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TO DAMN OR NOT DAMN A DAM: STAKEHOLDER COLLABORATION AS A TOOL FOR DAM MANAGEMENT*

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ABSTRACT

Dams have played an integral role in the development and economic growth of the United States for centuries, and remain important fixtures in water and energy management. However, after standing for decades, aging dams across the country are deteriorating or creating harmful environmental impacts that have made them sources of contention in many river basins. Calls to remove certain dams have been growing and in recent years have particularly intensified with respect to some large federally owned or regulated hydroelectric dams. These larger dams are subject to ongoing environmental review under the National Environmental Policy Act. Nonfederally owned dams also are subject to review through the Federal Energy Regulatory Commission's relicensing process, and federally owned dams are reviewed by the agencies that own and manage their operations, such as the U.S. Army Corps of Engineers or Bureau of Reclamation. As dams age, these environmental reviews are generating increasing discord and litigation among dam operators, landowners, local communities, Native American Tribes, and environmental activists. Fortunately, as experience in other areas of natural resource management has shown, collaborative governance regimes that replace or supplement traditional agency decision-making can often reduce conflicts in large multi-stakeholder settings. Among other things, well-structured stakeholder collaboration schemes tend to incorporate more diverse perspectives and increase public acceptance of agency actions. Recognizing these potential

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advantages, this Article argues that federal agencies should reshape dam relicensing and reevaluation policies to incorporate more collaborative elements and outlines specific strategies for pursuing that goal.

INTRODUCTION

In 2017, California evacuated nearly 200,000 residents from downstream areas surrounding Oroville Dam on California's Feather

River.[1] Heavy rains from the previous months had filled the reservoir to the brim.[2] Winter storms also had damaged the dam's main spillway, preventing releases of water to reduce capacity.[3] These circumstances required dam operators to release water over the top of the dam into an earthen emergency spillway, increasing erosion on the hillside and threatening total failure of dam infrastructure.[4]

More than a decade prior to the Oroville Dam incident, the Federal Energy Regulatory Commission ("FERC") had relicensed the operation of Oroville Dam for hydroelectric power.[5] Despite fervent calls at that time from environmental groups to require reinforcements for the dam's earthen emergency spillway and other safety improvements, FERC relicensed the dam without obligating the California State Department of Water Resources to make any such changes.[6] Unfortunately, the hazards at Oroville were not an isolated incident. There have been numerous dam failures or near failures across the country in recent years.[7] Governments' general

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[1] Emauella Grinberg et al., *A Race Against the Weather to Avoid Disaster at California's Oroville Dam*, CNN (Feb. 14, 2017, 12:11 AM), https://www.cnn.com/2017/02/13/us/california-oroville-dam-spillway-failure/index.html [https://perma.cc/6J95-J2FC] ("Some people had just a few minutes to prepare to evacuate, in what one Oroville resident described as 'pure chaos.'").

[2] *Id.*

[3] Luisa Gattone, *Oroville Dam crisis, why 200,000 people near the US' tallest dam are in danger*, LIFEGATE (Feb. 15, 2017), https://www.lifegate.com/oroville-dam-crisis [https://perma.cc/3F2L-9B5T].

[4] *Id.* ("The latter isn't built with the same specifications as the main one, which is controlled by gates and made in concrete, leaving water to flow down the earthen hillside instead. Its use increases the risk of collapse because when the water starts to erode the ground, the dirt and water start to roll down the hill, leading to the potential creation of a 10-metre tall wall of water.").

[5] Kristine Phillips, *The Government was Warned that the Oroville Dam Emergency Spillway Was Unsafe. It Didn't Listen.*, WASHINGTON POST (Feb. 14, 2017), https://www.washingtonpost.com/news/post-nation/wp/2017/02/13/officials-were-warned-the-oroville-dam-emergency-spillway-wasnt-safe-they-didnt-listen/ [https://perma.cc/MJW3-SSBM].

[6] In its decision to relicense the dam, a federal official stated that "the emergency spillway meets FERC's engineering guidelines for an emergency spillway. . . the guidelines specify that during a rare flood event, it is acceptable for the emergency spillway to sustain significant damage." *Id.* (quoting John Onderdonk, a senior civil engineer for FERC).

[7] *See, e.g.*, Moriah Balingit et al., *Michigan dam disaster an example of what could happen in many other communities: Heavy rains influenced by climate change and aging dam infrastructure could spell disaster in many states*, WASHINGTON POST (May 23, 2020), https://www.washingtonpost.com/national/michigan-dam-disaster-infrastructure/2020/05/22/26bc380a-9c34-11ea-ac72-3841fcc9b35f_story.html [https://perma.cc/2GQU-VTS6]; Bill Chappell, *18 Dams Breached And Death Toll Rises In S.C. Flooding*, NAT'L PUB. RADIO (Oct. 6, 2015, 2:14 PM), https://www.npr.org/sections/thetwo-way/2015/10/06/446352304/s-c-flooding-18-dams-breached-and-death-toll-rises [https://perma.cc/S386-LHRB]; McKenzie Romero, *Broken dam in northeast Nevada flooding homes, farms and*

unwillingness to invest in repairing the nation's aging dam infrastructure has already resulted in millions of dollars in damages and even claimed the lives of some downstream residents.

As dams grow increasingly unsafe across the country, their harm to river ecosystems are also becoming more acutely clear. Many dams flood river valleys, altering the natural beauty of the surrounding landscape. One notable example of the potential aesthetic and environmental harm associated with dams involves the O'Shaughnessy Dam in northern California.[8] For decades, the O'Shaughnessy Dam and the entire Hetch Hetchy system have supplied nearly all of the City of San Francisco's municipal drinking water.[9] To do so, the O'Shaughnessy Dam floods the Hetch Hetchy Valley, whose beauty is said to have rivaled the neighboring Yosemite Valley before the former became a reservoir.[10] The flooding of the Hetch Hetchy Valley has been a source of controversy and conflict for nearly as long as the O'Shaughnessy dam has existed.[11] It is an infamous example of the environmental costs associated with dams and of the intensifying pressure to remove many of these structures from rivers across the western United States.[12]

In addition to creating environmental and aesthetic concerns, the presence of dams on western rivers in the United States has also resulted in the collapse of fish populations in regions such as the Pacific Northwest[13] and the Colorado River Basin.[14] In 2002 alone, over 70,000 fish washed ashore in northern California as a result of extensive damming

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railroads, KSL (Feb. 8, 2017, 10:38 PM), https://www.ksl.com/article/43126767/broken-dam-in-northeast-nevada-flooding-homes-farms-and-railroads [https://perma.cc/FF9W-YZQK].

[8] *See* Sarah E. Null & Jay R. Lund, *Reassembling Hetch Hetchy: Water Supply Without O'Shaughnessy Dam*, 42 J. AM. WATER RES. ASS'N 395, 398, 402 (2006).

[9] *Id.* at 395 ("The Hetch Hetchy System provides San Francisco with most of its water supply. O'Shaughnessy Dam is one component of this system, providing approximately 25 percent of water storage for the Hetch Hetchy System . . . .").

[10] Brian E. Gray, *Hetch Hetchy: To Drain or Not to Drain*, 57 HASTINGS L.J. 1261, 1263 (2005) ("John Muir said that there are so many cascades and waterfalls on the Tuolumne that they surpass any other river system in the whole Sierra Nevada mountain range in beauty and glory.").

[11] Null & Lund, *supra* note 8, at 395 ("Throughout the past century, the idea of removing O'Shaughnessy Dam to restore Hetch Hetchy Valley has never entirely gone away . . . ").

[12] As the most recent example to remove the O'Shaughnessy Dam, see Restore Hetch Hetchy v. City & Cty. of S.F., 236 Cal. Rptr. 3d 417, 420 (Cal. App. 5th 2018).

[13] David N. Allen, *The Klamath Hydroelectric Settlement Agreement: Federal Law, Local Compromise, and the Largest Dam Removal Project in History*, 16 HASTINGS W.-NW. J. ENV'T L. & POL'Y 427, 429 (2010).

[14] Joseph M. Feller, *Collaborative Management of Glen Canyon Dam: The Elevation of Social Engineering over Law*, 8 NEV. L.J. 896, 897–98 (2008) (describing the declining population of the humpback chub in the Colorado River due, in part, to Glen Canyon Dam).

on the Klamath River.[15] The Klamath River fish incident gained national attention,[16] ultimately resulting in commitments to remove several dams on the river.[17] Dams equipped with fish ladders in the same region have drawn criticism as well for their propensity to block the spawning paths of salmon from the Pacific Ocean to their historic inland spawning waters.[18] Meanwhile, allocated rivers, such as the San Joaquin and the Colorado, increasingly run dry before reaching their deltas, thereby preventing spawning salmon from moving upstream[19] and decimating downstream riparian habitats on those rivers as well.[20]

In recent decades, a combination of crumbling infrastructure and increased awareness of the harmful environmental effects of damming has spurred a growing movement to remove many dams across the United States.[21] Since the 1970s, over 1,200 U.S. dams have been removed due to safety concerns, or to improve river ecologies across the country.[22] Early

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[15] Allen, *supra* note 13, at 429–30 ("In 2002, the plight of the Klamath River salmon became national news when an estimated 79,000 adult chinook salmon died in the lower forty miles of the river.").

[16] *Id.* at 430.

[17] *Id.* ("For PacifiCorp, a private electric company whose license to operate four hydroelectric dams on the Klamath River would need to be renewed in two years, the national attention was bad timing.").

[18] For a discussion of how technologies that were supposed to mitigate dam effects on fish populations have failed, see J. Jed Brown et al., *Fish and Hydropower on the U.S. Atlantic Coast: Failed Fisheries Policies from Half-Way Technologies*, 6 CONSERVATION LETTERS 280, 280–83 (2013).

[19] *See* Nathan Matthews, *Rewatering the San Joaquin River: A Summary of the Friant Dam Litigation*, 34 ECOLOGY L.Q. 1109, 1110 (2007) ("The Friant litigation is only now drawing to a close. In fall 2006, eighteen years after the complaint was filed, the parties conditionally approved a settlement that will restore flows to the San Joaquin River. If Congress passes the settlement's enabling legislation, water could begin to flow through the main stem of the San Joaquin in 2009, and Chinook salmon could be reintroduced to the river by 2012.").

[20] Jim Robbins, *Restoring the Colorado: Bringing New Life to a Stressed River*, YALE ENV'T 360 (Feb. 14, 2019), https://e360.yale.edu/features/restoring-the-colorado-bringing-new-life-to-a-stressed-river [https://perma.cc/NBK4-Z53T] ("The pale green river flows smack into the Morelos Dam on the U.S.-Mexico border, and virtually all of it is immediately diverted into a large irrigation canal that waters a mosaic of hundreds of fields—alfalfa, asparagus, lettuce, and other vegetables, their vivid green color clashing against the sere desert. The slender thread of water that remains in the Colorado's channel continues to flow south but is soon swallowed up by a sea of sand, far short of its delta, which lies 100 miles farther on.").

[21] Molly Pohl, *Bringing Down our Dams: Trends in American Dam Removal Rationales*, 38 J. AM. WATER RES. ASS'N 1511, 1513 (2007).

[22] *See* J. Ryan Bellmore et al., *Status and Trends of Dam Removal Research in the United States*, U.S. GEOLOGICAL SURV.'S JOHN WESLEY POWELL CTR. ANALYSIS & SYNTHESIS 1, 1

dam removal efforts focused on those dams deemed the most economically unproductive, structurally unsound, and ecologically harmful.[23] A lack of continuing economic benefits from maintaining these dams limited the degree of controversy surrounding their removal.[24]

Even more recently, dam removal advocates have begun shifting their focus onto larger dams or dam systems whose removal is far more contested. Many of these larger dams still produce sizable benefits that must be weighed against their harms. Landowners, dam operators, and surrounding communities have resisted efforts to remove these larger dams because of their economic interests in these dams' continued operation.[25] For example, the Klamath River's dams assist with flood control and protect valuable irrigation and drinking water supplies.[26] On the other hand, these dams also threaten other important interests such as river

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(2016) ("Today, however, over 1200 dams have been removed, and the majority of these dams were removed within the last two decades. Dam removal is now considered as a viable option when the cost of keeping a dam in place exceeds the expense of its removal, particularly in locations where the possibilities for river restoration are high.") (footnotes omitted); *see also* Pohl, *supra* note 21, at 1513 ("Environmental rationales were cited most often as the motivation for removing a dam. . . [s]afety was also a leading rationale. . . .").

[23] The CRS report highlights two dam removal projects—the Elwha and Glines Canyon Dams—as examples of Dam Owners removing economically unproductive dams when facing high maintenance costs. Nic Lane, *Dam Removal: Issues, Considerations, and Controversies*, CONG. RES. SERV. 4 (2006) ("Dam owners often consider removal because of the costs associated with maintaining the projects. These costs include normal maintenance and upgrades to improve safety and meet regulatory requirements. Regulatory costs may include costs associated with mitigating environmental damage caused by the dam and could include altered dam configuration, operational changes, or habitat repair, to name a few common examples.").

