLC archives.

In 1989, *PGE* took on a large undertaking: the 1913 Marmot Dam was demolished, and a new dam was constructed in its place. The new dam was larger, standing forty-seven feet tall and three hundred and forty-five feet wide, and was composed entirely of concrete.[227] Modern fish ladders were included in the dam's design but salmon runs in the area still struggled; the hydroelectric project reduced the Sandy Basins salmon population by 75% to 90%.[228]

In 1999, five years before the end of the Bull Run's *FERC* license, *PGE* began to consider the ramifications of applying for re-licensing. *PGE* was aware of the environmental issues associated with the project and the modern standards it would likely have to meet to receive another license. Based on the power production of the project and the surmised cost of retrofits mandated by a new license, *PGE* concluded that surrendering their license and decommissioning the project would be the most financially feasible option. In November the company filed an application for surrender of its license and was granted until 2002 to submit a full decommissioning plan.[229] In 2002 that plan was submitted along with a Settlement Agreement signed by twenty-three parties.[230]

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[227] One primary document describes the original dam as being capped with concrete and left in place. All other documents however, site that the original dam was completely removed and replaced.

[228] Blumm and Erickson, "Dam Removal in the Pacific Northwest, " *SSRN Electronic Journal*, 2012, 1068.

[229] Ibid., 1069.

[230] "Portland General Electric Company, Project No. 477-024: Order Granting Surrender Application," (U.S. Federal Energy Regulatory Commission, 2004), 2.
The Settlement Agreement signatories included: PGE; the Forest Service; BLM; U.S. Fish and Wildlife Service (FWS); National Marine Fisheries Service (NOAA Fisheries); State of Oregon; Oregon Department of Environmental Quality; Oregon Division of State Lands; Oregon Department of Fish and Wildlife; Oregon Department of Water Resources; City of Sandy, Oregon; Western Rivers Conservancy; Sandy River Basin Watershed Council; Association of NW Steelheaders; Northwest Sportfishing Industry Association; Alder Creek Kayak Supply, Inc.; American Whitewater; WaterWatch of Oregon; American Rivers; Oregon Trout; Native Fish Society; Trout Unlimited; and Oregon Council of Trout Unlimited.

The 2002 Decommissioning plan recognized six primary features of the Bull Run Hydroelectric project: (1) the Marmot Dam, (2) a concrete canal that transferred water from the Marmot Dam to the Little Sandy River, (3) the Little Sandy Diversion Dam, (4) the timber flume, (5) Roslyn Lake, and (6) the Bull Run Powerhouse.[231] Within the decommissioning plan *PGE* recognized that several National Register eligible properties (under Criterion A for their association with events that have made a significant contribution to the broad patterns of history) would be adversely effected and that an *MOA* had already been developed since filing for a license surrender in 1999. The *MOA* specifically stated that the Marmot Dam, Little Sandy Dam, and "all Project-associated structures including but not limited to canals, tunnels, and the wooden flume" would be demolished. Prior to the of removal of these features *PGE* was responsible for taking archival quality photographic documentation and providing that documentation to the University of Oregon Knight Library, the Oregon *SHPO*, and the Oregon Historical Society.[232]

In addition to this documentation, the *MOA* specified that *PGE* would hold two open houses prior to closing the facility. These open houses would be intended for the public and notice would be provided at least thirty days in advance in local newspapers. Interpretive and educational presentations would be held to engage the local community. The Oregon *SHPO* was also provided opportunity, upon a case by case approval from *PGE*, to remove architectural items from the project for future public education, reuse, or curation. Only one estimated National Register eligible archeological resource was present within the projects *APE* and the *MOA* stipulated for

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[231] "Decommissioning Plan for the Bull Run Hydroelectric Project FERC Project No. 477," filed by the Portland General Electric Company (2002), 2.

[232] "Memorandum of Agreement Among the Federal Energy Regulatory Commission, the Oregon State Historic Preservation Office, and the Advisory Council on Historic Preservation Regarding Managing Historic Properties That Will Be Affected By an Order Issuing to Portland General Electric," (Advisory Council on Historic Preservation, 2002), 2.

avoidance, and data recovery if the project scope changed and avoidance was no longer possible.[233]

The Bull Run Powerhouse was initially slated for demolition by *PGE* but during Section 106 consultation, the licensee agreed to retain the building and offer it for redevelopment. The *MOA* stipulated that *PGE* would develop a marketing proposal for potential adaptive re-use of the property. The proposal would include the transfer of the property at no cost to a "responsible and appropriate steward."[234] All proposals for redevelopment would be reviewed by both *PGE* and the *SHPO* and if no suitable proposals were received by a pre-determined deadline the licensee could move forward with the demolition of the structure. This *MOA* was signed by the *FERC*, Oregon *SHPO*, and *ACHP*, and by several concurring parties including *PGE*, the Mount Hood National Forest, and the Bureau of Land Management.[235] Additionally, numerous entities were involved in the consultation process but not included as signatories, including the Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of the Siletz Indian Reservation, the Confederated Tribes of the Warm Springs Indian Reservation of Oregon, the Yakama Indian Nation, the Chinook Indian Tribe, the Confederated Tribes of the Umatilla Reservation of Oregon, the Cowlitz Indian Tribe, the Sandy Chamber of Commerce, the Sandy Historical Society, the Clackamas County Historical Society, and the Sumpter Valley Railroad Historical Society.[236]

In 2004, *FERC* approved the Bull Run Hydroelectric Project decommissioning plan and implementation of the plan began in 2007. September of that year, the Marmot Dam was removed with the use of explosives, in May of 2008 Rosalyn Lake was drained,

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[233] Ibid., 3-4.

[234] Ibid., 5.

[235] Ibid., 8-9.

[236] Ibid., 1-2.

and in September of 2008 the Little Sandy Dam was removed.[237] All stipulations described in the project *MOA* were implemented, including the redevelopment of the property. This aspect of the mitigation however faced several unforeseen challenges and although the Powerhouse has been retained it has not been fully utilized. *PGE* received ten offers for redevelopment of the Powerhouse and settled on one that did not have a specific use planned at the time of application but emphasized redeveloping the property in a manner that would reflect its historic significance and the community's desires.

The transfer of the Powerhouse from *PGE* to the chosen applicant, the non-profit Powerhouse Re Gen LLC., was not executed in the manner specified in the project *MOA*. The property came to include eighty acres, not just the Powerhouse, and encompassed the former Lake Rosalyn Forebay and the former Bull Run elementary school [Figure 7.5]. Additionally, the Powerhouse was not awarded to the applicant at no-cost. After purchasing the property, Powerhouse Re Gen LLC proposed turning the Bull Run property in to an events and artists community space and constructing a new building on site to be used as a lodge and restaurant. Today, due to issues with local zoning and Oregon's Statewide Land Use Planning Goals, the Powerhouse and associated structures have been preserved but the non-profit's plans have not yet come to fruition. The property has some interpretive elements, is open to the public on scheduled tours, and held a large "100 Year Anniversary" public open house at the Powerhouse in 2012 [Figure 7.6].[238]

[237] Blumm and Erickson, "Dam Removal in the Pacific Northwest, " *SSRN Electronic Journal*, 2012, 1071.

[238] Powerhouse Re Gen LLC Interview, "Interview With Powerhouse Re Gen LLC," interview by author, March 11, 2019.

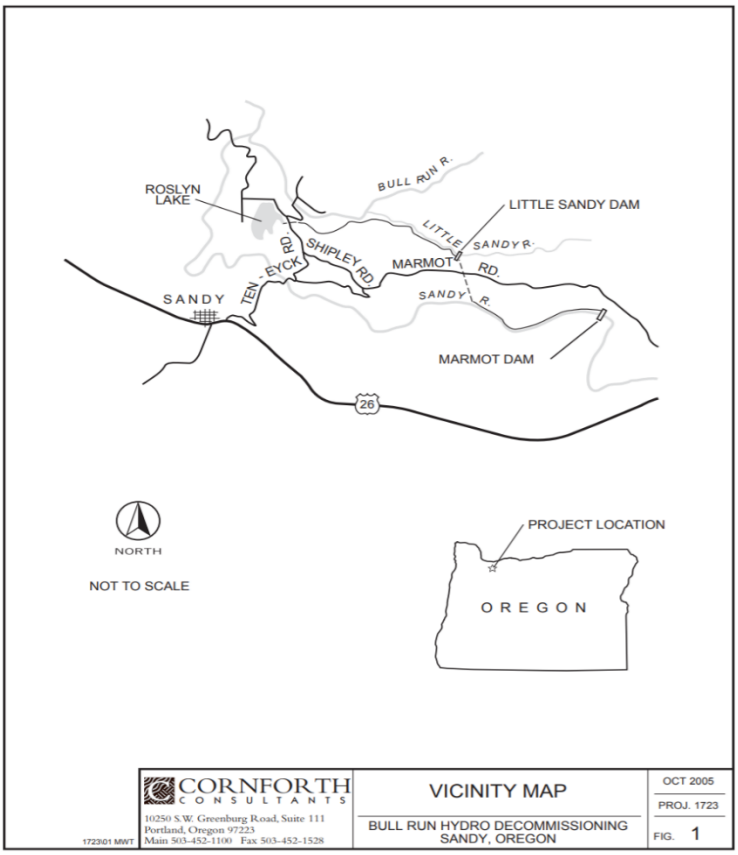

Figure 7.6 Bull Run Hydroelectric Project Decommissioning Vicinity Map. The Powerhouse (not labeled) is located east of Roslyn Lake on the Bull Run River. Source: Cornforth Consultants and Crockett Environmental. "Portland General Electric, Turbidity Management Plan: Bull Run Hydropower Project Decommissioning." November 2005.

Figure 7.7 Bull Run Powerhouse 100 Year Anniversary Post Card. Source, Powerhouse Re Gen LLC archives.

Bull Run Site Visit

Photographs of the Bull Run Hydroelectric project site can be found in Appendix C, figures C-20 through C-40. The former Bull Run Powerhouse and associated structures have been retained. The property is enclosed by fencing and is only accessible by appointment and tour. After entering the property, the layout of the site is visible: the west side of the road leading through the property is flanked by one non-historic property and the Transformer Building (c. 1912) while the east side is flanked by the Powerhouse (c. 1912) and Machine Shop (c. 1912).

The Transformer Building, which still has railroad tracks running through its tri-part arched entryway, is empty on the interior except for one remaining piece of equipment [Figures C-21, 28, 29, and 31]. There is no interpretive signage in the building, but it is fully accessible with a scheduled tour. A storage area adjacent to the Transformer Building holds several historic items and to the north, on the exterior of the building, three replacement pieces for the Power Plant's turbine's sit in place (they were never needed) [Figure C-32].

The Power Plant is accessible from numerous entrances. The first entrance leads to a series of offices with interpretive panels, artifacts, a scale-model of the historic flume, and records regarding the project's history [Figures C-22 through C-25]. From these rooms a hallway is accessible that leads to a second-story platform in the main Powerhouse. From that vantage the entire interior of the Powerhouse is visible including all the original machinery [Figures C-26 and C-27]. An entrance at the Powerhouse's ground floor leads to the main room. The building's original machinery have been left in place and much of the original windows are intact [Figures C-34 and C-35]. A second-story atrium holds a small office, employee locker room, and electrical switchboards [Figure C-37]. The original machine shop is located adjacent to the Powerhouse and also still houses all of the original machinery, which can still be run today [Figure C-38].

The Bull Run River is accessible from a path located beyond the properties fence. From the banks of the river the entire Powerhouse can be viewed as well as the

penstocks, which have been filled in with gravel [Figure C-40]. The Marmot and Little Sandy Dams were not located next to the Powerhouse and are not easily accessible.

Condit Hydroelectric Project

The Condit Hydroelectric Project was located on the White Salmon River in Washington near the towns of White Salmon and Hood River. It was situated just over three miles upstream from the confluence of the White Salmon and the Columbia River in the Columbia River Gorge National Scenic Area.[239] The project encompassed the Condit Powerhouse, Condit Dam, a wooden flume, penstocks, two operator's homes, a garage, and an outbuilding. At the beginning of the twentieth century communities along the Columbia River gorge were beginning to grow and residents and businesses sought new sources of power. Paper Mills were the most prevalent economic activity within the Gorge during this period and were the impetus for the development of hydroelectricity. In 1911 the largest paper mill in the region, the Crown Columbia Mill, founded the Northwestern Energy Company (*NEC*) to establish a hydroelectric plant specifically for the use of the mill. This plant was the Condit.[240]

The *NEC* found a suitable location for their venture on the White Salmon River, a river with a swift current and narrow canyon walls. Construction of the Condit Powerhouse and Dam commenced, and both were completed in 1913 [Figures 7.7 and 7.8]. The concrete gravity dam stood one hundred and twenty-five feet tall and completely diverted the Salmon River through penstocks to the Powerhouse. As the rivers flow was impeded, Northwestern Lake formed behind the dam. Wooden fish ladders were included in the dam's design but were soon destroyed by flooding. Between 1917 and 2011, the year of the dam's removal, no fish ladders or other means

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[239] "Condit Hydroelectric Project Decommissioning FERC Project No. 2342, Historic Properties and Cultural Resources Management Plan," Mead & Hunt (2011), 3.

[240] Blumm and Erickson, "Dam Removal in the Pacific Northwest, " *SSRN Electronic Journal*, 2012, 1059.

of fish passage were present at the Condit Dam. This completely blocked fish from the upper White Salmon river and drastically reduced the river's salmon population.[241]

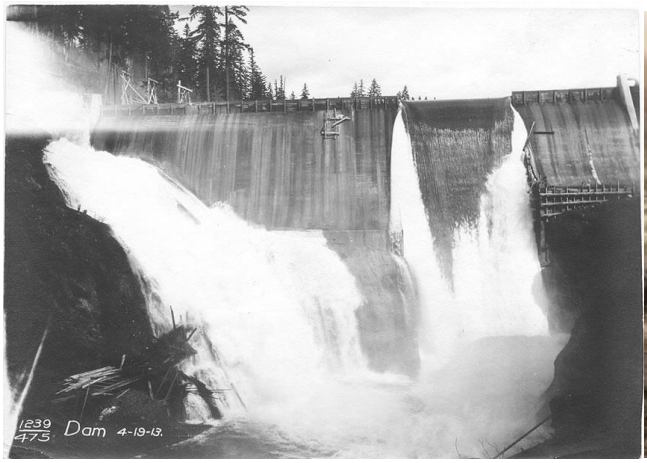

Figure 7.8 (left) Condit Dam at time of completion in 1913. Source, PacifiCorp.
Figure 7.9 (right) Condit Powerhouse, date unknown. Source, PacifiCorp.

Upon completion, the Condit Dam and Powerhouse supplied the *NEC* with a surplus of power. 20% of the electricity went to powering the Crown Columbia Mill and the remaining 80% was sold to growing towns and cities near the gorge, including Portland, Oregon and Vancouver, Washington. The NEC was highly profitable and in 1947 merged with the Pacific Power and Light Company, which is today PacifiCorp. PacifiCorp operated the project from the merged until the decommissioning.[242]

The Condit Hydroelectric Project received its first *FERC* license in 1968 for the next twenty-five years of operation. As the projects license neared expiration in 1993, PacifiCorp applied for relicensing. However, in 1996 *FERC* released an *EIS* which stipulated PacifiCorp would need to install fish ladders on the Condit Dam to meet the requirements for relicensing. The cost of the fish ladders were estimated at thirty

[241] Ibid., 1059-1060.

[242] Ibid., 1060.

million dollars, a cost PacifiCorp found too prohibitive. Subsequently, PacifiCorp asked *FERC* to halt the relicensing process in 1997 to allow further discussions with invested organizations. After consulting with the Yakama Nation, the Columbia River Inter-Tribal Fish Commission, and additional parties, PacifiCorp reached a Settlement Agreement to decommission the dam in 1999. They found that the added costs of the fish ladders would make operation of the dam financially infeasible and that no other options existed to restore salmon populations on the river.[243]

Although agreement to remove the Condit Dam was reached in 1999 the dam was not actually demolished until 2011. This excessively long process was caused by delays at the federal level as well as opposition on the local level. The *FERC* process for dam decommissioning was relatively young, having just been established in 1994, and was a major contributor to set-backs during the project. The local counties of Klickitat and Skamania employed local permitting requirements to slow down the project due to its proposed effects to local cabins. The lake created by the Condit Dam, Northwestern Lake, was surrounded by historic cabins leased by PacifiCorp to individuals. The loss of the lake presented foreseeable decreases in property value, structural issues as the water table lowered and sediment shifted, and equated to a loss of recreational activities for residents.[244]

Despite these setbacks the Section 106 review process for the proposed removal was completed in 2002 with the signing of a *MOA.* Prior to completing the *MOA* it was determined that all of the historic structures and infrastructure of the Hydroelectric Project would be adversely effected as well as the historic cabins on Northwestern Lake, several archeological resources, and a Traditional Cultural Property (*TCP*).[245] The *MOA*,

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[243] "Condit Hydroelectric Project Decommissioning FERC Project No. 2342, Historic Properties and Cultural Resources Management Plan," Mead & Hunt (2011), 6.

