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Dam Removal and the Federal Role

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SUMMARY

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Dam Removal and the Federal Role

Dam owners sometimes consider dam removal as a policy option to address dam safety, ecosystem restoration, or other concerns. The National Inventory of Dams (NID) lists more than 90,000 dams in the United States, many of which function as part of the nation's water infrastructure and provide benefits (e.g., flood control, hydroelectric power, recreation, navigation, and water supply). Stakeholders may consider the removal of a dam for various reasons—for example, if a certain dam requires major dam safety modifications or no longer provides its intended benefits. In addition, dams often affect ecosystem processes and aquatic species mobility; these effects may be costly to mitigate and may prompt consideration of dam removal. According to a stakeholder database that tracks dam removals, nearly 1,800 dams were removed in the United States from 1912 to 2020, with approximately 800 removed from 2011 to 2020. Small, nonfederal dams accounted for most of these removals; removal of federally owned or regulated dams was less frequent during the 1912-2020 period (e.g., approximately 70 of the dams removed since 1912 were federally owned).

Dam removal is a multistep process. The decision to remove a dam usually starts with the dam owner. Approximately 97% of dams are owned by private entities, state or local governments, or public utilities; the federal government owns 3% of dams in the NID. Stakeholders, such as communities, policymakers, river-dependent industries, tribes, nongovernmental organizations, scientists, and academics, among others, also may participate in the dam removal consideration process. This process often involves an evaluation of potential alternatives, which can include changes to dam operations, dam rehabilitation or repair, modifications to add or improve fish passage, dam removal, and/or a "no action" option.

The federal government's role in dam removal varies based on ownership (e.g., federal versus nonfederal), purpose (e.g., federally regulated hydropower facilities), location (e.g., a nonfederal dam on federal land), and other factors. Federal law and associated regulations may require the involvement of applicable federal agencies for a proposed dam removal project. Such involvement may include the issuance of a Clean Water Act Section 404 permit (33 U.S.C. §1344) from the U.S. Army Corps of Engineers (USACE), a National Environmental Policy Act (NEPA; 42 U.S.C. §§4321 et seq.) review process, and consultations with government agencies to meet requirements of federal laws. The Federal Power Act (16 U.S.C. §§791 et seq.) regulates nonfederal hydropower projects, and the relicensing process under this authority has in some cases spurred consideration of dam removal.

The congressional role in removal of a federal dam typically depends on whether Congress authorized the dam. For federally owned dams that Congress authorized for specific purposes, such as dams owned and operated by federal water resource agencies (e.g., USACE, U.S. Bureau of Reclamation), removal generally requires specific congressional authorization following a feasibility study that selects dam removal as the preferred alternative. By contrast, federal agencies generally may remove federally owned dams without specific congressional authorization at their discretion, based on agency policies and in adherence to state and federal law. For example, federal land management agencies may consider removal of dams when seeking to reduce operation and safety costs while pursing restoration initiatives. At times, Congress has considered prohibiting removal of certain federal dams.

The federal government is sometimes involved in the removal of nonfederal dams. Although there is no underlying statutory authority for federal involvement in nonfederal dam removal, Congress has authorized involvement in some individual dam removals when it found a compelling reason to do so, often due to a federal nexus (e.g., proximity to federal land or project, tribal responsibilities, listed species). Additionally, Congress has authorized programs that provide support (e.g., grants, loans, technical assistance) to address issues including dam safety, flooding risks, fish and wildlife passage, and watershed restoration. Some of these efforts may facilitate (or result in) nonfederal dam removal.

In the 117th Congress, several bills would create new authorities related to dam removal or would provide emergency and/or mandatory appropriations for dam removal activities. Congress may consider the federal government's role in studying and executing specific projects for dam removal and whether to change the amount of appropriations for new or existing programs that fund dam removal activities. In addition, Congress may oversee agency implementation of new or amended authorities for dam removal and may review the effectiveness, efficiency, and priorities of agencies funding dam removal activities.

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Introduction

Dams can provide benefits to society, such as flood control, hydroelectric power, recreation, navigation, and water supply. However, some dams may no longer provide benefits for which they were built (e.g., dams that supported mills) or may be abandoned and in disrepair. Dams often affect ecosystem processes and aquatic species mobility; efforts to mitigate these impacts (e.g., fish ladders) may be costly for dam owners. Maintaining dam operation and safety also entails financial costs for operation and maintenance, rehabilitation (i.e., bringing a dam up to current safety standards), and repair. For these reasons and others, dam removal is a policy option to address safety, ecosystem restoration, or other concerns.

The United States Society on Dams defines a *dam removal project* to include all necessary activities associated with the full or partial removal of a dam and restoration of the river, from project planning and permitting through design and implementation.[1] Analysis of a U.S. dam removal database shows an apparent increase from 200 dams removed between 1991 and 2000 to approximately 800 dams removed between 2011 and 2020.[2] The benefits and detriments of a dam are case specific, and the feasibility of dam removal often relies on an evaluation of tradeoffs. Dam owners and other stakeholders may participate in the evaluation process; stakeholders may include communities, policymakers, river-dependent industries, tribes, nongovernmental organizations, scientists, and academics, among others. Dam removal can range from partial removal to full removal of the dam itself and structures associated with the dam.[3]

The federal government's role in dam removal varies based on ownership (e.g., federal versus nonfederal), purpose (e.g., federally regulated hydropower facilities), location (e.g., a nonfederal dam on federal land), and other factors. This report discusses the U.S. portfolio of dams, dam removal trends, and tradeoffs when considering the consequences of dam removal. It also addresses federal authorities, regulatory requirements, and assistance for dam removal. In addition, it provides examples of prior federal involvement in dam removal projects. Finally, the report summarizes legislation related to dam removal that has been introduced in the 117th Congress.

Dams and Dam Removal in the United States

Dams and their associated structures range in size, design, purpose, ownership, age, potential risk, and current condition. These factors are important considerations when determining future management options for dams, including the option of removal. Most dam removal projects in the United States have been for small, nonfederal dams; in many cases, these projects may not be illustrative of the challenges and tradeoffs inherent to removal of larger dams.[4] Where dam removal has been pursued, considerations in favor of doing so have included benefits such as the

[1] United States Society on Dams (USSD), *Guidelines for Dam Decommissioning Projects*, July 2015, at https://www.ussdams.org/wp-content/uploads/2016/05/15Decommissioning.pdf. Hereinafter, USSD, *Guidelines*.

[2] American Rivers, "American Rivers Dam Removal Database," February 17, 2021, at https://doi.org/10.6084/m9.figshare.5234068 (retrieved on September 14, 2021). Hereinafter, American Rivers, "Database."

[3] For partial removal, the dam height and storage capacity may be reduced to the point that the structure no longer meets the statutory definition of a dam (which varies from state to state) or no longer presents a downstream hazard. A controlled breach of a dam also may constitute a method of dam removal. USSD, *Guidelines*.

[4] A narrative list of some of the dams removed from 1999 to 2020 can be found at American Rivers, "69 Dams Removed in 2020 to Restore Rivers," at https://www.americanrivers.org/wp-content/uploads/2021/02/DamsRemoved_1999-2020.pdf.

potential for ecosystem restoration and improved dam safety (i.e., prevention of full or partial dam failure), as well as the possibility of replacing benefits provided by dams by other means, among other issues. Opponents of some dam removals cite their potential to lessen or eliminate existing benefits, such as energy generation, water supply, and flood risk reduction, or their potential to release sediments or impact associated infrastructure.

Dams by the Numbers

The U.S. Army Corps of Engineers (USACE) maintains the National Inventory of Dams (NID), a database of dams in the United States.[5] The NID defines a *dam* as any artificial barrier with the ability to impound water, wastewater, or any liquid-borne material for the purpose of storage or control of water that (1) is at least 25 feet in height, with a storage capacity of more than 15 acre-feet; (2) is greater than 6 feet in height, with a storage capacity of at least 50 acre-feet; or (3) poses a significant threat to human life or property should it fail (i.e., high- or significant-hazard dams).[6] The 2018 NID included 91,468 dams. Thousands of dams do not meet these criteria and are not included in the NID.

Most dams in the United States are owned by private entities, state or local governments, or public utilities; in 2018, the federal government owned approximately 3% of NID dams.[7] States have regulatory authority for more than 69% of NID-listed dams. Federal agencies regulate dams associated with hydropower projects, certain mining activities, and nuclear facilities and materials.[8]

The most common type of dam is an earthen dam, which is made from natural soil or rock. Other dams include concrete dams, tailings dams (i.e., dams that store mining byproducts), overflow dams (i.e., dams regulating downstream flow), and dikes (i.e., dams constructed at a low point of a reservoir of water).[9] Some dams create reservoirs, which store water for various uses. Other dams that have limited storage (i.e., pondage) are called *run-of-the-river dams*.[10] (This report does not cover levees, which are man-made structures designed to control water movement along a landscape.) Dams have various purposes: recreation, flood control, fish and wildlife management, municipal and industrial and/or agricultural water supply, hydroelectric power generation, navigation, mining, and others.[11] Some dams serve multiple purposes.

Dams are built to engineering and construction standards and regulations corresponding to the time of their construction or rehabilitation. Some dams, including older dams, may not meet current dam safety standards, which have evolved over time as scientific data and engineering

[5] Online National Inventory of Dams (NID) data are used throughout this report unless otherwise specified. State and federal agencies self-report dam information to the NID. As of October 2021, the NID was last updated in 2019 with 2018 data. In this report, the number of dams owned by federal agencies is based on federal agency reporting to the NID. State agencies also reported additional dams owned by the federal government, though CRS could not confirm ownership of these dams. The NID can be accessed at https://nid.sec.usace.army.mil. Hereinafter, 2018 NID.

[6] 33 U.S.C. §467. One acre-foot equals about 326,000 gallons, or enough water to cover 1 acre of land, about the size of a football field, 1 foot deep.

[7] 2018 NID.

[8] For more information, see CRS Report R45981, *Dam Safety Overview and the Federal Role*, by Anna E. Normand.

[9] USSD, "Types of Dams," at https://www.ussdams.org/dam-levee-education/overview/types-of-dams/.

[10] International Hydropower Association, "Types of Hydropower," at https://www.hydropower.org/iha/discover-types-of-hydropower.

[11] 2018 NID.

have improved.[12] Of the 91,468 dams in the 2018 NID, 15,426 (17%) did not report a construction date. Of the 76,042 dams that reported a construction date in the 2018 NID, 50,135 were built more than 50 years ago.

Federal guidelines set out a hazard potential rating to quantify the potential harm associated with a dam's failure or misoperation.[13] The three hazard ratings (low, significant, and high) do not indicate the likelihood of failure; instead, the ratings reflect the amount and type of damage a failure would cause:

- High hazard: Loss of at least one life is probable
- Significant hazard: No probable loss of human life but could result in economic loss, environmental damage, disruption of lifeline facilities, etc.
- Low hazard: No probable loss of human life and few economic or environmental losses that generally are limited to the owner

Of dams in the 2018 NID, 17% were classified as high hazard and 5% did not have a hazard classification. From 2000 to 2018, thousands of dams were reclassified, increasing the number of high-hazard dams from 9,921 to 15,629.[14]

The NID also includes condition assessments—assessments of relative dam deficiencies determined from inspections—as reported by federal and state agencies.[15] Of the high-hazard-potential dams in the 2018 NID, 15% had a poor or unsatisfactory condition assessment and 22% were not rated.[16]

Dam Removal by the Numbers

Removal of dams in the United States has occurred primarily for environmental, dam safety, and economic reasons.[17] Most dam removals have involved small, nonfederal dams, including run-of-the-river dams, with costs ranging from thousands to millions of dollars.[18] A lesser number of large, federally owned or regulated dams have been removed.

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[12] For more information on dam safety, see CRS Report R45981, *Dam Safety Overview and the Federal Role*, by Anna E. Normand. American Society of Civil Engineers (ASCE), *2021 Report Card for America's Infrastructure: Dams*, 2021, at https://infrastructurereportcard.org/cat-item/dams/ (hereinafter, ASCE, *Infrastructure Report Card*).

[13] Federal Emergency Management Agency (FEMA), *Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams*, 2004, at https://www.ferc.gov/sites/default/files/2020-04/fema-333.pdf.

[14] According to FEMA, the primary factor increasing dams' hazard potential is development upstream and downstream of a dam. Reclassification from low hazard potential to high or significant hazard potential may trigger more stringent requirements by regulatory agencies, such as increased spillway capacity, structural improvements, more frequent inspections, and requirements to create or update an emergency action plan. 2018 NID; FEMA, *The National Dam Safety Program: Biennial Report to the United States Congress, Fiscal Years 2016-2017*, May 2019, at https://www.fema.gov/sites/default/files/2020-08/national-dam-safety_biennial-report-2016-2017.pdf; ASCE, *Infrastructure Report Card*.

[15] FEMA, *The National Dam Safety Program: Biennial Report to the United States Congress, Fiscal Years 2012-2013*, 2014, at https://www.fema.gov/emergency-managers/risk-management/dam-safety/progress-report.

[16] *Poor* condition means one or more dam safety deficiencies are recognized for hydrologic conditions that may realistically occur and remedial action is necessary. *Unsatisfactory* condition means one or more dam safety deficiencies are recognized that require immediate action or emergency remedial action for problem resolution. 2018 NID.

[17] USSD, *Guidelines*.