[24] *Id.*

[25] *See* Brad Plumer, *Environmentalists and Dam Operators, at War for Years, Start Making Peace*, N.Y. TIMES (Oct. 13, 2020), https://www.nytimes.com/2020/10/13/climate/environmentalists-hydropower-dams.html [https://perma.cc/A4HG-H25B] ("[O]ver the past 50 years, conservation groups have rallied to block any large new dams from being built, while proposals to upgrade older hydropower facilities or construct new water-powered energy-storage projects have often been bogged down in lengthy regulatory disputes over environmental safeguards."). *See also* Matthews, *supra* note 19, at 110, for a discussion of the contentious battle over Friant Dam; Restore Hetch Hetchy, 236 Cal. Rptr. 3d 417, 420–21 (Cal. App. 5th 2018) for discussion over the fight over O'Shaughnessy Dam; Save the Colo. v. United States DOI, No. CV-19-08285-PCT-MTL, 2020 U.S. Dist. LEXIS 71635, *3 (D. Ariz. Apr. 23, 2020) for background on recent litigation over Glen Canyon Dam; N.W.F. v. Nat'l Marine Fisheries Serv., 184 F. Supp. 3d 861, 869 (D. Or. 2016) for background on the ongoing dispute of hydroelectric dams on the lower Snake River. All recent examples together show that larger, hydroelectric dams are harder to remove.

[26] *See* THE KLAMATH PROJECT, U.S. BUREAU OF LAND MGMT. 2, https://www.usbr.gov/mp/kbao/aboutus/multimedia/klamath-project/video-508caption-version.pdf [https://perma.cc/GV4W-C6BL] (last updated Sept. 29, 2020).

ecology and native water and fishing rights, and thus, inherently involve broader groups of diverse stakeholders.[27] Unfortunately, the current relicensing and reevaluation processes for larger dams through FERC, the Army Corps of Engineers, and other government agencies do not adequately account for all the myriad interests and stakeholder concerns associated with maintaining or decommissioning dams. As a result, dissatisfied parties—often, environmental advocates—are increasingly opposing applications to relicense or update dams.[28]

Formalized stakeholder collaboration, which is not a new concept in water law and resource management,[29] could potentially mitigate some of the tension surrounding decisions about dam removal and relicensing. Formal stakeholder groups are an increasingly important tool in the management of rivers, river basins, and watersheds.[30] Stakeholder collaborations working with federal agencies are also common in the public land management context.[31] Recent collaborative efforts in the Klamath River Dam removal project have shown that stakeholder groups can promote greater citizen involvement and more equitable outcomes in connection with dam removals.[32] The reality is that many dams will be removed in

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[27] As an example, the stakeholder engagement report prepared by the State of Washington highlights differing views on maintaining dams on the Snake River. Note that the stakeholder engagement was not prepared by the U.S. Army Corps of Engineers, which operates the four dams on the lower Snake River. KRAMER CONSULTING ET AL., LOWER SNAKE RIVER DAMS STAKEHOLDER ENGAGEMENT REPORT 1 (Dec. 20, 2019) ("Salmon, orca, agriculture and energy are fundamental to Washington's past and future. They symbolize who we are as residents of the Pacific Northwest and define our communities and our economy. The lower Snake River dams touch all these issues since their construction over 40 years ago. They represent positive gains to the economy and local communities in southeast Washington as well as losses to tribal and fishing communities. The future of the LSRD is inextricably linked to the future of southeast Washington, Washington state and the Pacific Northwest.").

[28] *See supra* note 25 and accompanying text.

[29] *See generally* Lawrence Susskind et al., *Collaborative Planning and Adaptive Management in Glen Canyon: A Cautionary Tale*, 35 COLUM. J. ENV'T L. 1, 21–22 (2010); Christy McCann, *Dammed if You Do, Damned if You Don't: FERC's Tribal Consultation Requirement and the Hydropower Re-Licensing at Post Falls Dam*, 41 GONZ. L. REV. 411, 419–22 (2006).

[30] William D. Leach & Neil W. Pelkey, *Making Watershed Partnerships Work: A Review of the Empirical Literature*, 127 J. WATER RES. PLAN. MGMT. 378, 378–79 (2001).

[31] Antony S. Cheng, *Build It and They Will Come*? *Mandating Collaboration in Public Lands Planning and Management*, 46 NAT. RES. J. 841, 841 (2006) ("Public lands are also places in which Americans work out the ever-changing relationships with one another with respect to the natural world, from debates over the appropriate role of government regulation to whether private entities should be able to benefit from the use of public forests. At the turn of the twenty-first century, the participants in this grand social experiment are turning to collaboration as a primary way to work out these relationships.").

[32] *See* Allen, *supra* note 13, at 468 (In agreeing to remove the dams, "for the first time in

the next several decades.[33] Whether or not these dam decommissioning activities proceed efficiently and equitably will depend, in part, on whether a well-crafted governance structure is in place to impact that process. Formalizing stakeholder collaboration with FERC and the other primary agencies responsible for dam governance, before dam relicensing or reevaluation efforts begin, could do much to improve the decision-making process for all involved. When removing a dam is the wrong choice, such cooperation promotes more equitable and democratic management of water resources on contested rivers.

Part I of this Article briefly summarizes the history of dams in the United States and highlights the costs and benefits of dams and the current dam removal effort. Part II outlines the major overlapping interests in larger hydroelectric dams that are most commonly at issue in dam decommissioning plan proceedings. Part III suggests that formalized stakeholder collaborations would be more effective than the current dam relicensing processes at addressing and incorporating major interests in dam decommissioning and relicensing decisions.

I. THE NATION'S DAM PROBLEM AND WHY IT IS GETTING WORSE

Dams provide a host of benefits and are an integral part of the United States' infrastructure. But, with those benefits, there are significant societal and ecological impacts that call into question whether dams should remain fixtures in the broader landscape of natural resource management. However, current processes to reevaluate dams do not adequately address the complete picture of interests for and against keeping dams.

A. A Legacy of Dam Building

The economic and societal landscape of the United States would be unrecognizable[34] without the nation's thousands of dams that store

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the history of the Klamath Basin, environmentalists and farmers, ranchers and fishermen, tribes, states, and the federal government agree on the path ahead.").

[33] *See* Pohl, *supra* note 21, at 1518 ("While most dams continue to provide sufficient benefits to warrant retaining the structure, this study indicates that dam removal is becoming increasingly common."); Brian Chaffin & Hannah Gosnell, *Beyond Mandatory Fishways: Federal Hydropower Relicensing as a Window of Opportunity for Dam Removal and Adaptive Governance of Riverine Landscapes in the United States*, 10 WATER ALT. 819, 821 (2017) ("[M]any of the original FERC licenses have expired or will expire before 2030 and the next decade will see a growing number of relicensing processes taking place around the US.").

[34] Michelle Ho et al., *The Future Role of Dams in the United States of America*, 53 WATER RES. RSCH. 982, 983 (2017).

water, provide power, and prevent billions in flood damage each year.[35] The U.S. federal government has been involved in dam construction and management activities since shortly after the Revolutionary War. Following in the French tradition of civil engineering corps, the United States formed the Army Corps of Engineers ("USACE") in 1802 to build dams aimed at improving navigation on major river systems.[36] In 1826, Congress passed the River and Harbors Act, expanding the USACE's work in waterway engineering.[37] The Act authorized the construction of twenty projects from the Great Lakes to the Atlantic.[38] These early dam building projects in the eastern United States focused on improving flood control and navigation on major river systems for improved steamboat operation, a critical source of transportation and shipping in the early United States.[39]

As the United States pushed westward under the banner of manifest destiny in the late nineteenth century, the roles of dams evolved and expanded. Arid western states could not support rain-fed agriculture, so dams became critical for providing reliable irrigation and drinking water to many western communities. Recognizing the importance of dams for the western frontier, Congress enacted the Reclamation Act 1902, and thereby created the Bureau of Reclamation.[40] The Bureau ultimately became responsible for the construction of major dams like the Hoover Dam and Glen Canyon Dam.[41] The Bureau's dam projects, which provided more

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[35] *See id.* ("Around 20% of dams listed in the national inventory of dams are primarily used for flood control, reducing the risks of loss of life and property to millions with potential flood exposure. Estimates indicate that over $5 billion of flood damage has been circumvented to date by flood control dams and levees in both the Central Valley, California, and the Tennessee Valley, respectively, while investments in U.S. Army Corps of Engineers (USACE) flood control structures have an estimated sixfold return in terms of flood loss prevention.").

[36] *See* DAVID P. BILLINGTON ET AL., DEP'T OF THE INTERIOR, BUREAU OF LAND RECLAMATION, THE HISTORY OF LARGE FEDERAL DAMS: PLANNING, DESIGN, AND CONSTRUCTION, IN THE ERA OF BIG DAMS, at iii (2005) ("The history of federal involvement in dam construction goes back at least to the 1820s, when the U.S. Army Corps of Engineers built wing dams to improve navigation on the Ohio River.").

[37] *Id.* at 14–16.

[38] *Id.*

[39] *Id.* at 13 ("The Corps' water projects in the early nineteenth century focused primarily on navigation. With the economic climate of the nation improving after the War of 1812, the steamboat came of age. In the West, the steamboat was vital to commerce and travel. Only 17 steamboats operated on western rivers in 1817, but there were no less than 727 by 1855.").

[40] Ho et al., *supra* note 34, at 984 ("The passage of the Reclamation Act by Congress in 1902 led to the creation of the Bureau of Reclamation and the construction of major dams for irrigation and hydroelectric production in the West, such as the Hoover Dam and Glen Canyon Dam, each over 200 m tall.").

[41] *Id.*

dependable sources of power and water, increased urban development in the arid West.[42] Policymakers acting during this era, marked by what became known as the "hydraulic mission," viewed any water that reached the ocean as waste of a valuable commodity.[43] These policymakers viewed water as a "tamable"[44] commodity, which needed to be dammed, just as the rest of the western frontier was "tamed" by the expanding country and industrial economy.[45] While "taming" the West and western rivers with dams shaped much of the country into what it is today, many of those dams were sited without consideration of modern understandings of social equity and environmental stewardship.

1. Benefits of Dams

Dams can provide numerous benefits for surrounding landowners and for entire river basins. Accordingly, stakeholders in river basins often have a variety of diverse and competing interests in the management and continued operation of dams. These interests are divisible into two distinct categories: (1) land use interests; and (2) energy interests. Land use interests focus primarily on dams' unique ability to provide flood protection, recreational amenities, and steady water supplies. By contrast, energy interests center on dams' capacity to generate clean, reliable, and renewable hydroelectric power.

a. Land Use Interests

Dams across the United States support nearby land uses in countless ways, including through their provision of recreation areas, flood control and water storage.[46] Although it might seem easy at first glance

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[42] *Id.* ("[The Reclamation] Act was perhaps the most transformative legislation in the history of the western United States enabling urban, energy, and irrigated agricultural development.").

[43] *See* Ahmet Conker & Hussam Hussein, *Hydraulic Mission at Home, Hydraulic Mission Abroad? Examining Turkey's Regional 'Pax-Aquarum' and Its Limits*, 11 SUSTAINABILITY 228, 228 (2019).

[44] *See id.* (We have chosen to include outdated language to reflect outdated historical views of water management.)

[45] Jeremy Allouche, *The Multi-Level Governance of Water and State Building Processes: A* Longue Durée *Perspective*, *in* THE POLITICS OF WATER: A SURVEY 45, 60–61 (Kai Wegerich & Jeroen Warner eds., 2010).

[46] TIMOTHY J. RANDLE & JENNIFER BOUNTRY, DEP'T OF INTERIOR, BUREAU OF RECLAMATION, DAM REMOVAL ANALYSIS GUIDELINES FOR SEDIMENT, 6 (2017), https://acwi.gov/sos/pubs/dam_removal_analysis_guidelines_for_sos_final_vote_2017_12_22_508.pdf [https://perma

to discount the importance of the recreational benefits of dams, many large reservoirs have created communities that are heavily dependent on the tourism generated by water recreation.[47] For instance, a visitor survey conducted in the City of Page, Arizona, found that a majority of tourists who came to the city visited nearby Lake Powell—a reservoir situated above Glen Canyon Dam—and that tourism supported 2,874 full-time equivalent jobs.[48] The survey suggested that Page, which has a population of only 7,529 people, is extremely reliant on tourism revenue associated with water recreation connected to the dam.[49] Because many dams, and the reservoirs they create, have major economic impacts like those in Page, it is important to consider how a dam's removal might affect local tourism and how such losses might be minimized.[50]

Flood control is another unique benefit of dams. For instance, in Connecticut, alone, the USACE has spent $79.1 million to construct twelve dams that have prevented $1.6 billion of flood damages.[51] Not surprisingly, operators have removed very few dams that provide critical flood control benefits.[52] The alternatives to maintaining these dams generally involve the development of expensive new canal systems, floodwalls, or other substantial infrastructure projects.[53]

.cc/XE7J-K238] ("The current primary purposes for the U.S. dams in the NID include recreation (28 percent), flood control (18 percent), fire protection (12 percent), irrigation (9 percent), water supply (6 percent), and hydropower (2 percent).").

[47] Ivan Penn, *The $3 Billion Plan to Turn Hoover Dam into a Giant Battery*, N.Y. TIMES (July 24, 2018), https://www.nytimes.com/interactive/2018/07/24/business/energy-environment/hoover-dam-renewable-energy.html?mtrref=www.google.com&gwh=50C4EF3103E4A196C11B2083933D985D&gwt=pay&assetType=REGIWALL [https://perma.cc/MGE5-87CE] ("The town (Bullhead City) thrives on the summer tourism that draws some two million visitors to the area for recreation on the greenish-blue waters.").