[244] Blumm and Erickson, "Dam Removal in the Pacific Northwest, " *SSRN Electronic Journal*, 2012, 1064.

[245] "Condit Hydroelectric Project Decommissioning FERC Project No. 2342, Historic Properties and Cultural Resources Management Plan," Mead & Hunt (2011), 10-12.

signed by the *FERC*, Washington *SHPO*, PacifiCorp and consulted with the Yakama Nation, stipulated the creation of a *HPMP* which had been completed in 2001 and was later revised in 2011.[246] Within the revised *HPMP* several treatments for avoidance, minimization, and mitigation are prescribed. These included documenting all of the project facilities using *HAER* level documentation methods and providing the documentation to the Washington *SHPO*, the Gorge Heritage Museum, and the Columbia River Gorge National Scenic Area.[247]

Similarly, to the Bull Run *MOA*, the Condit *HPMP* stipulated that PacifiCorp develop a marketing plan for redevelopment and potential adaptive-reuse of the Powerhouse and the operator's homes. The plan would include the terms under which PacifiCorp would be willing to sell the properties to a responsible and appropriate steward as well as a comparative analysis of the property with other similar redevelopment projects. If no suitable offers were made by a pre-determined deadline, PacifiCorp would consider donation or a long-term lease of the properties. As a last resort, PacifiCorp could move forward with the sale of the structure with no considerations of stewardship or demolish the structures.[248] The *HPMP* also provided for the creation of a historic resources interpretive plan, *HABS* Level II survey of cabins on Northwestern Lake, an archeological data recovery plan and areological monitoring, monitoring of *TCP*s located in proximity to the projects *APE*, and dedicated funding to

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[246] Ibid., 1.
"Memorandum of Agreement Among the Federal Energy Regulatory Commission and the Washington State Historic Preservation Officer For Managing Historic Properties That May be Affected by PacifiCrop's Surrender For The Condit Hydroeletric Project In Klickitat and Skamania Counties Washington (FERC NO. 2342)," (Advisory Council on Historic Preservation, 2002), 1.

[247] Both operators' homes and the project outbuildings were not included in this documentation. The *HPMP* was amended to recommend PacifiCorp document the structures prior to their loss, but they are currently extant.

[248] "Condit Hydroelectric Project Decommissioning FERC Project No. 2342, Historic Properties and Cultural Resources Management Plan," Mead & Hunt (2011), 17-18.

the Yakama Nation and other tribes for the future management of the *TCP* within the project *APE*.[249]

Removal of the Condit Dam was official initiated in 2011 when explosives were used to form a drain at the base of the dam. It took just six hours for Northwestern Lake to drain through the opening, but the entire process of removal was not completed until 2012, nineteen years after PacifiCorp initially applied for relicensing.[250] It is unknown if PacifiCorp and the Washington *SHPO* received proposals for redevelopment and adaptive-reuse of the property. As of the writing of this paper the Powerhouse, operators' homes and associated structures have been retained but do not appear to be in use. Additionally, as of 2016 residents of cabins on Northwestern Lake have continued to experience issues with their properties, ranging from shifting foundations to increased fire concerns [Figure 7.9].[251]

Figure 7.10 Erosion behind cabins located on the former Northwestern Lake, 2012. Source: The Columbia.

[249] Ibid., 19-20.

[250] Blumm and Erickson, "Dam Removal in the Pacific Northwest, " *SSRN Electronic Journal*, 2012, 1066. Dameon Pesanti, "Condit Dam: Life after the Breach," The Columbian, October 23, 2016, accessed May 11, 2019, https://www.columbian.com/news/2016/oct/23/condit-dam-life-five-years-after-breach-white-salmon-river/.

[251] Ibid.

Condit Site Visit

Photographs of the Condit Hydroelectric project site can be found in Appendix C, figures C-1 through C-7. The Condit Hydroelectric project site is accessible via a rural road with no signage. Parking is limited to several spots at a dead-end road which requires a short walk back to the project site. The project site has several signs and gates that warn against trespassing. Due to this, access to the site was limited views of the project attainable from the public road. Several buildings are located above the boarding house. These include the Operators House (c. 1913) and what are presumed to be a garage (c. 1980) and second Operator's House (c. 1960), all of which are boarded up and in a state of abandonment [Figures C-1 and C-6]. The Powerhouse is located down a steep gravel road from these outbuildings. The Powerhouse is also boarded up and not accessible.

The former site of the Condit Dam is located slightly upriver from the Powerhouse and associated buildings. There is no signage, but the location can be presumed based on historic photographs and photographs from the removal [Figure C-7].

Elwha River Restoration Project

The Elwha River Restoration project encompassed two separate hydroelectric projects both located on the Elwha River in Washington, near the city of Port Angeles. The Elwha Hydroelectric Project (c. 1913) was located outside of the boundaries of Olympic National Park while the Glines Canyon Hydroelectric Project (c. 1927) was located farther upstream on the Elwha and within the boundaries of the National Park. Hydroelectric interest in the Elwha River valley emerged before the twentieth century and was promoted frequently by Thomas Aldwell, an entrepreneur that moved to Port

Angeles to take advantage of the growing city's economic potential.[252] Over the course of twelve years Aldwell bought small pieces of land along the River until 1911 when he had secured enough land and funding to begin construction of the Elwha dam.[253] Aldwell's company, Olympic Power and Development, finished construction of the concrete gravity Elwha dam that year, but just eight days after the reservoir behind the dam reached its complete height the foundation of the dam gave-way to the Elwha's pressure.[254] While the dam and Elwha Powerhouse were not completely lost, the foundation blowout was a major setback for the project. Electricity was eventually provided to the city of Port Angeles in 1913 and final repairs were completed in 1919, but the one-hundred-foot dam suffered from leaks for the rest of its lifetime [Figure 7.10].[255]

This first dam on the Elwha had drastic ecological and social impacts. The Elwha dam design did not include fish ladders and effectively blocked the passage of migratory fish to spawning grounds upriver of the dam. Once this impact was realized, Aldwell was pushed to add a fish ladder to the dam, but he was adamant that there was no configuration to transport fish over the large dam. The Washington State Fish Commissioner instead stipulated the Aldwell donate land next to the dam for the development of a hatchery.[256] The hatchery however proved to be unsuccessful in maintaining the salmon population. The Lower Elwha Klallam tribe, who historically had depended on salmon for sustenance and the river for transportation, were forced to fundamentally change their customs and culture due to the loss of salmon on the Elwha.

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[252] Paul Sadin and Dawn Vogel, "An Interpretive History of the Elwha River Valley and the Legacy of Hydropower on Washington's Olympic Peninsula," Historical Resource Associates (2011), 52.

[253] Ibid., 55-57.

[254] Ibid., 72.

[255] Ibid., 76.

[256] Ibid., 79.

Figure 7.11 The Elwha Dam and Powerhouse. Source: The Library of Congress.

In 1919, the Elwha Dam and Powerhouse were sold to the Washington Paper and Pulp Company to power their mill and continue to power the city. In 1922, the hatchery at the dam site was abandoned and the fate of salmon on the Elwha were sealed.[257] That same year the Elwha Powerhouse was expanded to accommodate an increased need in power for the Washington Paper and Pulp Company. In 1924, seeking an even larger intake, the mill asked the Northwestern Power and Manufacturing Company (a later iteration of Aldwell's original Olympic Power and Development Company) to construct a second dam and powerhouse on the Elwha.[258] Glines Canyon was chosen for the location of Aldwell's second dam due to the canyon's nearly two hundred foot vertical sides, which were well-suited for the construction of a concrete arch dam.[259]

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[257] Jeff Crane, "The Elwha Dam: Economic Gain Wins Out Over Saving Salmon Runs," *Columbia: The Magazine of Northwest History* 17, no. 3 (2003).

[258] Sadin and Vogel, "An Interpretive History of the Elwha River Valley and the Legacy of Hydropower on Washington's Olympic Peninsula," 98-110.

[259] Ibid., 103.

Construction of the second dam on the Elwha River began in 1926 and was finished by the following year [Figure 7.11]. The Glines Canyon Dam allowed the Washington Paper and Pulp Company, which at the point had changed to the more familiar Crown Zellerbach Company, to expand, employing forty-five full-time employees.[260] This expansion also aided the mill, and other industries in Port Angeles, in surviving the Great Depression.[261] By 1940 however, the city of Port Angeles had outgrown the hydroelectric capacity of the two Elwha dams, and turned to the *BPA* Columbia River dams for its power needs. Crown Zellerbach continued to use the Elwha dams for 40% of their power needs until the powerhouses went offline in 2011 and 2013.[262]

In 1968 Crown Zellerbach, which still owned and operated both dams and powerhouse, applied for *FERC* relicensing. The Lower Elwha Klallam tribe, which had been severely impacted by the Elwha dam's decimation of salmon populations, seized this opportunity to push for the dam's removal.[263] The tribe cited safety issues with the dams to bolster its argument, but eventually four environmental groups joined the tribe's opposition movement and focused the conversation on environmental issues. In 1986, FERC suspended the relicensing proceedings. The following year, the now infamous environmental group Earth First! painted a crack on the face of the Elwha Dam accompanied by the text "ELWHA BE FREE" [Figure 7.12].[264]

Initially the *NPS*, which had administered the section of the Elwha River within Olympic National Parks boundaries since the 1930s, was not a proponent of removing

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[260] Ibid., 117.

[261] Ibid., 120.

[262] Ibid., 123-124.

[263] Ibid., 176.

[264] Ibid., 189.

the Elwha Dams. In the 1980s however, the *NPS* joined the Lower Elwha Klallam Tribe and environmental groups in calling for the dams' removals after realizing the situation presented a unique opportunity to undertake the largest river restoration project in the country.[265] Significant opposition to removal of the dams however was growing among the community of Port Angeles and was based on three primary claims: dam removal wouldn't bring back the salmon, the sediment released by removal would ruin the city's water supply (the city of Port Angeles sourced water from the Elwha), and that it would cause the closure of the mill. This opposition culminated in the creation of Rescue Elwha Area Lakes (*REAL*), a group composed of citizens against the dam removal and loss of the two associated reservoirs. [266]

Figure 7.12 The Glines Canyon Dam, Powerhouse, and reservoir, 1995. Source: The Library of Congress.

[265] Ibid., 193.

[266] Ibid., 195, 205.

Figure 7.13 "ELWHA BE FREE" painted on the Glines Canyon Dam by Earth First!, 1986. Source, seattlemet.com.

Ultimately, the final blow to the Elwha Dam and Glines Canyon Dam was the passage of the Elwha River Ecosystem and Fisheries Restoration Act in 1992. The act authorized the Secretary of the Interior to acquire the two hydroelectric projects for the purposed of removal and restoration of the river.[267] In 1999 the Department of the Interior purchased the two projects for a combined $29 million dollars and removal of the dams finally came to fruition beginning in 2011.[268] By 2014, both dams and associated structures had been removed and the Elwha River was restored. The restoration of the Elwha is the largest river restoration project undertaken in the United States and Glines Canyon Dam is the tallest dam to have been removed in the United States.

[267] H.R. 4844, *Elwha River Ecosystem and Fisheries Restoration* Act, 1992.

[268] Ibid., 216-217.

The complexity of the Elwha River Restoration and the ownership of the hydroelectric projects by the Department of the Interior prior to removal led to the creation of a *PA* rather than an *MOA* as the result of Section 106 review. The *PA* stipulated two main mitigation measures for above-ground resources: *HABS* or *HAER* level documentation and the development of an interpretive plan including themes and materials. Regarding archeological resources and *TCP*s, the *PA* stipulated the creation of a treatment plan for all resources to ensure either avoidance or mitigation. In 1995, the *PA* was signed by the *NPS*, Lower Elwha Klallam Tribe, and Washington *SHPO* and concurring parties including the United States Bureau of Indian Affairs, *USFS*, and *BR*.

Elwha Site Visit

Photographs of the Elwha River Restoration project site can be found in Appendix C, figures C-41 through C-66. The Elwha River Restoration project encompasses two interpretive sites. One site, the Elwha Interpretive Center, is located off the Strait of Juan De Fuca Scenic Byway while the other, the Glines Canyon Spillway Overlook, is located within the Boundaries of Olympic National Park. The Elwha Interpretive Center is a few hundred feet off the Scenic Byway and has signage on the main road. The center includes an outdoor, open-air, interpretive installation and a trail with overlooks [Figure C-41]. The interpretive installation features Native American artwork and several interpretive signs that present the history of the dams, the ecology of the region, the history of the Lower Elwha Klallam Tribe, the restoration project, and more [Figures C-42 through C-51].

From a separate parking lot, the trail to the overlooks can be accessed. The first half of the trail is well-maintained and accessible but leads to an overlook that is overgrown and does not provide sight of the Elwha River [Figure C-52]. A smaller, unmarked, and much less accessible trail leads to a second overlook that provides a view of the Elwha River [Figure C-53 and C-54]. A white object hung above the river is presumed to signify the former location of the dam, but no signage indicates so.

The second interpretive element of the Elwha River Restoration project is the Glines Canyon Spillway Overlook within Olympic National Park. After the removal of the Glines Canyon Dam in 2014, the Elwha River washed out sections of Olympic Hot Springs Road, which provides access to the interpretive site. The road has been open intermittently since but has been closed since January 2017. Access to the site is currently accessible through a three mile hike and following one mile hike on the road on the West side of the River or a four mile hike on the road on the East side of the River [Figure C-55]. The interpretive site sits at the precipice of a hill and is situated on top of the preserved Glines Canyon Dam spillway [Figures C-57 and C-66]. The opposite side of the dam also has a small section of the wing wall preserved which is accessible from the East bank of the river [Figure C-58]. Both have been implemented with lighting and safety railings.

Several interpretive boards line the top of the spillway and provide information on the history of the dam, the dam removal, the restoration project, salmon, and ecological changes since the removal of the dam [Figures C-56, 59, 60, 61, 63-65]. The Spillway provides a view of the restored Elwha River Valley which was previously covered by the dam's reservoir [Figure C-62].

CHAPTER VIII. EFFECTIVENESS EVALUATION

The case studies presented in the previous chapter illustrate the various paths which lead to dam removal, the complex and often lengthy process, and the diversity of mitigation measures implemented through Section 106 review. Each of the case studies presented were significant historically but caused negative environmental impacts over the course of their existences. The case studies also demonstrated the varying level of public participation in the Section 106 review process, and the varying level of community opposition to dam removals. Drawing from the historical context of each case study, the mitigation measures implemented, site visits, and interviews, this chapter will evaluate the effectiveness of Section 106 mitigation in each case study. Two categories of effectiveness will be evaluated: the effectiveness of the mitigation in preserving or interpreting historic significance and the effectiveness of the mitigation in retaining community place attachment. These evaluations will provide insight into the ability of Section 106 to balance the interests of historic preservation and community place attachment with environmentalism during dam removal projects.

DEVELOPING EFFECTIVENESS MEASURES

To develop the criteria for evaluating effectiveness of the two categories, historic preservation effectiveness and community place attachment effectiveness, first had to be defined and discerned from one another. For the purposes of this study historic preservation is considered the physical preservation of the built environment or the interpretation of historical significance. Community place attachment is considered the intangible connection between a community and its environment. The retention of these two categories may be accomplished through the same or similar mitigation measures, but they are fundamentally different issues. Historic preservation addresses the imbued historic significance of the built environment, while community place attachment addresses the bond between people and place, whether that place is historic or not.

To determine measures of historic preservation effectiveness, the historic significance of hydroelectric projects were broken down into several general categories: (1) physical elements, (2) scale, and (3) historical narrative. The physical elements of a hydroelectric project encompass the generally associated structures and infrastructure including the dam, powerhouse, canals, flumes, penstocks, forebay, or reservoir. These physical structures can illustrate the technological or architectural significance of the project, provide insight into the function of the project, and can reflect the larger societal themes and trends prevalent at the time of construction. For example, the physical character of the Libby Dam Hydroelectric Project, constructed in 1972 on the United States and Canadian Border, illustrates the changing attitude toward dam construction as the environmental movement gained traction. Its design was conceptualized as part of the environment, rather than as a conqueror of the environment, and this is reflected in the materials, landscaping, and layout of the project.[269] While not all hydroelectric projects echo the zeitgeist of their period of construction as clearly as the Libby Dam Project, the physical elements of hydroelectric projects provide a tangible link to the past and can provide insight into historic trends and themes.

Although the scale of a hydroelectric project does not equate to historic significance, sheer size is a significant visual aspect of such projects. The large scale of many dams and their corresponding power houses reflects the principle that guided hydroelectric infrastructure for the first half of the twentieth century: that humanity could and was destined to control nature. Dams were placed in the natural environment in locations that geographically made sense (think of the Glines Canyon Dam), but their size and function reflect a complete separation from and control over the natural environment. Additionally, the large massing of powerhouses and dams, and even

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[269] Philip Van Huizen, "Building a Green Dam: Environmental Modernism and the Canadian American Libby Dam Project," (Pacific Historical Review 79.3, 2010): 418–53. https://doi.org/10.1525/phr.2010.79.3.418.

flumes, creates a sensational and at times awe-inspiring visual effect. As a quote in an earlier chapter observed, big dams were to Americans in the 1930s as skyscrapers were in the 1920s.[270] Both reflected the ingenuity of man to construct something so large and novel, and seemingly unnatural.