[18] Headwater Economics, *Dam Removal: Case Studies on the Fiscal, Economic, Social, and Environmental Benefits of Dam Removal*, October 2016, at https://headwaterseconomics.org/economic-development/dam-removal-case-studies/;

According to a stakeholder database that tracks dam removals, nearly 1,800 dams were removed in the United States from 1912 to 2020, although this list is likely incomplete due to reporting challenges.[19] Approximately 70 of these removed dams were federally owned, of which 51 were U.S. Forest Service (FS) dams removed between 2015 and 2020. Although a majority of existing dams within the NID are concentrated in the Plains states and the Southeast, most dam removals have been in the Northeast, upper Midwest, and western coastal states.[20] According to the database, Pennsylvania has removed the most dams of any state (342); California has removed the second-largest number (178), with nearly half of these from one national forest; and Wisconsin has removed the third-largest number (142), with assistance from a long-running state grant program for dam removals.[21] In 2020, 69 dams were removed across 23 states—11 in Ohio, 6 in Massachusetts, and 6 in New York.[22] A recent study projects the removal of thousands of NID dams by 2050, based on current trends.[23]

The U.S. Geological Survey (USGS) also has developed an online site called the Dam Removal Information Portal (DRIP) that provides a map-based visualization of dam removal information and associated scientific studies.[24] A 2017 review of these studies found that scientific evaluation has occurred at fewer than 10% of dam removals and that most of these studies were short in duration (< four years), with limited pre-removal monitoring.[25]

Considerations for Dam Removal

Dams may be considered for removal for various reasons. Many dams continue to operate after their design lives and, if the dams are not properly maintained and rehabilitated as necessary, safety issues may arise or sediment buildup in reservoirs may affect dam benefits.[26] In some

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H. John Heinz III Center for Science, Economics, and the Environment, *Dam Removal: Science and Decision Making*, 2002, at https://semspub.epa.gov/work/01/273439.pdf (hereinafter, Heinz Center, *Dam Removal*).

[19] American Rivers, "Database."

[20] Dams removed in the Northeast tend to be dams with safety issues after decades or centuries of inadequate maintenance or dams that no longer serve their initial purpose, such as powering mills. The concentration of dam removals in the Pacific Northwest may be due to concerns over endangered species and tribal culture affected by dams, as well as to companies choosing to decommission dams rather than invest in Federal Energy Regulatory Commission (FERC) relicensing requirements, such as fish passage construction. Melissa M. Foley et al., "Dam Removal: Listening In," *Water Resources Research*, vol. 53, no. 7 (2017), pp. 5229-5246; Heinz Center, *Dam Removal*.

[21] American Rivers, "Database"; Vincent Gonzales and Margaret A. Walls, *Dams and Dam Removals in the United States*, Resources for the Future, October 22, 2020, at https://www.rff.org/publications/reports/dams-and-dam-removals-united-states/ (hereinafter, Resources for the Future, *Dam Removals*).

[22] American Rivers, "69 Dams Removed in 2020," February 18, 2021, at https://www.americanrivers.org/2021/02/69-dams-removed-in-2020/.

[23] Zbigniew J. Grabowski, Heejun Chang, and Elise F. Granek, "Fracturing Dams, Fractured Data: Empirical Trends and Characteristics of Existing and Removed Dams in the United States," *River Research and Applications*, vol. 34, no. 6 (2018), pp. 526-537. Hereinafter, Grabowski, "Empirical Trends."

[24] U.S. Geological Survey, "Dam Removal Information Portal (DRIP)," at https://data.usgs.gov/drip-dashboard/.

[25] The majority of studies focused on hydrologic and physical responses to dam removal rather than biological and water quality responses, and few studies were published on linkages between these physical and ecological components. J. Ryan Bellmore et al., "Status and Trends of Dam Removal Research in the United States," *Wiley Interdisciplinary Reviews: Water*, vol. 4, no. 2 (2017), p. e1164.

[26] Most dam infrastructure is designed with expected operation life of 50 years for the dam's purpose; however, proper maintenance and necessary rehabilitation and repair may extend operation lifecycles. ASCE, *Infrastructure Report Card*; Duminda Perera et al., *Ageing Water Storage Infrastructure: An Emerging Global Risk*, UNU-INWEH Report Series 11, 2021, at https://inweh.unu.edu/ageing-water-storage-infrastructure-an-emerging-global-risk/ (hereinafter, Perera et al., *Ageing Infrastructure*).

cases, a dam's original purposes are no longer necessary or dam removal may provide environmental benefits. Dam removal may be a viable management option when the benefits lost by removing a dam or reservoir could be achieved through alternative means; however, it may be difficult to replace some benefits that dams provide, such as water storage, flood control, and multiple benefits.[27]

The decision to remove a dam typically involves an evaluation of potential alternatives to address specific concerns relating to the dam. These alternatives may include changes to dam operations, dam rehabilitation or repair, modifications to include or improve fish passage, dam removal, and a "no action" option.[28] In some cases, the specific concerns can be addressed by partial removal of the dam rather than by full removal of the dam and associated facilities.

Identifying and assessing potential dam removal projects involves consideration of diverse tradeoffs that may vary in relevance and importance based on the type of dam, the landscape of the dam, and the stakeholders involved.[29] Factors in a decision to pursue a dam removal project also depend in part on the type of dam ownership (e.g., federal government, nonfederal government, private, abandoned). Below are tradeoffs that owners, and other stakeholders, may evaluate when considering dam removal.

Fish Passage and Aquatic Migration. A dam may hinder or prevent the passage of anadromous fish and other fish species.[30] Blocked passage may affect migration upstream to historic spawning or nursery grounds and downstream during various seasons important to fish migration.[31]

Fish passage can be a key environmental factor for fish species and is often cited as a primary consideration for dam removal, especially for dams affecting species listed as either endangered or threatened under the Endangered Species Act (ESA;, 16 U.S.C. §§1531-1544).[32] Fish passage alternatives for large dams, such as fish ladders or trap-and-haul operations, can be expensive and may be less effective than fish passage provided by dam removal.[33] Dam removal may rejuvenate certain riverine fisheries near and upstream of the former dam location; however, if there is a dam downstream of the removed dam, fish migration may remain limited.[34]

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[27] Advisory Committee on Water Information, Subcommittee on Sedimentation, U.S. Department of the Interior, Bureau of Reclamation (Reclamation), *Dam Removal Analysis Guidelines for Sediment*, December 2017, at https://rsm.usace.army.mil/initiatives/other/DamRemovalAnalysisGuidelines2017_508.pdf. Hereinafter, Reclamation, *Sediment Guidelines*.

[28] David D. Hart et al., "Dam Removal: Challenges and Opportunities for Ecological Research and River Restoration: We Develop a Risk Assessment Framework for Understanding How Potential Responses to Dam Removal Vary with Dam and Watershed Characteristics, Which Can Lead to More Effective Use of This Restoration Method," *BioScience*, vol. 52, no. 8 (2002), pp. 669-682, at https://academic.oup.com/bioscience/article/52/8/669/254910.

[29] Natallia L. Diessner et al., "I'll Be Dammed! Public Preferences Regarding Dam Removal in New Hampshire," *Elementa: Science of the Anthropocene*, vol. 8, no. 1 (2020), at https://online.ucpress.edu/elementa/article/8/1/003/114206/I-ll-be-dammed-Public-preferences-regarding-dam; F. J. Magilligan, C. S. Sneddon, and C. A. Fox, "The Social, Historical, and Institutional Contingencies of Dam Removal," *Environmental Management*, vol. 59, no. 6 (2017), pp. 982-994, at https://link.springer.com/content/pdf/10.1007/s00267-017-0835-2.pdf (hereinafter, Magilligan, "Contingencies of Dam Removal").

[30] *Anadromous* fish are fish that live as juveniles in fresh water, migrate to the ocean to develop, and, when sexually mature, return to freshwater to spawn.

[31] National Oceanic and Atmospheric Administration (NOAA) Fisheries, "Reopening Rivers to Migratory Fish in the Northeast," at https://storymaps.arcgis.com/stories/c7dfb5ea18da4c7db9eb77848b827b6f; USSD, *Guidelines*.

[32] U.S. Fish and Wildlife Service (FWS), "What Is Fish Passage?," at https://www.fws.gov/fisheries/fish-passage/what-is-fish-passage.html.

[33] USSD, *Guidelines*.

[34] FWS, "Dam Removal: An Opportunity for Our Rivers," fact sheet, at https://www.fws.gov/southeast/pdf/fact-sheet/

At the same time, dam removal may jeopardize recreational fisheries for species supported by the reservoir habitat.[35] Further, reservoirs created by dams may provide reliable fish refuge habitat under reduced rainfall and flow conditions in regions where human-induced climate change may be affecting precipitation trends.[36] In addition, a dam may provide a beneficial impediment to aquatic species migration, such as in the case of exotic or invasive species that could negatively impact upstream populations of native or managed fish species.[37]

River Restoration. Waters impounded by a dam may result in a lake-like habitat of warmer water or stratified water temperatures, and dam removal may result in more free-flowing cold water habitat found in riverine environments. In addition to lower water temperatures, dam removal may result in increased dissolved oxygen and improved aquatic habitat diversity and availability. For example, dam removal may lead to revegetation of the formerly inundated areas, which can result in the creation or restoration of riparian buffers or flood plain wetlands beneficial for birds and other terrestrial species. For this reason, dam removal projects also may include planting programs and erosion protection measures to accelerate desired revegetation, preserve water quality, and prevent dust hazards.[38] Although limited studies on dam removal have provided evidence that dammed ecosystems may quickly return to riverine conditions following dam removal, the studies also show that the post-dam ecosystem may not necessarily be the same as the pre-dam ecosystem.[39]

Sediment Management. Sedimentation behind a dam may require intensive dam maintenance or may accelerate the end of the dam's life.[40] Dam removal may reestablish the natural sediment transport and deposition that supports riverine ecosystems; however, managing the initial release of trapped sediment, and the potential of that sediment being contaminated, is often a consideration for a dam removal project.[41] Sediment management also may represent a significant portion of the total dam removal project cost. If removing a dam could release impounded sediments that may be contaminated at levels above background levels for the river system, then those sediments may need to be removed or contained to prevent downstream release. Even if reservoir sediments are not contaminated, sediment release following dam removal may affect downstream conditions.[42] The sudden release of fine and coarse sediments may at least temporarily increase the suspended sediment concentration, possibly creating lethal conditions for fish, and may result in sediment deposition along the downstream channel, where there may be fish spawning beds. If coarse sediment is deposited along a channel, river water surface elevations may increase and affect flood stages.[43]

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dam-removal.pdf; J. Ryan Bellmore et al., "Conceptualizing Ecological Responses to Dam Removal: If You Remove It, What's to Come?," *BioScience*, vol. 69, no. 1 (2019), pp. 26-39, at https://academic.oup.com/bioscience/article/69/1/26/5285462 (hereinafter, Bellmore, *BioScience*).

[35] Leandro E. Miranda, *Reservoir Fish Habitat Management*, 2017, at https://www.friendsofreservoirs.com/wp-content/uploads/2017/01/Reservoir-Fish-Habitat-Management-_Manual.pdf.

[36] Stephen Beatty et al., "Rethinking Refuges: Implications of Climate Change for Dam Busting," *Biological Conservation*, vol. 209 (2017), pp. 188-195, at https://doi.org/10.1016/j.biocon.2017.02.007.

[37] For example, dams throughout the Great Lakes states prevent sea lamprey from migrating upstream into tributary streams and rivers. Bellmore, *BioScience*.

[38] USSD, *Guidelines*.

[39] Bellmore, *BioScience*.

[40] Perera et al., *Ageing Infrastructure*.

[41] Bellmore, *BioScience*; Reclamation, *Sediment Guidelines*.

[42] Bellmore, *BioScience*.

[43] USSD, *Guidelines*.

Public Safety. Dam owners are responsible for meeting relevant regulatory requirements related to dam safety.[44] Deficient dams may fail due to floods, earthquakes, progressive deterioration, or lack of maintenance; dam failure can pose a risk to life and property, as well as a loss of dam benefits. Dam owners may address dam safety concerns through measures other than dam removal, both nonstructural (e.g., lowering water storage) and structural (e.g., rehabilitation, repair).[45] In some instances, the safety of abandoned dams becomes the responsibility of federal, state, or local government agencies; in these cases, dam removal and site restoration to ensure public safety may be a desirable alternative to taking over legal ownership.[46] Outside of potential structural concerns, dams also may pose public safety hazards to recreational users.[47]

Conversely, removing a dam may increase the potential flood risks to downstream areas (i.e., by removing a structure that reduces flood risk).[48] In some cases, partial dam removal may be a compromise to reduce downstream hazard potential from dam failure while retaining some of the dam's flood control capacity. Otherwise, alternative flood risk reduction measures may need to be implemented or constructed following dam removal to provide protection from unregulated, high flows.

Costs of Alternatives. A decision to pursue dam removal can be driven by the costs of ongoing maintenance, dam safety rehabilitation or repairs, or ecosystem mitigation, particularly if the dam is no longer serving its original designed purpose (e.g., hydropower) and is providing few or no benefits. Overall costs for dam removal by the owner may be lower than modifications that regulatory agencies may require, such as the construction and operation of fish passage structures or structural modifications to accommodate larger floods or earthquakes.[49] The cost of dam removal varies based on the type and location of the dam. For example, a stakeholder group estimated that, keeping all other factors constant, dam removal increases in costs by 10% as dam height increases by 10% and that concrete and cement dams have higher removal costs than earthen dams.[50]

Dam removal considerations also include who will pay for dam removal and compensation for lost benefits of the dam and reservoir.[51] Funding issues often limit whether and when dam removal will move forward, even when the owner and other stakeholders agree to remove a dam. Dam removal projects with complications that result in added expenses (e.g., projects involving contaminated sediments) may require supplemental funding beyond what a dam owner can provide. Specific funding assistance may be available for dam removal that would not be available for other project alternatives. Some states, nongovernment organizations, and

[44] Association of State Dam Safety Officials (ASDSO), "Roadmap to Reducing Dam Safety Risks," at https://damsafety.org/Roadmap.

[45] Common safety improvements to dams may include increased spillway discharge capacity; replacement of inlet and outlet structures, gates, and valves; modifications to increase stability of concrete and masonry dams; modifications to control seepage and piping potential of embankment dams; erosion control improvements for embankment dams and unlined spillways; and dam overtopping protection. USSD, *Guidelines*.

[46] USSD, *Guidelines*.

[47] ASDSO, "Public Safety Hazard," at https://damsafety.org/public-safety-hazards.

[48] Heinz Center, *Dam Removal;* Julien Boulange et al., "Role of Dams in Reducing Global Flood Exposure Under Climate Change," *Nature Communications*, vol. 12, no. 1 (2021), pp. 1-7.