[48] CHERYL COTHRAN ET AL., NORTHERN ARIZONA UNIVERSITY, PAGE TOURISM SURVEY 4 (2015) (discussing popular visitor activities and the economic impact of these tourism activities).

[49] *QuickFacts Page City, Arizona*, CENSUS BUREAU, https://www.census.gov/quickfacts/pagecityarizona [https://perma.cc/Z76F-VQCG] (last visited Oct. 14, 2021).

[50] RANDLE & BOUNTRY, *supra* note 46, at 11 ("In some cases, mitigation may be an important component of dam removal discussions involving social concerns. For example, perhaps a new greenway with bike paths, fishing access, and river raft launch sites can be included to replace lost lake recreational opportunities.").

[51] *Connecticut Flood Risk Management Projects*, U.S. ARMY CORPS OF ENG'S, https://www.nae.usace.army.mil/Missions/Civil-Works/Flood-Risk-Management/Connecticut/ [https://perma.cc/HL62-C976] (last visited Oct. 14, 2021).

[52] *Id.*

[53] Alcoforado FAG, *Flood Control and Its Management*, 1 J. ATMOSPHERIC & EARTH SCI. 1, 9–10 (2018).

Nearby communities also use water stored in reservoirs for applications that make many dams indispensable. Irrigation is a common use of water stored in dams.[54] For example, dams along the Colorado River alone provide 7,000 square miles of farmland with reliable irrigation water.[55] For this reason, dams can be particularly important for rural farmers.[56] Some dam removal inquiries have concluded that removal is not an option solely because there was no realistic way to reliably supply water to farmers without the dams.[57] Fire protection is another common purpose for stored reservoir water.[58] This use has become particularly important due to the increased intensity of wildfires.[59] Some reservoirs even help to supply steady drinking water supplies to communities, and when a dam is relied upon for that purpose, removing it can have particularly devastating consequences.[60]

b. Energy Interests

In addition to providing flood control, irrigation and recreational benefits, many dams are also valuable sources of clean, dispersible, renewable energy. Hydroelectric dams account for a significant proportion of the electricity mix in many western states.[61] The Hoover Dam alone produces roughly four billion kilowatt-hours of energy per year, supplying more than 1.3 million people with power in Arizona, California, and Nevada.[62] The Glen Canyon Dam, also located on the Colorado River, has

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[54] *Id.*

[55] Felicia Fonseca, *Environmentalists Push for Removing Dam Along Colorado River*, ASSOCIATED PRESS (Oct. 2, 2019), https://apnews.com/e4dc62aed0bb4598868649887c8d5657 [https://perma.cc/P4TQ-6RRD].

[56] Presidential Memorandum on Promoting the Reliable Supply and Delivery of Water in the West, 2018 DAILY COMP. PRES. DOC. 714 (Oct. 19, 2018).

[57] Associated Press, *Federal Regulators Throw Wrench into Klamath River Dam-Demolition Plan*, L.A. TIMES (July 17, 2020, 4:39 AM), https://www.latimes.com/world-nation/story/2020-07-17/regulators-throws-wrench-klamath-river-dam-demolition-plan [https://perma.cc/ZY4B-JFHR].

[58] RANDLE & BOUNTRY, *supra* note 46, at 6.

[59] *See Wildfires: How Do They Affect Our Water Supplies?*, EPA (Aug. 13, 2019), https://www.epa.gov/sciencematters/wildfires-how-do-they-affect-our-water-supplies [https://perma.cc/6RTG-NTRJ].

[60] RANDLE & BOUNTRY, *supra* note 46, at 3.

[61] *See, e.g.*, *2019 Total System Electric Generation*, CAL. ENERGY COMM'N, https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2020-total-system-electric-generation/2019 [https://perma.cc/YQB2-FMWE] (last visited Oct. 14, 2021); *Electricity Mix in Oregon*, OR. DEP'T OF ENERGY, https://www.oregon.gov/energy/energy-oregon/pages/electricity-mix-in-oregon.aspx [https://perma.cc/UWP4-TH7Y] (last visited Oct. 14, 2021).

[62] *Hoover Dam*, *Frequently Asked Questions and Answers*, BUREAU OF RECLAMATION,

likewise historically served as an important source of base load and peaking power.[63] The growth of major urban centers in the Southwest, including Las Vegas and Phoenix, would not have been possible without the power generated by hydroelectric plants on the Colorado.[64]

Hydroelectric power is a clean and climate-friendly source of energy. Hydroelectric dams produce far fewer carbon dioxide emissions per unit of generated power than traditional coal and gas-fired power plants.[65] Hydropower is also fully dispersible, suffering from none of the intermittency problems that limit solar and wind energy sources.[66] Accordingly, it can be difficult and costly to replace a hydroelectric dam's energy supply.

2. Costs of Dams

Unfortunately, along with the numerous benefits that dams provide come a host of harmful social and environmental impacts on river basins. Stakeholders within river basins often cite these harmful impacts as justifications for calls to remove dams and restore rivers to natural flow conditions. This section discusses some of the adverse effects dams have had on Native Americans and ecosystems along U.S. rivers.

a. Effects on Tribal Nations

Throughout U.S. history, governments have often sited dams in locations that disproportionately burden disadvantaged groups, most notably Native American tribes. Dams disrupt the flow of rivers, often creating a new lake where one previously did not exist. Land areas flooded by reservoirs are also no longer available for development, potentially

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https://www.usbr.gov/lc/hooverdam/faqs/powerfaq.html#:~:text=Hoover%20Dam%20generates%2C%20on%20average,one%20of%20the%20country's%20largest [https://perma.cc/5SUT-ZU68] (last visited Oct. 14, 2021).

[63] THOMAS MICHAEL POWER ET AL., *The Impact of the Loss of Electric Generation at Glen Canyon Dam*, GLEN CANYON INST. ii–iv (2015).

[64] *See* BILLINGTON ET AL., *supra* note 36, at 386 ("Water and hydroelectricity were intimately woven with urban growth in general in the twentieth century.").

[65] Ilissa B. Ocko & Steven P. Hamburg, *Climate Impacts of Hydropower: Enormous Differences among Facilities and over Time*, 53 ENV'T SCI. TECH. 14070, 14073 (2019) ("Overall, global median hydropower emissions are greater and thus worse for the climate than nuclear, solar, and wind but better for the climate than coal and natural gas.").

[66] *See* Todd Myers, *The Environmental Tradeoffs of Removing Snake River Dams*, 53 IDAHO L. REV. 209, 216 (2017) ("This may change in the future, but there are limitations to the amount of intermittent energy, like wind power, the grid can accommodate.").

harming nearby landowners.[67] Generally, Native American tribes often experienced disproportionate adverse impacts from flooding above a dam.[68]

For example, the Fort Berthold Reservation had a significant portion of its valuable, irrigable land drowned in water backed up by the Garrison Dam—a dam built by the USACE in 1953.[69] The loss of that land not only stripped the tribe of a source of food and economic development;[70] ironically, it also caused the tribe to lose some of its water resources due to the prevailing standard for calculating tribal water rights. Under the *Winters* Doctrine[71] and the Practicably Irrigable Acreage ("PIA") standard, tribes are allocated water resources based upon available irrigable land.[72] When land flooded under the Garrison Dam, that land no longer factored in the PIA calculation.[73]

Dams can also interfere with tribal fishing rights. Often treaties with tribes allow them to retain traditional uses of rivers, including fishing.[74] A conflict over fishing rights and the use of riverways was central in the landmark case *United States v. Winans*.[75] The *Winans* Court acknowledged that a treaty with a Native American tribe was a grant of

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[67] *See* S. Rep. No. 102-250, at 3 (1992) (arguing that the government provide just compensation to replace the lost economic base for the Fort Berthold Tribe after the Garrison Dam flooded their arable land.).

[68] *See* MICHAEL LAWSON, DAMMED INDIANS: THE PICK-SLOAN PLAN AND THE MISSOURI RIVER SIOUX, 1944–1980, at 27 (1994) ("As a result the Pick-Sloan Plan disrupted the lands of several native groups. Whether or not the Corps of Engineers and Bureau of Reclamation deliberately chose Indian over non-Indian land for their project sites as some tribal leaders charged, their plans ultimately affected twenty-three different reservations.").

[69] Barbara A. Cosens, *The Measure of Indian Water Rights: The Arizona Homeland Standard, Gila River Adjudication*, 42 NAT. RES. J. 835, 861 (2002).

[70] *See* LAWSON, *supra* note 68, at 59 (discussing how the Fort Berthold Reservation lost over ninety percent of its best arable land under the waters behind Garrison Dam).

[71] The *Winters* doctrine is the legal doctrine that stands for when the federal government creates a reservation of land, such as a tribal reservation, there is an implied right to water to meet the needs of the reservation. *See* Winters v. United States, 207 U.S. 564, 575–77 (1908).

[72] The PIA standard is the quantification standard used to determine the amount of water reserved under the Winters Doctrine. *See* Arizona v. California, 373 U.S. 546, 600 (1963).

[73] Cosens, *supra* note 69, at 861.

[74] *See, e.g.*, Dana Johnson, *Native American Treaty Rights to Scarce Natural Resources*, 43 UCLA L. REV. 547, 548 (1995) ("During negotiations of the Stevens Treaties, representatives of the various signatory tribes adamantly refused to cede tribal lands to the United States until provisions guaranteeing the Tribes' continued right to take fish at traditional fishing locations were incorporated into the treaties.").

[75] For Native Americans in places like the Pacific Northwest, fishing is "not much less necessary . . . than the atmosphere they breathed." United States v. Winans, 198 U.S. 371, 381 (1905).

rights to the United States from the tribe.[76] As such, the tribe retained rights not expressly transferred to the United States, including rights of access to rivers for fishing and rights to certain amounts of river flow needed to maintain those practices.[77] Dams can potentially interfere with, or infringe upon, these rights by disrupting natural spawning cycles for many fish and reducing the flow in a river.[78]

Dams can also degrade or alter rivers in ways that interfere with Native Americans' religious interests. Tribes often view rivers as more than mere sources of water and food. Rivers can be integral parts of their religion and religious practices.[79] For instance, the Yurok Tribe views the Klamath River—or more accurately the salmon in the Klamath—as a sacred resource.[80] The Tribe recently asserted that the river had the same legal rights as a person to protect the river from pollution and misuse.[81] Damming a river sacred to a tribe could, potentially, be even more impactful than simply depriving them of fishing or water rights. However, courts generally have not favored arguments supporting religious protections for sacred sites located off tribal trust lands.[82] Therefore, a more formal stakeholder collaboration arrangement might better support such tribes' perspectives.

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[76] Richard Griffin & Claudia Antonacci, *Agua Caliente and the Argument for Aboriginal Rights to Groundwater*, 19 UNIV. DENV. WATER L. REV. 316, 320 (2016) ("While Winans was not a water rights case, it contains a principle of Indian law applicable to water rights, namely that treaties and other federal actions are not a grant of rights to the Indians, but rather a grant of rights from them.").

[77] *See* United States v. Adair, 723 F.2d 1394, 1413 (9th Cir. 1983) (the Ninth Circuit held the Klamath Tribe possessed title to certain lands, hunting, and fishing rights, through their treaty and "by the same reasoning, an aboriginal [or *Winans*] right to the water used by the Tribe as it flowed through its homeland.").

[78] *See* Brown et al., *supra* note 18, at 281.

[79] *See infra* notes 80–82 and accompanying text.

[80] Erin Gould, *Salmon as a sacred resource in the Klamath*, COLO. COLL., https://sites.coloradocollege.edu/indigenoustraditions/sacred-lands/salmon-as-a-sacred-resource-in-the-klamath-river/ [https://perma.cc/4HSU-EJ3B] (last visited Oct. 14, 2021).

[81] Lulu Garcia-Navarro, *Tribe Gives Personhood to Klamath River*, NPR (Sept. 29, 2019, 8:02 AM), https://www.npr.org/2019/09/29/765480451/tribe-gives-personhood-to-klamath-river#:~:text=A%20Native%20American%20tribe%20has,status%20on%20the%20Klamath%20River [https://perma.cc/C8FJ-9JBS].

[82] The Navajo Nation tried to prevent the use of artificial snow made from recycled wastewater on a ski resort in the San Francisco Mountains in northern Arizona. The peaks are sacred to the tribe but are not located within reservation land. The court denied their argument that use of wastewater on the mountain (which the Tribe likened to desecrating the Vatican) was a violation of their religious liberties. *See* Navajo Nation v. U. S. Forest Serv., 479 F.3d 1024, 1028–30, 1046 (9th Cir. 2007).

b. Ecological Impacts

In addition to threatening tribal interests, dams can likewise create broader ecological harm throughout entire river systems. By blocking the natural flow of a river, dams prevent fish from an upstream habitat that is critical to their spawning cycles.[83] As discussed, damming on the Klamath River caused one of the largest fish kills in U.S. history.[84] Extensive damming in the Columbia and Snake River systems has similarly decreased fish populations and threatened the survival of the Orca population off the coast of Washington.[85] In order to improve fish populations, environmentalists advocate for the removal of dams. Evidence suggests that fish populations rebound following a dam's removal,[86] which, in turn, encourages further dam removal on other rivers.[87] Dams also interfere with the natural temperature of rivers, potentially harming fish and plant life that require seasonal changes in temperature. Before the Bureau of Reclamation built the Glen Canyon Dam, the temperature of the Colorado River fluctuated significantly.[88] After the construction of the

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[83] John Waldman, *Blocked Migration: Fish Ladders on U.S. Dams Are Not Effective*, YALE ENV'T 360 (Apr. 4, 2013), https://e360.yale.edu/features/blocked_migration_fish_ladders_on_us_dams_are_not_effective [https://perma.cc/ZE3N-G6QK] ("For one species, American shad, less than 3 percent of the fish made it past all the dams in these rivers to their historical spawning reaches. Results for other anadromous species (those that spawn in freshwater and migrate to the ocean and back again) were nearly as bad.").