The final category, historical narrative of the hydroelectric project, is an intangible aspect of the historic preservation evaluation. The physical built aspects of hydroelectric projects can communicate some aspects of the associated history and significance but are unlikely to tell the full story. The retention and dissemination of a projects historical narrative is essential to promoting a wholistic understanding of the hydroelectric project. This narrative should not be limited to one primary story but should encompass the many aspects of a hydroelectric project's history, from human activity at the site before construction to the environmental aftermath of construction. This type of inclusive narrative provides a truer reflection of the complex story of hydroelectricity in the United States than a simple recounting of construction from start to finish can.

To determine measures of community place attachment effectiveness, three general categories of characteristics essential to retaining place attachment were selected: (1) accessibility, (2) historical narrative, and (3) participation. Accessibility is perhaps the most obvious trait necessary for a community to retain place attachment. The bond that creates place attachment itself is intangible, but the bond exists in relation to a physical location. A community or individual can still hold place attachment even if the place no longer exists (for example, an adult can feel place attachment to the home they grew up in despite the home being demolished), but providing access to a location that recognizes this loss or provides alternative benefits can alleviate feelings of disconnection. For example, the loss of a reservoir popular for swimming in the community could be mitigated with the construction of a community pool to replicate

[270] McCormmach, *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*, 12.

the benefit of the reservoir and the installation of a picnic area at the former reservoir site to provide a continued connection to that place.

Similar to effective preservation or interpretation of historic significance, community place attachment retention is bolstered by the retention and dissemination of an historical narrative. As in the case of historic significance, this narrative should be a representation of the entire story of the associated place, not just the simplest or most appealing narrative to tell. Including the community in this narrative is essential to promoting continued place attachment or mitigating the loss of place attachment. For example, excluding the history of the Elwha dam's significance in allowing for the continued operation of the local mill that supplied jobs to residents for nearly eighty years, would further alienate the community and erase their perceived significance of the dams. Reserving a place for the community in the projects historical narrative creates feelings of inclusion, recognition, and can alleviate the loss of a significant place.

The last category of community place attachment effectiveness is based upon both the products of Section 106 and the process of consultation. As discussed in "Chapter VI: Section 106 of the *NHPA*" the level of public participation in the consultation process is largely based on the discretion of the Agency Official. Section 106 mandates a base level of providing public notice and encourages public participation but has no mechanisms with which to enforce this. Public participation occurs on a scale, from least involved to most involved. The International Association for Public Participation ranks the levels of participation as follows: (1) inform, (2) consult, (3) involve, (4) collaborate, and (5) empower [Table 8.1].[271] Consultation or mitigation that goes beyond the level of informing the public can ensure that all voices and opinions are considered in decision making and can lead to more creative and collaborative solutions. A higher level of public participation can retain or mitigate

[271] Core Values, Ethics, Spectrum – The 3 Pillars of Public Participation - International Association for Public Participation, accessed June 09, 2019, https://www.iap2.org/page/pillars.

community place attachment by providing the community with a sense of agency regarding proposed plans or mitigation measures and ensuring the significance they associate with the project is fully considered by all parties involved in consultation.

INCREASING IMPACT ON THE DECISION

	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARTICIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.
PROMISE TO THE PUBLIC	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

Figure 8.1 International Association for Public Participation Spectrum of Public Participation. Source: www.iap2.org

Derived from these three categories of historic preservation significance and community place attachment, a basic list of questions was developed [Table 8.2]. In addition to these questions tailored to assess the corresponding categories, several general questions were included that provided insight into the mitigation measures implemented in each project. Based on the framework of these questions, a simple checklist was then developed to assess each case study project [Table 8.3]

GENERAL EVALUATION	HISTORIC PRESERVATION EVALUATION	COMMUNITY PLACE ATTACHMENT EVALUATION
• What aspects of the project were completely removed? • What mitigation measures were implemented regarding above-ground resources? • Were any of these measures creative? • What types of consulting parties were involved (i.e. THPOs, tribes, environmental groups, etc.) • Have all of the mitigation measures stipulated in the project *MOA* or *PA* been implemented?	**Physical Elements** • Has the dam been partially preserved? • Has the powerhouse been preserved or partially preserved? • Has associated infrastructure been preserved or partially preserved (i.e. penstocks, flumes, canals, etc.) **Scale** • Is the scale of the dam discernable? • Is the scale of the powerhouse discernable? • Are environmental changes caused by the dam (i.e. the creation of a reservoir) discernable? **Historical Narrative** • Is a historical narrative disseminated at the project site? • Is this narrative inclusive?	**Accessibility** • Is the site accessible to the public? **Historical Narrative** • Is a historical narrative disseminated at the project site? • Does this narrative include the projects relation to the community? **Participation** • Were any community groups invited signatories on the project *MOA* or *PA*? • What was the level of community participation in consultation or mitigation: inform, consult, involve, collaboration, or empower? • Was there public opposition and if so, was it addressed by mitigation measures?

Table 8.2 Initial questions for evaluating effectiveness. Source, author.

GENERAL EVALUATION		HISTORIC PRESERVATION EVALUATION		COMMUNITY PLACE ATTACHMENT EVALUATION	
Creative Mitigation Implemented		Dam partially preserved		Reasonably Accessible	
All Mitigation in MOA/PA implemented		Powerhouse preserved		Community association included in historical narrative	
		Associated structures preserved		Community group included in *MOA/PA*	
		Scale of dam or powerhouse discernable		Level of community participation beyond inform achieved	
		Physical environmental changes discernable			
		Inclusive historical narrative disseminated			

Table 8.3 Evaluation Checklist. Source, author.

EFFECTIVENESS EVALUATION

The following sections will assess each case study Hydroelectric Project with the determined measures in Table 8.3. The assessment will follow the format of Table 8.3 and will be followed with a summary of each evaluation.

Gold Ray Hydroelectric Project

General Evaluation:

The Gold Ray Hydroelectric dam removal project resulted in the loss of all structures associated with the project except for portions of the dam and certain mechanical equipment. Regarding above-ground resources, the project *MOA* stipulated: the completion of *HAER* level II documentation; salvage and re-use of the project generator system, *ODFW* fish counting station, powerhouse monitor, and cut stone for landscaping; the design of an interpretive park with multiple panels featuring photos and maps and salvaged elements to create an "attractive, accessible and historically accurate record of the Gold Ray projects history and significance in Jackson County".[272] Based on the authors knowledge of common mitigation measures and the examples of creative mitigation recognized by the *ACHP*, the development of an interpretive nature park using salvaged materials is recognized as creative. Although salvaging materials is commonly used as a mitigation measure, the placement of the material on site in nature and allowing it to rust and become a ruin is creative. The state of the salvaged materials can be interpreted as a representation of the state of dams, as a metaphor for their decline and nature's reclaiming of a former dam site. The project *MOA* included the *NOAA/NMFS* and Oregon *SHPO* as signatories and Jackson County as a concurring party. All of the mitigation measures outlined in the project *MOA* have been implemented at this time.

Historic Preservation Evaluation – Physical Elements:

The Gold Ray dam was removed from the Rogue River, but a section of the abutment was left on the place on the southern bank. This provides a good sense of the original location and scale of the dam. All other structures and infrastructure associated

[272] "Memorandum of Agreement Among National Marine Fisheries Service an Oregon State Historic Preservation Officer Regarding Historic Properties Affected by a Proposed Undertaking," (Advisory Council on Historic Preservation, 2010).

with the dam have been removed including the powerhouse. Mechanical elements from within the powerhouse however were salvaged as stipulated in the project *MOA*.

Historic Preservation Evaluation – Scale:

The retention of a portion of the Gold Ray dam's southern abutment makes the scale of the dam discernable. At only thirty-eight feet high the dam would be categorized as small, but it was quite long, spanning the Rogue River at 368 feet.[273]While the powerhouse was completely demolished the machinery salvaged from inside of it provides an idea of the scale of the building needed to house it. Additionally, historic photographs implemented in the interpretive elements of the site which show the physical changes made to the river by the dam provided a basis from which comparison can be drawn to the current path of the river. This illustrates the physical environmental changes caused by the dam's construction.

Historic Preservation Evaluation – Historical Narrative:

A historical narrative is disseminated at the project site through the implementation of two large interpretive panels. Several smaller interpretive panels describe specific salvaged machinery. The large panels provide a relatively inclusive history of the site, encompassing the construction of the dam, its relation to the surrounding communities, the dams impact on fish passage, and the dam's removal. The history of the site prior to construction of the dam however is not included, such as the Takelma tribe's village on the Rogue and their dependence on salmon harvested from the river.[274]

Community Place Attachment Evaluation – Accessibility:

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[273] Kramer & Company, "Oregon Inventory of Historic Properties Section 106 Documentation Form: Jackson County Parks/Gold Ray Hydroelectric Project", December 2009: 3.

[274] "Takelma Tribe," National Parks Service, 2015, , accessed June 10, 2019, https://www.nps.gov/orca/learn/historyculture/takelma-tribe.htm.

The Gold Ray Interpretive Park is completely open to the public from dusk to dawn every day. While there are no signs on the main road providing wayfinding to the site it is accessible via a paved rural road. Parking is available along the road and a wooden information kiosk at the entry provides a map of the park. A second sign directs visitors specifically to the interpretive section of the park. Outside of the interpretive section of the park there is little in the way of development, but Jackson County plans to further develop the area.[275]

Community Place Attachment Evaluation – Historical Narrative:

The interpretive elements at the Gold Ray park include a brief description of the dams significance to development of the region stating that the project provided the first electricity to most of the Rogue valley including Ashland, Medford, Jacksonville, Gold Hill, and Grants Pass.

Community Place Attachment Evaluation – Participation:

No community groups or individuals were included in the Gold Ray project *MOA* as signatories or concurring parties. Based on secondary sources public participation in the project appears to have been limited to informing the public. At least two public meetings were held in Jackson County which included short presentations on the project's history but provided little information about the proposed impacts of the project (for example it was not communicated at either meeting that the Gold Ray Dam was slotted for demolition).[276] Some opposition to the removal project existed in the community but opposition was driven primarily by just four residents. At least one of these residents stated his opposition to the removal of the dam stemmed from its historic significance claiming, "to a lot of us who've lived here all our lives, I think it's

[275] Cultural Resource Specialist Interview, "Interview with Cultural Resource Specialist," e-mail interview by author, April 16, 2019.

[276] Duane Ericson, *The Gold Ray Dam: Public Involvement in the Process of Removing a Historic Structure*, report, Historic Preservation, University of Oregon (2010), 7.

important to retain that history."[277] If this was indeed the primary concern of the community members in opposition to the removal project, this issue was addressed through the salvage of materials and creation of the interpretive park.

Evaluation Summary:

The removal of the Gold Ray Dam and demolition of its associated structures was a relatively well received removal project. Little opposition existed in the community, and the dam's abandonment since the 1970s likely resulted in less community place attachment than in other removal projects. The interpretive park implemented as a mitigation measure is well designed, provides a good overview of the project's history and significance, and emphasizes the projects salvaged mechanical items. The removal project however, lacked significant public participation beyond simply informing the public, and the interpretive materials could have provided a more inclusive history through the addition of history of the site prior to construction of the dam. As a Jackson-County Commissioner observed during a vote to approve removal of the dam, "[this project] is restoring the river to its original path and course. Herein lies a historical significance that predates us."[278] Recognizing that earlier significance would create a more inclusive historical narrative of the site.

Bull Run Hydroelectric Project

General Evaluation:

The Bull Run Hydroelectric dam removal project resulted in the loss of the Marmot Dam, Little Sandy Dam, the flume, associated infrastructure, and the Rosalyn Lake Forebay. Regarding above-ground resources, the project *MOA* stipulated:

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[277] Mark Freeman, "Gold Ray Dam Removal Backed," Mail Tribune, February 26th, 2010, accessed May 12, 2019, https://mailtribune.com/archive/gold-ray-dam-removal-backed.
The Associated Press, "Judge Halts Removal of Gold Ray Dam on Rogue River," Oregonlive.com, July 21, 2010, accessed May 12, 2019, https://www.oregonlive.com/pacific-northwest-news/2010/07/judge_halts_removal_of_gold_ray_dam_on_rogue_river.html.

[278] Freeman, "Gold Ray Dam Removal Backed," Mail Tribune, February 26th, 2010, https://mailtribune.com/archive/gold-ray-dam-removal-backed.

documentation of all historic structures with archival quality photography; two open houses held at the powerhouse prior to the dam going off-line, to include educational and interpretive presentations; the removal of architectural features by the Oregon *SHPO* on a case-by-case basis for the purposes of education, reuse, or curation; and the sale and redevelopment of the Bull Run Powerhouse. Based on the author's knowledge of common mitigation measures and the examples of creative mitigation recognized by the *ACHP,* none of the implemented mitigation measures were creative. There was potential however, for the powerhouse to be creatively redeveloped, but this lies beyond the constraints of the project *MOA*.

The project *MOA* included the *FERC*, Oregon *SHPO*, and *ACHP* as signatories and *PGE*, Mt. Hood National Forest, and the *BLM* as concurring parties. The *MOA* also stated that additional parties were consulted including the Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of the Siletz Indian Reservation, the Confederated Tribes of the Warm Springs Indian Reservation of Oregon, the Yakama Indian Nation, the Chinook Indian Tribe, the Confederated Tribes of the Umatilla Reservation of Oregon, the Cowlitz Indian Tribe, the Sandy Chamber of Commerce, the Sandy Historical Society, the Clackamas County Historical Society, and the Sumpter Valley Railroad Historical Society. All of the mitigation measures stipulated in the *MOA* have been implemented; however, the redevelopment of the Powerhouse and additional buildings has faced several setbacks.

Historic Preservation Evaluation – Physical Elements:

The locations of the Little Sandy and Marmot dams are not accessible, and it is unknown if any part of the dams were left in-tact. It is believed however, that the dams were completely removed. Associated infrastructure, specifically the project flume and a canal, were demolished along with the two dams. The Bull Run Powerhouse, transformer building, machine shop, and a non-historic office building were all retained through sale of the property. All machinery within the Powerhouse and machine shop have also been maintained in place. The retention of most of the project's structures and the powerhouse and machine shop machinery evokes a sense that the project was

simply stopped in time. The function of the site is obvious and the absence of the dams, which were not historically visible from the powerhouse, has virtually no impact on the physical significance on the remainder of the project's structures.

Historic Preservation Evaluation – Scale:

Due to the complete removal of the dams and inaccessibility of the former sites, the scale of the former dams are not discernable. The retention of the powerhouse, however, adequately illustrates the scale of the project through its size and the large machinery left in place. Additionally, the large outflow openings visible from the bank of the Bull Run River (now filled in with gravel but still apparent) illustrate the physical environmental impact of the hydroelectric project. While they did not make lasting environmental changes, like the Rosalyn Lake Forebay, one can imagine the physically large release of water from the outflow which would alter the rivers flow.

Historic Preservation Evaluation – Historical Narrative:

The Bull Run Hydroelectric site has several interpretive elements, including interpretive panels, artifacts, and a to-scale replication of the project's historic wooden flume. These elements together provided an historical narrative of the project that encompassed the construction of the project, the significance of the project to the growth of nearby communities, the significance of the project to its employees, the detrimental impacts of the project on the Sandy and Little Sandy Rivers, and the removal of the dams. Information of the former Rosalyn Lake Park and artifacts including a sign from the park provide insight into the former park's importance to the Bull Run and Sandy communities. Despite consultation with numerous tribes and tribal organization, no history of the site pre-construction of the dam was included in the interpretation. In addition to the physical interpretive elements on site, the Bull Run project is only accessible via a scheduled tour. The tour guide is very knowledgeable and added to the inclusivity of the project's historical narrative.

Community Place Attachment Evaluation – Accessibility:

The Bull Run project site is accessible to the public but only through scheduled tours. The site is currently surrounded by chain link fence and is only accessible through

one automated gate. Previously the site was not fenced off, but vandalism created a need for increased security (this also led to large exterior screens being placed over the powerhouse's original windows in an effort to prevent vandals from breaking the glass).[279] There is also adequate signage on the road that provides access to the site. The need to schedule a tour to access the site limits accessibility but is necessary due to the historic machinery and archives located on site.

Community Place Attachment Evaluation – Historical Narrative:

The interpretive information at the Bull Run site provides significant insight into the importance of the project to the community of Bull Run. Interpretive panels discuss the day-to-day experience of employees at the powerhouse, the project's aid in fueling the growth of Portland, Oregon, the town of Bull Run that was home for many of the project's employees, as well as Rosalyn Lake Park and the Bull Run elementary school. The historical narrative of the site is oriented around the Bull Run community and the people who experienced life at the hydroelectric project. This interpretive information was developed by Powerhouse Re Gen LLC which aimed to emphasize the importance of the community to the hydroelectric project's history. [280]

Community Place Attachment Evaluation – Participation:

While no community groups were invited signatories on the Bull Run *MOA*, several local historical organizations were consulted during the Section 106 process. Additionally, the MOA stipulated public open houses as a mitigation measure prior to the decommissioning of the project. Besides these open houses however, community participation in the consultation process encompassed the basic level of public notice. The current owners of the Powerhouse have organized numerous public outreach meetings to consult with and involve the community in the redevelopment of the

[279] Powerhouse Caretaker Interview, "Interview with Bull Run Caretaker," interview by author, April 29, 2019.