[49] Costs for these types of modifications may require a significant expenditure of project funds and a temporary loss of project benefits during construction. USSD, *Guidelines*.

[50] Resources for the Future, *Dam Removals*.

[51] Reclamation, *Sediment Guidelines*.

companies have provided funding for dam removal, including for abandoned dams.[52] In some cases, the federal government has provided funding for dam removal.[53]

Project Benefits and Associated Value. Dam removal may affect the power sector, fisheries, agriculture, recreation, nearby properties, and cultural heritage. If the dam and reservoir are still providing benefits, then considerations may include whether those benefits would remain after dam removal, perhaps through alternate means, or whether stakeholders would be compensated for lost benefits.[54]

- **Hydropower**. Dam removal halts hydropower generation.[55] If alternative access to electricity is available, removing small or obsolete hydropower dams may have a limited impact on communities using hydropower. By contrast, in communities where there are no viable power alternatives, hydropower dam removal may have negative consequences.
- **Agricultural Uses**. The agricultural sector generally benefits from dams, which provide a steady water supply source from their reservoirs. However, the agricultural sector also may benefit from dam removal if it would provide an opportunity to farm lands previously in the reservoir footprint and if there were little need for water supply storage from a reservoir.[56]
- **Recreation**. The primary purpose of a plurality of dams in the United States is recreation, which the public may value highly.[57] Dam removal may provide new recreational opportunities for river boating (e.g., rafting and paddling) but may reduce water activities that require more stable and deep pools (e.g., motor boating).[58] Dam removal also may negatively alter aesthetics by leaving a reservoir footprint, but this newly exposed zone may establish new ecosystems, create green space, and spur riverfront revitalization.[59] Recreational facilities (such as public boat ramps and campgrounds) located along the former lakeshore of a reservoir may need to be relocated closer to the river.
- **Property Values**. Dam removal may not be desirable for lakefront (i.e., reservoir) properties that would no longer be near the water following dam removal.[60] Dam removal may be attractive for those who seek riverfront properties.[61] Some dam removal considerations for property value may include the value of added land once the reservoir is removed, changes in tax rates, and

[52] American Rivers, *Paying for Dam Removal: Guide to Selected Funding Sources*, October 2000, at https://www.michigan.gov/documents/dnr/Paying-Dam-Removal_513758_7.pdf. Hereinafter, American Rivers, *Paying for Dam Removal*.

[53] See "Federal Assistance for Nonfederal Dam Removal" and "Congressional Intervention in Nonfederal Dam Removal."

[54] Although dam removal may result in the loss of project benefits, some project benefits may be achieved by other means and project lands may be sold or developed for other purposes. USSD, *Guidelines*.

[55] Perera et al., *Ageing Infrastructure*.

[56] Perera et al., *Ageing Infrastructure*.

[57] Recreation was the primary purpose of 31% of dams in the 2018 NID.

[58] USSD, *Guidelines*.

[59] USSD, *Guidelines*.

[60] William L. Graf, *Dam Removal Research: Status and Prospects*, Heinz Center, 2003, at http://www.riversimulator.org/Resources/NGO/DamResearchFullReport.pdf.

[61] Heinz Center, *Dam Removal*.

property buyout options due to the loss of reservoir storage and the altered level of flood protection.[62]

- **Cultural History**. Dam removal may impact the cultural history and heritage of a particular region. Obsolete dams may still hold value to communities because of their long-standing history and ties to past industries. Commemorating the location of a former dam or leaving behind some dam remnants, however, may satisfy those wishing to acknowledge cultural history.[63] Dam removal may restore access to sacred lands or may lead to revival of culturally important species. At the same time, exposure of previously inundated cultural and archeological sites may subject these sites to erosion or human disturbance.[64]
- **Associated Infrastructure.** The loss of reservoir storage and changes in river flow from dam removal may affect associated infrastructure. Reservoir drawdown may impact communities that rely on infrastructure around the shoreline upstream of dams. Reservoirs also affect groundwater, and dam removal may alter groundwater flow and groundwater availability downstream of dams (e.g., water intake, wastewater disposal, local wells and springs).[65]

Users of reservoir water supply may need to develop alternative water resources or adopt water conservation measures following dam removal. Legal rights to water diversions may need to be addressed if there is a loss of water storage. Changes to channel water depths and locking structures associated with the dam may affect river navigation, and dam removal may eliminate a river crossing.[66] Existing bridges, roadway and railroad embankments, levees, drainage culverts, and buried or submerged utilities (e.g., water and natural gas pipelines) may be subjected to higher flow and erosion following dam removal.[67] A dam removal project could mitigate for some or all of these effects, but the decision to pursue dam removal would need to weigh potential impacts to existing infrastructure against cost and effectiveness of mitigation measures, among other considerations.

Federal Role and Resources for Dam Removal

The federal government's involvement in dam removal varies based on dam ownership (e.g., federal versus nonfederal), regulations and required permitting related to the dam and removal activities, and availability of federal assistance for dam removal. Removal of federal dams that were authorized by Congress for specific purposes, such as those managed and operated by federal water resource agencies (e.g., USACE, Reclamation), in most cases requires specific congressional authorization.[68] Federal agencies that manage federally owned dams that lack specific congressionally authorized purposes may exercise their discretion to remove these dams, in adherence to agency policy and state and federal law.

[62] USSD, *Guidelines*.

[63] Magilligan, "Contingencies of Dam Removal."

[64] Perera et al., *Ageing Infrastructure*; USSD, *Guidelines*.

[65] Desirée D. Tullos et al., "Synthesis of Common Management Concerns Associated with Dam Removal," *JAWRA Journal of the American Water Resources Association*, vol. 52, no. 5 (2016), pp. 1179-1206.

[66] USSD, *Guidelines*.

[67] USSD, *Guidelines*.

[68] Removal of congressionally authorized dams owned by the U.S. Army Corps of Engineers (USACE) or by Reclamation has been rare. See below section on "Federal Dams."

The Federal Power Act (FPA; 16 U.S.C. §§791-828c) provides the statutory authority for the regulation of nonfederal hydropower projects. Federal agencies may be involved in most nonfederal dam removal projects as part of the overall regulatory process, though federal regulations may not apply to some projects. Congress also has authorized programs that may aid in nonfederal dam removal and, in very limited cases, has authorized and funded federal involvement for specific nonfederal dam removal projects.

Statutory and Regulatory Requirements

Federal law and associated regulations may require the involvement of applicable federal agencies for a proposed dam removal project.[69] The following are selected federal laws that commonly dictate federal agency regulatory actions for dam removal projects.

Clean Water Act, Section 404. Most dam removal projects require a Clean Water Act (CWA) Section 404 permit from USACE for the discharge of dredged or fill material into waters of the United States (33 U.S.C. §1344).[70] USACE may issue two types of Section 404 permits for a dam removal project: individual permits or general permits, including nationwide permits (NWPs). Larger, more complex projects may be reviewed under the individual permit process, whereas general permits such as NWPs or regional permits may be issued for smaller, less complex dam removals.[71] In January 2017, USACE published a new NWP specifically for low-head dam removal.[72]

In conjunction with a CWA Section 404 permit, USACE issues a Rivers and Harbors Act of 1899 (RHA) Section 10 permit for activities affecting a navigable waterway (33 U.S.C. §403) if there is no adverse impact on interstate navigation.[73]

National Environmental Policy Act. A proposed project with dam removal as an alternative that qualifies as a major federal action will trigger a National Environmental Policy Act (NEPA; 42 U.S.C. §§4321 et seq.) review process.[74] For dam removal projects, the most common types of actions that would trigger NEPA review include consideration of removing a federally owned dam or a dam on federal land, the process to surrender a Federal Energy Regulatory Commission

[69] Additional state environmental compliance requirements may vary but generally complement federal regulatory compliance requirements. Local regulations may require various permits specific to local jurisdictions. USSD, *Guidelines*.

[70] For more information, see Environmental Protection Agency (EPA), "Permit Program Under CWA 404," at https://www.epa.gov/cwa-404/permit-program-under-cwa-section-404; and section "Permits, Regulations, and Enforcement" in CRS Report RL30030, *Clean Water Act: A Summary of the Law*, by Laura Gatz.

[71] EPA, "Frequent Questions on Removal of Obsolete Dams," EPA-840-F-16-001, December 2016, at https://www.epa.gov/cwa-404/frequent-questions-removal-obsolete-dams. Hereinafter, EPA, "Frequent Questions."

[72] For the purposes of a nationwide permit, USACE defines the term *low-head dam* as a dam built across a stream to pass flows from upstream over all, or nearly all, of the dam's width on a continual and uncontrolled basis. In general, a low-head dam does not have a separate spillway or spillway gates and provides little storage. USACE, "Issuance and Reissuance of Nationwide Permits," 82 *Federal Register* 1860, January 6, 2017. Nationwide Permit 53, "Removal of Low-Head Dams," is available at https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll7/id/8593.

[73] American Rivers, *Obtaining Permits to Remove a Dam*, at http://scrcog.org/wp-content/uploads/hazard_mitigation/background_material/dam_removal/Obtaining_Permits_to_Remove_a_Dam.pdf. Hereinafter, American Rivers, *Obtaining Permits*.

[74] The National Environmental Policy Act (NEPA; 42 U.S.C. §§4321 et seq.) process requires federal agencies to consider environmental impacts in the decisionmaking process for a major federal action. For more information on the NEPA process, see CRS Report RL33152, *The National Environmental Policy Act (NEPA): Background and Implementation*, by Linda Luther.

(FERC) hydropower project licensing, application for a CWA Section 404 permit, or use of federal funds for a project.

Under NEPA, a project could involve federal issuance of a categorical exclusion (CATEX) or development of an environmental assessment (EA) or an environmental impact statement (EIS).[75] The level of effort, review time, and public comment period vary depending on the level of NEPA analysis required. Federal agency issuance of a CATEX exempts further analysis and documentation of the project in an EA or an EIS.[76] The development of an EA or an EIS may require the federal agency to evaluate "no action" and other feasible alternatives and to conduct analyses to support conclusions regarding environmental impacts.[77]

Agencies may develop programmatic EAs and EISs for conducting environmental analyses of similar federal actions.[78] For some comprehensive restoration projects across a landscape or watershed, a region-wide programmatic EA or EIS covering a suite of restoration techniques, including dam removal, may be pursued rather than addressing specific projects in individual EAs or EISs.[79] If an NWP is used for a dam removal project, then no additional activities pursuant to NEPA requirements would be needed for issuance of the CWA Section 404 permit.[80]

Consultations. As part of issuing permits or complying with NEPA, federal agencies, nonfederal regulatory agencies, or dam owners may need to consult with government agencies and tribes to meet the requirements of federal laws.[81] The following are selected examples of consultations that are commonly required for dam removal projects.

[75] EPA, "Frequent Questions."

[76] For example, the U.S. Forest Service (FS) Categorical Exclusion 18 allows the restoration of wetlands, streams, and riparian areas by removing, replacing, or modifying water control structures including, but not limited to, dams, levees, dikes, drainage tiles, ditches, culverts, pipes, valves, gates, and fencing to allow waters to flow into natural channels and floodplains that restore natural flow regimes to the extent practicable. FS, "US Forest Service Categorical Exclusions for Soil and Water Restoration Activities," at https://www.fs.fed.us/emc/nepa/restorationCE/.

[77] In many cases, an environmental assessment (EA) would be an appropriate level of analysis for dam removal, as long as the agency concludes through the EA that there is a finding of no significant impact. However, for more complex projects with the potential for significant impacts, an environmental impact statement (EIS) may be required. EPA, "National Environmental Policy Act Review Process," at https://www.epa.gov/nepa/national-environmental-policy-act-review-process.

[78] NOAA's Office of Habitat Conservation completed programmatic NEPA documents in 2002, 2006, and 2015 (*Restoration Center Programmatic Environmental Impact Statement*) to assess the impacts of its habitat restoration activities, reduce administrative costs, and maximize program efficiency. NOAA Fisheries, "Environmental Compliance in the Office of Habitat Conservation," at https://www.fisheries.noaa.gov/national/habitat-conservation/environmental-compliance-office-habitat-conservation.

[79] For example, FS evaluated restoration and removal of 81 dams in Cleveland National Forest in a single EA, which reduced the time and expense to complete the NEPA process compared with conducting EAs for individual dams and provided flexibility in the timing and removal methods for individual dams. FS, *Environmental Assessment Trabuco District Dam Removal Project: Silverado, Holy Jim, and San Juan Creeks*, February 2014, at https://www.fs.usda.gov/project/?project=41140&exp=overview.

[80] EPA, "Frequent Questions"; USSD, *Guidelines*.

[81] USSD, *Guidelines*; American Rivers, *Obtaining Permits*.

- If threatened or endangered species are present at or near the dam, projects may require Section 7 ESA consultation with the U.S. Fish and Wildlife Service (FWS) and/or the National Marine Fisheries Service (NMFS) regarding the impact of dam removal on these species to avoid injury to the species.[82]
- The Magnuson-Stevens Fishery Conservation and Management Act (MSA; 16 U.S.C. §§1801 et seq.) may require consultation to ensure a dam removal would not adversely impact essential fish habitat established in any fishery management plan developed by a fishery management council.[83]
- Proposed actions affecting Native American interests, including fishing rights and cultural resources, may involve consultations with the affected tribal governments and the Bureau of Indian Affairs (BIA).[84]
- Dam removal activities may trigger an obligation to assess the proposed action's impact on historic properties (e.g., potentially exposed archaeological sites, the dam itself) with the state historic preservation officer, pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C. §470f).[85]

In addition to these consultations, removal activities may trigger federal statutes that require the state to issue a certification that actions are consistent with the state's implementation of federal law. For example, some dam removal activities require a water quality certification pursuant to CWA Section 401 (33 U.S.C. §1341) to ensure the proposed activity will not violate state water quality standards. Some removal projects also require a National Pollutant Discharge Elimination System permit issued by the state pursuant to CWA Section 402 (33 U.S.C. §1342), which sets conditions and effluent limitations under which a facility may discharge potential pollutants into navigable waters of the United States.[86] If the dam is located in a coastal zone, the state must issue a certification pursuant to the Coastal Zone Management Act (16 U.S.C. §§1451 et seq.) stating that the proposed activity is consistent with the state's approved coastal zone management program.[87]

Federal Dams

Federal dams are dams owned by the federal government and managed by one or more federal agencies. According to the 2018 NID, in that year, federal agencies managed 2,714 federally owned dams, or 3% of the dams in the NID.[88] Federally owned dams include dams that were constructed based on congressional authorizations specific to each dam (e.g., most dams managed by USACE and Reclamation) and dams that were constructed or acquired through broader authority not specific to an individual dam (e.g., most dams managed by federal land

[82] For more information, see CRS Report R46867, *Endangered Species Act (ESA) Section 7 Consultation and Infrastructure Projects*, by Erin H. Ward, R. Eliot Crafton, and Pervaze A. Sheikh.