[84] *See supra* notes 13–16 and accompanying text.

[85] Michael C. Blumm & Doug DeRoy, *The Fight over Columbia Basin Salmon Spills and the Future of the Lower Snake River Dams*, 9 WASH. J. ENV'T. L. & POL'Y 1, 14 n.69 (2019) ("Belying claims of salmon abundance is the tragic condition of Southern Resident Killer Whales (Orcas), which are in danger of extinction due to a lack of food sources, principally chinook salmon from the Columbia River. Orcas, which feed near the mouth of the Columbia River in winter along their annual migration from southeast Alaska to Monterrey, California, do not distinguish between wild and hatchery salmon. But low salmon abundance in recent years has resulted in low reproductive success, and the population is now down to fewer than 80 individual whales. Many scientists have concluded that the best chance for recovery lies in removal of the LSR dams and a restoration of more natural migration conditions in the Snake River, historically the largest supplier of salmon in the Columbia Basin").

[86] *See, e.g.*, Bryan A. Burroughs et al., *The Effects of the Stronach Dam Removal on Fish in the Pine River, Manistee County, Michigan*, 139 TRANSACTIONS AM. FISHERIES SOC'Y 1595, 1596, 1610 (2010); Matthew J. Catalano, *Effects of Dam Removal on Fish Assemblage Structure and Spatial Distributions in the Baraboo River, Wisconsin*, 27 N. AM. J. FISHERIES MGMT. 519, 523 (2007); Emily H. Stanley & Martin W. Doyle, *Trading Off: The Ecological Effects of Dam Removal*, 1 FRONTIERS ECOLOGY & ENV'T 15, 20 (2003).

[87] *See* Blumm & DeRoy, *supra* note 85, at 14.

[88] Feller, *supra* note 14, at 902 ("Before the construction of the dam, the temperature of

dam, the water temperature has become colder and has less seasonal variability than pre-dam conditions.[89] This affected aquatic life that cannot withstand the thermal conditions of the continual cold water released from the dam.[90]

In addition to impacting fish ecology, many dams block the flow of sediments downstream that are needed to naturally maintain riparian and delta habitats.[91] Dams, like the Glen Canyon Dam on the Colorado River, obstruct the flow of sediment downstream.[92] While some tributaries below the dam still feed silt to the river, sediment load in the river is at a fraction of pre-dam levels.[93] Because of this loss of high silt levels in the river, sandbars located on the river in places like the Grand Canyon may periodically require repair to counteract erosive conditions.[94] Likewise, extensive damming and over-allocation along the Colorado River have largely been responsible for the demise of the Colorado River delta on the Gulf of California.[95]

Although dams provide numerous economic benefits across the United States, the environmental impacts and social inequities created by certain dams casts doubt on whether they were worth the initial investment. Some dams are increasingly viewed as more costly than

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the water in the Grand Canyon varied from near freezing in winter to around eighty degrees Fahrenheit in summer, with a year-round average of around fifty-seven degrees.").

[89] *Id.*

[90] *Id.* at 902–03.

[91] *See id.*; J.D. Carriquiry & A. Sanchez, *Sedimentation in the Colorado River Delta and Upper Gulf of California after Nearly a Century of Discharge Loss*, 158 MARINE GEOLOGY 125, 143 (1999) (discussing changes in delta sediment load and effects surrounding ecology, including endangered species).

[92] Feller, *supra* note 14, at 902 ("The drastic reduction in sand supply, along with the change in flow pattern, has changed the physical environment in the Grand Canyon. Beaches and sandbars in the canyon, if they are to be maintained, need to be periodically replenished with fresh sand to offset the constant loss of sand to erosion by wind and water. Before the construction of the dam, these beaches and sandbars were replenished by the deposit of sand from the river during periods of high flows in the spring and summer.").

[93] *Id.* at 901 ("Tributaries entering the river below Glen Canyon Dam, primarily the Paria River and the Little Colorado River, still provide some sediment to the Grand Canyon, but the total sand supply is only approximately 16% of the pre-dam supply.").

[94] *Id.* at 902.

[95] Robbins, *supra* note 20 ("The water that flowed in the once-lush delta has been replaced by sand, and the cottonwoods and willows have surrendered their turf to widespread invasive salt cedar and arrowweed. Without the river and its load of nutrients, marine productivity in the Gulf of California—where the Colorado River once ended—has fallen by up to 95 percent. But despite the dismal forecast for the future of water on the Colorado, some conservationists are hoping to return at least a portion of the delta to its former glory.").

beneficial, leading to a rise in dam removal projects and calls to restore river ecosystems.

B. An Imperfect Dam Reevaluating Process

The current process for relicensing and reevaluating hydroelectric dams is well intentioned, but often fails to generate adequate engagement with relevant stakeholders. One deficiency of the current dam decommissioning system in the U.S. is that there is no universal dam relicensing process. State law governs most of the nation's smaller dams, and the process required for relicensing those dams differs from state to state. This patchwork of laws can make it difficult to generalize the features of the various relicensing and decommissioning processes through which dams across the country are periodically reevaluated.

1. FERC

FERC under the authority the Federal Power Act ("FPA") regulates all nonfederal hydroelectric dams, which include most large dams.[96] FERC generally grants 30-year and 50-year licenses to dam operators.[97] Licensees must file a notice of intent to relicense their dam five or more years before the license expires.[98] An application for relicensing must be submitted at least two years before the current license expires.[99] FERC conducts an environmental impact survey to determine whether relicensing a dam will harm the environment.[100] FERC is required to include in the license any conditions prescribed by other agencies.[101] This particular requirement often means the incorporation of fish-ways to the dams.[102] While FERC solicits comments from the public, the interests that it is balancing are the environmental impact versus the power generated.[103] The other substantial interests of a dam are not considered.

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[96] Shannon Morrissey, *FERC and USACE: The Necessity of Coordination in Implementation of the Hydropower Regulatory Efficiency Act*, 48 U.C. DAVIS L. REV. 1581, 1589 (2015).
[97] Chaffin & Gosnell, *supra* note 33, at 824.
[98] *Application for New Licenses*, FED. ENERGY REGUL. COMM'N (Mar. 3, 2021), https://www.ferc.gov/industries-data/hydropower/licensing/applications-new-licenses-relicenses [https://perma.cc/EUZ8-9KQU].
[99] *Id.*
[100] Umpqua Valley Audubon Society v. F.E.R.C., 149 Fed. App'x 598, 600 (9th Cir. 2005).
[101] Allen, *supra* note 13, at 433.
[102] *See id.* at 431.
[103] *Hydropower Licensing—Get Involved A Guide for The Public*, FED. ENERGY REGUL. COMM'N 9–10, https://www.ferc.gov/sites/default/files/2020-05/hydro-guide.pdf [https://perma.cc/523W-ZTVX].

The FERC dam relicensing process is subject to review under the National Environmental Policy Act ("NEPA").[104] NEPA reviews only allow for public participation in a proposed action through a notice and comment period.[105] This type of public engagement is, therefore, reactionary to a proposed course of action that FERC has started considering. This does not allow for more proactive and prospective public engagement found in stakeholder collaboration, leading to increased litigation. FERC rarely considers dam removal as a first option based on cost and potential environmental impacts.[106] Not surprisingly, this process has only led to a few notable dam removals based on changing perspectives on dam management through the FERC relicensing.

Even if FERC does not recommend dam removal, the commission may impose requirements that make the operation of dams uneconomical. But the cost of removing a dam can cost millions of dollars. Because of the high cost of removing dams, operators will only consider it as a final alternative. As an example, PacifiCorp, an electric company operating in the Pacific Northwest, decommissioned the Condit Dam on the White Salmon River based on the economic productivity of the dam. While FERC granted PacifiCorp a new license, the commission required PacifiCorp to build new fish passages on the Condit as a condition for relicensing the dam's operation.[107] Ultimately it was the dam operators who made the decision to remove the dam, not the federal agency, even with the host of environmental issues with the Condit.[108]

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[104] *See Umpqua*, 149 Fed. App'x at 600 (holding that FERC was the appropriate agency to conduct NEPA review).

[105] NEPA requires that agencies solicit comments from the public, "[h]owever, the full potential for more actively identifying and engaging other federal, tribal, state, and local agencies, affected and interested parties, and the public at large in collaborative environmental analysis and federal decision-making [is] rarely realized." Fredette, *infra* note 166, at 140–41.

[106]
> We found FERC's dam removal policy—they actually have one—and we wrote a letter to them addressing the 18 different points that they needed to look at to determine whether they would even be going to investigate dam removal. Most of the time, FERC never even investigates dam removal. It ends up in the NEPA pile of alternatives which isn't considered further because they're not going to do that, or it's infeasible. But we kept at it. We kept at it when PacifiCorp wouldn't meet with us for over six years. We used every means that we could.

CA Water Law Symposium: *Removing the Dams on the Lower Klamath*, MAVEN'S NOTEBOOK (Apr. 22, 2020) [hereinafter MAVEN'S NOTEBOOK], https://mavensnotebook.com/2020/04/22/ca-water-law-symposium-removing-the-dams-on-the-lower-klamath-river/ [https://perma.cc/BHL8-J4KA] (quoting Michael Belchik, Senior Fisheries Biologist with the Yurok Tribe).

[107] *See* Lane, *supra* note 23, at 3.

[108] *See id.* at 4.

2. USACE and Other Federal Agencies

USACE, the Bureau of Reclamation, and other agencies manage the hydroelectric dams operated by the federal government under the authority of various environmental statutes.[109] Dams owned and maintained by federal agencies, like the USACE, also reevaluate dams under a NEPA review. The NEPA reviews of these types of dams do not occur based on an expiring license. Instead, the agencies undertake an environmental review and prepare an EIS to evaluate changing conditions in the river system.[110] These reviews address the continued, effective management of dams while mitigating environmental harms. Like with FERC, federal agencies will likely look to other alternatives rather than outright removal of the dam.[111] And, like with FERC, the NEPA reviews for other federal agencies are subject to the same challenges from dam removal advocates.[112]

Although more democratic approaches to environmental and natural resource management are beginning to gain traction in the United States, top-down approaches still dominate the nation's dam relicensing and evaluation structures. A top-down agency review process does not adequately include the perspectives of stakeholders, forcing opponents of dams to challenge decisions through litigation. First, the decision-making process to relicense or maintain a dam is through a central federal agency. These agencies are unlikely to have the capability of addressing the localized issues surrounding dams. Secondly, the current decision-making process relies on interested stakeholders to challenge it through litigation. This adversarial approach prolongs the decision-making process. With many dams facing potential removal in the next few decades, a new

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[109] The most recent environmental review completed by USACE and the Bureau of Reclamation involved the dams on the lower Snake River, U.S. ARMY CORPS OF ENG'RS NW. DIV. ET AL., COLUMBIA RIVER SYSTEM OPERATIONS ENVIRONMENTAL IMPACT STATEMENT RECORD OF DECISION 1 (2020) [hereinafter U.S. ARMY CORPS OF ENG'RS] ("The CRSO EIS evaluated the long-term coordinated operation and management of the CRS projects for the multiple authorized project purposes. An underlying need is to review and update the management of the CRS, including evaluating measures to avoid, offset, or minimize impacts to resources affected by managing the CRS in the context of new information and changed conditions in the Columbia River Basin subsequent to the 1995 System Operation Review EIS, with the RODs in 1997.").

[110] *Id.* at 4.

[111] For example, despite the controversy surrounding the dams on the lower Snake River, the agencies continued their operation. *See id.*

[112] The EIS performed by the agencies and published this year was ordered due to continued litigation about the effects of dams on the Snake and Columbia River. *See* N.W.F. v. Nat'l Marine Fisheries Serv., 184 F. Supp. 3d 861, 871 (D. Or. 2016).

approach is necessary to better address changing perspectives and limit costly litigation.

II. THE INCORPORATION OF MORE DIVERSE PERSPECTIVES IN OTHER RESOURCE MANAGEMENT SETTINGS

As discussed above, dam management and decision processes regarding dam removal are complicated endeavors incorporating numerous stakeholders—a complex resource governance challenge that is not unique to dams. Water law and natural resource management are replete with controversies involving diverse stakeholders competing for a single natural resource, and there is growing interest in using more collaborative and democratic governance structures to manage these situations.[113]

A. Moving Beyond Top-Down Agency Action

The last third of the 20th century saw the rise of more collaborative governance models in the United States as an alternative to unilateral agency action.[114] Over this period, top-down agency regulations increasingly gave way to more collaborative structures that better incorporate stakeholder participation.[115] In 1972, Congress enacted the Federal Advisory Committee Act ("FACA") to encourage and outline federal agency cooperation with private groups.[116] While agencies generally retain discretion not to use the formal FACA certification for their stakeholder groups, the legislation still recognized collaboration as a viable method of agency engagement with stakeholders. In 1998, Congress passed the Alternative Dispute Resolution Act, which has led to even more and earlier collaborations between federal agencies in connection with projects involving federal

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[113] RHETT B. LARSON, JUST ADD WATER: SOLVING THE WORLD'S PROBLEMS USING ITS MOST PRECIOUS RESOURCE 102 (2020).