[280] Powerhouse Re Gen LLC, "Interview with Powerhouse Re Gen LLC," interview by author, March 11, 2019.

property moving forward.[281] No public opposition was mounted against the Marmot and Little Sandy Dam removals. Rather, the retention of the powerhouse through redevelopment was widely supported and nearly six hundred individuals attended the Bull Run Powerhouse 100 Year Anniversary Event.

Evaluation Summary:

The Bull Run Hydroelectric project resulted in the removal of two environmentally unsounds dams and the retention of much of the projects other elements, excluding the flume and canal. The mitigation measures implemented through Section 106 review were not particularly creative, but the redevelopment of the powerhouse and associated structures made their preservation possible. The level of public participation was also basic entailing only of informing the public of the project. The successes of this project – its inclusive historical narrative, accessibility, and retention of historic fabric – can be attributed to the current owners of the property. These successes were not created or guaranteed by the Section 106 process but rather are a product of the commitment to community oriented historic preservation by Powerhouse Re Gen LLC. If a different applicant had been awarded the sale of the powerhouse, these successes may not have occurred.

Condit Hydroelectric Project

General Evaluation:

The Condit Hydroelectric dam removal project resulted in the loss of the Condit Dam and the flume and penstocks associated with the project. The Condit Powerhouse, two operators' homes, and associated outbuildings were retained. Regarding above-ground resources, the project *MOA* stipulated: the creation of a *HPMP*; development of a marketing plan for the redevelopment of the Condit Powerhouse, operators' homes, and associated buildings, including alternative options of sale of the property with no consideration of historic preservation stewardships or demolition of the structures if no

[281] Ibid.

sales occurred by certain pre-determined deadlines; HABS level II documentation of cabins on Northwestern lake, per approval from the resident. Based on the author's knowledge of common mitigation measures and the examples of creative mitigation recognized by the *ACHP,* none of the implemented mitigation measures were creative. The project *MOA* included the FERC, PacifiCorp, Washington SHPO, and was consulted with the Yakama Nation. As of the completion of this study, the Condit Powerhouse and associated structures are still owned by PacifiCorp and no redevelopment of the property has occurred.

Historic Preservation Evaluation – Physical Elements:

The Condit Dam Hydroelectric dam removal project resulted in the complete removal of the Condit Dam. The location of the former dam was discernable to the author using historical photographs but would be difficult for someone without considerable knowledge of the project to determine. The Condit Powerhouse has been preserved but its windows have been boarded up and it appears to have been mothballed for the time being. The project's flume and penstocks were removed, but two operators' homes, a garage, and outbuilding have been preserved. Like the powerhouse, these structures have been boarded up and appear to have been mothballed. Despite their somewhat dilapidated state, the general size and layout of the project is discernable from the preserved elements.

Historic Preservation Evaluation – Scale:

The scale of the former Condit Dam is not discernable. The former location of the dam as aforementioned is difficult to find; no signage indicates its location. The only indicators of the former location of the dam are historical photograph and a slightly less vegetated area which may have been a staging area for deconstruction materials. The narrow canyon the dam was located within does not allude to the dam's scale; it extended significantly both vertically and horizontally beyond the canyon walls. From the former location of the dam the former waterline of Northwestern lake is also discernable. A change in vegetation type and size indicates the former water line and provides insight into the large environmental change created by the reservoir. This view,

however, is only temporary (as the vegetation matures the former water line will become less apartment) and is difficult to find. The retention of the Powerhouse provides some notion of the scale of the project. The Powerhouse, however, can only be viewed from the rear and the large, multi-light windows characteristic of powerhouses constructed early in the twentieth century cannot be viewed. These windows add to the sensational, "larger than life" feeling hydroelectric projects often evoke.

Historic Preservation Evaluation – Historical Narrative:

There are no interpretive elements present at the Condit Hydroelectric Project site that disseminate the project's historical narrative. *HAER* level documentation of the project is accessible on the PacifiCorp website but the documentation is not included in the online Library of Congress database.[282] Besides this *HAER* report, no interpretive elements associated with the removal of the dam could be found. Additionally, HABS documentation of cabins on Northwestern Lake could not be found on the Library of Congress database.

Community Place Attachment Evaluation – Accessibility:

The Condit Hydroelectric Project site is not accessible to the public. There is no signage on nearby roads indicating the location of the project and the site features numerous signs warning against trespassing. The associated buildings and powerhouse are boarded up and can only be viewed from the public road.

Community Place Attachment Evaluation – Historical Narrative:

There is no historical narrative disseminated at the project site. As previously mentioned, there are no interpretive elements present.

Community Place Attachment Evaluation – Participation:

The Condit Hydroelectric Project dam removal *MOA* did not include any community organizations as signatories. The level of public participation in the

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[282] EDAW, Inc., *History of the Condit Hydroelectric Project - Prepared in Accordance with the Historic American Engineering Record (HAER)*, report (2002). http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Condit/2003.02.18_HAER_Report_Final.pdf

consultation process and mitigation appears to be minimal, entailing just public notice. There was significant opposition to the removal of the dam within the local community, rallied by two separate groups. The White Salmon River Steelheader's group opposed the removal of the dam for its possible effects to steelhead trout habitat located below the dam and rainbow trout populations within Northwestern Lake. The Salmon Conservation League group, composed of primarily residents of the Northwestern Lake cabins, opposed the removal of the dam for its likely effect on the property value of Northwestern Lake cabins and possible property damages.[283] The local government's involved in the removal project reflected this community opposition through their efforts to stall the project's progress.[284] While the redevelopment of the property could possible address these issues and the general discontent of the community, the property is currently mothballed. Additionally, the exceptionally long timeframe of the project (from 1993 to 2011) and the years that have passed since removal may create difficulties in any future plans to engage the public in the project's future.

Evaluation Summary:

The Condit Hydroelectric dam removal project was a controversial undertaking that has produced relatively unsuccessful results considering historic preservation and community place attachment. While the removal of the dam has helped to restore salmon runs, the Condit Powerhouse and associated structures sit vacant and boarded up. The site has no interpretive elements and therefore does not reflect an inclusive historical narrative that encompasses the project's history and its value to the community. The Section 106 process did not include the community beyond providing public notice, despite considerable community opposition to the removal of the dam. If the powerhouse and associated structures are eventually redeveloped in a creative, inclusive, and community-oriented manner, some of these pitfalls could be remedied.

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[283] Erik Robinson, "Groups Oppose Condit Dam Destruction," Northwest Hydropower News, March 23, 2000, accessed May 12, 2019, https://news.fwee.org/?p=2136.

[284] Blumm and Erickson, "Dam Removal in the Pacific Northwest, " *SSRN Electronic Journal*, 2012, 1064.

Elwha River Restoration

General Evaluation:

The Elwha River Restoration project resulted in the removal of all structures and infrastructure associated with the Glines Canyon and Elwha Hydroelectric Projects. A portion of the western spillway of the Glines Canyon Dam was the only resource retained. Regarding above-ground resources, the project *PA* stipulated: *HABS* or *HAER* level documentation and the development of an interpretive plan including themes and materials. Based on the author's knowledge of common mitigation measures and the examples of creative mitigation recognized by the *ACHP,* none of the implemented mitigation measures were creative. The project *PA* included the *NPS*, Lower Elwha Klallam Tribe, and Washington *SHPO* and the United States Bureau of Indian Affairs, *USFS*, and *BR* as concurring parties. All of the mitigation measures outlined in the project *PA* have been implemented at this time

Historic Preservation Evaluation – Physical Elements:

Both the Glines Canyon Dam and Elwha Dam were removed as part of the Elwha River Restoration project. A section of the Glines Canyon Dam spillway however was preserved and is now used as the site of an interpretive installation. Both powerhouses associated with either dam were also demolished, and their former locations are not accessible or easily discernable. Additionally, all associated infrastructure of both hydroelectric projects have been removed.

Historic Preservation Evaluation – Scale:

The Elwha River Restoration project encompassed two different dams and they will be evaluated separately regarding scale. The scale of the Glines Canyon dam, the larger of the two and located within the boundaries of Olympic National Park, is easily discernable. The retention of the western spillway and the addition of a viewing platform on the eastern side of the Elwha make the massive scale of the former dam obvious. From either side of the platforms, both repurposed as interpretive sites, the approximate height and width of the former Glines Canyon Dam can be visualized.

The scale of the Elwha Dam, located outside of the National Park, is not discernable. The site of the dam is only visible from a viewing platform located several hundred feet away. The river itself is not visible from this point, just the banks, so it cannot be determined how tall the dam may have been. The environmental changes caused by the Elwha dam are not visible due to the inaccessibility of the site. The environmental changes caused by the Glines Canyon Dam however are readily apparent. From the spillway overlook, the water line of the reservoir created by the dam is still visible due to vegetation changes. While this is temporary, interpretive panels at the site feature images of the reservoir, thus providing a comparison between the river's course today and how the dam altered and impeded it.

Historic Preservation Evaluation – Historical Narrative:

The former sites of both hydroelectric projects removed in the Elwha River Restoration project features interpretive elements that disseminate the historical narrative of the Elwha River. Seven large interpretive panels atop the Glines Canyon Spillway Overlook describe the Elwha Rivers important to the Lower Elwha Klallam, the hydroelectric project's significance in proving power to Port Angeles and jobs to the community, the environmental impacts of the dams, the opposition and support of the dam removals, and the ongoing river restoration efforts. This narrative is inclusive of all stories and communities associated with the project and provides a multi-faceted understanding of the project.

Located off of the Strait of Juan de Fuca Scenic Byway, the Elwha River Interpretive Center provides an historical narrative of the project near the former site of the Elwha Hydroelectric Project. The open-air center includes ten large interpretive panels dedicated to interpreting the project's history. These panels encompass the ecological history of the Elwha River, the history of inhabitation of the Olympic Peninsula (including the Elwha Klallam people), the history of the Elwha hydroelectric projects, the deconstruction of the projects, and the planning and progress of the river restoration effort. The site also includes a large art installation picturing the river along

with painted salmon and faces reflective of the Lower Elwha Klallam people. This represents a fully inclusive narrative of the Elwha River's history.

Community Place Attachment Evaluation – Accessibility:

Currently the Glines Canyon Spillway Overlook located at the site of the former Glines Canyon Dam has limited accessibility. Since the removal of the Glines Canyon Dam in 2014, the changing course of the Elwha River and flooding events have washed out the access road to the site, the Olympic Hot Springs Road.[285] Currently access to the site is only achievable through an approximately eight mile hike, which severely limits the ability of all members of the public to access the site. It is unknown when the road will be re-opened. The Elwha Interpretive Center is easily accessed from the Strait of Juan de Fuca Scenic Byway and there is ample signage directing the public to the site. The overlooks of the dam at the Interpretive Center are less accessible: the first is reached by a short and easily walked trail but the overlook is overgrown, while the second provides a better view of the former Elwha Dam site but is a longer and more difficult hike.

Community Place Attachment Evaluation – Historical Narrative:

Both former project sites feature interpretive materials that include the significance of the projects to the Port Angeles community and industry. They describe the role of the dam in supporting growth of the city, providing jobs to its resident, and also implement historical photographs to illustrate the community's relation to the hydroelectric project.

Community Place Attachment Evaluation – Participation:

The Elwha River Restoration Project *PA* did not include any community groups as concurring or invited signatories. The project however, involved the Lower Elwha Klallam tribe at the highest level of public participation, empowerment. The project has

[285] Lynda V. Mapes, "Elwha River Takes out Olympic Hot Springs Road - Yet Again," The Seattle Times, December 01, 2017, accessed June 10, 2019, https://www.seattletimes.com/seattle-news/environment/elwha-river-takes-out-olympic-hot-springs-road-yet-again/.

garnered recognition and praise for the instrumental role the Lower Elwha Klallam tribe played in initiating and shaping the project.[286] Outside of the tribe however, other residents of the Olympic Peninsula were not involved at a high level of participation. There was significant opposition to the removal of the dams within Port Angeles from the group *REAL* in response to the loss of the two reservoirs associated with the dams. No information could be found indicating this group was involved In the Section 106 process or the development of the interpretive installations at either site. However, interpretive material at the sites communicated that opposition to the dam removals existed.

Evaluation Summary:

The Elwha River Restoration was a large, complex, and contentious undertaking. While the retention of the Glines Canyon Dam spillway and the interpretive elements at both sites contribute to the effectiveness of the project regarding historic preservation and community place attachment, the project also has shortcomings. The inaccessibility of the Glines Canyon Spillway Overlook within Olympic National Park effectively negates the positive features of the site. This inaccessibility, however, is not a product of the sites planning but is due to environmental occurrences. Additionally, while the project empowered the Lower Elwha Klallam tribe, the Port Angeles community had little participation in the Section 106 process. Overall, Section 106 resulted in the presentation of an inclusive narrative of the Elwha River but did not engage the Port Angeles community.

CONCLUSION

The evaluation of the four case study hydroelectric dam removal projects provides insight into the success and failures of each project regarding the historic preservation and community place attachment measures. These positive and negative

[286] Julia Guarino, "Tribal Advocacy and The Art of Dam Removal: The Lower Elwha Klallam and The Elwha Dams," *American Indian Law Journal* 2, no. 1 (Fall 2013).

attributes of each project reveal trends in the effectiveness of Section 106 and best-practices for planning and implementing successful consultation and mitigation. Table 8.2 quantifies each case study's effectiveness, based on individual category and overall effectiveness. Derived from this

quantification, the Bull Run Hydroelectric Project and Gold Ray Hydroelectric Project were the most successful in preserving historic significance and retaining or mitigating community place attachment, the Elwha River Restoration fell just short of the same score, and the Condit Hydroelectric Project was the least successful. The following paragraphs will compare the projects and summarize the key findings of the evaluation.

In the general evaluation, only the Gold Ray Hydroelectric Project included mitigation measures that can be considered creative. The salvage of materials from structures scheduled for demolition is not uncommon, but the specific stipulation in the Gold Ray *MOA* to include these materials in an outdoor interpretive park exceeded the basic stipulation of simply salvaging the materials with no dedicated purpose. The mechanical elements in the Gold Ray Interpretive park provide a sense of the project's scale, insight into the technological evolution of hydroelectricity, and provide a framework for which to organize interpretive elements upon.

The second measure in the general evaluation, the implementation of all of the mitigation measures included in the case study *MOA/AP*, was met by all case studies but the

Condit Hydroelectric Project. The Condit Powerhouse and associated structures have yet to be redeveloped and no information could be found which established a deadline for the sale of the property. While this could be a factor of not receiving credible applicants, the project *MOA* should have been more specific in stipulating a use for the powerhouse until its sale. The current state of the powerhouse and associated buildings detracts from its ability to successfully interpret the site's history. Although mitigation measures cannot always be efficiently implemented, seven years is a prohibitively long period for the Condit Powerhouse to sit unused.

GENERAL EVALUATION		HISTORIC PRESERVATION EVALUATION		COMMUNITY PLACE ATTACHMENT EVALUATION	
Creative Mitigation Implemented	1/4 - Gold Ray	Dam partially preserved	2/4 - Gold Ray - Elwha	Reasonably Accessible	3/4 - Gold Ray - Bull Run - Elwha
All Mitigation in MOA/PA implemented	3/4 - Gold Ray - Bull Run - Elwha	Powerhouse preserved	2/4 - Bull Run - Condit	Community association included in historical narrative	3/4 - Gold Ray - Bull Run - Elwha
Category Totals - Gold Ray: 2/2 Bull Run: 1/2 Condit: 0/2 Elwha: 1/2		Associated structures preserved	3/4 - Gold Ray - Bull Run - Condit	Community group included in *MOA/PA*	0/4
		Scale of dam or powerhouse discernable	4/4	Level of community participation beyond inform achieved	0/4
		Physical environmental changes discernable	4/4	**Category Totals - Gold Ray: 2/4 Bull Run: 2/4 Condit: 0/4 Elwha: 2/4**	
		Inclusive historical narrative disseminated	2/4 - Bull Run - Elwha		
		Category Totals - Gold Ray: 4/6 Bull Run: 5/6 Condit: 4/6 Elwha: 4/6			

CUMULITIVE TOTALS	**Gold Ray: 8/12**	**Bull Run: 8/12**	**Condit: 4/12**	**Elwha: 7/12**

Table 8.3 Effectiveness evaluation results. Source, author.