[83] 16 U.S.C. §1855(b)(2); USSD, *Guidelines*; American Rivers, *Obtaining Permits*.

[84] For more information, see CRS Insight IN11606, *Tribal Consultation: Administration Guidance and Policy Consideration*, by Tana Fitzpatrick.

[85] USSD, *Guidelines*; American Rivers, *Obtaining Permits*.

[86] For more information, see section "Permits, Regulations, and Enforcement" in CRS Report RL30030, *Clean Water Act: A Summary of the Law*, by Laura Gatz.

[87] For more information, see CRS Report R45460, *Coastal Zone Management Act (CZMA): Overview and Issues for Congress*, by Eva Lipiec.

[88] 2018 NID.

management agencies).[89] For individually authorized dams, the authorizing statute for each dam provides the primary guidance for the dam's management to satisfy authorized purposes; subsequent acts may provide additional operating authority.[90]

Removal of a federal dam that was constructed or acquired under a project-specific authority may require authorization by Congress.[91] This process generally begins with a federal agency, such as USACE or Reclamation, conducting a study, under its authority, that considers various alternatives and environmental laws and regulations.[92] If the agency selects removal as the preferred alternative, then it may recommend that Congress authorize removal.[93] If Congress authorizes the agency recommendation, Congress also would need to appropriate funds to conduct dam removal, which would be used along with any required cost sharing from a nonfederal partner.[94]

Generally, removal of a congressionally authorized dam has been rare.[95] A study for removal of this type of dam would likely only take place if the dam is no longer serving its purpose (e.g., commercial navigation); the dam poses a safety threat; the dam is not competitive for dam safety modification funding; and/or dam removal may provide aquatic ecosystem benefits.[96]

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[89] Federal land management agencies include the Bureau of Land Management (BLM), FWS, FS, and National Park Service (NPS). For more information on federal land management agencies, see https://www.crs.gov/video/detail/WVB00399.

[90] For example, USACE's Water Control Management Engineering Regulation states that "these public laws generally authorize the project for construction and operation for certain purposes with details being outlined in referenced project documents, which USACE carries out, including through the development of water control plans and appropriate revisions thereto under the discretionary authority of the Chief of Engineers." USACE, Water Control Management, Engineering Regulation 1110-2-240, May 30, 2016, at https://www.publications.usace.army.mil/portals/76/publications/engineerregulations/er_1110-2-240.pdf.

[91] USACE and Reclamation follow the Economic and Environmental Principles for Water and Related Land Resources Implementation Studies (Principles and Guidelines) established in 1983 for planning and evaluating alternatives for civil works projects. Larry Oliver et al., *Low-Head Dam Removal for Aquatic Ecosystem Restoration in the Corps*, 2018, at https://www.nalms.org/wp-content/uploads/2018/09/38-1-3.pdf. Hereinafter, Oliver et al., *Corps Dam Removal*.

[92] If a USACE-managed dam no longer serves its authorized purposes, USACE may conduct a disposition study under its Section 216 authority to review navigation, flood control, and water supply projects (33 U.S.C. §549a). For example, USACE conducted a disposition study in 2014 for Green River Locks and Dams 3 through 6 and the Barren River Lock and Dam, which were no longer serving their navigation purposes. USACE, *Green and Barren Rivers Locks and Dams Disposition Feasibility Study*, February 2014, at https://www.lrl.usace.army.mil/Portals/64/docs/CWProjects/Green%20and%20Barren%20dispo/Main%20Report.pdf.

[93] In Section 1315 of the Water Resources Development Act of 2016 (WRDA 2016; Title I of P.L. 114-322), Congress deauthorized Green River Locks and Dams 3 through 6 and the Barren River Lock and Dam, while stipulating the removal of Green River Locks and Dams 5 and 6 and the Barren River Lock and Dam. Removal of Green River Locks and Dams 5 and 6 was completed in 2017 and 2021, respectively. USACE, "Conservation Partners Celebrate Green River Dam Removal," September 20, 2021, at https://www.lrl.usace.army.mil/Media/News-Releases/Article/2781999/.

[94] For example, following construction authorization in the Water Resources Reform and Development Act of 2014 (P.L. 113-121) for aquatic ecosystem restoration, USACE allocated construction appropriations in USACE's FY2016 work plan to the Marsh Lake, MN, project, which included removal of the Marsh Lake Dam and construction of other structures. The nonfederal sponsor provided the 35% nonfederal cost share, as required for USACE ecosystem restoration projects (33 U.S.C. §2213). USACE removed the dam in October 2018 and completed project construction in June 2020. USACE, "Marsh Lake Ecosystem Restoration Project, Minnesota," at https://www.mvp.usace.army.mil/Home/Projects/Article/571148/marsh-lake-ecosystem-restoration-project/.

[95] For example, the American Rivers Dam Removal Database lists only seven USACE-managed dams and no Reclamation-managed dams removed between 2000 and 2020. American Rivers, "Database."

[96] For example, USACE has repeatedly considered deauthorizaton and removal of the New Savannah Bluff Lock and Dam since commercial navigation ceased through the lock, USACE determined the structure was unsafe, and dam

Recently, a ruling on litigation by nonfederal groups required the federal government to consider removing four hydroelectric dams on the lower Snake River, WA, as an alternative in its revision of Columbia River Basin dam operations to improve fish passage.[97] Ultimately, the federal government did not choose dam removal as its preferred alternative, in part because the dams still provide for multiple authorized purposes (e.g., navigation, hydroelectric power).[98]

At times, Congress has considered prohibiting federal agencies from using appropriations for activities related to the removal of federal dams managed by USACE and Reclamation. For example, the House of Representatives passed H.R. 3144 in 2018 to prevent any structural modification, action, study, or engineering plan that may hinder electrical generation from the Federal Columbia River Power System or navigation along the Snake River unless authorized by Congress, but the Senate did not act on the legislation.[99] The House of Representatives also passed a provision in H.R. 5895 under Division A, the Energy and Water Development and Related Agencies Appropriations Act, 2019, that would have prohibited use of any funds provided by Division A to remove any federally owned or operated dam unless the removal was previously authorized by Congress. The Senate removed this provision prior to enactment of H.R. 5895.

Federal agencies may remove dams that they manage and that were constructed or acquired without specific congressional authorization at the agencies' discretion, based on agency policies and in adherence to state and federal law.[100] For example, federal land management agencies may pursue dam removal as an alternative to reduce costs for operation, maintenance, and safety work on dams in poor or unsatisfactory condition and/or to improve fish passage and watershed restoration.[101] When evaluating such projects, the agencies determine if the action complies with their general authorities and is consistent with the planning document governing the management of that specific land unit. For example, in assessing dam removal activity in a national forest, FS would determine if dam removal is consistent with the National Forest Management Act of 1976 (P.L. 94-588), in part by meeting standards and guidelines found in the forest's land management plan.[102] Funding for dam removal activities from federal land management agencies'

safety modifications did not compete for funding. USACE then identified fish passage construction at the location as a mitigation strategy for impacts to fish species from USACE's Savannah Harbor Expansion Project. In 2019, the USACE Savannah District Commander approved removal of the lock and dam and construction of a fixed weir, in-stream fish passage, an option authorized by Section 1319 of P.L. 114-322. USACE is awaiting appropriations for the work, which has faced stakeholder opposition due to potential changes in incidental benefits currently provided by the lock and dam. USACE Savanah District Website, "SHEP Fish Passage at New Savannah Bluff Lock and Dam," at https://www.sas.usace.army.mil/Missions/Civil-Works/Savannah-Harbor-Expansion/SHEP-Fish-Passage/.

[97] National Wildlife Federations v. NMFS, No. 3:01-CV-00640 (D. Or. May 4, 2016).

[98] The EIS noted that breaching (i.e., removing) the lower Snake River dams would require legislative changes to the agencies' current authorities and mandates, as well as appropriations to carry out such activities. USACE, Reclamation, Bonneville Power Administration, *Columbia River System Operations Environmental Impact Statement Record of Decision*, 2020, at https://www.nwd.usace.army.mil/CRSO/.

[99] The lower Snake River dams are part of the Federal Columbia River Power System.

[100] For example, according to BLM's facility maintenance manual, dams that are "no longer functioning as originally designed, are no longer cost effective to maintain, and do not meet a resource need ... shall be obliterated as soon as funding becomes available." BLM, *Facility Maintenance*, MS 9104, April 2014, pg. A-3, at https://www.blm.gov/sites/blm.gov/files/uploads/mediacenter_blmpolicymanual9104.pdf. In 2021, BLM completed an EA proposing to remove two dam assets that breached in recent years; the agency stated that removal would provide long-term savings in the annual and deferred maintenance program by decreasing facility assets (see Upper Lone Tree and Double Crossing Dam Decommissioning Project at https://eplanning.blm.gov/eplanning-ui/project/2011409/510).

[101] For example, NPS removed Cascades Dam in Yosemite National Park in 2003 to protect visitors from consequences of potential dam failure and to facilitate river restoration of the Merced River, a designated wild and scenic river. NPS, "Cascades Diversion Dam Removal," at https://www.nps.gov/yose/learn/nature/dam-removal.htm.

[102] 16 U.S.C. §1604. For example, in the *Environmental Assessment Trabuco District Dam Removal Project: Silverado,*

appropriations may compete with funding needs for other facilities (e.g., roads, buildings). To the extent that federal land management agencies have deferred maintenance needs for dams they manage,[103] dam removal (as an option to address the deferred maintenance needs) could be eligible for deferred maintenance funding provided in discretionary or mandatory appropriations. One such source of funding would be mandatory funds from the National Parks and Public Land Legacy Restoration Fund established by the Great American Outdoors Act (P.L. 116-152).[104]

BIA is responsible for all dams on Indian lands, in accordance with the Indian Dams Safety Act of 1994, as amended (IDSA; P.L. 103-302; 25 U.S.C. §§3801 et seq.).[105] BIA has no policies and procedures specific to dam removal, likely because the IDSA does not authorize BIA to conduct dam removal. IDSA authorizes the Secretary of the Interior to establish a program within BIA to maintain dams identified under ISDA "in a satisfactory condition on a long-term basis."[106]

Federal Involvement in Nonfederal Dam Removal

Some federal agencies are involved in removal of nonfederal dams. This involvement may consist of voluntary coordination, regulatory actions (including those discussed in the "Statutory and Regulatory Requirements" section), or activities performed at the specific direction of Congress. Federal agencies also may provide technical and financial assistance for dam removal activities under more general authorities, such as those to address dam safety, flood risks, fish and wildlife passage, and watershed restoration.

Nonfederal Dams on Federal Land

There are over 5,000 nonfederal dams on federal land, mostly located on Bureau of Land Management and FS land.[107] Most federal agencies do not have authorities for regulating these dams, though some may have policies outlining operating responsibilities established through agreements.[108] For example, FS may allow nonfederal entities to use National Forest System

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Holy Jim, and San Juan Creeks, FS stated that the environmental analysis complied with the Cleveland National Forest Land Management Plan, which was completed in 2006. FS, "Trabuco District Dam Removal Project," at https://www.fs.usda.gov/project/?project=41140.

[103] *Deferred maintenance* is defined as maintenance that was not performed as needed or scheduled and was put off to a future time. See, for example, Financial Accounting Standards Advisory Board, "Statement of Federal Financial Accounting Standards 42: Deferred Maintenance and Repairs: Amending Statements of Federal Financial Accounting Standards 6, 14, 29 and 32," April 25, 2012, p. 5, at http://files.fasab.gov/pdffiles/original_sffas_42.pdf.

[104] For more information, see CRS In Focus IF11636, *The Great American Outdoors Act (P.L. 116-152)*, by Carol Hardy Vincent, Laura B. Comay, and Bill Heniff Jr. For FY2021, CRS identified that the National Parks and Public Land Legacy Restoration Fund supported at least two dam removal projects managed by BLM ("Joint Explanatory statement for P.L. 116-260, Consolidated Appropriations Act, 2021," *Congressional Record*, December 21, 2020).

[105] BIA manages 126 NID dams on Indian lands, in addition to unclassified dams not in the NID. The agency reports that it is not aware of all low-hazard dams under its jurisdiction. 2018 NID; Department of the Interior, *Reports Required by: The Water Infrastructure Improvements for the Nation (WIIN) Act of 2016, Title III, Subtitle A—Indian Dam s Safety Subtitle B—Irrigation*, April 15, 2017, Appendix A1.

[106] 25 U.S.C. §3803(a). In testimony before the Senate Committee on Indian Affairs in 2016, the BIA Director stated that the Tribal Safety of Dams Committee (authorized by 5 U.S.C. §3805) could consider recommendations addressing "the removal of dams in order to eliminate the safety hazards posed by deteriorating dams." Testimony of BIA Director Michael Black, in U.S. Congress, Senate Committee on Indian Affairs, *S. 2205, S. 2421, S. 2564, and S. 2717*, hearing, 114th Cong., 2nd sess., April 13, 2016, S.Hrg. 114-326.