[114] Lisa Blomgran Amsler, *Collaborative Governance: Emerging Practices and the Incomplete Legal Framework for Public and Stakeholder Voice*, 2009 J. DISP. RESOL. 269, 274 (2009).

[115] *Id.* at 272 ("Some have characterized the legal scholarship of the new governance as a new form of legal realism, one that looks pragmatically at law in context and in action; these legal scholars 'seek[] to reinvent governance from the "bottom up" by rejecting ancient administrative strategies of command and control and replacing them with a continuous dynamic process governed by the relevant stakeholders.'").

[116] *Id.* at 313 ("[FACA] is an instance of federal legal infrastructure that anticipates a collaborative network, namely the committee, but again ties it to a single agency as defined in the APA to preserve accountability. It also requires public records and the availability of public participation in committee meetings to ensure both transparency and accountability.").

natural resources.[117] The legislation encourages collaboration and provides agencies a tool to arrive at better decisions that benefit more stakeholders without giving ultimate decision-making authority to those stakeholders.[118]

Natural resource stakeholders generally receive more benefits when they participate in collaborative decision-making efforts than when resources are managed solely under more conventional top-down governance regimes.[119] Collaborative governance processes tend to more evenly distribute benefits and costs among those affected by resource management decisions.[120] While some stakeholders gain more than others, generally no individual is worse off for having participated.[121] Stakeholder collaborations improve agency action by democratizing the decision-making process and providing avenues for resource pooling.[122] By relying on the collective wisdom of the group of stakeholders, agencies are better able to incorporate moral and social considerations that might otherwise be overlooked in a top-down agency analysis.[123] Through increasing public involvement, stakeholder collaborations can help to overcome entrenched views and political inertia and thereby promote greater overall acceptance of decisions.[124]

Well-developed stakeholder collaborations can furnish agencies with much of the information typically obtained only through lengthy environmental reviews. As evidenced by the Four Forest Initiative ("4FRI")—which is discussed in detail below[125]—in certain contexts agencies such as the U.S. Forest Service do not have to perform traditional reviews usually

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[117] *Id.* at 308 ("The . . . ADRA can be viewed as legal infrastructure intended to enhance public participation through new collaborative processes . . . .").

[118] Karen Bradshaw, *Agency Engagement with Stakeholder Collaborations in Wildfire Policy and Beyond*, 51 ARIZ. ST. L.J. 437, 482 (2019) ("This observation should not be misunderstood as a call for Congress to relax agencies' decision-making authority over public land and resources. The non-delegation doctrine and related laws exist for numerous reasons, including to ensure that agencies manage resources in the public trust—for the collective benefit of all citizens.").

[119] Karen Bradshaw, *Stakeholder Collaboration as an Alternative to Cost-Benefit Analysis*, 2019 BYU L. REV. 655, 672 (2019).

[120] *Id.* ("The group voluntarily smooths the distributional effects of decisions by re-allocating the benefits and harms. For example, a wildlife advocacy organization may agree to compensate ranchers whose livestock are killed by wolves reintroduced to an area, even though the agency managing wolves has no legal obligation to compensate ranchers.").

[121] *See id.* (discussing Pareto superior outcomes to collaborative negotiations).

[122] *Id.*

[123] *See id.* at 680 ("Through the democratic process, the parties will negotiate until they reach a Pareto superior outcome, in which both parties are better off than the status quo.").

[124] *Id.* at 689.

[125] *See infra* Section II.D.

required by NEPA.[126] NEPA reviews are costly and take years, requiring federal agencies to look at alternatives to planned federal projects that have an adverse impact on the environment.[127] But with 4FRI, the stakeholders were given the ability to weigh alternatives outside a traditional review process, ultimately accelerating the process.[128]

Stakeholder groups can provide the ability to pool resources. The benefit of stakeholder collaborations is that the group can do more than any individual stakeholder.[129] This includes the actual sharing of financial resources in the context of larger projects. The stakeholder collaboration that formed out of the Klamath dam removal projects was able to distribute costs more evenly, making the prospect of tearing down dams more acceptable to dam operators.[130] In addition, other stakeholder collaborations have become a critical component of managing a variety of natural resources from public land management and general stream adjudications to water releases from dams on major river systems.

B. Lessons from Water Law

Water resource management is another area where stakeholders have implemented collaborations successfully. The Glen Canyon Adaptive

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[126] A forest service supervisor once stated about 4FRI:

> What's beautiful about this group, and what it offers us, is that we don't have to do traditional NEPA. That is the nice thing about a group and the social context around it. Ideally, we would just have one alternative and compare it to the no action and be good to go.

Bradshaw, *supra* note 118, at 472 ("The clear implication from the Supervisor's response was that 4FRI was the appropriate forum for public involvement—that if a group or individual cared about the outcome, the appropriate forum was the collaborative, not the NEPA process.").

[127] *See* National Environmental Policy Act, 42 U.S.C. 4321–4347.

[128] Bradshaw, *supra* note 118, at 472.

[129] Bradshaw, *supra* note 119, at 689 ("By pooling capacities, the group can jointly achieve more than any individual stakeholder could achieve alone.").

[130] *See* Allen, *supra* note 13, at 459 ("The KHSA funds dam removal from two sources: surcharges on PacifiCorp's customers in Oregon and California (customer contribution); and the sale of general obligation bonds in California (bonds). The customer contribution would raise $200 million by 2020 and would be applied first. California's sale of bonds would bridge the gap between the $200 million customer contribution and the actual cost of facilities removal, if these additional funds are necessary for removal, but shall not exceed $250 million. The total $450 million dollars represent the total state contribution ('state cost cap') and no party is responsible for costs beyond the state cost cap. The KHSA does not provide for additional funds if the project goes over budget. Indeed, PacifiCorp and the federal government are expressly shielded from any costs or liability for removal. Instead, costs over budget require the parties to meet and identify additional funding, also potentially delaying dam removal.").

Management Plan ("AMP") is an example of some of the successes and drawbacks of a federal advisory committee. General stream adjudications offer an example of collaborative groups in the context of complex natural resource litigation.

1. Glen Canyon Adaptive Management Plan

The AMP provides an example of collaboration through a federal advisory committee.[131] Glen Canyon Dam forms Lake Powell on the Colorado River in northern Arizona.[132] Due to concerns of downstream fish populations and stream flow, the Bureau of Reclamation adopted the AMP in the 1990s.[133] This plan required formal stakeholder involvement, through the Adaptive Management Work Group, in the operation of the dam to improve river flow and fish populations.[134] The AMP was a progressive step toward more collaborative management of natural resources.[135]

The AMP has produced new opportunities for developing improved river ecosystems following the implementation,[136] but critics have argued that this type of collaborative process is too slow moving for dam management, pointing to continued declines in fish populations downstream.[137] While there is evidence of some success at Glen Canyon, it has taken two decades to reach marginal results.[138] The slow process at Glen Canyon is not unique; it is a common problem with federal advisory committees and why many stakeholders choose to avoid FACA certification. While not

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[131] *Glen Canyon Dam Adaptive Management Program*, U.S. BUREAU RECLAMATION (July 19, 2021), https://www.usbr.gov/uc/progact/amp/index.html [https://perma.cc/3X54-6R5E].
[132] *Glen Canyon Unit*, U.S. BUREAU RECLAMATION (Aug. 19, 2021), https://www.usbr.gov/uc/rm/crsp/gc/ [https://perma.cc/YLS2-RB37].
[133] Lawrence Susskind et al., *Collaborative Planning and Adaptive Management in Glen Canyon: A Cautionary Tale*, 35 COLUMBIA J. ENV'T L. 1, 3 (2010).
[134] Feller, *supra* note 14, at 921, 930 (describing the goals of the AMP and the role of the Adaptive Management Working Group, the stakeholder group).
[135] *See* Sandra B. Zellmer & Lance Gunderson, *Why Resilience May Not Always Be a Good Thing: Lessons in Ecosystem Restoration from Glen Canyon and the Everglades*, 87 NEB. L. REV. 893, 898 (2009) ("It is the great uncertainty that accompanies complex restorations that led to an approach called adaptive management. Adaptive management strives to build capacity to anticipate environmental and social change and to inform decision-makers and stakeholders of alternative pathways and the potential consequences of choosing among those pathways.").
[136] Theodore S. Melis et al., *Surprise and Opportunity for Learning in Grand Canyon: The Glen Canyon Dam Adaptive Management Program*, 20 ECOLOGY & SOC'Y. 22, 22 (2015) ("However, the experimental results from the Glen Canyon Dam program actually represent scientific successes in terms of revealing new opportunities for developing better river management policies.").
[137] *See generally* Feller, *supra* note 14; Susskind et al., *supra* note 133.
[138] Melis et al., *supra* note 136.

perfect, the AMP has greatly increased stakeholder participation and has proven useful over the two decades it has helped operate Glen Canyon.[139] Stakeholder groups, working in collaboration with FERC and other government agencies, can learn from the Glen Canyon AMP while also avoiding some of the slow processes that can hinder federal advisory committees.

2. General Stream and Basin Adjudications

The length and complexity of general stream adjudications often requires collaborative effort amongst stakeholder-claimants in order to reach resolutions in decades-long judicial proceedings.[140] Entire river basins—some including thousands of landowners—are plunged into decades-long court battles to determine the priorities of individual water rights.[141] One of the most complex stream adjudications in the country is in the Snake River.[142] Due to the size and complexity of the adjudication, stakeholders in the river basin petitioned the court to form a steering committee.[143] Any stakeholder involved in the adjudication was eligible to join the committee.[144] The steering committee's purpose was to make recommendations to the Court and address issues proactively. By forming the steering committee, stakeholders were able to democratize decisions and resolve issues outside of litigation. This was essential in the smooth progression of these complicated proceedings.[145]

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[139] *See generally* Feller, *supra* note 14; Susskind et al., *supra* note 133.

[140] General stream adjudications are the most complex legal proceedings in the United States. *See* Joseph M. Feller, *The Adjudication that Ate Arizona Water Law*, 49 ARIZ. L. REV. 405, 406 (2007) ("The [Gila River] Adjudication is the largest and longest judicial proceeding in the history of Arizona, and is among the most complex judicial proceedings in the history of the United States.").

[141] *See* Ann Y. Vonde et al., *Understanding the Snake River Basin Adjudication*, 52 IDAHO L. REV. 53, 56 (2019) ("More than 158,600 water rights were decreed. United States Supreme Court Justice Antonin Scalia succinctly captured the enormity of this effort when he observed that the number of water rights decreed over 27-years 'works out to around one claim every 90 minutes—an astonishing pace by anyone's standard.'").

[142] *Id.* at 53 ("Initially envisioned as a 10-year process to catalog water rights at a cost of $27.3 million dollars, the SRBA instead evolved into a 27-year long general stream adjudication that addressed some of the most complex water issues in the State's history.").

[143] *Id.* at 65 ("In 1987, the State of Idaho, United States, and various private water right claimants requested that a steering committee be formed to make recommendations to the SRBA Court with regard to issues of common interest.").

[144] *Id.*

[145] *Id.* ("The steering committee was made up of a group of stakeholders who agreed to sit around a table to discuss issues as they arose in an attempt to deal with conflicts proactively. It provided a forum for consensus building and allowed many issues to be resolved through settlement discussions rather than through litigation.").

California's state government has similarly mandated stakeholder involvement in groundwater management to improve resource sustainability. In 2014, the California legislature passed the Sustainable Groundwater Management Act ("SGMA").[146] SGMA mandated that local agencies located in a groundwater basin develop sustainability plans in conjunction with interested stakeholders, including Native American tribes.[147] By mandating stakeholder engagement, California recognized that local communities understood the complexities of groundwater management in their areas better than a state-level agency.[148] The sustainability plans developed in conjunction with local agencies and stakeholders have greater public acceptance and avoid massive general basin adjudications.[149] While these examples highlight successes for collaboration in general, their structures are designed to achieve only specific limited results such as avoiding lengthy litigation. A more formalized structure without the same hurdles of FACA is more ideal for application in the dam removal context.

C. Lessons from the Klamath River

The successful dam removal projects along the Klamath River provide further support for incorporating more formal collaboration structures into U.S. dam management. To date, the Klamath dam removal project is the largest dam removal project in the history of the United States.[150] In 2002, 79,000 Chinook salmon died in the river,[151] and overall, their population in the river has decreased by ninety-eight percent.[152]

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[146] Cal. Water Code § 10720 (West 2021).

[147] *See id.* § 10723.4 (requiring GSAs to maintain a list of and communicate interested parties in a groundwater basin); *Guidance Document for the Sustainable Management of Groundwater: Engagement with Tribal Governments*, CAL. DEP'T WATER RES. 1, 2 (Jan. 2018), https://groundwaterexchange.org/wp-content/uploads/2020/02/Guidance_Document_Tribal_Governments.pdf [https://perma.cc/679L-5G6R] (clarifying that tribes are interested parties for the purpose of CAL. WATER CODE § 10723.4).

[148] *See* Alec D. Tyra, *When the Well Runs Dry*: *Groundwater Policy and Sustainability Post* Agua Caliente, 38 UCLA J. ENV'T. L & POL'Y 309, 318 (2020).