In evaluating historic preservation, each case study entailed the retention of either a portion of the associated dam or the associated powerhouse. The retention of this historic fabric provides a sense of the scale of the project, provides a physical location where interpretation can be implemented, and can reflect the architectural or engineering significance of the case study. The partial preservation of a case study dam and the preservation of a case study powerhouse were weighted equally, as both provide the aforementioned benefits and represent integral parts of the larger hydroelectric project. Each case study also illustrated the drastic physical changes made to the environment by the creation of a dam. All case study projects but the Condit Hydroelectric Project include on-site historical photographs in their interpretation. These photographs allow visitors to visually conceptualize the physical differences between the river dammed and the river undammed. There are no interpretive elements present at the Condit Hydroelectric Site, but the tree line of the former Northwestern lake is visible and can be compared to the current water level of the White Salmon River. This environmental element however is impermanent, and interpretation should be installed at the site that will provide a permanent visual of the environmental changes created by the Condit Dam. Just the Bull Run Hydroelectric Project and Elwha Restoration Project provided inclusive historical narratives through interpretive elements at the former project sites. These historical narratives presented visitors with the entire history of the sites – from their ecological creation to the planning of the dam removal.

In evaluating the retention or mitigation of community place attachment, all case study projects but the Condit Hydroelectric Project were determined to be adequately accessible to the public and to include the community in the site's historical narrative through interpretive elements. These measures allow the community to benefit from the new environment created by the dam removal and recognize the significance of the project to the community. None of the case studies however were found to have involved the community beyond the basic public notice required by

Section 106. No community groups participated as consulting parties or participated in the development and implementation of mitigation measures.

Based on these findings, several general recommendations can be made to ensure Section 106 is used effectively to balance the interests of historic preservation and community place attachment with environmentalism.

RECOMMENDATIONS

After evaluating the four case study hydroelectric project dam removals, it is apparent that not all shared the same level of success. While all of the case study dams were relatively successful in preserving and interpreting historic significance, most fell short in preserving or interpreting community place attachment and did not implement creative mitigation measures. From these results several overall recommendations have been developed. These recommendations should be employed to guide the process of Section 106 consultation and to inform the mitigation developed and implemented. The recommendations developed from the evaluation of the case study dams are as follows.

<u>Embrace creative mitigation measures.</u>

The Gold Ray Hydroelectric Project Section 106 consultation was the only of the four case studies to stipulate and implement a creative mitigation strategy. Gold Ray was also determined to be one of the most successful dam removal projects out of the four case studies evaluated. Creative mitigation is hard to define, but that is perhaps exactly what defines it. It embraces new and unique approaches and is constantly being redefined as preservation professionals push the boundaries of mitigation. While techniques like adaptive re-use and redevelopment used to be considered creative, the field has come to accept these as the status-quo.[287] Modern creative mitigation can be achieved through the use of new technologies (think of the possibilities of virtual reality or cellphone apps), flexible budgets that are not based on common mitigation

[287] Oregon SHPO Interview #2, "Interview with Oregon SHPO" interview by author, May 3, 2019.

measures, and collaborative engagement of various interest groups. The large utility companies that own and operate hydroelectric projects have the resources to implement cutting-edge and creative mitigation.[288] Striving to implement creative mitigation in dam removal projects can better serve communities and create a more engaging experience.

Aim for balanced preservation.

All of the case studies evaluated resulted in the preservation of at least one significant element of each Hydroelectric Project: the powerhouse, partial preservation of the dam, and mechanical equipment from the Gold Ray Hydroelectric Park. The preservation of these elements can illustrate the scale of the associated project, reflect the project's significance, and provide a setting for which to implement interpretive materials. Preservation of all elements of a hydroelectric project are not necessary to effectively preserve and interpret the significance of the project. Aiming to preserve just select elements of a project's built resources can ensure its history is effectively told, keep project costs down, and allow for the restoration of the majority of the project's environment.

Develop inclusive interpretive material.

History is often presented in a way the oversimplifies, white-washes, and dilutes its true narrative. Inclusive historical narratives represent all aspects of a places story, even those that are unfortunate or represent only a small part of the larger picture. The development and implementation of inclusive interpretive material as mitigation for adverse effects to a hydroelectric project can accurately reflect the complex story of hydroelectricity in America. Historical narratives should encompass the good and the bad of hydroelectricity and provide a full understanding of the impacts of the project. Interpretive material at former dam sites should also emphasize the groups that were negatively impacted by the dam as well as those that benefitted from it, including

[288] Cultural Resource Specialist Interview, "Interview with, Cultural Resource Specialist," e-mail interview by author, April 16, 2019.

obvious beneficiaries like Powerhouse employees and more removed beneficiaries like rural communities that were provided electricity by the dam. This type of inclusive narrative can be developed through historical research but also through oral histories and community engagement. Inclusive interpretive material ensures an equitable approach to telling history.

Ensure accessibility.

Historic preservation exists for everyone. History does not belong to an individual and the benefits of historic preservation should be enjoyed by everyone. Ensuring the accessibility of mitigation measures implemented at former hydroelectric dam sites promotes this ideal. It also ensures that the community that benefited from the dam's existence, whether that be from the electricity it supplied to their home or the recreation they enjoyed on its reservoir, can still benefit from the site. While unforeseen consequences can limit accessibility, like the flooding of the Elwha and access to the Glines Canyon Spillway overlook, efforts should be taken to develop mitigation that does not prohibit access. For example, if a site will only be accessible by guided tour, the tours should be free of charge and there should be a simple process for booking a tour. Accessible mitigation of a hydroelectric project's adversely impacted historic features allows all individuals to benefit from the project.

Involve the community in planning and implementing mitigation.

As evidenced by the four case study projects, not all dam removals are controversial. Some may be wholly supported by a community while others may face opposition from the community for a variety of reasons. Even if those reasons are not due to the loss of historic fabric, efforts should be made to involve those in opposition to the project prior to implementing mitigation measures. Developing a process or plan for identifying all the members of a community and methods for outreach and engagement can ensure that an appropriate audience is reached. While Section 106 will not be able to address and solve every issue of contention, giving those in opposition a chance to be heard and inform the results of mitigation can alleviate tension.

Additionally, involving diverse parties in the process of planning and implementing mitigation can lead to the development of more creative strategies.[289]

Strive for a multidisciplinary approach.

The underlying goal of Section 106 consultation to mitigate the decommissioning of hydroelectric projects should be to approach the task with an interdisciplinary focus. Dam removal effects many parties, involves countless agencies and professionals, and should be approached as such. Preservationists involved in the Section 106 review process should keep in mind that environmental issues and social issues should be considered during the process and represented in interpretive materials. A multidisciplinary problem requires a multidisciplinary solution. Preservationist should push the constraints of mitigation and consider strategies like collecting oral histories, creating public art, capturing musical traditions, and more.

KENT DAM REMOVAL: AN IDEAL EXAMPLE?

Taking into consideration these recommendations, the ideal dam removal project would have several key characteristics. It would incorporate active community engagement during both consultation and the development of mitigation measures. The consultation would be collaborative, involving multidisciplinary stakeholders and would result in the implementation of creative mitigation measures. These measures would reflect a multidisciplinary and inclusive approach to history and would ensure the retention of the built portion of the project and ideally reflect the project's scales. The result of mitigation would be an accessible post-removal site that could be a place of memory and celebration for all communities. From a review of high-profile dam removals on a national scale, one project presents the best embodiment of the recommendations: the Kent Dam removal on the Cuyahoga River in Ohio.

[289] Oregon SHPO Interview #1, "Interview with OR SHPO" interview by author, May 3, 2019.

The Kent Dam, located in the Kent community near the campus of Kent State University, was constructed in 1836 and provided hydropower to local industry. The dam was an arched masonry dam located directly in front of a masonry bridge spanning the Kent River and perpendicular to a canal lock. Although the dam helped develop the city of Kent and was visually pleasing, it blocked migratory fish, depleted oxygen levels in the river, and damaged aquatic habitat. In 1998, the City of Kent considered removal of the dam to restore the Kent River. Aware of the dam's historic significance and importance to the community, the city established the Kent Dam Advisory Committee, composed of nineteen stakeholders representing various interests in the removal project. Section 106 consultation of the removal resulted in mitigation measures agreed upon by all members of the advisory committee. The mitigation included retaining all of the historic dam, installing a water feature to replicate the falls created by the dam, creating an interpretive park on land uncovered by the draining of the dams reservoir, and modifying the historic canal to create an alternative route around the dam suitable for fish passage.

These mitigation measures and their development illustrate the recommendations derived from the analysis of the case study dam removal projects. The city of Kent engaged numerous community members and interest groups to reach creative and collaborative mitigation solutions and retain much of the project's built environment. It includes inclusive interpretive elements and is now a place accessible to the community that provides both recreational and educational benefits. Although this is an exemplary dam removal project, the mitigation measures implemented after section 106 consultation are not suitable for all projects. Not all rivers can be diverted for fish passage and not all dams can or should be completely retained. The process of consultation and the development of the mitigation measures at Kent Dam however, provide attainable goals for other large dam removal projects.[290]

[290] McClain et al., *Dam Removal and Historic Preservation: Reconciling Dual Objectives*, 30-31.

CHAPTER IX. CONCLUSION

The recommendations developed from the evaluation of the case study projects provide a basis for planning and implementing Section 106 review effectively in future dam removal projects. As illustrated throughout this study, hydroelectricity has a complex history in the United States, the decommissioning of a hydroelectric project entails a complex process, and equally complex issues arise from the removal of a dam. This study sought to address three interests involved in dam removal that are often framed as at-odds: environmental goals, historic preservation goals, and community place attachment. These different interests can be balanced during dam removal and Section 106 of the *NHPA* is the tool to do so. While Section 106 has its shortcomings, it is the most effective tool for representing the interests of both preservationists and communities. The recommendations developed provide a framework for ensuring Section 106 review is used in the most effective manner. This study is timely, as dam removal continues to grow as a trend across the nation, and it is hoped that these recommendations inform future removal projects.

THE FUTURE OF PACIFIC NORTHWEST DAMS

At the time of completion of this study, several large-scale dam removals are either already planned or are being considered within the Pacific Northwest. Four dams on the Klamath River, three located in California and one in Oregon, have been approved for removal and operations are slated to begin by 2020.[291] The Washington legislature recently approved funding for a study group to determine the impacts of the removal of the four Lower Snake River dams, a series of dams that have long been the

[291] George Plaven, "Contractor Chosen to Remove Klamath River Dams," Capitalpress.com, April 26, 2019, accessed May 13, 2019, https://www.capitalpress.com/ag_sectors/water/contractor-chosen-to-remove-klamath-river-dams/article_c6b50e54-6788-11e9-8700-4f683247eaa1.html.

ire of environmental groups.[292] As larger dams are removed and entire river basins are freed from their concrete shackles, dam removal will become an even more complex issues. Dams such as those on the Lower Snake River and Columbia River are multi-purpose; they are used for irrigation, hydroelectric production, flood control, and navigation. The removal of these dams presents a more intricate web of interests than the smaller, single hydroelectric projects discussed in this study. While the Columbia River dams are not being considered for removal at this time, it plausible that their fate may not be as certain in the near future. This study can inform the process of Section 106 review for dams of a similar scale and impact as the case study dams in the future, but more research should be undertaken to understand how to approach the removal of the larger projects currently being considered. These recommendations can provide a foundation for approaching Section 106 review of future large-scale dam removals, but the added intricacies of those projects will require more development of the recommendations.

APPLICABILITY

Although the recommendations and insights provided by this study will not adequately serve proposed large-scale and multi-dam removal projects, they are applicable to dam removal projects on a national scale. The scope of this study was limited to hydroelectric dams in the Pacific Northwest, but the measures used to evaluate the case study projects and recommendations developed are applicable to all dam removals. While state and local regulations vary depending on the project location, Section 106 will always be required if a dam removal involves a federal undertaking (and a federal undertaking can be something as trivial seeming as the granting of a federal permit). The recommendations are general enough that they can guide Section 106

[292] Courtney Flatt, "Washington Budget Funds Group To Study Snake River Dam Removal," Oregon Public Broadcasting, April 29, 2019, accessed May 13, 2019, https://www.opb.org/news/article/washington-budget-snake-river-dam-removal-study/.

review of all dam typologies and functions and can be made more specific to cater to the individual project.

Dams are also not the only resources imbued with both historic significance and environmental negligence. Resources like nuclear facilities, coal plants, mining operation, and various manufacturing operations, share a similar juxtaposition. The recommendations made in this study regarding hydroelectric dam removal can also be applied to these resources. Like dams, these types of resources were once technologically advanced and provided benefits to communities but are now recognized as producing negative environmental effects. Section 106 review and mitigation of these types of resources can also be guided by the recommendations made in this study as they share many characteristics with dams. As both technology and human knowledge of the environment advances, resources like dams will and should be taken out of operation. Their decommissioning, however, need not signify the end of their history or their benefits to humanity. Following the basic recommendations of this study can ensure that environmental, historic preservation, and community goals are met simultaneously.

PRESERVATIONISTS IN THE TWENTY FIRST CENTURY

This study concludes on one final recommendation which was the primary impetus for the development of this research. Historic preservation is a changing field, as evidenced by the many new ideas and critical reflections featured in *Bending the Future: Fifty Ideas for the next Fifty Years of Historic Preservation in the United States*.[293] The world is changing, rapidly and drastically due to climate change. The way people interact with and treat one another is also changing, as a result of the current political climate and increasing knowledge of the importance of social equity. Historically, preservation has been treated like a field which exists within a glass home. It has been

[293] Page and Miller, *Bending the Future: Fifty Ideas for the next Fifty Years of Historic Preservation in the United States.*

practiced with little regard given to other issues, like social and environmental issues, despite the thin and frail membrane that separates it from these exterior elements. Modern preservations need to shatter these arbitrary boundaries and embrace the notion of preservation as an interdisciplinary field. If preservationists continue to operate in a manner that does not recognize the full breadth of historic preservation, as inextricably linked to the well-being of the environment and humanity and existing within a larger community of issues, the field will forever be associated with white women in white tennis shoes saving high-style architecture. To retain relevancy in the twenty-first century, preservation professionals must embrace new identities as not just caretakers of history but of environmental advocates and community allies.

The removal of historic dams is just one example of the type of resource that provides an opportunity for historic preservationists to embrace such an identity. Dams were integral to the development of the United States, are relics of a technological revolution, and are well deserving of the historic significance with which they have been imbued. But their construction also disenfranchised Native American tribes from their land and sources of sustenance; they drastically altered river ecosystems, creating unhealthy environments; and they decimated anadromous fish populations. Conversely, dams provided electricity to communities, recreational opportunities, employed Americans during times of war and depression. To adequately address these complex histories, social implications, and environmental tragedies associated with dams, preservationists need to embrace an interdisciplinary identity. The recommendations developed from the evaluation of the case study projects reflect this necessity by attempting to balance environmental, historic, and social concerns. This balance of interests is attainable and must be sought out for the future of the nation's history, its delicate ecosystems, and its diverse communities.

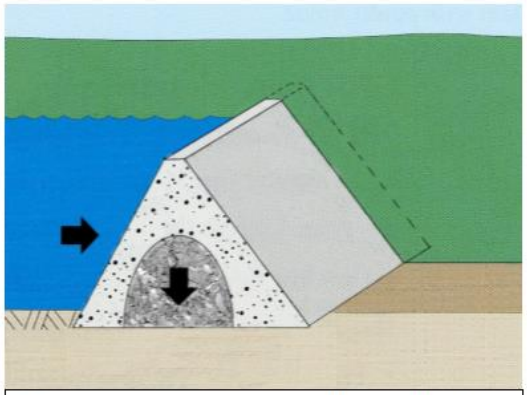
APPENDIX

APPENDIX A. ACRONYMS

ACHP – Advisory Council on Historic Preservation
ALP – Alternative Licensing Process
APE – Area of Potential Effect
BLM – Bureau of Land Management
BPA – Bonneville Power Administration
BR – Bureau of Reclamation
CLG – Certified Local Government
COPCO – California-Oregon Power Company
CRSP – Colorado River Storage Project
CWA – Clean Water Act
DAHP – Department of Archeology and Historic Preservation
DEQ – Department of Environmental Quality
DSL – Department of State Lands
ECPA – Electric Consumers Protection Act
EIS – Environmental Impact Statement
EPA – Environmental Protection Act
ESA – Environmental Species Act
FERC – Federal Energy Regulatory Commission
FHWA – Federal Highway Administration
FPA – Federal Power Act
FPC – Federal Power Commission
FRD – Federal Record of Decision
FWCA – Fish and Wildlife Coordination Act
FWPA – Federal Water Power Act
HABS – Historic American Building Survey
HAER – Historic American Engineering Record
HALS – Historic American Landscape Service
ILP – Integrated Licensing Process
MOA – Memorandum of Agreement
NAGPRA – Native American Graves Protection and Repatriation Act
NEC – Northwestern Energy Company
NEPA – National Environmental Policy Act
NHPA – National Historic Preservation Act
NID – National Inventory of Dams
NMFS – National Marine Fisheries Act
NOAA – National Oceanic and Atmospheric Administration
NOI – Notice of Intent
NPDES – National Pollutant Discharge Elimination System
NPS – National Park Service
NRHP – National Register of Historic Places
NWPA – Northwest Power Act
NWPPC – Northwest Power Planning Council
ODFW – Oregon Department of Fish and Wildlife
PA – Programmatic Agreement
PAD – Pre-Application Documentation
PGE – Portland General Electric
REAL – Rescue Elwha Area Lakes
SHPO – State Historic Preservation Office
SEPA – State Environmental Policy Act
SPD – Study Plan Determination
TCP – Traditional Cultural Property
THPO – Tribal Historic Preservation Office
TLP – Traditional Licensing Process
USACE – United States Army Corps of Engineers
USFWS – United States Fish and Wildlife Service

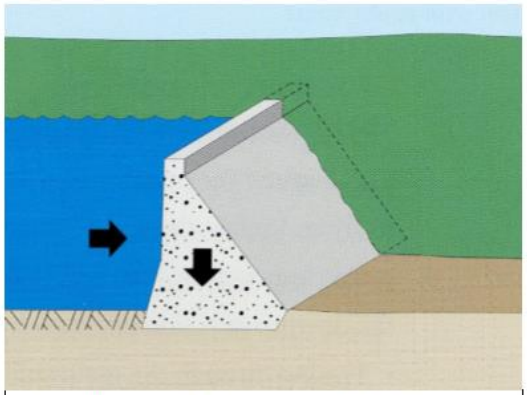
APPENDIX B. DAM TYPOLOGIES

Embankment Dam



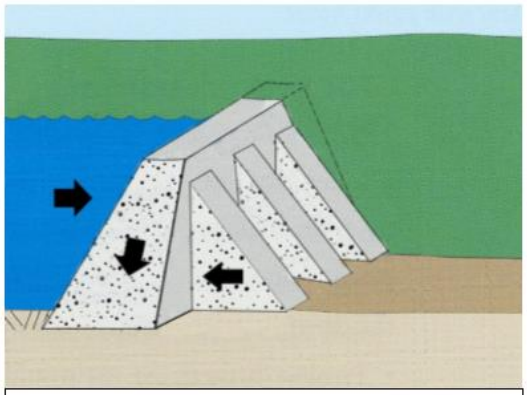
Most common dam typology. Either earthen-fill (compacted earth) or rock-fill (compacted or dumped rocks).