[107] 2018 NID; FEMA, *The National Dam Safety Program, Biennial Report to the United States Congress, Fiscal Years 2014–2015*, FEMA P-1067, 2016, at https://www.fema.gov/sites/default/files/2020-08/national-dam-safety_biennial-report-2014-2015.pdf.

[108] For BLM, see 43 C.F.R. Part 2800; for FWS, see 361 FW 2.14. Congress has enacted specific conditions related to

lands for dams through an agreement called a *special use authorization*, which establishes the terms under which the authorized activity must be conducted (e.g., maintenance and dam safety measures).[109] These agreements may end in various ways, such as through planned termination, voluntary termination by the holder, or agency termination or revocation due to noncompliance with the agreement's terms. Generally, upon agreement termination, the holder is responsible for removing improvements, including dams. If improvements have not been removed within the time allowed, they become government property and are considered agency-managed dams.

Relicensing of Nonfederal Hydropower Projects Under the Federal Power Act

The FPA authorizes FERC to license new nonfederal hydropower projects, relicense existing projects, and provide oversight for all ongoing nonfederal projects.[110] Licenses, which establish operating parameters for nonfederal hydropower projects, typically are issued for 30-50 years.[111] As part of nonfederal hydropower projects, FERC has jurisdiction over more than 2,500 dams that together generate approximately 55,500 megawatts of hydropower capacity.[112] In September 2021, FERC reported that 178 licensed projects (17% of the total licensed projects in 2021) are set to expire between FY2022 and FY2026.[113] The relicensing process provides an opportunity to periodically reassess the relative benefits and impacts of hydropower projects.[114]

A project must adhere to several requirements to be relicensed. In the FPA, Congress gave certain conditioning and recommendation authorities to federal land management and resource agencies; BIA, representing Indian tribes; and state agencies. These authorities included the following:[115]

- Section 4(e) (16 U.S.C. §797) allows FERC to issue licenses for projects located on public lands and reservations of the United States, only after a finding that the license will not interfere or be inconsistent with the purposes for which the reservation was established. Any license issued within a federal reservation is

nonfederal hydropower projects on federal lands (see "Relicensing of Nonfederal Hydropower Projects Under the Federal Power Act").

[109] Land management agencies generally are responsible for monitoring whether the holders of special use authorizations comply with these requirements.

[110] For more information, see section on "Nonfederal Hydropower" in CRS Report R42579, *Hydropower: Federal and Nonfederal Investment*, by Kelsi Bracmort, Adam Vann, and Charles V. Stern; CRS In Focus IF11411, *The Legal Framework of the Federal Power Act*, by Adam Vann; and FERC, *Hydropower Primer: A Handbook of Hydropower Basics*, 2017, at https://www.ferc.gov/sites/default/files/2020-05/hydropower-primer.pdf (hereinafter, FERC, *Hydropower Primer*).

[111] FERC has developed three hydropower licensing processes: the Traditional Licensing Process, the Alternative Licensing Process, and the Integrated Licensing Process, which is the default process. FERC, *Hydropower Primer*.

[112] FERC, *Hydropower Primer*.

[113] FERC, "Licensing, Complete List of Active Licenses," at https://www.ferc.gov/licensing, accessed September 23, 2021. FERC provides relicensing data that include the number of projects with license applications expected to be filed for each fiscal year from FY2019 through FY2033. See FERC, "Licensing, Expected Relicense Projects FY2019-FY2033," at https://www.ferc.gov/licensing.

[114] Jeffrey J. Opperman et al., "The Penobscot River, Maine, USA: A Basin-Scale Approach to Balancing Power Generation and Ecosystem Restoration," *Ecology and Society*, vol. 16, no. 3 (2011). Hereinafter, Opperman et al., "Penobscot River."

[115] See Sections 4(e), 10(a), 10(j), and 18 of the Federal Power Act (FPA; 16 U.S.C. §§791-828c); and FERC et al., *Interagency Task Force Report on Agency Recommendations, Conditions, and Prescriptions Under Part I of the Federal Power Act*, December 2000, at https://www.ferc.gov/sites/default/files/2020-04/AgencyRecommendations%2CConditions%2CandPrescriptionsunderPartIoftheFederalPowerAct.pdf.

also subject to mandatory terms and conditions issued by the federal agency managing that reservation.

- Section 10(a) (16 U.S.C. §803) requires FERC to give consideration to purposes other than power generation, including the environmental and recreational concerns listed in Section 4(e), and states that any project licensed must be, in FERC's judgment, best adapted to a comprehensive plan for improving or developing a waterway(s) for the benefit of multiple public uses.
- Section 10(j) (16 U.S.C. §803) requires any license issued to include conditions to protect, mitigate damages to, and enhance fish- and wildlife-related habitat based on recommendations from federal and state fish and wildlife agencies.
- Section 18 (16 U.S.C. §811) states that FERC must require the construction, operation, and maintenance by a licensee of such fishways (e.g., fish ladders) as may be prescribed by the Secretary of the Interior or the Secretary of Commerce.[116]

FERC can make various decisions once a relicense application has been filed. Following the filing of a license application, agencies submit their recommendations and conditions. FERC considers the agencies' recommendations and incorporates the requirements into its final NEPA document (either an EA or an EIS). FERC then rules to grant the license with operating conditions or to deny the license; denial of the license could trigger decommissioning of the project and removal of the project's dam(s).[117] FERC also has coordinated the licensing of several projects in a watershed with agreement among parties to remove some dams in the watershed for restoration purposes.[118]

In addition, FERC may approve or deny the surrender of a project license. A project licensee may choose to surrender a license for various reasons, such as that the project is no longer economical (e.g., due to mandatory conditions to construct fish passage or dam safety repairs).[119] Once a licensee files an application to surrender, FERC reviews the application and issues an order approving or denying the request for surrender.[120] Licenses may be surrendered only after

[116] These prescriptions are mandatory and must be included in the license. The licensee, however, may appeal these prescriptions with the Secretaries of Commerce and the Interior. FERC, *Hydropower Primer*.

[117] In 1995, FERC issued a policy statement concluding that it had the authority as part of a relicensing proceeding to deny a relicense application and to order a dam to be removed if FERC determines such an action is in the public interest. FERC, "Project Decommissioning at Relicensing: Policy Statement," 60 *Federal Register* 339, January 4, 1995. For example, FERC exercised this dam removal authority in a 1997 order requiring removal of the Edwards Dam on the Kennebec River in Maine (Edwards Mfg. Co., 81 FERC 61,225 (1997)). Natural Resources Council of Maine, "A Brief History of Edwards Dam," at https://www.nrcm.org/programs/waters/kennebec-restoration/history-edwards-dam/.

[118] In 2004, parties negotiating the relicensing of hydropower projects in the Penobscot River watershed filed with FERC the Lower Penobscot River Comprehensive Settlement Accord, a multiparty legal agreement designed to reconfigure hydropower production on the lower Penobscot system to both restore migratory fish populations (through dam removal and by installing fish passages at certain dams) and maintain hydropower production under new licenses at selected PPL Corporation dams. The parties involved in negotiations included the PPL Corporation, Penobscot Indian Nation, State of Maine, Department of the Interior (BIA, FWS, NPS), and five nonprofit conservation organizations. Opperman et al., "Penobscot River"; 69 *Federal Register* 41799.

[119] Where the entity responsible for a project has indicated its intent to abandon the project but has not filed a surrender application (e.g., allowing a project to be in a state of disrepair for a long period, with no plan to put it back in operation in the foreseeable future), FERC may issue an order terminating a license or exemption by implied surrender. FERC, *Hydropower Primer*.

[120] A licensee must prepare an application for a license surrender as specified in 18 C.F.R. §6.1, which includes the reason for surrendering the license and a copy of the license and all amendments associated with the project. If

fulfilling any obligations under the license order that FERC may prescribe and any conditions for disposing of project works and restoring project lands that FERC and relevant federal and state fish and wildlife agencies may require.

Federal Assistance for Nonfederal Dam Removal

Congress has authorized and funded various programs that may address dam safety, flood risks, fish passage, and watershed restoration; these programs may include dam removal as an eligible activity. For example, in 2020, Congress enacted a new authority for ecosystem restoration under Reclamation that may include funding the design, study, and construction to remove fish passage barriers.[121] This report's **Appendix** includes a table that provides information on selected federal assistance (e.g., grants, loan programs) for nonfederal dam removal that spans multiple departments and agencies (e.g., Environmental Protection Agency [EPA]; Departments of Agriculture, Commerce, Defense, Interior, and Homeland Security). Some of these agencies also may provide technical assistance specific to their expertise to nonfederal entities interested in pursuing dam removal. For example, the National Oceanic and Atmospheric Administration's (NOAA's) Community-Based Restoration Program provides technical assistance to owners and stakeholders for various phases of a dam removal project: feasibility study, permitting and environmental compliance, project design, implementation, and monitoring.[122] Other programs are available through public-private partnership organizations, such as the National Fish and Wildlife Foundation's Five-Star and Urban Waters Restoration Matching Grant Program.[123]

In addition, dam removal activities may receive financial assistance from payments associated with natural resource damages.[124] When a chemical or oil spill occurs, responsible parties may be liable for the cost of removal and remedial actions, as well as for natural resource damages.[125] Responsible parties may be liable for natural resource damages under one or more federal laws, particularly the Oil Pollution Act of 1990 (33 U.S.C. §§2701 et seq.) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA; 42 U.S.C. §§9601 et seq.). Federal agencies may act as trustees for the payments used for restoration efforts. In some cases, payments for natural resource damages have supported dam removals as part of restorative actions to compensate for damages.[126] For example, officials from NOAA, FWS, and Connecticut's Department of Energy and Environmental Protection designated dam removal projects as part of a series of Housatonic River watershed projects funded by a 1999 legal settlement involving natural resource damages.[127]

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appropriate, a NEPA document is prepared before an order is issued. FERC, "How to Surrender a License or Exemption," at https://www.ferc.gov/industries-data/hydropower/administration-and-compliance/how-surrender-license-or-exemption.

[121] Section 1109, Title XI, Division FF of P.L. 116-260.

[122] NOAA Fisheries, "Providing Technical Support for Habitat Restoration Efforts," at https://www.fisheries.noaa.gov/national/habitat-conservation/providing-technical-support-habitat-restoration-efforts.

[123] National Fish and Wildlife Foundation, "Five-Star and Urban Waters Restoration Matching Grant Program," at https://www.nfwf.org/programs/five-star-and-urban-waters-restoration-grant-program.

[124] American Rivers, *Paying for Dam Removal*.

[125] For more information, see CRS Report R43251, *Oil and Chemical Spills: Federal Emergency Response Framework*, by David M. Bearden and Jonathan L. Ramseur.

[126] American Rivers, *Paying for Dam Removal*.

[127] NOAA, Office of Response and Restoration, "$2 Million in Aquatic Restoration Projects Proposed for Polluted Housatonic River in Connecticut," at https://response.restoration.noaa.gov/about/media/2-million-aquatic-restoration-projects-proposed-polluted-housatonic-river-connecticut.html.

In addition to liability for natural resource damages, parties responsible for chemical or oil spills may be subject to civil penalties for violations under CERCLA or CWA. Enforcement actions involving these violations may include *supplemental environmental projects* (SEPs), which are projects that provide benefits that a party may voluntarily agree to undertake in exchange for mitigation of penalties.[128] EPA has stated that in certain circumstances, dam removal projects have the potential to meet the conditions for SEPs.[129]

Another potential incentive for dam removal in certain scenarios may be the opportunity for the project proponent to receive mitigation credit for the project.[130] Under CWA Section 404 and RHA Sections 9 and 10, USACE has authority to issue permits (see "Statutory and Regulatory Requirements"). USACE may require these permits to include compensatory mitigation to offset any unavoidable impacts to waters of the United States that occur as a result of the permitted activity. *Compensatory mitigation* refers to the restoration, establishment, enhancement, and/or, in certain circumstances, preservation of wetlands, streams, or other aquatic resources for the purpose of offsetting unavoidable adverse impacts. According to USACE guidance, "the removal of obsolete dams and other obsolete in-stream structures can be an effective approach to restoring river and stream structure, functions, and dynamics."[131] The guidance further explains that these restoration activities may be performed by mitigation banks and in lieu fee programs to generate mitigation credits, which can be sold or transferred to permittees to fulfill compensatory mitigation requirements. The activities also can be conducted as permittee-responsible mitigation. Whether mitigation credits may be considered for dam removal depends on the nature of the specific project and is subject to review by the USACE and other applicable federal and state agencies.

Congressional Intervention in Nonfederal Dam Removal

Although there is no underlying statutory authority for federal involvement in nonfederal dam removal, Congress has authorized federal involvement in some individual dam removals when it found a compelling reason to do so, likely due to a federal nexus (e.g., proximity to federal land or project, tribal responsibilities, listed species). The "Case Histories" box provides an example of when Congress directed federal involvement in nonfederal dam removal and an example of when Congress initially was involved in dam removal studies but ultimately did not authorize federal involvement for removal. These examples also represent large and complex dam removal projects. Congress provided $325 million for restoration of the Elwha River, which included the largest dam removal projects ever executed in the United States at the time.[132] Removal of four Klamath River dams also would be a massive project costing nearly $450 million.[133]

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[128] EPA, "Supplemental Environmental Projects (SEPs)," at https://www.epa.gov/enforcement/supplemental-environmental-projects-seps.

[129] EPA, "Frequent Questions."

[130] This section was written by Laura Gatz, Analyst in Environmental Policy. The Nature Conservancy, *Environmental Markets and Stream Barrier Removal*, 2017, at https://www.nature.org/content/dam/tnc/nature/en/documents/2017_Stream_Barrier_Removal_and_Mitigation_Report.pdf.

[131] USACE, *Regulatory Guidance Letter 18-01*, September 25, 2018, at https://www.nap.usace.army.mil/Portals/39/docs/regulatory/regs/RGL-18-01-Determination-of-Compensatory-Mitigation-Credits-for-Dams-Structures-Removal.pdf.

[132] NPS, "Elwha River Restoration Frequently Asked Questions," at https://www.nps.gov/olym/learn/nature/elwha-faq.htm.