[149] *See* Eric Garner et al., *The Sustainable Groundwater Management Act and the Common Law of Groundwater Rights—Finding a Consistent Path Forward for Groundwater Allocation*, 38 UCLA J. ENV'T. L & POL'Y 163, 209 (2020) ("GSAs provide a different venue for negotiation than litigation, and they are in a unique position to bring together stakeholders to seek groundwater sustainability solutions outside of a litigation context. In its development of a GSP, the GSA must consider and document stakeholder input.").

[150] Gillian Flaccus, *Largest US Dam Removal Stirs Debate Over Coveted West Water*, ABC NEWS (Mar. 29, 2020), https://abcnews.go.com/Politics/wireStory/largest-us-dam-removal-stirs-debate-coveted-west-69861899 [https://perma.cc/WR7Y-XG8C].

[151] Allen, *supra* note 13, at 429.

[152] Flaccus, *supra* note 150.

This has brought greater attention to the environmental problems of the river and reinvigorated a dam removal effort that had been in the works for decades. The dams along the Klamath River are important to local tribes, farmers, ranchers, homeowners, and conservationists.[153] When a development project is this large, it is difficult to appropriately consider all of the relevant interests. If the group left out an interest, litigation could dismantle the project. This project circumnavigated this issue by creating a collaborative management organization, the Klamath River Renewal Corporation ("KRRC").[154]

The KRRC is a nonprofit dedicated to supporting all the communities of the river basin.[155] The KRRC was formed by the signing of the amended Klamath Hydroelectric Settlement Agreement ("KHSA").[156] Myriad groups and entities signed this agreement, including, "the States of California and Oregon, local governments, Tribal nations, dam owner PacifiCorp, irrigators, and several conservation and fishing groups."[157] Collaborative management enabled this large group with diverse interests to have their needs considered, and a balanced agreement to be reached.

Importantly, the KRRC focused more broadly on sound river management and did not adopt a formal position of being pro- or anti-dam. After hearing from all major interests, the KRRC was ultimately formed to remove four of the many dams on the Klamath River.[158] These dams are used exclusively for power generation.[159] They are not used for irrigation, and they do not include fish passageways.[160] In contrast, there are two upstream dams, which were considered for decommissioning, that the group agreed not to remove.[161] Those dams are used for irrigating 300 square miles of farmland and have fish passageways installed.[162] In short, the collaborative management group was able to examine the nuances of each dam and determine which were worth keeping and which should be removed.[163]

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[153] *Id.*
[154] *Our Story*, KLAMATH RIVER RENEWAL CORP., https://www.klamathrenewal.org/our-story/ [https://perma.cc/ELY4-V7FD] (last visited Oct. 14, 2021).
[155] *Id.*
[156] *Id.*
[157] *Id.*
[158] Flaccus, *supra* note 150.
[159] Associated Press, s*upra* note 57.
[160] *Id.*
[161] *Id.*
[162] *Id.*
[163] *The Project*, KLAMATH RIVER RENEWAL CORP., https://klamathrenewal.org/the-project/ [https://perma.cc/398Y-SVDW] (last visited Oct. 14, 2021).

Of course, the Klamath River stakeholder collaboration was not without structural problems. The initial model gave Congress ultimate authority over approval of the Klamath dam removal plan.[164] Once it became clear that this plan was indefinitely delayed, they pivoted to a plan that does not require congressional support.[165] Although the experience with the Klamath highlighted the flexibility and potential of collaboration, pairing a collaborative stakeholder group with a federal agency with final decision-making power would be more ideal in the dam context.

D. Lessons from Forest Management: The 4FRI Partnership

The "4FRI" partnership is an example of a more formal, ongoing stakeholder engagement with a federal agency that provides a promising model for future collaborations, including those related to dam management.[166] 4FRI is a collaboration between public and private stakeholders and the U.S. Forest Service that addresses the wildfire and forest management issues in four national forests.[167] Notably, 4FRI is not a certified advisory committee under FACA, underscoring how some stakeholder groups view FACA certification as a barrier to natural resource management.[168] While not a certified advisory committee, 4FRI's stakeholder group works closely with the U.S. Forest Service in addressing forest management.[169] After a series of devastating forest fires highlighted deficiencies in forest management strategies, multiple stakeholder groups coalesced into groups that ultimately became 4FRI.[170] 4FRI's goal today is to move forest management away from fire exclusion to more adaptive strategies such as controlled burns and mechanical thinning.[171]

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[164] *Klamath River Restoration and Dam Renewal*, CRS (Aug. 7, 2020), https://crsreports.congress.gov/product/pdf/IF/IF11616 [https://perma.cc/ZQ9B-C3WC].
[165] *Id.*
[166] *See* Annette Fredette, *4FRI and the NEPA Process*, 48 ARIZ. ST. L.J. 139, 139 (2016) ("The Four Forest Restoration Initiative (4FRI) is the largest collaborative, landscape-scale restoration initiative in the country, the largest initiative of its kind ever endeavored.").
[167] *What is the Four Forest Restoration Initiative?*, FOUR FOREST RESTORATION INITIATIVE, https://4fri.org/ [https://perma.cc/T5LD-MYV9] (last visited Oct. 14, 2021).
[168] Bradshaw, *supra* note 118, at 470.
[169] *4FRI Overview, History and Accomplishments*, FOUR FOREST RESTORATION INITIATIVE (Aug. 2019), https://4fri.org/wp-content/uploads/2019/08/4FRI_Overview_Aug2019_final.pdf [https://perma.cc/MB6J-F3UU].
[170] *See* Diane Vosick, *Democratizing Federal Forest Management Through Public Participation and Collaboration*, 48 ARIZ. ST. L.J. 93, 102 (2016).
[171] *What is the Four Forest Restoration Initiative?*, *supra* note 167.

Although 4FRI's stakeholder group formed out of a diverse and historically adversarial set of stakeholders in northern Arizona, it is not an exclusive group and members of the public are free to join at any time.[172] The Forest Service is not an official member of the stakeholder group.[173] However, the Forest Service has several full-time staff members dedicated to working with 4FRI on forest management.[174] The 4FRI stakeholder group created a memorandum of understanding with the Forest Service, formalizing the collaborative process between the two groups.[175] The structure of the memorandum of understanding has aligned the collaboration and the agency's goals for forest management.[176]

The alignment of interests between 4FRI and the Forest Service has allowed stakeholders greater participation in the NEPA review process. Through the collaboration, the stakeholder group took responsibility for drafting an Environmental Impact Statement ("EIS") for the Forest Service.[177] As such, the stakeholder group was able to proactively address alternatives and reach consensus on planned forest management policies instead of participating in the notice and comment period.[178] At a public meeting, when groups outside of 4FRI raised objections to the plan, the Forest Service asked if the stakeholder group had considered the objections.[179] When the stakeholder group stated that they had

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[172] *See* Fredette, *supra* note 166, at 141 ("One of the reasons 4FRI is so unique, and so successful, is the unprecedented stakeholder involvement. 4FRI builds on many years of collaboration, research, and action since the mid-1990s. The 4FRI Stakeholder Group is made up of individuals and groups, including members of local, county, and state governments; environmental groups, organizations, and institutions; and industry representatives."); *see also Who Are We?*, FOUR FOREST RESTORATION INITIATIVE, https://4fri.org/about-us/ [https://perma.cc/U7FD-HLSK] (last visited Oct. 14, 2021).

[173] Bradshaw, *supra* note 118, at 470.

[174] *Id.* at 472 ("Five full-time Forest Service employees are devoted to 4FRI. The Forest Service provides 4FRI with an annual budget of approximately $33 million, comprised of several different funding sources . . . .").

[175] Key provisions of the MOU outline clearly what 4FRI shall do, what the Forest Service shall do, and what is mutually understood between the parties. *See* U.S. DEP'T OF AGRIC., FOREST SERV., FS AGREEMENT NO. 10-MU-11031600, MEMORANDUM OF UNDERSTANDING BETWEEN THE 4 FOREST RESTORATION INITIATIVE (4FRI) COLLABORATIVE STAKEHOLDER GROUP REPRESENTATIVES AND THE U.S. FOREST SERVICE (2011), https://4fri.org/wp-content/uploads/2018/04/MOU_with_signatures.pdf [https://perma.cc/B5RU-2DDH].

[176] *Id.*

[177] Fredette, *supra* note 166, at 139.

[178] *See id.* at 142 ("Parties working collaboratively on a NEPA analysis can surface and resolve differences as they arise, thus preventing conflict and building agreements between stakeholders. This was very evident during the objection process for the first 4FRI EIS.").

[179] *Id.* ("The Stakeholder Group's extensive engagement in the development of the EIS

considered the objections in drafting the EIS, the Forest Service concluded that it had been considered.[180] The Forest Service's approval of the stakeholder group's work showed that the agency now viewed 4FRI as the appropriate public forum for NEPA considerations.[181] In the end, the EIS was adopted and implemented without challenges through litigation, indicating broad public support for the plan.[182]

The best method to accommodate stakeholders in dam decommissioning is 4FRI's non-exclusive stakeholder partnership structure formalized through a memorandum of understanding with FERC or other agencies. Like the 4FRI stakeholder group, dams include a diverse number of stakeholders.[183] 4FRI has built stakeholder consensus between groups that have historically had divergent perspectives on forest management.[184] The stakeholder group has done this without excluding any group that may have otherwise wanted to join.[185] With 4FRI's help, the Forest Service has been able to adopt forest management strategies with less risk of public opposition and litigation.[186] Public and private stakeholders interested in the management and decommissioning of dams would do well to follow the Non-Exclusive Memorandum of Understanding ("NEMU") model exemplified by 4FRI.

III. ADDRESSING THE DAM REEVALUATION PROCESS PROBLEM

Given the increasingly complex nature of dam relicensing or removal decisions, federal agencies should introduce reforms that better integrate stakeholder collaboration schemes into the nation's dam decommissioning processes. Dams are a central aspect of the nation's current water infrastructure, but are also monuments to an era when a rapidly industrializing United States pushed aggressively forward into the western frontier.[187] While the dominant view of water management at that time

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and draft ROD was acknowledged and appreciated in this last phase of administrative review, and their involvement contributed to a successful objection resolution process. The collaborative process with engaged stakeholders helped to narrow the issues still of concern and made them easier to reach some level of agreement on.").

[180] Bradshaw, *supra* note 118, at 472.

[181] *See* Vosick, *supra* note 170, at 93.

[182] *Id.*

[183] *See* Bradshaw, *supra* note 118, at 495.

[184] *See* Vosick, *supra* note 170, at 102–03.

[185] *4FRI Stakeholder Group*, U.S. FOREST SERV., https://www.fs.usda.gov/detail/4fri/home/?cid=STELPRDB5292325 [https://perma.cc/HEP4-GZWG] (last visited Oct. 14, 2021).

[186] Vosick, *supra* note 170, at 101.

[187] *See generally* Allouche, *supra* note 45, at 61.

was to use it as any other commodity in an industrial economy, more modern views of water management require greater attention to broader social, aesthetic and even spiritual considerations.[188] As the views of water management evolve to include a more diverse set of stakeholder perspectives, so too must the method of hydroelectric dam relicensing and reevaluation.

The growing calls to remove dams have come to a tipping point. Proponents of dam removal are now targeting larger dams or dam systems like those on the Klamath, Snake, and Colorado Rivers.[189] These larger dams are economically important structures for many stakeholders in the river system.[190] As the dam removal movement targets larger dams, the number and diversity of stakeholders will naturally increase as well. This makes it more important than ever to find processes that better incorporate the range of diverse interests among adversarial groups.

A. Stakeholder Collaboration as an Alternative

FERC and other federal agencies could greatly improve the dam review process by mandating more formal stakeholder collaboration schemes like those highlighted above. This would specifically improve the process by increasing public participation of affected stakeholders and democratizing the decision-making process.[191] Collaborative input from stakeholders can be achieved in a variety of ways, whether through a formal FACA committee or more informal collaborative groups.[192] Agencies

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[188] LARSON, *supra* note 113, at 15–16, 26.

[189] *See, e.g.*, Kimberly Wear, *Historic Klamath Dam Removal Project Takes Another Step Forward*, N. COAST J. POL., PEOPLE & ART (Jun. 17, 2021, 12:27 PM), https://www.northcoastjournal.com/NewsBlog/archives/2021/06/17/historic-klamath-dam-removal-project-takes-another-step-forward [https://perma.cc/RP52-RNTP]; Jacques Leslie, *On the Northwest's Snake River, the Case for Dam Removal Grows*, YALE ENV'T 360 (Oct. 10, 2019), https://e360.yale.edu/features/on-the-northwests-snake-river-the-case-for-dam-removal-grows [https://perma.cc/X8BA-ZHYN]; Fonseca, *supra* note 55.

[190] *See, e.g.*, LARSON, *supra* note 113, at 148; Leslie, *supra* note 189.

[191] Using 4FRI as an example of the benefits of collaboration, the collaborative process has created more consensus and developed better solutions to forest management. *See* Fredette, *supra* note 166, at 143 ("But the results are clear, and are becoming clearer, as we implement different 4FRI projects—that the same things that are challenges: the scope, the scale, the extensive collaboration—have given us a better, richer process which incorporates a wider range of interests and values, and leads to better decisions and solutions for our natural resources and the communities that depend upon them.").