Gravity Dam



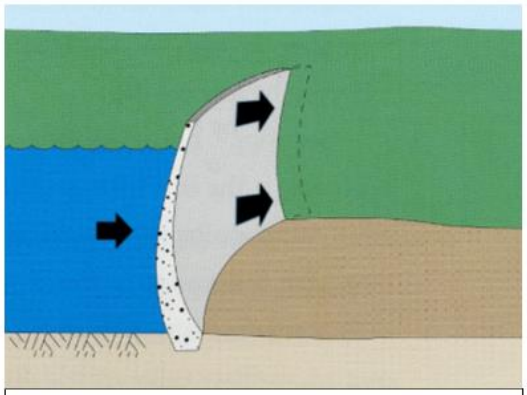
Generally concrete. Constructed of vertical blocks with flexible seals in the joints between blocks.

Buttress Dam



Type of gravity dam with a reduced mass accomplished using vertical or sloping buttresses.

Arch Dam



An arch either half circular or elliptical in shape. Generally constructed of a series of thin vertical blocks keyed together.

Figure Sources: https//:damsafety.org

APENDIX C. DAM REMOVAL PROJECT SITE VISIT PHOTOS

Condit Hydroelectric Project Site Visit

Date of Visit: January 30th, 2019

Weather: Overcast, cool in the 50s.

Figure C-1 Boarded up buildings at the Condit Hydroelectric Site. Source, author.

Figure C-2 Rear elevation of the Condit Powerhouse located on the White Salmon River. Source, author

Figure C-3 Rear of Condit Powerhouse and gravel access road. Source, author.

Figure C-5 View upstream of the White Salmon River from the Condit Powerhouse. Source, author.

Figure C-6 Boarded up buildings at the Condit Hydroelectric Site. Source, author.

Figure C-7 Location of the Condit Dam prior to its removal. Source, author.

Gold Ray Hydroelectric Project Site Visit
Date of Visit: April 26th, 2019
Weather: Sunny, in the 70s.

Figure C-8 Entry sign at the Gold Ray Natural Area. Source, author.

Figure C-9 "Interpretive Site" sign on trailhead to Gold Ray dam interpretive site. Source, author.

Figure C-10 View of the Rogue River from the Gold Ray Natural Area. Source, author.

Figure C-11 Former site of the Gold Ray Dam on the Rogue River. Source, author.

Figure C-12 Original Gold Ray Dam Water pump at interpretive park. Source, author.

Figure C-13 "Gold Ray Dam on the Rogue River" interpretive signage. Source, author.

Figure C-14 "Gold Ray Hydroelectric Project" interpretive signage. Source, author.

Figure C-15 Salvaged mechanical elements from Gold Ray Powerhouse. Source, author.

Figure C-16 Salvaged mechanical elements from Gold Ray Powerhouse. Source, author.

Figure C-17 Gold Ray Powerhouse original control panel. Source, author.

Figure C-18 Salvaged mechanical elements from Gold Ray Powerhouse. Source, author.

Figure C-19 Original Gold Way water tank. Source, author.

Bull Run Hydroelectric Project Site Visit

Date of Visit: April 29th, 2019

Weather: Sunny, in the 70s.

Figure C-20 Entrance to Bull Run Hydroelectric project. Source, author.

Figure C-21 Exterior of Bull Run transmission building. Source, author.

Figure C-22 To-scale model of historic wooden flume. Source, author.

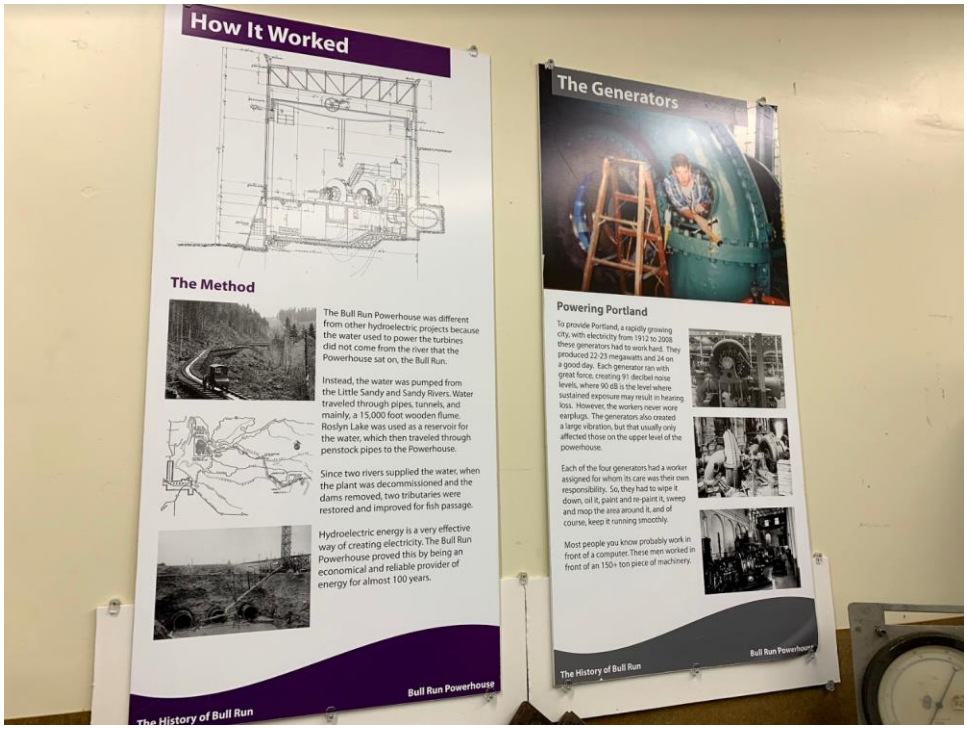


Figure C-23 Interpretive signage instead Bull Run Powerhouse. Source, author.

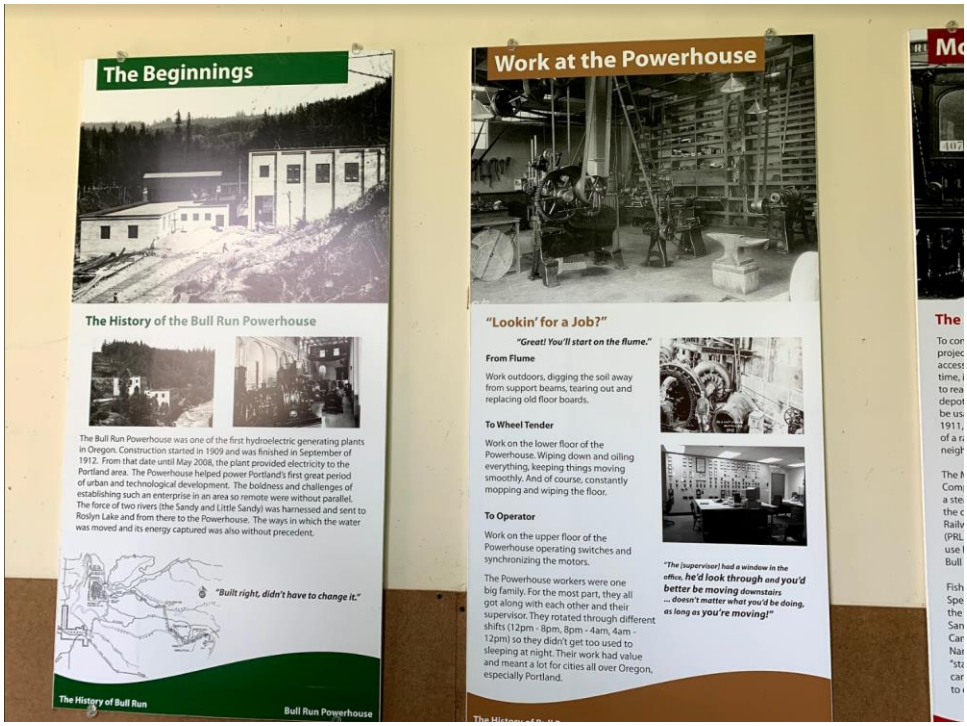


Figure C-24 Interpretive signage inside Bull Run Powerhouse. Source, author.

Figure C-25 Historic plans of Bull Run Powerhouse and associated structures. Source, author.

Figure C-26 Interior of Bull Run Powerhouse and mechanical crane from second story platform. Source, author.

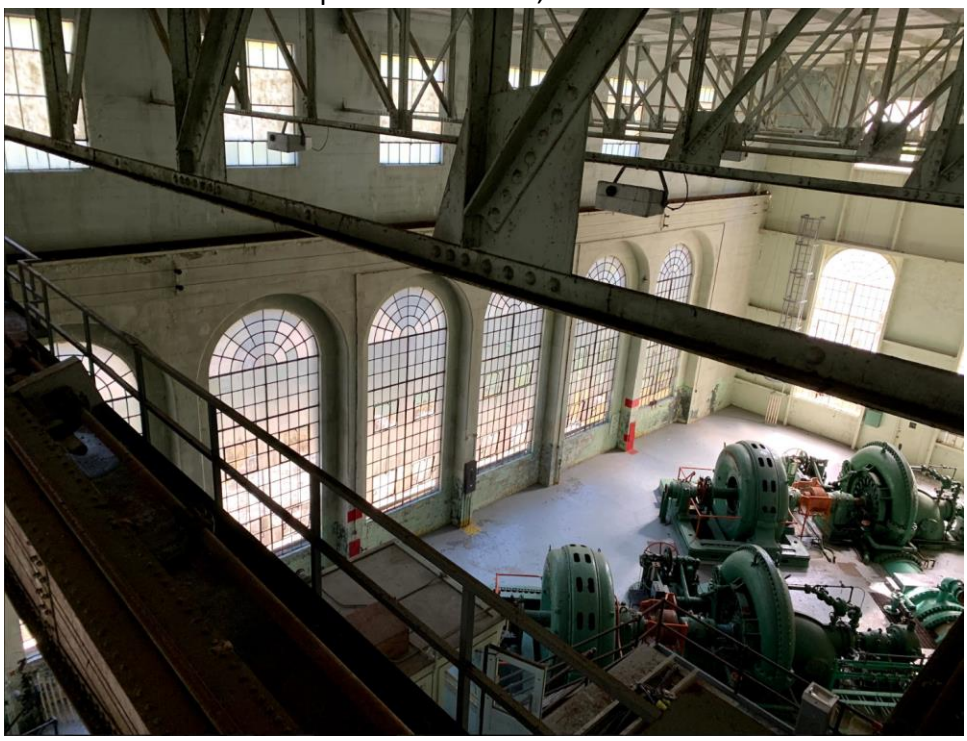


Figure C-27 Interior of Bull Run Powerhouse and generators from second story platform. Source, author.

Figure C-28 Only remaining equipment within Bull Run Transmission Building. Source, author.

Figure C-29 Bull Run Transmission Building second-story interior. Source, author.

Figure C-30 View of Bull Run Powerhouse roof and Bull Run River from the roof of the Transmission Building. Source, author.

Figure C-31 Final remaining section of train tracks at Bull Run Hydroelectric Site, located within the Bull Run Transmission Building. Source, author.

Figure C-32 Replacement turbine parts never used. Source, author.

Figure C-33 Bull Run River and the Bull Run Powerhouse. Source, author.

Figure C-34 Interior and generators of Bull Run Powerhouse. Source, author.

Figure C-35 Mechanics in the Bull Run Powerhouse. Source, author.

Figure C-36 View from below a generator in the Bull Run Powerhouse. Source, author.

Figure C-37 Electrical board inside Bull Run Powerhouse. Source, author.

Figure C-38 Original machinery in Bull Run blacksmith shop. Source, author.

Figure C-39 View of the Bull Run River upstream from the Powerhouse.

Figure C-40 View of the Powerhouse from the banks of the Bull Run River. Source, author.

Elwha River Restoration Project Site Visit

Date of Visit: May 8thth, 2019

Weather: Sunny, in the 70's.

Figure C-41 Elwha Interpretive Center, located on the Strait of Juan de Fuca Scenic Byway. Source, author.

Figure C-42 Elwha Interpretive Center art installation. Source, author.

Figure C-43 Elwha Interpretive Center signage. Source, author.

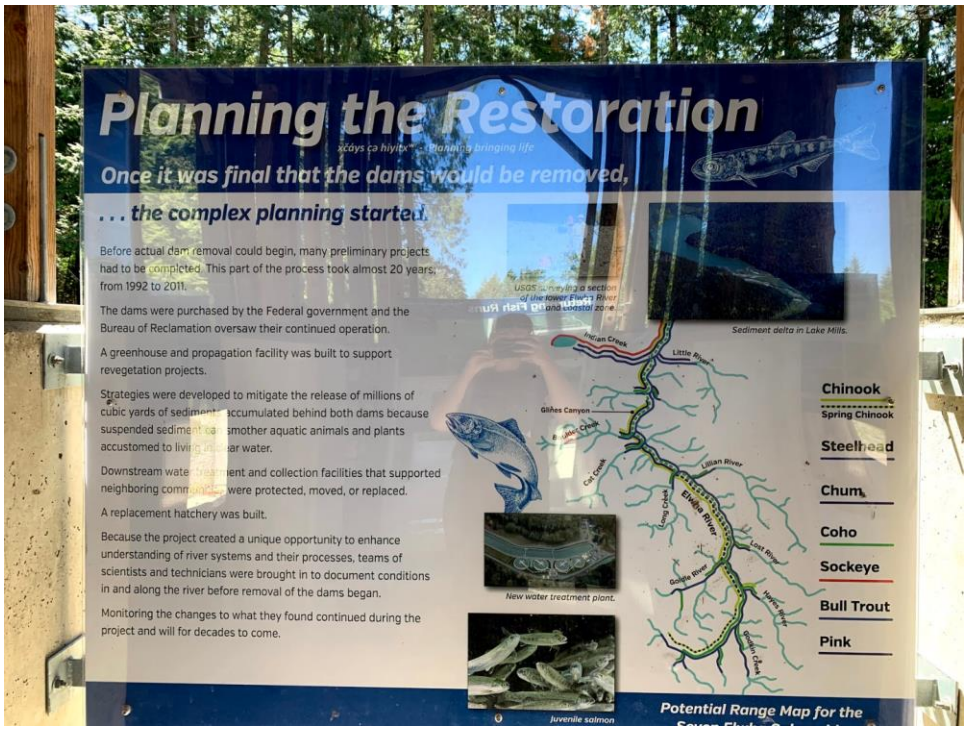


Figure C-44 Elwha Interpretive Center signage. Source, author.

Figure C-45 Elwha Interpretive Center signage. Source, author.

Figure C-46 Elwha Interpretive Center signage. Source, author.