[133] Klamath River Renewal Corporation, *Definite Plan for the Lower Klamath River*, June 2018, at https://klamathrenewal.org/definite-plan/.

Case Histories

Elwha and Glines Canyon Dams

The Elwha Dam was built in the 1910s and the Glines Canyon Dam was built in the 1920s on the Elwha River in Washington's Olympic Peninsula. Both dams were operated to provide hydropower, and neither had fish passage facilities. Dam construction impacted cultural resources of the Lower Elwha Klallam Tribe; the tribe historically was sustained by the Elwha River's fish resources and now resides in the Lower Elwha Klallam Reservation at the mouth of the river. In 1938, Congress established Olympic National Park (16 U.S.C. §251), which included the Elwha Dam within its boundaries. These boundaries expanded in 1940 to include the Glines Canyon Dam.

The Elwha Dam was never licensed for hydropower production. The dam's owner, Crown Zellerbach Corporation, filed a license application for the Elwha Dam in 1968. Crown Zellerbach Corporation also filed an application to relicense Glines Canyon Dam in 1973, the year its original license expired. In 1979, the Federal Energy Regulatory Commission (FERC) consolidated the applications into a single process. In 1986, Congress amended the Federal Power Act (16 U.S.C. §§791 et seq.), which required FERC to consider impacts of natural resources and effects on federal and tribal lands in licensing hydropower projects (see "Relicensing of Nonfederal Hydropower Projects Under the Federal Power Act"). Also in 1986, the Lower Elwha Klallam Tribe filed an intervening motion aiming to halt relicensing proceedings by FERC and require removal of the dams. FERC proceeded to prepare an environmental impact statement (EIS) for the Elwha and Glines Canyon hydroelectric projects to evaluate their potential impacts for licensing and potential alternative actions. The process was subject to controversy and delay, due in large part to the policy implications of licensing a project within a national park; conflicting federal, state, and tribal resource goals; and legal challenges.

After a protracted administrative process, Congress legislated a resolution by enacting the Elwha River Ecosystem and Fisheries Restoration Act (P.L. 102-459) in 1992. The act directed the Secretary of the Interior to develop a report for Congress assessing alternatives to fully restore the native anadromous fisheries and the Elwha River ecosystem, and it removed FERC's authority to issue a final licensing decision. In the 1994 *Elwha Report to Congress*, the Secretary of the Interior recommended dam removal as the preferred alternative. Under the 1992 act, a recommendation for dam removal authorized the Department of the Interior (DOI) to acquire the dams at a fixed cost of $29.5 million and required the Secretary of the Interior to prepare appropriate EISs. The National Park Service (NPS) issued an EIS and a record of decision in 1995 recommending removal of both dams, and it issued an implementation EIS in 1996 to address the specific construction methods and mitigation measures.

After DOI acquired the project facilities in 2000, NPS issued a final supplemental EIS in 2005 to account for changes, including newly listed fish species under the Endangered Species Act (ESA; P.L. 93-205, 16 U.S.C. §§1531-1544), and to incorporate water quality mitigation plans. Originally, the primary source of funding for dam removal was the NPS construction budget, but the American Recovery and Reinvestment Act (P.L. 111-5) provided the remaining funding necessary to remove both dams. The total cost of Elwha River restoration was approximately $325 million and included purchasing the two dams and hydroelectric plants from their previous owner; removing the dams; and constructing two water treatment plants, flood protection facilities, a fish hatchery, and a greenhouse to propagate native plants for revegetation. NPS removed the Elwha Dam in 2011 and the Glines Canyon Dam in 2014. Federal agencies, such as the U.S. Geological Survey, continue to monitor the Elwha River's ecosystem restoration progress following dam removal.

Klamath River Dams

Much of the Upper Klamath River Basin relies on economic activity supported by irrigated agriculture and the Bureau of Reclamation's Klamath Project within DOI. Mitigating the effects of water management practices, habitat alteration activities, and other factors on species listed under the ESA is a perennial issue in the basin. The basin contains seven dams on the Klamath River and its tributaries, built between 1918 and 1962. PacifiCorp, a regulated utility, originally owned six of these dams. These six dams are known collectively as the Klamath Hydroelectric Project (KHP). Historically, all but one of the dams have produced hydroelectric power for the basin, including relatively low-cost power for Klamath Project irrigators. The original FERC license to operate the KHP expired in 2006. In 2004, PacifiCorp applied for relicensing of the project, and, in 2007, FERC issued an EIS for the application. FERC analyzed various alternatives for the application, ultimately recommending a new license with mandatory prescriptions to create fish ladders. FERC estimated that fish ladders would cost hundreds of millions of dollars to implement and likely would result in net operating losses for the project. As a result of the EIS, PacifiCorp entered into basin settlement negotiations with stakeholders and continued to operate the project under temporary annual licenses.

In 2010, the Secretary of the Interior, the governors of Oregon and California, PacifiCorp, and 44 other parties announced two interrelated settlement agreements intended to resolve long-standing issues in the basin: the Klamath Basin Restoration Agreement (KBRA) and the Klamath Hydroelectric Settlement Agreement (KHSA). The KBRA proposed actions to restore Klamath fisheries and assurances for water deliveries, among other things,

and the KHSA laid out a process for removal of four of PacifiCorp's dams, which would be one of the largest and most complex dam removal projects undertaken in the United States. After a secretarial determination on dam removal, the dams would be transferred to DOI, which would oversee their removal.

Much of the Klamath settlement agreements' provisions required congressional action. For the agreements to enter into force and be carried out, Congress would need to (1) enact legislation authorizing both agreements, (2) authorize the Secretary of the Interior to make a determination on dam removal, and (3) appropriate funding for federal components of both agreements. Congress held hearings on proposed legislation in the 113th Congress (S. 2379 and S. 2727) and 114th Congress (S. 133) but did not enact the bills into law.

Despite the lack of congressional authorization, some work related to the KBRA and the KHSA proceeded under existing authorities. For example, DOI completed studies to inform the secretarial determination on dam removal; however, the Secretary of the Interior could not act because Congress did not pass legislation allowing the Secretary to make a determination to remove the dams.

After some stakeholders argued that Congress was unlikely to act on the agreements, in 2016, the parties amended the KHSA to not require the transfer of dams to DOI, thus avoiding the need for congressional authorization. The amended KHSA lays out a process for PacifiCorp to transfer the dams slated for removal to a new nonprofit entity, the Klamath River Renewal Corporation (KRRC), and to proceed with decommissioning the projects. In June 2021, FERC approved the transfer of the license from PacifiCorp to KRRC and the States of Oregon and California, as co-licensees. KRRC states that it plans to commence dam removal in 2023.

Sources: DOI; FERC; KRRC; NPS; PacifiCorp; U.S. Geological Survey; and Julia Guarino, "Tribal Advocacy and the Art of Dam Removal: The Lower Elwha Klallam and the Elwha Dams," *American Indian Law Journal*, vol. 2, no. 1 (2013), pp. 114-145.

Notes: For more information on Upper Klamath River Basin issues, see CRS Insight IN11689, *Drought in the Klamath River Basin*, by Charles V. Stern and Pervaze A. Sheikh. The KRRC is led by a 15-member board appointed by the governors of California and Oregon, the Karuk and Yurok Tribes, and conservation and fishing groups. For more information on Klamath River restoration and dam removal, see CRS In Focus IF11616, *Klamath River Restoration and Dam Removal*, by Charles V. Stern and Pervaze A. Sheikh.

Congress also has authorized and funded removal of nonfederal dams at a lesser expense than the Elwha and Glines Canyon Dams. At times, these federal actions intervened in what is normally considered a nonfederal responsibility. For example, Congress authorized and funded USACE to remove the Embrey Dam, owned by the City of Fredericksburg, VA, on the Rappahannock River, for $10 million.[134] Congress also authorized and funded Reclamation to remove the Savage Rapids Dam in Oregon, which was owned by an irrigation district, for $39 million.[135]

In addition, Congress may authorize studies and construction projects that involve dam removal activities but are not primarily for the purposes of dam removal. For example, a USACE study for flood risk reduction and/or aquatic ecosystem restoration could include nonfederal dam removal in the area of study as part of a project alternative. If the USACE Chief of Engineers recommends that alternative, Congress may authorize a USACE project that includes nonfederal dam removal; in some cases, USACE can pursue dam removal without further congressional action.[136] Congress

[134] USACE, "USACE Sets the Rappahannock River Free," 2004, at https://apps.dtic.mil/sti/pdfs/ADA596489.pdf. P.L. 106-53 authorized the removal of the Embrey Dam.

[135] Reclamation, "Reclamation Starts Savage Rapids Dam Removal," 2009, at https://www.usbr.gov/newsroom/newsroomold/newsrelease/detail.cfm?RecordID=27841. Title XII of P.L. 93-493 authorized the removal of the Savage Rapids Dam. H.Rept. 108-357 accompanying P.L. 108-137, among other appropriations bills, directed funds for the Embrey Dam and Savage Rapids Dam removal projects.

[136] Oliver et al., *Corps Dam Removal*. In some cases, after completing a feasibility study that recommends dam removal, USACE may have authority to begin construction of dam removal without additional authorization from Congress. In January 2015, USACE completed a feasibility study for the Upper Des Plaines River in Illinois, which Section 419 of the WRDA of 1999 (P.L. 106-53) authorized to address flood control and ecosystem restoration. Although USACE recommended the removal of five dams as part of the preferred alternative, USACE chose to remove the dams under its Section 206 Continuing Authorizations Program (33 U.S.C. §2330) authority, which does not require congressional authorization for construction. Other aspects of the preferred alternative were authorized in

may consider whether the federal government should have a more limited or an expanded role in studying and executing specific projects for nonfederal dam removal, especially in regard to the federal nexus for pursuing such projects.

Dam Removal Legislation in the 117th Congress

In the 117th Congress, legislation has been introduced to create new authorities related to dam removal and to provide emergency and mandatory appropriations for certain activities that may include dam removal.[137] These provisions are summarized below.

Several bills introduced in the House and the Senate contain multiple provisions related to dams, including dam removal. Title II of H.R. 4375, the Twenty-First Century Dams Act, would create a new 30% federal tax incentive, with a direct pay option, to support efforts by private, state, local, and nonprofit groups to remove obsolete dam obstructions.[138] Eligible expenses include the removal, in whole or in part, of powered and non-powered dams, with the dam owner's consent, along with any remediation and ecosystem restoration costs associated with a removal project.[139] Title III of H.R. 4375 also would direct USACE to establish a new dam removal program; it would authorize appropriations for the program at $7.5 billion over five years, which would fund dam removal projects or dam removal technical assistance programs aimed at protecting human health and safety, restoring aquatic habitat and riverine processes, and enhancing river-based recreation, among other objectives.[140] The bill would establish a dam removal council comprising the heads of multiple federal agencies to develop a strategy to remove dams and to make recommendations to USACE regarding dam removal projects and technical assistance programs. The council also would establish an advisory board of tribal representatives, state agencies, nongovernmental organizations, and organizations representing dam owners to provide advice and recommendations to the council. Title IV of H.R. 4375 would direct the USGS and the Department of Energy to conduct a national dam assessment to assimilate data for stakeholders and federal agencies to determine whether government and privately owned powered and non-powered dams may be appropriate candidates for removal, upgrading, enhancement for environmental performance, or retrofitting for hydropower production.[141]

WRDA 2016 (Title I of P.L. 114-322). USACE, *Upper Des Plaines River and Tributaries, IL and WI: Integrated Feasibility Report and Environmental Assessment*, January 2015, at https://www.lrc.usace.army.mil/Missions/Civil-Works-Projects/Des-Plaines-River-Phase-II/. USACE also removed the Sandy River Delta Dam in 2013 under the authority of Section 536 of the WRDA of 2000 (P.L. 106-541), which authorized USACE to conduct studies and implement ecosystem restoration projects necessary to protect, monitor, and restore fish and wildlife habitat in the lower Columbia River and Tillamook Bay estuaries. USACE, *Sandy River Delta Section 536 Ecosystem Restoration Project Environmental Assessment*, June 2013, at https://www.nwp.usace.army.mil/Missions/Current/Sandy-River-Delta/.

[137] In addition, Representative Simpson released a $3.35 billion legislative framework in February 2021 that proposed breaching the four lower Snake River dams while compensating for lost benefits with programs related to energy, transportation, and other services. United States Congressman Mike Simpson, "The Columbia Basin Initiative," at https://simpson.house.gov/salmon/.

[138] The amount of the credit would be 30% of the taxpayer's basis in eligible property (generally, the cost of dam removal). A *direct pay* option would allow taxpayers to elect a cash payment in lieu of the tax credit.

[139] The provision does not include demolishing or removing a federal hydroelectric dam.

[140] The program would not support dam removal of federal hydropower dams. The federal share of the cost of a dam removal project would be 100%, unless a different federal share is required by the program of the agency executing the project. Monitoring would be an eligible use of funds. Of the authorized appropriations, $30 million would be for nonfederal dam removal technical assistance programs.

[141] The bill states that the assessment would be for data gathering and analysis tools and would not make

S. 2356, also titled the Twenty-First Century Dams Act, includes the same dam removal provisions that appear in Titles III and IV of H.R. 4375 but does not include the tax provisions in Title II of H.R. 4375. Separate legislation, the Maintaining and Enhancing Hydroelectric and River Restoration Act (S. 2306 and H.R. 4499) includes tax provisions similar to those in Title II of H.R. 4375. Section 204 of H.R. 3404, the FUTURE Western Water Infrastructure and Drought Resiliency Act, would direct the Secretary of the Interior to arrange for a study with the National Academies of Sciences, Engineering, and Medicine on sediment transport following dam removal.