[192] *See* U.S. GOV'T ACCOUNTABILITY OFF., GAO-12-472, FEDERAL ADVISORY GROUPS: DOT AND DOE CAN TAKE STEPS TO BETTER ASSESS DUPLICATION RISK AND ENHANCE USEFULNESS (2012), https://www.gao.gov/assets/590/589748.pdf [https://perma.cc/7TAJ-HF96].

are already equipped with the institutional framework to allow collaborative input in other areas so making it policy for dam reevaluation is not difficult to establish.[193] The flexibility of stakeholder collaborations is ideal for governing the more localized issues associated with dams in particular river basins or systems, enabling federal agencies and stakeholder groups to tailor approaches for each dam. While agencies can engage with stakeholders in a variety of ways, formal advisory committees are particularly useful tools in reevaluating and managing dams.

1. Benefits of Formalized Collaboration Schemes

Stakeholder collaborations tend to function most effectively in the context of localized, highly contested decision-making processes. It is often difficult for distant federal agencies to simply weigh clear costs and benefits in these complex multi-stakeholder situations.[194] By contrast, interested local stakeholders are often well equipped to assist in the decision-making process in these contexts in ways that accurately account for the unique characteristics of each community.[195] Formal collaborations involving these stakeholders are able to provide more balanced approaches to decision making processes that a cost-benefit analysis cannot easily resolve.[196] These balanced decisions derived from collaboration are able to weigh and incorporate a diverse set of social, environmental, and economic factors to inform the agency in the decision-making process.[197]

A decision of whether to remove a dam is the type of localized, highly contested situation that is well suited for formal stakeholder collaboration in agency decision-making.[198] While dams are important on the national scale, localized river basins and communities are generally more burdened or benefited by a dam's presence.[199] The decision to remove the dam particularly affects the local landowners and downstream

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[193] *See, e.g.*, *id.*
[194] *See* Bradshaw, *supra* note 119, at 710.
[195] *Id.*
[196] *See id.* ("Collaborative analysis provides benefits relative to cost-benefit analysis. It is most appropriate in localized but high-stakes decisions that elude analytical exactness.").
[197] *See* M.E. KRAFT, *Influence of American NGOs On Environmental Decisions and Policies: Evolution Over Three Decades*, *in* THE ROLE OF ENVIRONMENTAL NGOS: RUSSIAN CHALLENGES, AMERICAN LESSONS: PROCEEDINGS OF A WORKSHOP 141, 155 (2001).
[198] *Id.*
[199] *See Public Participation Guide: Introduction to Public Participation*, EPA, https://www.epa.gov/international-cooperation/public-participation-guide-introduction-public-participation [https://perma.cc/G5WH-TNX8] (last visited Oct. 14, 2021).

communities that benefit from flood control, energy generation, and commerce from improved river navigation.[200] Furthermore, the decision to remove a dam is almost always critical, costing millions of dollars and dramatically changing the environmental landscape.[201] For these reasons, dams are an appropriate subject for collaboration with agencies.

Two likely benefits of more formal collaboration between agencies and stakeholders include improved implementation and greater public acceptance of environmental review. As discussed, dam removal is rarely a considered alternative in the environmental review under NEPA.[202] Stakeholder collaborations prospectively consider alternatives before a federal agency begins formal environmental review.[203] Agencies then can rely on the considerations and proposed alternatives of stakeholders without having to undergo the lengthy process of a traditional NEPA review.[204] One example of agencies relying on the considerations of a stakeholder group is the United States Forest Service's reliance on 4FRI to prospectively consider alternatives in wildfire management.[205] The same can be said for the steering committee in the Snake River general stream adjudication.[206] Similarly, stakeholders can address issues and alternatives prospectively for dam removal. Because agencies like FERC rarely consider removal as a serious alternative in the NEPA process under current dam reevaluations, if the stakeholder group arrives at that being the best decision, it can greatly improve and accelerate river restoration without the need to challenge agency action.[207] If a stakeholder group finds that dam removal is not the best option for a particular river system, the negotiations can improve the equitable management of the dam, as is the case in the operation of Glen Canyon and the Glen Canyon Adaptive Management Work Group.[208]

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[200] *See supra* Sections I.B.1–2.
[201] *See* Mallory Gruben, *Study: Snake River dam removal would cost $2.3B, jeopardize regional economies*, COLUMBIAN (Jan. 7, 2020), https://tdn.com/news/local/study-dam-removal-would-cost-2-3b-jeopardize-regional-economies/article_e8e76101-ca40-5b6b-bbc9-a9d358961222.html#:~:text=A%20new%20study%20commissioned%20by,fragile%20local%20and%20regional%20economies [https://perma.cc/7TNU-L8T6].
[202] MAVEN'S NOTEBOOK, *supra* note 106.
[203] Gruben, *supra* note 201.
[204] *See* Bradshaw, *supra* note 118, at 472.
[205] *Id.*
[206] *See* Vonde et al., *supra* note 141, and accompanying text.
[207] *See* Bradshaw, *supra* note 119, at 685 ("Agency officials believe that decisions they make through collaborative processes benefit from greater social acceptance.").
[208] *See* discussion *supra* Section II.B.1.

Another benefit of stakeholder collaboration in dam removal decision-making is the potential to pool resources to improve project completion.[209] Dam removals are an expensive operation, with dam operators generally unwilling to give up the economic benefits of dams in exchange for the costs of removing them.[210] Collaborative efforts in Washington and California on dam removal projects have allowed dam operators to work with stakeholders who would be willing to take on the cost of dam removal to gain the social and ecological benefits of having a restored ecosystem.[211] In Washington, the city of Snohomish made the decision to stop operating a dam due to the increased costs of upgrading the aging infrastructure.[212] Through collaboration, the Tulalip Tribe, having more expertise than the city, took the lead on the dam removal projects.[213] The town was able to gain the benefit of not leading the project while the tribe benefited from improved fish ecology.[214] Both parties benefited from an improved relationship fostered through collaboration.[215] Similarly, on the Klamath, collaboration was able to provide some funding to help remove the dam projects.[216] These two examples highlight the successes of collaboration in its ability to pool resources, both financial and through technical expertise.

Stakeholder collaborations like those just described often garner greater public acceptance than traditional agency action. Many communities and landowners often have invested interests in and are relying on a dam's continued existence.[217] These stakeholders can reach a balance between their interests through collaborative processes. On the Klamath, negotiations allowed for upstream dams to remain while the group agreed to remove dams downstream.[218] Landowners continue to benefit from the

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[209] Bradshaw, *supra* note 119, at 672.
[210] *A dam good example of collaboration on california water issues*, GRIST (Feb. 22, 2021), https://grist.org/article/a-klamath-dam-good-example-of-collaboration-on-california-water-issues/ [https://perma.cc/YN9V-RLLM].
[211] *Id.*
[212] Lynda V. Mapes, *Another Washington dam removal—and 37 more miles of salmon habitat restored*, SEATTLE TIMES (Aug. 5, 2020, 9:18 AM), https://www.seattletimes.com/seattle-news/environment/another-washington-dam-removal-and-37-more-miles-of-salmon-habitat-restored/#:~:text=The%20%242%20million%20dam%20removal,teardown%20project%20in%20two%20months [https://perma.cc/VV36-H7SQ].
[213] *Id.*
[214] *Id.*
[215] *Id.*
[216] Allen, *supra* note 13, at 459.
[217] *See* KRAMER CONSULTING ET AL., LOWER SNAKE RIVER DAMS STAKEHOLDER ENGAGEMENT REPORT 2 (Dec. 20, 2019) (highlighting how the economic benefits are critical to many stakeholders).
[218] Jes Burns, *Plan revived for dam removal on Klamath River in Oregon, California*, OPB

flood control and irrigation of the upstream dams while tribes are hopeful that the removal of the downstream dam stream dams will improve fish populations and the river ecosystem.[219] By bringing this set of opposed stakeholders together, the collaboration on the Klamath was able to produce results that were more readily acceptable to them both.[220] By establishing stakeholder collaboration as policy in dam reevaluation projects, federal agencies and stakeholders can share in the benefits described above in future dam removal projects and reevaluation discussions.

In summary, while every dam decommissioning decision is unique, the examples of successful collaborations discussed above provide a useful starting point for structuring groups in the context of dam removals. Formal stakeholder collaborations can improve the environmental review process by helping to evaluate alternatives and by ultimately increasing social acceptance of the decision process. Stakeholder collaborations can also improve the removal process by creating resource pooling for removal projects.

2. A New Stakeholder Collaboration Structure for Dams—The NEMU Model

The process of developing an optimal dam stakeholder collaboration scheme bears some similarity to the search for a perfect bowl of porridge in the *Goldilocks and the Three Bears* fairytale. An ideal formalized collaboration structure for dam relicensing is capable of appropriately addressing adaptive management issues associated with a dam, but avoids the additional institutional hurdles that currently plague the FACA process. As seen by the Glen Canyon Adaptive Management Work Group, FACA certified committees create hurdles to implementation that ultimately freeze public participation.[221] FACA does provide a formalized

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(Nov. 17, 2020, 7:26 PM), https://www.opb.org/article/2020/11/17/klamath-river-dam-removal-oregon-california/ [https://perma.cc/CWA3-7RV6] (discussing dam removals scheduled for 2023).

[219] Cassandra Love, *Case Study: Klamath Basin*, NAT'L GEOGRAPHIC SOC'Y (Jan. 22, 2014), https://www.nationalgeographic.org/article/case-study-klamath-basin/ [https://perma.cc/HD9X-QH3C].

[220] Allen, *supra* note 13, at 468 (noting that stakeholders in the basin have historically not been able to come to agreement on the proper management of their shared natural resources).

[221] Melinda Harm Benson, *Integrating Adaptive Management and Oil and Gas Development: Existing Obstacles and Opportunities for Reform*, 39 ENV'T. L. REP. NEWS & ANALYSIS 10962, 10970 (2009).

structure intended to increase public awareness and participation in agency decision-making processes.[222] However, FACA is inflexible, and the certification process can take years.[223] In addition, the statutory language in FACA has created ambiguities in its interpretation, specifically when and how it should apply.[224] This ambiguity has created litigation that further slows the collaborative process. Increasing the risk of litigation is the opposite of what collaborations are trying to achieve in the dam and natural resource management context.[225] In this sense, FACA is the porridge that is too hot for Goldilocks by being overly formalized.

Without a formal structure, collaborative groups run the risk of being too limited in scope to effectively address adaptive management issues like dam river restoration or major projects like dam removals. Collaborative groups that are more limited in scope, like those associated with general stream adjudications, are effective at limiting the risk for potential litigation.[226] However, these groups are too narrow in scope to address adaptive management strategies that prospectively address natural resource management. When less formal collaborations, like the Klamath partnership, do address natural resource management issues, there can be a problem with implementation of the proposed plan.[227] The Klamath Partnerships goals and interests at times were misaligned with federal agencies, creating delays.[228] In this sense, the "Goldilocks' porridge" provides less formal collaboration.

The NEMU model, following the 4FRI example, has the potential to be a "just right" collaboration for many dam decommissioning decisions. As discussed above, NEMU collaborations like 4FRI are non-exclusive, allowing membership to all interested in being a part of the stakeholder group. It is also not the exclusive method of public participation with the federal agencies.[229] While the Forest Service relies on 4FRI to address forest management strategies proactively and prospectively,

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[222] Sheila Lynch, *The Federal Advisory Committee Act: An Obstacle to Ecosystem Management by Federal Agencies*, 71 WASH. L. REV. 431, 439–40 (1996).
[223] *Id.*
[224] See *id.* for a discussion of how various courts have interpreted provisions of FACA.
[225] Alexander Conley & Margaret A. Moote, *Evaluating Collaborative Natural Resource Management*, 16 SOC'Y & NAT. RES. 371, 374 (2003).
[226] *See supra* Section II.B.2.
[227] *See supra* Section II.C.
[228] *See* Gillian Flaccus, *Federal agency throws curveball at Klamath dams demolition plan*, OPB (July 16, 2020, 7:00 PM), https://www.opb.org/news/article/federal-agency-curveball-klamath-river-dams-removal/ [https://perma.cc/U3A7-KTGH].
[229] *See supra* Section II.D.

stakeholders who are not a part of the group are still free to engage with the agency.[230] The 4FRI group may be a favored source of public participation—and take a more active role in the NEPA review process—but other, nonmember stakeholders can and do participate with the Forest Service.[231] In this way the NEMU model fosters more diverse perspectives without one stakeholder interest dominating the group. Nor does the NEMU model dictate results; the federal agency still makes the final decision on adopting strategies.[232] In other words, this "porridge" provides just the right amount of formalization.

In similar ways, collaborations following the NEMU model could take a more proactive approach in addressing dam reviews outside of the normal opportunities afforded to the public to address dam decommissioning questions during relicensing or review periods.[233] This would allow stakeholders direct input into drafting environmental reviews and opportunities to address all alternatives available. FERC and other federal agencies would still be responsible for the final decision but could rely on the stakeholder collaboration more so than other stakeholders.[234] This would build greater public acceptance, increase resource pooling, and avoid litigation in the same way 4FRI has achieved those results with the U.S. Forest Service.

One other advantage of collaborations under the NEMU model is that federal agencies retain authority to implement such structures without additional legislation or agency action. The only real obstacle left for implementation is the same as that for any collaboration: persuading a diverse group of stakeholders to agree to work together rather than against

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[230] *4FRI Stakeholder Group*, USDA FOREST SERV., https://www.fs.usda.gov/detail/4fri/home/?cid=STELPRDB5292325 [https://perma.cc/RN27-EC55] (last visited Oct. 14, 2021).