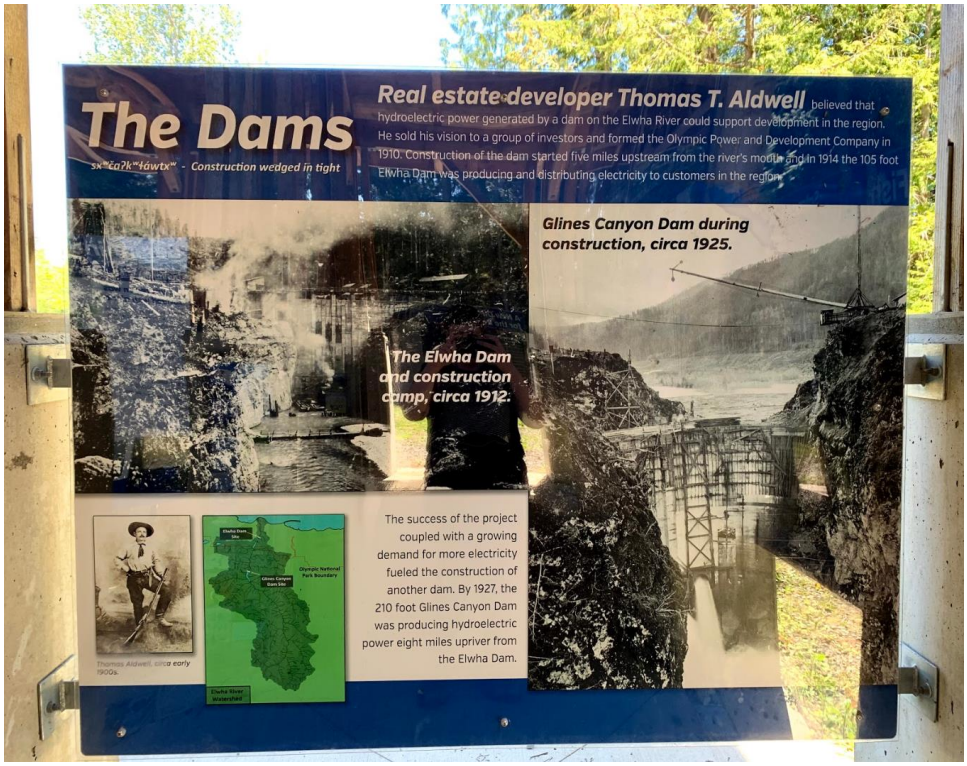


Figure C-47 Elwha Interpretive Center signage. Source, author.

Figure C-48 Elwha Interpretive Center signage. Source, author.

Figure C-49 Elwha Interpretive Center signage. Source, author.

Figure C-50 Elwha Interpretive Center. Source, author.

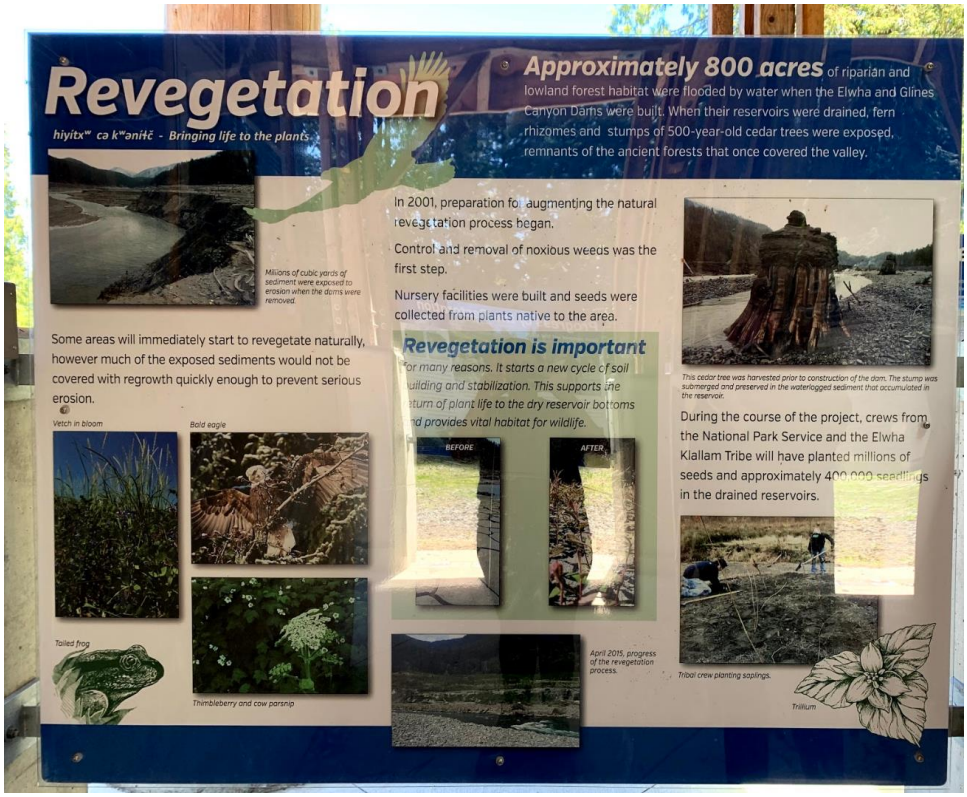


Figure C-51 Elwha Interpretive Center signage. Source, author.

Figure C-52 Elwha Interpretive Center trail viewpoint #1. Source, Author

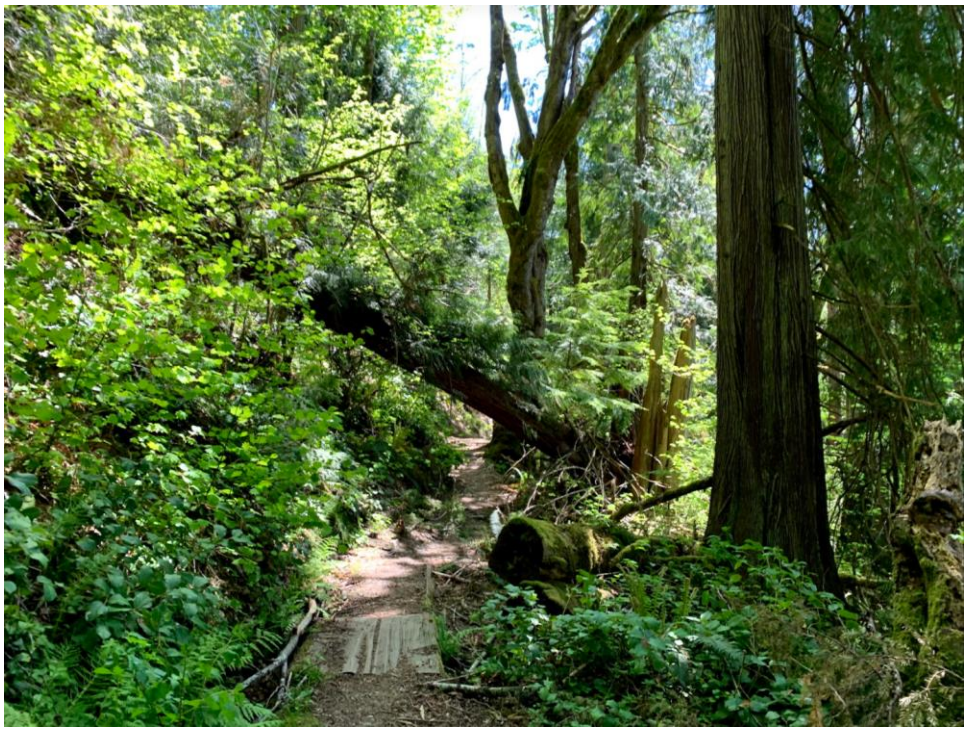


Figure C-53 Elwha Interpretive Center trail condition. Source, Author

Figure C-54 Elwha Interpretive Center trail viewpoint #2 Source, Author

Figure C-55 Section of the Olympic Hot Springs road leading to the Glines Canyon Spillway Overlook. The road, which provides the only access to the Elwha River Valley, has been shut down to vehicles intermittently since the removal of the dams in 2014. The last opening of the road was a three-week period in January, 2017. Access to the overlook is currently accessible only by foot and bike and is approximately eight miles. Source, author.

Figure C-56 Glines Canyon Spillway Overlook interpretive sign. Source, author.

Figure C-57 Glines Canyon Spillway Overlook, view of preserved spillway. Source, author.

Figure C-58 Glines Canyon Spillway Overlook, view of preserved eastern wingwall and western spillway. Source, author.

Figure C-59 Glines Canyon Spillway Overlook interpretive signage. Source, author.

Figure C-60 Glines Canyon Spillway Overlook interpretive signage. Source, author.

Figure C-61 Glines Canyon Spillway Overlook interpretive signage. Source, author.

Figure C-62 View south of the restored Elwha River from the Glines Canyon Spillway Overlook. Source, author.

Figure C-63 Glines Canyon Spillway Overlook interpretive signage. Source, author.

Figure C-64 Glines Canyon Spillway Overlook interpretive signage. Source, author.

Figure C-65 Glines Canyon Spillway Overlook interpretive signage. Source, author.

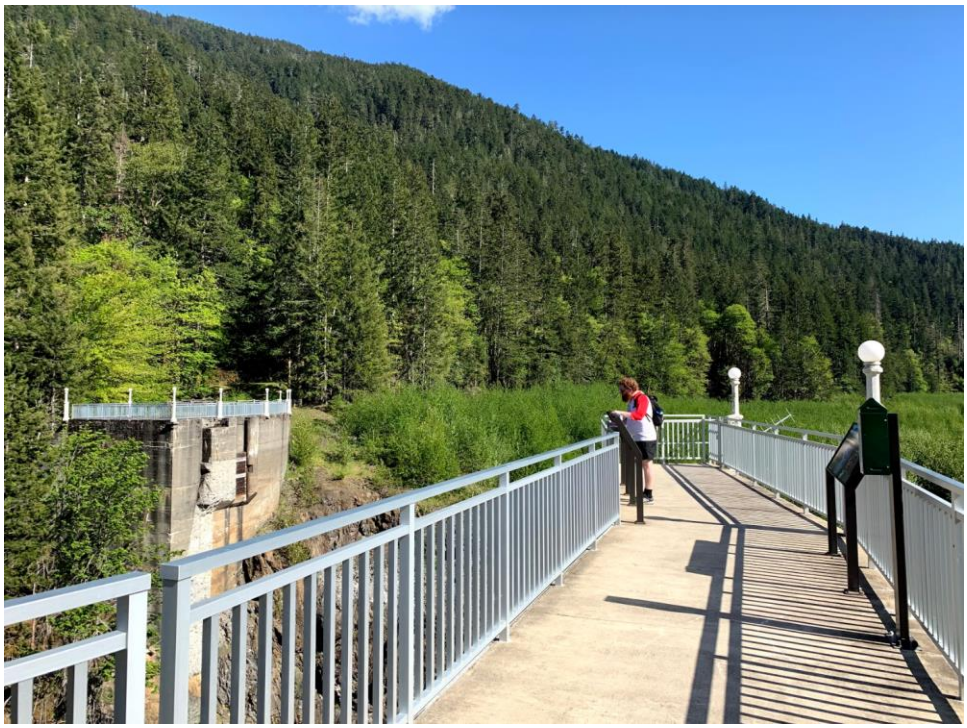


Figure C-66 Glines Canyon Spillway Overlook. Source, author.

REFERENCES CITED

"3.1.3 Decommissioning as a Result of License Surrender." Hydropower Reform Coalition. Accessed March 27, 2019. https://www.hydroreform.org/hydroguide/hydropower-licensing/3-1-3-decommissioning-as-a-result-of-license-surrender.

"106 Success Story: Creative Mitigation Heralded as Success for Local Economy." (The Advisory Council on Historic Preservation, 2018). https://www.achp.gov/sites/default/files/2018-07/Milton%20Madison2.pdf

"106 Success Story: Strong Public-Private Coalition Leads to Establishment of Park." (The Advisory Council on Historic Preservation, 2018). https://www.achp.gov/sites/default/files/2018-06/New%20Fork%20River%20Park.pdf

"106 Success Story: Routine Bridge Replacement Saves Revolutionary War Battlefield." (The Advisory Council on Historic Preservation, 2018). https://www.achp.gov/sites/default/files/2018-12/Broad%20River2.pdf

Abbey, Edward. *The Monkey Wrench Gang*. Salt Lake City: Dream Garden Press, 1999.

American Association of State Highway and Transportation Officials. *A Summary of Existing Research on Low-Head Dam Removal Projects*. By ICF Consulting. 2005. http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/25-25(14)_FR.pdf

Altman, Irwin, and Setha M. Low, eds. *Human Behavior and Environment: Advances in Theory and Research*. Vol. 12: Place Attachment. New York: Plenum Press, 1992.

Badman, Tim, Kristal Buckley, Leticia Leitao, Maya Ishizawa, Nobuko Inaba, and Lisa Prosper. "Forward Together: A Culture-Nature Journey Toward More Effective Conservation in a Changing World." Proceedings of Past Forward 2018, San Francisco.

Blumm, Michael C., and Andy B. Erickson. "Dam Removal in the Pacific Northwest: Lessons for the Nation." SSRN Electronic Journal, 2012, 1043-084. doi:10.2139/ssrn.2101448.

Borgde/Pinger. "Clackamas County Cultural Resource Survey Form: Bull Run Flume." SHPO NO. 1191, 1984.

"Columbia Basin Research." Columbia and Snake Rivers Hydroelectric Project Information | Columbia Basin Research. Accessed May 05, 2019. http://www.cbr.washington.edu/hydro.

“Condit Hydroelectric Project Decommissioning FERC Project No. 2342, Historic Properties and Cultural Resources Management Plan.” Mead & Hunt (2011), 3.

Conservation of Power and Water Resources, 18 CFR § 5.1.

Core Values, Ethics, Spectrum – The 3 Pillars of Public Participation - International Association for Public Participation. Accessed June 09, 2019. https://www.iap2.org/page/pillars.

Crane, Jeff. "The Elwha Dam: Economic Gain Wins Out Over Saving Salmon Runs." Columbia: The Magazine of Northwest History17, no. 3 (2003).

Cronon, William, ed. *Uncommon Ground: Rethinking the Human Place in Nature*. New York: W.W. Norton, 1995.

Cultural Resource Specialist Interview. "Interview with Cultural Resource Specialist." E-mail interview by author. April 16, 2019.

"Dam Safety Facts and Figures." US Army Corps of Engineers. Accessed February 02, 2019. https://www.usace.army.mil/media/fact-sheets/fact-sheet-article-view/article/590578/dam-safety-facts-and-figures/.

“DAHP Mitigation Options and Documentation Standards.” Washington Department of Archaeology and Historic Preservation, 2010. http://www.dahp.wa.gov/sites/default/files/MitigationDocumentationStandards.pdf

Dam Nation. Directed by Travis Rummel and Ben Knight. United States: Patagonia, 2014.

Darby, Stephen, and David A. Sear. *River Restoration: Managing the Uncertainty in Restoring Physical Habitat*. Chichester: Wiley, 2008.

“Decommissioning Plan for the Bull Run Hydroelectric Project FERC Project No. 477.” Filed by the Portland General Electric Company, 2002.

Deemer, Bridger R., John A. Harrison, Siyue Li, Jake L. Beaulieu, Tonya DelSontro, Nathan Barros, Jose F. Bezerra-Neto, Stephen M. Powers, Marco A. Dos Santos, and J. Arie Vonk. "Greenhouse Gas Emissions from Reservoir Water Surfaces: A New Global Synthesis." *BioScience*66, no. 11 (November 2016): 949-64.

Duara, Nigel. "Army Corps Agrees to Disclose Oil Pollution from Dams in Historic Settlement." U.S. News & World Report. August 4, 2014. Accessed March 27, 2019. https://www.usnews.com/news/us/articles/2014/08/04/apnewsbreak-corps-agrees-to-monitor-dam pollution?preview=true&preview_id=12304&preview_nonce=4467851722.

EDAW, Inc. “History of the Condit Hydroelectric Project - Prepared in Accordance with the Historic American Engineering Record (HAER).” Report, 2002.

Effect of undertaking on historic property, 54 U.S. Code § 306108.

Endangered Species Act, 16 U.S. Code 35.

“Environmental Assessment for the Arra Rouge River Restoration - Gold Ray Project.” National Oceanic and Atmospheric Administration. June 2010.

"Environmental Impacts of Hydroelectric Power." Union of Concerned Scientists. Accessed March 27, 2019. https://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/environmental-impacts-hydroelectric-power.html.

"Environmental Impact Statement Process." Washington State Department of Ecology – Environmental Impact Statements. Accessed March 29, 2019. https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/Guide-for-lead-agencies/Environmental-impact-statements.

Ericson, Duane. “The Gold Ray Dam: Public Involvement in the Process of Removing a Historic Structure.” Report. Historic Preservation, University of Oregon. 2010.

Federal Emergency Management Agency. “Dam Safety in the United States: A Progress Report on the National Dam Safety Program.” Report. U.S. Department of Homeland Security, 2014. https://www.fema.gov/media-library-data/1467048771223-c5323440700a175565a2c0c9d604f9e3/DamSafetyUnitedStatesAug2014.pdf

“FHWA FY 2019 Budget”. Report. Federal Highway Administration, 2019. https://www.fhwa.dot.gov/cfo/fhwa-fy-2019-cj-final.pdf

Flatt, Courtney. "Washington Budget Funds Group to Study Snake River Dam Removal." Oregon Public Broadcasting. April 29, 2019. Accessed May 13, 2019. https://www.opb.org/news/article/washington-budget-snake-river-dam-removal-study/.