In August 2021, the Senate passed H.R. 3684, the Infrastructure Investment and Jobs Act of 2021, which includes new authorizations related to dam removal and emergency appropriations under new and existing authorities related to dam removal. The bill would authorize a new $80 million collaborative-based, landscape-scale restoration program from FY2022 through FY2026. The program would be administered by the Secretaries of Agriculture and the Interior and would aim to restore water quality or fish passage on federal land, including Indian forest land or rangeland.[142] Under the program, the Secretaries would solicit collaboratively developed proposals for up to $5 million in funding for five-year projects to restore fish passage or water quality on federal and nonfederal land.[143] The bill also would authorize $250 million for FY2022 through FY2026 to Reclamation for the design, study, and construction of aquatic ecosystem restoration and protection projects, which may include removing fish passage barriers.[144] The bill includes emergency appropriations that may fund dam removal, such as the following:[145]

- $115 million for USACE's Section 206 Continuing Authorizations Program (33 U.S.C. §2330) to restore fish and wildlife passage by removing in-stream barriers and providing technical assistance to nonfederal interests carrying out such activities[146]
- $250 million from FY2022 through FY2026 for Reclamation to design, study, and construct aquatic ecosystem restoration and protection projects, which may include removing fish passage barriers[147]
- $400 million through FY2026 for NOAA's Community-Based Restoration Program (16 U.S.C. §1891a) to restore fish passage by removing in-stream barriers and providing technical assistance[148]

recommendations on individual dams.

[142] Sections 40804(b)(10) and 40804(f) of Division D of H.R. 3684.

[143] The bill would direct the Secretaries of Agriculture and the Interior to fund project proposals that would result in the most miles of streams being restored for the lowest amount of federal funding and to discontinue funding for a project that fails to achieve its intended results after two consecutive years.

[144] The authorization of appropriations would be in accordance with Section 1109 of Division FF of P.L. 116-260.

[145] Details of many these programs are in the **Appendix**.

[146] The bill would provide that USACE would execute these projects at full federal expense (instead of 35% nonfederal cost share) and without a cost limit (Section 206 Continuing Authorities Program projects normally are limited to $10 million in federal funds).

[147] Section 40901, Division D, of H.R. 3684 would authorize appropriations in accordance with Section 1109 of Division FF of P.L. 116-260.

[148] The provision would prohibit appropriations to this program for removing, breaching, or otherwise altering the operations of a federal hydropower dam. It also states that dam removal projects must include the dam owner's written consent. The provision would provide up to 15% of appropriations to the program for projects pursued by Indian tribes or partnerships of Indian tribes.

- $585 for the Federal Emergency Management Agency's (FEMA's) High Hazard Dam Mitigation Grant Program (33 U.S.C. §467f–2), of which $75 million is for the removal of nonfederal dams[149]
- $200 million from FY2022 through FY2026 for FWS's National Fish Passage Program to provide technical assistance and restore fish and wildlife passage by removing in-stream barriers
- $10 million from FY2022 through FY2026 for FS's Capital Improvement and Maintenance account for the removal of non-hydropower federal dams and to provide dam removal technical assistance
- $2.9 billion from FY2022 through FY2026 for FS to carry out activities in Sections 40803-40804 of Division D of H.R. 3684[150] (Section 40804 would authorize $80 million for the program described above to restore water quality or fish passage on federal land)

The 21st Century Conservation Corps Act (S. 487 and H.R. 1162) also would provide emergency appropriations from FY2021 through FY2023 to the Departments of Agriculture and the Interior for federal land management and conservation, such as fish passage.

In addition, Congress is debating whether to provide mandatory appropriations for environmental restoration in the FY2022 budget reconciliation process, and funding allocated for environmental restoration activities could include dam removal. H.R. 5376—approved by the House Committee on the Budget on September 27, 2021, in response to reconciliation directives from S.Con.Res. 14—includes provisions in Title VII related to environmental restoration.[151] Some of the provisions would provide mandatory appropriations for activities such as habitat restoration and restoration of natural resources, among other purposes.[152] H.R. 5376 also would provide $250 million in mandatory appropriations for Reclamation's aquatic ecosystem restoration program, which may include projects that remove fish passage barriers, to be expended between FY2027 and FY2031.[153]

The 117th Congress may debate whether to enact new authorities related to dam removal and whether to provide additional appropriations for programs that may fund dam removal activities. It also may engage in oversight of federal agency activities pursuant to new or amended authorities related to dam removal and may review the effectiveness, efficiency, and priorities of agencies funding dam removal activities.

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[149] The provision states that dam removal projects must include written consent of the dam owner, if ownership is established.

[150] This provision would allow FS to allocate the money among the many purposes outlined in Sections 40803-40804 of Division D of H.R. 3684. FS would have the discretion to use or not use the money for all of the purposes in those sections. The bill also would appropriate $905 million for the Secretary of the Interior to carry out activities that Section 40804 of Division D would authorize.

[151] U.S. House of Representatives, "Markup of Markup to Consider the Committee Print Containing Legislative Proposals to Comply with the Reconciliation Directive Included in Section 2002 of the Concurrent Resolution on the Budget for Fiscal Year 2022, S.Con.Res. 14.," September 2021, at https://docs.house.gov/Committee/Calendar/ByEvent.aspx?EventID=114022.

[152] For example, the Title VII language would appropriate $9.5 billion in mandatory funds to NOAA for coastal and Great Lakes restoration and technical assistance (Section 70501) and $400 million in mandatory funds to NOAA for the Pacific Coastal Salmon Recovery Fund, which has funded dam removal in the past. These funds would be appropriated in FY2022; would remain available until September 30, 2031; and would not require nonfederal cost share.

[153] Section 70309 would provide mandatory appropriations in accordance with Section 1109 of Division FF of P.L. 116-260.

Appendix. Federal Assistance for Nonfederal Dam Removal

Table A-1 provides a list of selected federal assistance (e.g., grants, loan programs) that may be available for certain nonfederal dam removal projects.[154] The table provides general information, if available, on assistance program authorities, eligible entities or dams, eligible activities and uses, applicable cost share, relevant authorizations of appropriations,[155] recent appropriations/funding levels, and relevant government websites. The list provides an overview of relevant assistance and authorities; it may not include all potential sources of federal assistance.[156]

[154] The federal assistance for dam removal described in **Table A-1** is generally applicable to nonfederal dams located on nonfederal lands.

[155] The table includes some authorities enacted in the 116th Congress that have not yet received funding.

[156] Some programs are available through public-private partnership organizations, including the National Fish and Wildlife Foundation's Bring Back the Native Fish Program (https://www.nfwf.org/programs/bring-back-natives), Five-Star and Urban Waters Restoration Matching Grant Program (https://www.nfwf.org/programs/five-star-and-urban-waters-restoration-grant-program/five-star-and-urban-waters-restoration-grant-program-2021-request-proposals), Columbia Basin Water Transactions Program (https://www.nfwf.org/programs/columbia-basin-water-transactions-program), and National Fish Habitat Partnership's programs (http://www.fishhabitat.org/). Some grant programs may be used to fund dam removal, but dam removal is not the primary purpose of the programs (e.g., North American Wetlands Conservation Act grants (16 U.S.C. §§4401 et seq.), grants related to National Fish Habitat Action Plans). Some FS authorities allow the agency to provide assistance for watershed or fisheries projects located on nonfederal lands in specified circumstances (e.g., Watershed Restoration and Enhancement Agreements (16 U.S.C. §1011a)). These authorities may apply to dam removal.