[231] Vosick, *supra* note 170, at 108 (discussing non-4FRI stakeholders engaging in the objection phase of environmental review process).

[232] *Id.* at 107.

[233] *Id.* ("[T]he Forest Service consistently reminded the 4FRI Stakeholder Group that federal law requires that final decision-making authority belonged to the Forest Service. What the Forest Service did yield in terms of authority to the Stakeholder Group was more opportunity to engage in the preparation of the document to create a cooperative and collaborative dialogue as opposed to a reactive, one-way discussion. In the end there was general agreement that this contributed to a better document with wider acceptance.").

[234] *See id.* ("It is logical to assume that the Forest Service would give more weight to a consensus recommendation from a stakeholder group representing more than thirty groups and hours of collaboration; however, collaboration does not remove or diminish the public involvement requirements by the Forest Service in order to comply with NEPA."); Bradshaw, *supra* note 118, at 472.

each other. While it is difficult to bring all interested parties to the table, collaborations do work when implemented in a way that is inclusive and addresses issues of significant importance.[235]

B. Stakeholder Collaboration on Future Projects

Multiple large river systems in the United States with persistent and growing dam relicensing controversies could benefit from the NEMU model of collaborative management. Two such river systems are the Snake River Basin and the Colorado River system.

1. Snake River Basin

The nation's next major dam removal project is likely to focus on dams in the Pacific Northwest's Snake River Basin. The Snake River Basin's characteristics mirror those of the Klamath River in many ways. The death of 70,000 fish led to the Klamath dam removal projects, and now widespread orca deaths have stirred conversations about the Snake River dam removal.[236] In 2018, an orca was filmed carrying her stillborn calf for days.[237] From 2007 to 2014, two-thirds of West Coast orca pregnancies failed and no orca calf from this time period have survived more than three years.[238] A major cause of this tragedy is the near starvation diet that orcas in this region live on due to the decimation of the Chinook salmon population.[239] The dams on the Snake River Basin have been under heavy scrutiny for years because of their contribution to low Chinook salmon populations.[240] Recently the USACE decided not to remove any of the dams after finishing an EIS in 2020.[241] The USACE's environmental

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[235] *See* Bradshaw, *supra* note 119, at 712 ("[R]isks with disproportionately concentrated effects and only local or regional benefits lend themselves to a more directed inquiry into the welfare of those most affected by positive or negative policy outcomes.").
[236] Leslie, *supra* note 189.
[237] James Rainey, *A Baby Orca's Death, a Mother's Grief and a State's Call to Action*, NBC NEWS (Oct. 14, 2018, 5:31 AM), https://www.nbcnews.com/news/us-news/baby-orca-s-death-mother-s-grief-state-s-call-n917186 [https://perma.cc/52ZF-CTG9]; *see* Lynda V. Mapes, *A Mother Orca's Dead Calf and the Grief Felt Around the World*, THE SEATTLE TIMES (May 13, 2019, 9:19 AM), https://www.seattletimes.com/seattle-news/environment/a-mother-orcas-dead-calf-and-the-grief-felt-around-the-world/ [https://perma.cc/4H8W-W3KV].
[238] Rainey, *supra* note 237.
[239] *Id.*
[240] Nicholas Gerainios, *US: Snake River dams will not be removed to save salmon*, ABC NEWS (July 31, 2020, 3:57 PM), https://abcnews.go.com/US/wireStory/us-snake-river-dams-removed-save-salmon-72109331 [https://perma.cc/67LX-QXKT].
[241] *Id.*

review favored other environmental mitigation measures to balance fish ecology with the benefits that the dams produce.[242]

The economic benefits of the Snake River dam system are significant enough to justify maintaining some dams. As late as 2012, dams on the Snake River generated 65 percent of the state's electric energy.[243] Since then, the dams have struggled to sell their energy as other energy sources have grown cheaper.[244] Today, hydroelectric power in the region has become so uncompetitive that the electrical utility, which holds the Snake River dams, now only needs six of its thirty-one dams to meet its contractual energy requirements.[245] The other major economic incentive for the dams, freight shipping on the river, has been reduced by 70 percent due to more competitive shipping options.[246] However, there are some farmers who still rely on the river for shipping.[247] Thus it makes sense that some of the dams would be maintained. It is also clear that the USACE can and should remove some of the dams. If the USACE were to remove the four dams in the Snake River, the Chinook salmon population would increase two or threefold.[248]

In its 2020 EIS, the USACE considered removing its four targeted Snake River dams as one of its many alternative courses of action.[249] The report's analysis concluded that choosing this alternative would produce major long-term benefits for the salmon population and distinctly superior benefits to the other alternatives.[250] However, the option of removing the four dams was passed over because it would not meet the USACE's power objective.[251] The power objective focuses on the need to provide adequate, efficient, economical, and reliable power to the Colorado River Power System.[252] The USACE chiefly based this determination on an analysis highlighting the potential decreases in power generation that

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[242] *See id.*
[243] Vonde et al., *supra* note 141, at 120.
[244] Leslie, *supra* note 189.
[245] *Id.*
[246] *Id.*
[247] Todd Myers, *The Environmental Tradeoffs of Removing Snake River Dams*, 53 IDAHO L. REV. 209, 212 (2017).
[248] Leslie, *supra* note 189.
[249] *See* U.S. ARMY CORPS OF ENG'RS, *supra* note 109 (discussing breaching four dams in multiple objective alternative three).
[250] *Id.* at 39 (indicating that multiple objective alternative three has the highest predicted smote-to-adults return, and a range of long-term benefits).
[251] *Id.* at 31 (the report also indicates that the alternative does not meet the integrated FCRPS, but the FCRPS is just the Federal Columbia River Power System and is not a specific objective).
[252] *Id.* at 29.

would result and the infeasibility of replacing those resources.[253] This is an unsound rationale, because the targeted dams were not needed to meet power generation obligations.[254] Producing uncompetitive surplus power should not have been a priority.

This EIS report is likely to result in more litigation. When the USACE released the EIS announcing this policy decision, many members of the public and local tribes expressed their distress at the decision not to remove the four dams.[255] U.S. Representative Mike Simpson, a Republican from Idaho, has even offered a proposed plan that includes breaching the four dams on the Snake.[256] This shows these types of natural resource management issues are not simply partisan issues, but rather involve unique local perspectives. Environmental groups are likely to challenge the USACE's findings and the ultimate decision of the EIS in a new round of litigation.[257] This is particularly disappointing because the 2020 EIS was conducted after a successful lawsuit asserting that the USACE did not adequately evaluate dam removal in its environmental review.[258] This type of protracted litigation is a particularly prominent shortcoming of the current management regime.

Collaborative management following the NEMU model could alleviate much of the political tension surrounding dams along the Snake River. There are strong and growing interests in removing some of these dams, and the current regulatory process has not effectively managed those interests.[259] Having more of the interested parties brought to a table and given opportunities to discuss their various interests could lead to less litigation and better agency decisions. As such, the interested stakeholders should draft a non-exclusive collaborative management charter and sign a memorandum of understanding with the USACE.

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[253] *Id.* at 31–32.
[254] Leslie, *supra* note 236.
[255] U.S. ARMY CORPS OF ENG'RS, *supra* note 109, at 43.
[256] Jacques Leslie, *Op-Ed: Listen up: A Republican Says We Have to Breach Four Snake River Dams*, LA TIMES (Mar. 10, 2021, 3:07), https://www.latimes.com/opinion/story/2021-03-10/snake-river-dams-demolition-mike-simpson-idaho-washington [https://perma.cc/Y34E-ZEE6].
[257] Eric Barker, *Federal plan keeps lower Snake River dam; legal challenges expected to follow*, IDAHO PRESS (Aug. 2, 2020), https://www.idahopress.com/eyeonboise/federal-plan-leaves-lower-snake-river-dams-intact-legal-challenges-expected-to-follow/article_7a018876-8820-5f52-992b-eced5ae48430.html [https://perma.cc/M64B-VAYD].
[258] Alyssa Moir et al., *Contemplating the Future of the Lower Snake River Dams*, NAT'L L. REV. (Oct. 23, 2020), https://www.natlawreview.com/article/contemplating-future-lower-snake-river-dams [https://perma.cc/4YYW-MEZQ].
[259] Barker, *supra* note 257.

2. Colorado River System

The Colorado River system's current dam management structure will also require significant change in the coming decades and could benefit from the NEMU model. The Colorado "provides water to one in eight Americans and supports one-seventh of the nation's crops."[260] As water scarcity has increased across the nation, more water has been allocated than the Colorado River system supplies.[261] This has caused several of the River basin's reservoirs to operate far below capacity.[262] Lake Powell and Lake Mead are two of the largest, and both operate at less than half capacity.[263] Thus there have been calls to drain Lake Powell into Lake Mead.[264] This would theoretically lessen the amount of water lost to evaporation by decreasing the total water surface area across the two reservoirs and reduce the loss of water drained through Lake Powell's more porous lakebed.[265] The science on that question is not settled: proponents of combining the reservoir estimate 179 billion gallons of water would be saved each year while opponents claim negligible quantities of water would be saved.[266] Regardless of whether the two dams should be combined, the water scarcity problem has made it clear that the river system management will need to be changed in the coming years. What is equally clear is the fact that making any substantial changes to this management system will be monstrously difficult.

The greatest obstacles to any major policy change on the Colorado River system are political in nature. Combining the two reservoirs through opening the Glen Canyon river dam's floodgates would require "an act of Congress, a new agreement among seven state legislatures, a revised treaty with Mexico, and a lengthy federal environmental impact analysis."[267] This massive number of stakeholders means that any change will take years to negotiate and could very well be destined for failure if a formal collaboration does not consider every interest.

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[260] Abrahm Lustgarten, *Unplugging the Colorado River*, N.Y. TIMES (May 20, 2016), https://www.nytimes.com/2016/05/22/opinion/unplugging-the-colorado-river.html [https://perma.cc/FN6Q-AS9V].
[261] Adam Wernick, *Is It Time to Think About Removing Dams on the Colorado River*, PUB. RADIO INT'L (July 2, 2016, 9:30 AM), https://www.pri.org/stories/2016-07-02/it-time-think-about-removing-dams-colorado-river [https://perma.cc/VHG6-TWLX].
[262] *Id.*
[263] Lustgarten, *supra* note 260.
[264] *Id.*
[265] *Id.*
[266] *Id.*
[267] *Id.*

A more formal collaborative management structure for the Colorado River system could do a lot of good. In particular, the NEMU model is particularly suited to this kind of multi-party agreement. This is because the memorandum of understanding can be a multilateral agreement between any number of parties. Bringing the various governments into a formal framework of collaboration with each other and stakeholders should substantially expedite negotiations and reduce litigation. Klamath showed that a multistate collaborative management group could successfully change the management of a complicated system of dams. It is time to bring collaborative management to the biggest and most complicated system of dams in the United States.

CONCLUSION

Several aging dams across the United States need more modernized management approaches. Even when a dam is clearly generating more costs than benefits, it can take an unacceptably long time to get decommissioning approval. While dam removal will always be a complicated and controversial issue, the nation's current, outmoded framework of dam management has become an unjustifiable contributor to these challenges. Collaborative dam management following a NEMU model like that highlighted in this Article could streamline and improve dam-related decision-making processes by increasing stakeholder involvement and thus decreasing delays from political and legal disputes. The NEMU model uses a memorandum of understanding to strike a more optimal balance between a non-exclusive public stakeholder group and a river's managing agency. This structure allows the public to freely engage in the decision-making process while also giving the governing agency a basis to rely on the collaborative group's work product. Widespread adoption of such management schemes could greatly improve future large-scale dam management.

The Pacific Northwest's Snake River system is just one example of a system that could greatly benefit from a more formal collaborative management structure based on the NEMU model. The river's current management regime has led to severe salmon population reductions that have caused local orcas to starve for more than a decade.[268] Nonetheless, the USACE recently approved a plan that prioritized energy production over a solution to restore the salmon population.[269] Sadly, the USACE

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[268] Rainey, *supra* note 237.
[269] Moir et al., *supra* note 258.

made this decision despite there being four dams on the Snake River not needed to meet electricity demands, whose removal would substantially restore the salmon population.[270] This controversial decision was not well received in the community and is certain to spark more litigation. The NEMU model would help the USACE to better understand the issues of the community, and help the community trust the decision of the USACE. These advantages of the NEMU model would result in better decision-making, and less litigation through clear communication.

The Colorado River system is also in need of a more formal collaborative governance structure and could benefit from adopting one akin to the NEMU model. Any substantial change of dam operating procedure "would probably require an act of Congress, a new agreement among seven state legislatures, a revised treaty with Mexico, and a lengthy federal environmental impact analysis."[271] Dam removal projects on the Klamath show that collaborative dam management fosters agreements between many state and local actors that have been historically adversarial. The experience of 4FRI's stakeholder group as highlighted in this Article shows that the NEMU model is a more effective framework for engaging all major stakeholders in such complex matters and ensuring that environmental and other impacts get full consideration in the decision-making process. Changing the management of any dam on the Snake, Colorado, or other major river systems will be a lengthy and arduous endeavor, but NEMU collaborative management will improve that process by mitigating litigation, improving relations among various stakeholders, pooling resources, and producing more equitable outcomes. By taking proactive steps today to modernize U.S. dam relicensing and decommissioning, policymakers can help to ensure the nation's aging dams are managed in the best interests of all Americans for many generations to come.

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[270] Leslie, *supra* note 189.
[271] Lustgarten, *supra* note 260.