Freeman, Mark. "Gold Ray Dam Removal Backed." Mail Tribune. February 26th, 2010. Accessed May 12, 2019. https://mailtribune.com/archive/gold-ray-dam-removal-backed.

"Frequently Asked Questions about Section 106 of the National Historic Preservation Act." National Endowment for the Humanities (NEH). Accessed March 30, 2019. https://www.neh.gov/grants/manage/frequently-asked-questions-about-section-106-the-national-historic-preservation-act.

Garvin, James L. "Education to Preserve Bridges and Dams as Capstones of Our Engineering Legacy." Preservation Education & Research1 (2008): 1-14.

Gaskell, Tamara. “Preserving Places: Reflections on the National Historic Preservation Act at Fifty from the Public Historian,” National Concil on Public History, October 2016, accessed June 8, 2019, https://ncph.org/wp-content/uploads/2009/12/Preserving_Places.pdf

"Gold Ray Dam Interpretive Display." John Vial to Ian Johnson. December 22, 2011.

Goldsmith, Edward. *The Social and Environmental Effects of Large Dams*. Wadebridge, Cornwall: Wadebridge Ecological Centre, 1992.

Grabowski, Zbigniew J., Heejun Chang, and Elise F. Granek. "Fracturing Dams, Fractured Data: Empirical Trends and Characteristics of Existing and Removed Dams in the United States." River Research and Applications 34, no. 6 (2018): 526-37. doi:10.1002/rra.3283.

Grace, Stephen. *Dam Nation: How Water Shaped the West and Will Determine Its Future*. Guilford, CT: Globe Pequot Press, 2012.

Griggs, Troy, Gregor Aisch, and Sarah Almukhtar. "America's Aging Dams Are in Need of Repair." The New York Times. February 23, 2017. Accessed February 02, 2019. https://www.nytimes.com/interactive/2017/02/23/us/americas-aging-dams-are-in-need-of-repair.html.

Guarino, Julia. "Tribal Advocacy and The Art of Dam Removal: The Lower Elwha Klallam and The Elwha Dams." American Indian Law Journal2, no. 1 (Fall 2013): 114-45.

Guthrie, Woody. "Grand Coulee Dam." Recorded 1941. Woody Guthrie. Bonneville Power Administration, 1988, CD.

H.R. 4844, Elwha River Ecosystem and Fisheries Restoration Act, 1992.

Harden, Blaine. *A River Lost: The Life and Death of The Columbia*. New York: W.W. Norton, 2012.

Harmon, David. "Intangible Values of Protected Areas: What Are They? Why Do They Matter?" The George Wright Forum21, no. 2 (June 01, 2004): 9-23. Accessed February 01, 2019. http://www.georgewright.org/212.pdf.

Hassell, Hank. "Echo Park and Beyond." In *Rainbow Bridge*, 92-114. University Press of Colorado, 1999.

Hawley, Steven. *Recovering a Lost River: Removing Dams, Rewilding Salmon, Revitalizing Communities*. Boston: Beacon Press, 2012.

Higgs, Stephen. "The Ecology of Dam Removal: A Summary of Benefits and Impacts." Edited by Elizabeth Maclin and Margaret Bowman. American Rivers, February 2002. https://www.michigan.gov/documents/dnr/ecodamrmvl_513770_7.pdf.

"Highway Finance Data Collection." U.S. Department of Transportation/Federal Highway Administration. 2011. Accessed February 09, 2019. https://www.fhwa.dot.gov/policyinformation/pubs/hf/pl11028/chapter1.cfm.

Hirt, Paul W. *The Wired Northwest: The History of Electric Power, 1870s-1970s*. Lawrence: University Press of Kansas, 2012.

"History: Sierra Club Timeline." Sierra Club History. Accessed May 06, 2019. http://vault.sierraclub.org/history/timeline.aspx.

"History of the River Restoration Movement." Glen Canyon Institute. Accessed May 06, 2019. https://www.glencanyon.org/history-of-the-river-restoration-movement/.

Hoffert-Hay, Denise. “Small Dam Removal in Oregon: A Guide for Project Managers.” 2008: Oregon Watershed Enhancement Board. https://digital.osl.state.or.us/islandora/object/osl:16500/datastream/OBJ/view

Honor Keeler, “Native Americans and Historic Preservation: Re-Indigenizing Native American Homelands,” proceedings of Past Forward 2018, San Francisco.

Huizen, Philip Van. 2010. “Building a Green Dam: Environmental Modernism and the Canadian American Libby Dam Project.” Pacific Historical Review79 (3): 418–53. https://doi.org/10.1525/phr.2010.79.3.418.

Hurtado, Maria E. "Hydroelectric Dams Emit a Billion Tonnes of Greenhouse Gases a Year, Study Finds." The Guardian. November 14, 2016. Accessed March 27, 2019. https://www.theguardian.com/global-development/2016/nov/14/hydroelectric-dams-emit-billion-tonnes-greenhouse-gas-methane-study-climate-change.

"Hydropower - How to Surrender a License or Exemption." FERC. July 11, 2017. Accessed March 28, 2019. https://www.ferc.gov/industries/hydropower/gen-info/comp-admin/surrender.asp.

“Hydropower Licensing - Get Involved: A Guide For the Public.” Federal Energy Regulatory Commission Office of Energy Projects. https://www.ferc.gov/resources/guides/hydropower/hydro-guide.pdf

ICF Consultation. “A *Summary of Existing Research on Low-Head Dam Removal Projects.*” American Association of State Highway and Transportation Officials, 2005.

"Infrastructure Report Card: Dams." 2017. Accessed February 1, 2019. https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/Dams-Final.pdf.

Jewell, Sally. "Obsolete Dams Are a Hazard to People and Wildlife. We're Working Together to Remove Them." U.S. Department of the Interior. July 05, 2017. Accessed February 09, 2019. https://www.doi.gov/blog/obsolete-dams-are-hazard-people-and-wildlife-were-working-together-remove-them.

Koler/Morrison. “Clackamas County Historic Resources Inventory 1989-1992: Bull Run Hydroelectric Plant.” SHPO NO. 1193, 1990.

Koler/Morrison, “Clackamas County Historic Resources Inventory 1989-1992: Bull Run Hydroelectric Plant.” SHPO NO. 1193, 1990.

Kramer & Company. “Oregon Inventory of Historic Properties Section 106 Documentation Form: Jackson County Parks/Gold Ray Hydroelectric Project”. December 2009.

Kramer & Company. “Oregon Inventory of Historic Properties Section 106: Level of Effect: NMFS (Jackson County Parks), Gold Ray Dam Removal Project.” 2010.

"Largest U.S. Reservoirs." National Performance of Dams Program. Accessed March 27, 2019. https://npdp.stanford.edu/node/63.

"Laws Governing Hydropower Licensing." Hydropower Reform Coalition. 2019. Accessed March 27, 2019. https://www.hydroreform.org/resources/laws.

Loomis, Brandon. "50 Years Later, Glen Canyon Dam Still Controversial." USA Today. October 14, 2013, accessed December 07, 2018. https://www.usatoday.com/story/news/nation/2013/10/14/glen-canyon-dam-50-years/2981273/.

Luff, Rebekah, Dorothy Byatt, and David Martin. “National Center for Research Methods Report: Review of the Typology of Research Methods within the Social Sciences.” National Center for Research Methods, 2015. http://eprints.ncrm.ac.uk/3721/1/research_methods_typology_2015.pdf

MacCully, Patrick. *Silenced Rivers: The Ecology and Politics of Large Dams*. London: Zed Books, 2001.

Mapes, Lynda. *Elwha: A River Reborn*. Seattle, WA: Mountaineers Books, 2013.

Mapes, Lynda V. "Elwha River Takes out Olympic Hot Springs Road - Yet Again." The Seattle Times. December 01, 2017. Accessed June 10, 2019. https://www.seattletimes.com/seattle-news/environment/elwha-river-takes-out-olympic-hot-springs-road-yet-again/.

McClain, Serena, Stephanie Lindloff, and Katherine Baer. “Dam Removal and Historic Preservation: Reconciling Dual Objectives.” Report. American Rivers, 2008.

McCormmach, Russell. *Power Lines: Giant Hydroelectric Power in the Pacific Northwest, an Era and a Career*. Eugene, Or.: Palimpsest Books, 2012.

“Memorandum of Agreement Among the Federal Energy Regulatory Commission, the Oregon State Historic Preservation Office, and the Advisory Council on Historic Preservation Regarding Managing Historic Properties That Will Be Affected By an Order Issuing to Portland General Electric.” Advisory Council on Historic Preservation. 2000, 2.

Molloy, Elizabeth. “Federal Energy Regulatory Commission and the Federal Power Act.” United States Office of General Counsel, 2015. https://www.fws.gov/northeast/ecologicalservices/pdf/hydro/Molloy_What_is_FERC_24_Feb_15.pdf

“National Environmental Policy.” 42 U.S. Code Chapter 55.

"National Inventory of Dams." National Inventory of Dams (NID) - Home. Accessed February 02, 2019. https://nidtest.sec.usace.army.mil/ords/f?p=105:113:11509753873265::NO:::.

National Park Service. HAER: Historic American Engineering Record.

"NPS Archaeology Program." National Parks Service. Accessed March 31, 2019. https://www.nps.gov/archeology/afori/whdo_discov3.htm.

“Oregon Parks & Recreation Department: Oregon Heritage: State Historic Preservation Office Example Mitigation for Adverse Effects.” Accessed March 31, 2019. https://www.oregon.gov/oprd/HCD/SHPO/Pages/preservation_106_examplemitigation.aspx.

“Oregon SHPO Documentation Standards.” Oregon State Historic Preservation Office, 2014. https://www.oregon.gov/oprd/HCD/SHPO/docs/oregonshpodocumentationstandards.pdf

Oregon SHPO Interview #1. "Interview with Oregon SHPO." Interview by author. May 3, 2019.

Oregon SHPO Interview #2. "Interview with Oregon SHPO." Interview by author. May 3, 2019.

Page, Max, and Marla R. Miller. *Bending the Future: Fifty Ideas for the next Fifty Years of Historic Preservation in the United States*. Amherst: University of Massachusetts Press, 2016.

United States Conference of Mayors. "With Heritage So Rich". 1966.

Pesanti, Dameon. "Condit Dam: Life after the Breach." The Columbian. October 23, 2016. Accessed May 11, 2019. https://www.columbian.com/news/2016/oct/23/condit-dam-life-five-years-after-breach-white-salmon-river/.

Pitzer, Paul C. *Grand Coulee: Harnessing a Dream*. Pullman, WA: Washington State Univ. Press, 1994.

Place and Power: Evolution of the Northwest's Energy System. Vimeo. March 30, 2016. Accessed May 4, 2019. https://vimeo.com/160916364.

Plaven, George, and Capital Press. "Contractor Chosen to Remove Klamath River Dams." Capitalpress.com. April 26, 2019. Accessed May 13, 2019. https://www.capitalpress.com/ag_sectors/water/contractor-chosen-to-remove-klamath-river-dams/article_c6b50e54-6788-11e9-8700-4f683247eaa1.html.

Plumer, Brad. "The Crisis at Oroville Dam, Explained." Vox.com. February 15, 2017. Accessed December 05, 2018. https://www.vox.com/science-and-health/2017/2/13/14598042/oroville-dam-flood-evacuation.

"Portland General Electric Company, Project No. 477-024: Order Granting Surrender Application, Adopting Proposed Terms, and Denying Application to Amend License." U.S. Federal Energy Regulatory Commission, 2004.

Powerhouse Caretaker Interview. "Interview with Bull Run Caretaker." Interview by author. April 29, 2019.

Powerhouse Re Gen LLC. "Interview with Powerhouse Re Gen LLC." interview by author. March 11, 2019.

"Preparing Agreement Documents: How to Write Determinations of No Adverse Effect, Memorandum of Agreement, and Programmatic Agreements Under 36 CFR Part 800." Report. Advisory Council on Historic Preservation, 1989.https://www.historycolorado.org/sites/default/files/media/document/2017/1538.pdf

"Protections of Historic Properties". U.S. 36 CFR.

"Reaching Agreement on Appropriate Treatment." ACHP. Accessed March 31, 2019. https://www.achp.gov/index.php/Section_106_Archaeology_Guidance/Questions and Answers/Reaching agreement on Appropriate Treatment.

Righter, Robert W. The Battle Over Hetch Hetchy: Americas Most Controversial Dam and The Birth of Modern Environmentalism. New York: Oxford University Press, 2006.

"Rivers and Harbors Act." 33 U.S. Code § 403.

Robinson, Erik. "Groups Oppose Condit Dam Destruction." Northwest Hydropower News. March 23, 2000. Accessed May 12, 2019. https://news.fwee.org/?p=2136.

Rome, Adam. *The Genius of Earth Day: How a 1970 Teach-in Unexpectedly Made the First Green Generation*. North Point Press, 2014.

Sadin, Paul and Dawn Vogel. "An Interpretive History of the Elwha River Valley and the Legacy of Hydropower on Washington's Olympic Peninsula." Historical Resource Associates, 2011.

"Section II: How to Apply the National Register Criteria for Evaluation, National Register of Historic Places Bulletin (NRB 15)." National Parks Service. Accessed March 31, 2019. https://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_2.htm.

Souers Kober, Amy. "Plan Released for Klamath River Dam Removal." American Rivers, July 02, 2018. https://www.americanrivers.org/2018/06/plan-released-for-klamath-river-dam-removal/

"Takelma Tribe." National Parks Service. 2015. Accessed June 10, 2019. https://www.nps.gov/orca/learn/historyculture/takelma-tribe.htm.

Task Committee of the Association of State Dam Safety Officials. “The Cost of Rehabilitating Our Nations Dams: A Methodology, Estimate & Proposed Funding Mechanisms.” December 2002. https://damsafety.s3.amazonaws.com/s3fs-public/Cost%20of%20Rehab%20Report-2016%20Update_1.pdf

Taylor, Joseph E. *Making Salmon: An Environmental History of the Northwest Fisheries Crisis*. Seattle: University of Washington Press, 2009.

The Associated Press. "Judge Halts Removal of Gold Ray Dam on Rogue River." Oregonlive.com. July 21, 2010. Accessed May 12, 2019. https://www.oregonlive.com/pacific-northwest-news/2010/07/judge_halts_removal_of_gold_ray_dam_on_rogue_river.html.

“The National Historic Preservation Program at 50: Priorities and Recommendations for the Future.” The Advisory Council on Historic Preservation, 2016. Accessed June 8, 2019, http://preservation50.org/wpcontent/uploads/2016/02/Preservation50FinalReport.pdf.

Thomas-Bates, Jessie. "Removing Dams Can Save Lives." American Rivers. June 28, 2017. Accessed February 07, 2019. https://www.americanrivers.org/2016/10/removing-dams-can-save-lives/.

Thomas-Blate, Jessie. "Dam Good Year for Dam Removal in 2017." American Rivers. February 13, 2018. Accessed May 06, 2019. https://www.americanrivers.org/2018/02/dam-removal-in-2017/.

“Undertaking.” 54 U.S. Code § 300320.

United States Society on Dams. “Guidelines for Dam Decommissioning Projects.” July 2015. https://www.ussdams.org/wp-content/uploads/2016/05/15Decommissioning.pdf

Viollet, Pierre-Louis. "From the Water Wheel to Turbines and Hydroelectricity. Technological Evolution and Revolutions." Comptes Rendus Mécanique345, no. 8 (2017): 570-80. doi:10.1016/j.crme.2017.05.016.

Waldman, John. "Blocked Migration: Fish Ladders On U.S. Dams Are Not Effective." Yale Environment 360. April 4, 2013. Accessed March 24, 2019. https://e360.yale.edu/features/blocked_migration_fish_ladders_on_us_dams_are_not_effective.

Wellinghoff, Jon. “Energy Regulatory Commission: FY 2014 Congressional Performance Budget Request.” Federal Energy Regulatory Commission, 2013. https://www.ferc.gov/about/strat-docs/fy14-budg.pdf

"West Coast Salmon & Steelhead Listings." NOAA Fisheries. September 06, 2012. Accessed March 29, 2019. https://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead_listings/salmon_and_steelhead_listings.html.

White, Richard. ""Are You an Environmentalist or Do You Work for a Living?": Work and Nature." In Uncommon Ground: Rethinking the Human Place in Nature, 171-86. New York: WW Norton &, 1996.

White, Richard. *The Organic Machine: The Remaking of the Columbia Rive*r. New York: Hill and Wang, 2001.

Winzenread, Stephen, Heloisa Young, Matt Haynes, and Kevin Okada. "The History of Dams." CA History. 1999. Accessed May 04, 2019. https://watershed.ucdavis.edu/shed/lund/dams/Dam_History_Page/History.htm

Worster, Donald. *Rivers of Empire: Water, Aridity, and the Growth of the American West*. New York: Oxford, 2010.