Table A-1. Selected Federal Assistance for Removal of Nonfederal Dams

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
Department of the Interior/Reclamation States Aquatic Ecosystem Restoration (Title XI, Division FF, Section 1109 of P.L. 116-260)	Eligible entities include states; tribes; irrigation districts; water districts; water or power delivery authorities; organizations that own a facility eligible for upgrade, modification, or removal; nonprofit conservation organizations partnering with an entity that owns the infrastructure or land; and agencies established under state law for the joint exercise of powers.	On the request of any eligible entity, the Secretary of the Interior may negotiate and enter into an agreement to fund the design, study, and construction of an aquatic ecosystem restoration and protection project in a Reclamation state (17 designated states west of the Mississippi River) if the Secretary of the Interior determines the project is likely to improve the health of fisheries, wildlife, or aquatic habitat, including through habitat restoration and improved fish passage via the removal or bypass of barriers to fish passage.	An eligible entity is to provide no less than 35% of the costs of project construction and 100% of any operation, maintenance, and replacement and rehabilitation costs with respect to the project.	$15 million annually for FY2022 through 2026.	Not yet funded.	NA (Charlie Stern)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
Environmental Protection Agency (EPA) Clean Water Act Section 319 Nonpoint Source Management Grant Program (33 U.S.C. §1329)	States and tribes are eligible for grants for projects consistent with a state's or tribe's written nonpoint source management program plan. Project proposals may be sent to state nonpoint source agencies, usually as part of an annual competitive request-for-proposals process.	This program awards grants to states and tribes to implement their approved state nonpoint source management programs. Dam removal projects need to be consistent with a state's or tribe's nonpoint source management program plan (e.g., some states/tribes may have hydrologic modification or dam removal as priorities in their plans). Dam removal projects that are consistent with EPA guidelines also are eligible.	Each Section 319 grant to a state or tribe requires a 40% nonfederal match. This match is not required to be met on a project-by-project basis.	Expired.	$177 million for FY2021.	https://www.epa.gov/nps/319-grant-program-states-and-territories (Laura Gatz)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
EPA Wetland Program Development Grants (33 U.S.C. §1254(b)(3))	States, tribes, local governments, interstate associations, and intertribal consortia are eligible to apply for funds to conduct projects that help develop and refine their wetland programs.	The program assists nonfederal governments with building or enhancing their wetland protection and restoration programs. Grant funds could be used to fund studies to identify how dam removal can improve wetland restoration. Construction activities are specifically prohibited, unless those efforts are undertaken as part of a scientific demonstration or study.	None.	Expired.	$14.2 million for FY2021.	https://www.epa.gov/wetlands/wetland-program-development-grants-and-epa-wetlands-grant-coordinators (Laura Gatz)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
Federal Emergency Management Agency (FEMA) High-Hazard Dam Rehabilitation Grant Program (33 U.S.C. §467f–2)	State governments may submit applications to FEMA on behalf of sub-recipients for eligible dams and then may distribute any grant funding received from FEMA to sub-recipients for the dams. Eligible dams must be in a state with a dam safety program, be classified as high hazard, fail to meet the state's minimum dam safety standards, and pose an unacceptable risk to the public, among other criteria. Federally owned dams, dams built under the authority of the Secretary of Agriculture, and hydropower dams with an authorized installed capacity of greater than 1.5 megawatts are not eligible for the program.	The program assists with technical, planning, design, and construction activities toward the repair, removal, and structural/ nonstructural rehabilitation of eligible high-hazard potential dams.	Nonfederal cost share of no less than 35%.	$60 million annually for FY2021 through FY2026.	$12 million in FY2021.	https://www.fema.gov/ emergency-managers/ risk-management/dam-safety/grants#hhpd (Anna Normand)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
FEMA Hazard Mitigation Grant Program (HMGP) (Section 404 of P.L. 93-288, as amended; 42 U.S.C. §5170c)	Eligible applicants include states, territories, the District of Columbia (DC), and federally recognized tribes. A federally recognized tribe has the option to apply for HMGP directly to FEMA as an applicant or through a state as a sub-applicant. Eligible sub-applicants include state agencies, federally recognized tribes, local governments/ communities, and private nonprofit organizations. A governor or equivalent may request that HMGP funding be available throughout the state, territory, or tribal area following a presidential major disaster declaration or Fire Management Assistance Grant (FMAG) declaration under Section 420 of the Stafford Act (42 U.S.C. §5187).	Eligible activities include localized and non-localized flood risk reduction projects, nonstructural retrofitting of existing buildings, and soil stabilization. Flood risk reduction projects may include the construction, demolition, or rehabilitation of dams. Modifications must be for the purpose of increasing the capacity for risk reduction of the existing structures and cannot constitute only repairs.	Nonfederal cost share of no less than 25%. The recipient may choose to meet the cost-share requirement by ensuring a minimum 25% nonfederal cost share for the overall award to the state rather than on an individual activity basis.	The program is funded from the Disaster Relief Fund and is available following a presidential major disaster declaration or FMAG declaration under the Stafford Act. Once the program is approved for an eligible applicant, HMGP program funding does not have to be used for the particular disaster for which it was allocated or for the particular location or type of disaster. The applicant makes decisions about allocating program funds to sub-applicants.	The level of funding for a given disaster is based on a percentage of the estimated total federal assistance under the Stafford Act for each presidential major disaster declaration or FMAG declaration, subject to a sliding scale formula (see U.S.C. §5170c(a) and 44 C.F.R. §206.432(b)).	https://www.fema.gov/ grants/mitigation/hazard-mitigation (Diane Horn)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
FEMA Building Resilient Infrastructure and Communities (BRIC), (Section 203 of P.L. 93-288, as amended; 42 U.S.C. §5133)	Eligible applicants include states, territories, DC, and federally recognized tribes. Tribes have the option to apply for BRIC funding directly to FEMA as an applicant or through a state as a sub-applicant. Eligible sub-applicants include state agencies, federally recognized tribes, and local governments/ communities. Any states or territories, or federally recognized tribes that are entirely or partially located in a state or territory, that have had a major disaster declaration in the seven years prior to the application start date are eligible to apply. All states, territories, and federally recognized tribes had COVID-19 disaster declarations in 2020.	Eligible activities for BRIC are the same as those described above for HMGP. The priorities for the BRIC program in FY2021 are (1) natural hazard risk reduction activities that mitigate risk to public infrastructure and disadvantaged communities; (2) projects that mitigate risk to one or more community lifelines; (3) projects that incorporate nature-based solutions; (4) projects that enhance climate resilience; and (5) projects proposed by applicants that adopt and enforce mandatory building codes based on the latest published editions of building codes.	Generally, nonfederal cost share of no less than 25%. However, small, impoverished communities (as defined in 42 U.S.C. §5133(a)) are eligible for an increase in the federal share up to 90% of project costs on request, and the nonfederal cost share may be waived for insular areas if the nonfederal share is under $200,000.	For each major disaster declaration under the Stafford Act, the President may set aside from the Disaster Relief Fund an amount equal to 6% of the estimated aggregate amount of the grants to be made pursuant to the following sections of the Stafford Act: 403, 406, 407, 408, 410, 416, and 428.	The notice of funding opportunity for BRIC FY2021 was posted on August 9, 2021, with a total of $1 billion available. As of August 31, 2021, there was $1.64 billion set aside in the fund for the program (see CRS Report R45484, *The Disaster Relief Fund: Overview and Issues*, for more information on the Disaster Relief Fund).	https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities (Diane Horn)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
FEMA Flood Mitigation Assistance Grant Program, (Title XIII of P.L. 90-448, as amended; 42 U.S.C. 4104c)	Eligible applicants include states, territories, tribal governments (federally recognized), and local communities, as defined in 42 U.S.C. §4003(a)(1) and 2 U.S.C. §4104c(h)(1). Sub-applicants include communities and tribal governments (including federally recognized tribes that choose to apply as sub-applicants). All sub-applicants must be participating in the National Flood Insurance Program and must not be withdrawn, on probation, or suspended. Structures identified in the sub-application must have an NFIP policy in effect when applying and must maintain it through the life of the project. FMA funding does not require a Stafford Act declaration.	Grants may be used for a number of purposes, including state and local mitigation planning; the elevation, relocation, demolition, or flood proofing of structures; the acquisition of properties; and other activities. The same restrictions on funding identified above for the HMGP apply to Flood Mitigation Assistance. In addition, mitigation projects are required to meet the minimum standards set by the NFIP.	Generally, federal funding is available for up to 75% of eligible costs. FEMA may contribute up to 90% for repetitive loss properties and up to 100% for severe repetitive loss properties, as defined in 42 U.S.C. §4014(h) and 44 C.F.R. §79.2(h).	The program is funded from NFIP policyholders' premiums, fees, and surcharges. No funding is appropriated for the program. Congress allows FEMA to withdraw funds from the National Flood Insurance Fund and to use those funds to operate the NFIP, but the spending authority to use these offsetting collections for the program must be authorized in appropriations acts.	$160 million is available for FMA from the National Flood Insurance Fund for FY2021.	https://www.fema.gov/grants/mitigation/floods (Diane Horn)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
FEMA Public Assistance (Sections 324, 402, 403, 406, 407, 418, 419, 428, and 502 of P.L. 93-288, as amended)	Eligible applicants include state, tribal, territorial, or local governments and certain nonprofit organizations, as defined in 42 U.S.C. §5122, when authorized as part of a presidential emergency declaration or major disaster declaration under the Stafford Act.	The program supports emergency work, including permanent work to repair, restore, reconstruct, or replace disaster-damaged facilities, including water control facilities. Water control facilities may include dams and levees not under the authority of other federal agencies.	The Stafford Act authorizes FEMA to reimburse not less than 75% of the eligible costs of specific types of disaster response and recovery work undertaken by eligible applicants. FEMA may recommend that the President increase the federal cost share, where warranted.	Assistance is funded from the Disaster Relief Fund and is available only pursuant to a Stafford Act declaration of emergency or major disaster (42 U.S.C. §5170). If significant damage occurs as a result of one or more FMAG declarations, the governor or tribal chief executive may request a major disaster declaration for the fire incident(s).	Public assistance funding is available only at the request of a governor or tribal chief executive when an incident exceeds local ability to recover. FEMA evaluates the request and then may recommend that the President authorize assistance.	https://www.fema.gov/assistance/public (Erica Lee)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
FEMA Resilience Revolving Loan Fund (P.L. 116-284)	There is no FEMA guidance available at this time. In statute, eligible entities include states, insular areas, and tribes that have received a major disaster declaration during a five-year period ending on the date of enactment of P.L. 116-284 P.L. 114-322 (January 1, 2021).	The revolving loan fund may be used to provide financial assistance for projects or activities that mitigate the impacts of natural hazards, including the construction, repair, or replacement of a nonfederal levee or other flood control structure, in consultation with USACE, among other activities.	Nonfederal cost share of no less than 10%.	The act authorizes the appropriation of $100 million annually for FY2022 and FY2023.	Not yet funded.	No website yet. (Diane Horn)
Fish and Wildlife Service (FWS) National Fish Passage Program (16 U.S.C. §§757a-757g; 16 U.S.C. §§5151 et seq.; 16 U.S.C. §§1531-1544; 16 U.S.C. §§742a-742c; 16 U.S.C. §742j; 16 U.S.C. §§661-667e)	The program works on a voluntary basis with federal, state, local, and tribal agencies, as well as with private partners and stakeholders. Fish passage projects are not eligible for funding if they are for any federal or state compensatory mitigation or if fish passage is a condition provided by existing federal or state regulatory programs.	Fish passage projects are to restore unimpeded flows and fish movement by removing barriers or bypass options. Assistance may be for dam removal, water diversion, culvert removal, bypass channels, research, inventories, and assessments (examples of funded projects: https://www.fws.gov/fisheries/fish-passage/fish-passage-projects-at-work.html).	Pursuant to FWS policy related to the Fish Passage Program, FWS seeks to secure at least 50% of total project costs from partners. This applies to the overall regional program and may not need to be achieved on every project. Funding matches may be in-kind services or cash.	NA.	$18.59 million for FY2021.	https://www.fws.gov/fisheries/fish-passage.html (R. Eliot Crafton)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
FWS Partners for Fish and Wildlife (16 U.S.C. §3771; 16 U.S.C. §742a-c; 16 U.S.C. §742e-742j; 16 U.S.C. §§661-667e)	The voluntary, incentive-based program provides direct technical and financial assistance in the form of cooperative and grant agreements to private landowners to restore and conserve fish and wildlife habitat for the benefit of federal trust resources. Projects must be implemented on private property, with the exception of efforts that support projects on private lands.	The program can assist with modernizing fish passage structures to allow safe travel by aquatic resources and, at the same time, allow for structural stability by designing units to avoid flood damage. Other eligible activities are water control structure and fencing projects.	Cost sharing is not required in statute, but FWS states that it strives to achieve a minimum cost share of 1:1 on selected projects. Cost share may be monetary or in-kind contributions.	NA.	$56.86 million in FY2021.	https://www.fws.gov/partners/ (R. Eliot Crafton)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
National Oceanic and Atmospheric Administration (NOAA) Atlantic Salmon Habitat Restoration Partnership Grants (16 U.S.C. §661; 16 U.S.C. §1891a; 16 U.S.C. §1535)	Eligible applicants are institutions of higher education; nonprofits; commercial (for-profit) organizations; U.S. territories; and state, local, and tribal governments. Applicants must propose work within one or more Salmon Habitat Recovery Units in the state of Maine.	The grants support projects providing sustainable and lasting benefits for Atlantic salmon. Proposals that incorporate proven restoration techniques and focus on removal of barriers will receive the highest priority. Dam removals will receive higher priority than installation of structures that require operations and maintenance.	There is no statutory matching requirement for this program. NOAA typically leverages its federal funding with matching contributions from a range of sources in the public and private sectors to implement restoration. Applicants are encouraged, but not required, to demonstrate a commitment of 1:1 federal funding to nonfederal match. NOAA considers cost sharing in the evaluation criteria.	Expired.	Up to $1 million for FY2021.	https://www.grants.gov/web/grants/view-opportunity.html?oppId=331374 (Eva Lipiec)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
NOAA Community-Based Restoration Program Coastal and Marine Habitat Restoration Grants (16 U.S.C. §661; 16 U.S.C. §1891a; 16 U.S.C. §1535)	Eligible applicants are institutions of higher education; nonprofits; commercial (for-profit) organizations; U.S. territories; and state, local and tribal governments. Applicants must propose work in geographic areas that benefit species with a nexus to NOAA management.	The grants support habitat restoration projects that use an ecosystem-based approach to foster species recovery and increase populations under NOAA's jurisdiction. Projects that restore natural ecosystem function and processes will receive higher priority than projects that install structures that require maintenance.	There is no statutory matching requirement for this program. NOAA typically leverages its federal funding with matching contributions from a broad range of sources in the public and private sectors to implement coastal and marine habitat restoration. NOAA considers cost sharing in evaluation criteria.	Expired.	$8.3 million for FY2021.	https://www.fisheries.noaa.gov/national/habitat-conservation/community-based-habitat-restoration. (Eva Lipiec)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
NOAA Great Lakes Habitat Restoration Regional Partnership Grants (16 U.S.C. §661; 16 U.S.C. §1891a)	Eligible applicants are institutions of higher education; nonprofits; commercial (for-profit) organizations; U.S. territories; and state, local, and tribal governments. Eligible applicants may be located anywhere but must propose work within the Great Lakes Basin and within one of the eight U.S. Great Lakes states (New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, and Minnesota).	The grants support planning and/or on-the-ground restoration activities. Projects can include fish passage barrier removal.	There is no statutory matching requirement for this program. NOAA typically leverages its federal funding with matching contributions from a range of sources in the public and private sectors to implement coastal and marine habitat restoration. NOAA considers cost sharing in evaluation criteria.	Expired.	Awards depend on the amount of funds made available to NOAA for this purpose by the EPA (through the Great Lakes Restoration Initiative—see 33 U.S.C. §1268c(7)(d)(ii)). Approximately $5 million was available for the FY2019 opportunity.	https://www.grants.gov/web/grants/view-opportunity.html?oppId=310918 (Eva Lipiec)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
NOAA Pacific Coastal Salmon Recovery Fund (16 U.S.C. §3645(d)(2))	The fund makes available funding to the states of Washington, Oregon, Idaho, Nevada, California, and Alaska and to federally recognized tribes of the Columbia River and Pacific Coast (including Alaska) for projects necessary for the conservation of certain salmon and steelhead populations.	Eligible activities include projects that address factors limiting the productivity of Pacific salmon and steelhead listed under the Endangered Species Act (16 U.S.C §§1531 et seq.) or those populations necessary for the exercise of tribal treaty fishing rights or native subsistence fishing.	State applicants are required to match or document in-kind contributions of at least 33% of received federal funds. Indian tribes, representative tribal commissions, and consortia are exempt from any cost-share requirement.	NA.	$65 million for FY2021.	https://www.grants.gov/web/grants/view-opportunity.html?oppId=331007 (Eva Lipiec)
U.S. Army Corps of Engineers (USACE) Section 206 Aquatic Ecosystem Restoration Continuing Authorities Program (33 U.S.C. §2330)	A nonfederal sponsor (e.g., a local government or nonprofit entity, with local government consent) is eligible to request assistance for an ecosystem restoration project.	Aquatic ecosystem restoration projects are eligible if they improve the quality of the environment, are in the public interest, and are cost effective, including dam removal. The federal cost may not exceed $10 million.	The nonfederal sponsor is responsible for 50% of funding for studies above the initial $100,000 in federal funds. The nonfederal sponsor is responsible for 35% of total project costs during the design, implementation, and monitoring periods. The nonfederal sponsor must provide all lands, easements, rights-of-way, relocations, and disposal areas required for the project.	$63 million for FY2021 through FY2024.	$11 million for FY2021.	https://planning.erdc.dren.mil/toolbox/library/FactSheets/CAP%20Section%20206%20Fact%20Sheet%20and%20Sample%20Request%20Letter.pdf (Anna Normand)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
USACE Section 506 Great Lakes Fishery and Ecosystem Restoration Program (42 U.S.C. §1962d–22)	A nonfederal sponsor, including a private interest or a nonprofit entity, may partner with USACE for a project to support the restoration of the fishery, ecosystem, and beneficial uses of the Great Lakes.	Eligible projects restore fish and wildlife habitat, remove dams and other barriers to fish migration, prevent and control non-native invasive species, and contribute to the removal of beneficial-use impairments in Great Lakes Areas of Concern.	Federal construction cost share is 65%. Operation, maintenance, repair, rehabilitation, and replacement of projects are nonfederal responsibilities.	NA.	Funding depends on the amount of funds made available to USACE for this purpose by the EPA (through the Great Lakes Restoration Initiative—see 33 U.S.C. §1268c(7)(d)(ii)).	https://www.lrd.usace.army.mil/Home/Great-Lakes-Fishery-Ecosystem-Restoration-Program/ (Anna Normand)

Program (Authority)	Eligible Entity/Dams	Eligible Activities	Cost Share	Authorization of Appropriations	Recent Funding	Website (CRS Contact)
U.S. Department of Agriculture Watershed Rehabilitation Program (16 U.S.C. §1012)	Only dams constructed under the Watershed and Flood Prevention Operations (WFPO) program and the Resource Conservation and Development (RC&D) program are eligible. WFPO consists of projects built under two authorities—the Watershed Protection and Flood Prevention Act of 1954 (P.L. 83-566) and the Flood Control Act of 1944 (P.L. 78-534). RC&D projects are authorized under Subtitle H of Title XV of the Agriculture and Food Act of 1981 (16 U.S.C. §§3451 et seq.).	Technical and financial assistance is available to project sponsors for the planning, design, and construction of rehabilitation efforts addressing health and safety concerns of eligible dams. Upgrading or decommissioning may be considered.	Federal funds account for 65% of the total cost of a rehabilitation project. Local project sponsors must provide 35% of the total cost of a rehabilitation project and must obtain needed land rights and permits. Federal funds cannot be used for operation and maintenance.	$85 million annually for FY2008 through FY2023.	$10 million for FY2021.	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wr/ (Megan Stubbs)

Source: CRS, using federal agency websites (see website column), public laws, and appropriations legislation.

Notes: NA = not applicable. Congress may appropriate funding for programs with expired authorizations of appropriations.
The Stafford Act defines *state* as the 50 states, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands (see 42 U.S.C. §5122(4)). Any reference in the Stafford Act to *state and local* is deemed also to refer to tribal governments, as appropriate (see 42 U.S.C. §5123). The Stafford Act defines *Indian tribal government* as the governing body of any Indian or Alaskan Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges to exist as an Indian tribe under the Federally Recognized Tribe List Act of 1994 (25 U.S.C. §§479a et seq.; also see 42 U.S.C. §5122(6)). Other programs not authorized by the Stafford Act may have different tribal definitions.

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