

Funding Options for Dam Removal in the United States

Issue Brief 20-11 by **Margaret Walls** and **Leonard Shabman** — December 2020

1. Introduction

Removing a dam can restore a river or stream to more natural conditions, improving water quality and aquatic habitat, enhancing river recreation, and opening up passage for anadromous fish. In addition to these environmental benefits, it can also eliminate a potential failure hazard, as many dams in the United States were built decades ago—even, in some cases, more than a century ago—and are in need of repair. Some of these dams no longer serve a valuable function, so removal could be a more cost-effective option than repair for the owner.¹

Finding money to pay for dam removal is a challenge, however, and often one of the biggest hurdles. Even small dam projects can cost \$100,000 or more, and larger dams or those with sediment management requirements, additional infrastructure, or other special circumstances can have project costs well into the millions. Costs include not only the deconstruction itself but securing the appropriate permits, undertaking historic mitigation activities (often required for very old dams), and doing environmental assessments. If sediment is contaminated, there may be hazardous materials requirements. Sometimes, even uncontaminated sediment that has built up behind a dam must be removed before deconstruction, which adds to project costs.

This issue brief summarizes possibilities for who might pay for dam removals and the logic behind each possibility. It sets the stage for three forthcoming companion issue briefs that discuss in more detail (i) federal funding programs, (ii) state and local funding approaches, and (iii) funding by permittees under Section 404 of the Clean Water Act or by responsible

parties under various federal and state laws that require compensation for natural resources damages.

Funding for dam removal has always been a challenge. In 2000, the nonprofit advocacy group American Rivers published a guide to funding sources, discussing various cost considerations, how combinations of funding can be pulled together for removal projects, and examples of successful projects. Some states, including Massachusetts and New York, have provided fact sheets and websites with information for dam owners on potential funding sources (Massachusetts Executive Office of Energy and Environmental Affairs 2007; New York State Department of Environmental Conservation n.d.; US Fish and Wildlife Service 2008). Our series of issue briefs updates some of the information in these publications but also steps back to take a look at the logic behind various options, discuss potential revenue sources for state and local programs, and cover additional funding approaches not included in these publications, such as Section 404 permittee and responsible party funding. We also offer observations about how to modify federal programs to be used more for dam removal.

2. Who Pays for Dam Removals?

Table 1 lists the three parties who might pay for dam removals: (1) owners, (2) beneficiaries of removal, such as the local community or the wider public at large, and (3) parties who owe compensation for actions that harmed the environment or permittees who are making alterations to the existing aquatic environment and need to meet requirements of the Clean Water Act (CWA).

¹ Some studies have compared repair to removal costs for dams that have eventually been removed and found that repair costs are two to three times higher (Born et al. 1998; ICF Consulting 2005; Massachusetts Division of Ecological Restoration 2015).

Table 1. Who May Pay for Dam Removals

	Examples	Potential funding mechanisms
Owners	Individuals, businesses, electric utilities, farms, municipal and county governments	Owner funds
Beneficiaries of dam removals	Local community via recreational access, enhanced recreation (whitewater, fishing) economic development, improved safety	State general fund revenues State dedicated taxes/fees
	Broader public via improved water quality, aquatic environment, fish passage	Local tax financing (e.g., TIF, special tax districts) NOAA, FWS, other federal agencies, National Fish and Wildlife Foundation
CWA Section 404 permittees/Natural Resource Damage responsible parties (RPs)	CWA Section 404 permittees (for compensatory mitigation)	Dam removal included to facilitate creating compensatory mitigation at a single-user mitigation bank, commercial mitigation sales bank, or from in-lieu fee program funded project
	NRD RPs (for a project to offset damages caused to the aquatic environment)	Stream habitat improvement from dam removal accepted as compensation for damages caused by the RP

Note: TIF is tax-increment financing.

2.1. Owner Pays

Sixty-three percent of dams in the US Army Corps of Engineers’ National Inventory of Dams (NID) are privately owned (Gonzalez and Walls 2020). Another 20 percent are owned by local governments. Usually, these dam owners—especially individual landowners, families, homeowners’ associations, and small towns—are not the ones who pay for removal, though in some cases, they may contribute. Across the nation, some small dams (usually not in the NID) have been removed at the owners’ expense if the cost is low. Local governments have sometimes paid for removal when the dam poses a drowning hazard or opportunities for river naturalization promise local economic development benefits, but they rarely cover the full cost.

Hydroelectric dams account for only 2 percent of all dams in the NID (Gonzales and Walls 2020), but utilities that own these dams have sometimes paid for their removal when they are no longer licensed to generate power. Portland General Electric paid the bulk of the cost of removing the Marmot Dam on the Sandy River in

Oregon, for example, and PacifiCorp paid to remove the Condit Dam in Washington. PacifiCorp removed Condit in lieu of investing in costly fish passage upgrades that were being required by the Federal Energy Regulatory Commission (FERC) as a condition of relicensing the hydroelectric facilities (Brewitt 2019). More than half the cost of removing the 100-foot tall San Clemente Dam in California—an estimated \$86 million—was paid by California American Water, the water utility that owned the dam.²

One possibility for making owners cover more of the costs of dam removal could be through the use of insurance premium taxes or performance bonds (Stavins 2003). One example of an insurance premium tax is the oil spill liability tax. The 1990 Oil Pollution Act established this tax (currently 9 cents per barrel) on crude oil received at U.S. refineries and imported petroleum products. The revenues from the tax are deposited into the Oil Spill Liability Trust Fund, the proceeds of which are used by the federal government on oil spill cleanup costs that are not covered by responsible parties. For many years, the Superfund

2 <https://www.sanclementedamremoval.org/faqs>.

program in the United States worked the same way: chemical companies paid taxes that went into a trust fund that the federal government used to clean up Superfund sites. The Superfund tax expired in 1995. Dam owners could similarly be charged a fee as a part of the dam permitting process, and the fees could be deposited into a state trust fund for dam removals.³

Another possibility is to require dam owners to hold an environmental surety performance bond that specifies particular conditions of dam maintenance and operations. If the conditions are not met, state dam safety regulators can file a claim against the performance bond to obtain the money to address the problems, including dam removal. Surety bonds are required for many contractors working with hazardous materials, doing brownfield remediation, mining rehabilitation work, and other activities, thus an active private market exists for these bonds. The “reclamation bond” required of coal mine operators in order to obtain a permit to operate is another example. Reclamation bonds were established in the Surface Mining Control and Reclamation Act of 1977 and they ensure that regulatory authorities have sufficient funds to reclaim mining sites if the permittees fail to do so.

Another important feature of insurance premium taxes and performance bonds is that the higher cost of legally maintaining and operating a dam provides a financial incentive for removal. If the dam is not providing services of sufficient value, removal may be less costly than the total cost of dam upkeep, including the additional taxes or bonds.

2.2. Beneficiary Pays

The public can benefit from dam removal through the restoration of the stream, the return of aquatic life, and improvement in water quality. These public benefits

provide the rationale for many of the federal grant programs used for dam removals, which often fund a range of project types. For fish passage benefits, these projects can include dam removals and culvert replacements. For water quality improvements, the projects can involve land conservation, various stream restoration activities, and dam removals.

The US Fish and Wildlife Service (FWS) and National Oceanic and Atmospheric Administration (NOAA) provide grants for dam removal to benefit fish passage and habitat.⁴ The Great Lakes Restoration Initiative has funded a variety of projects that benefit the Great Lakes environment, sometimes including dam removal.⁵ These kinds of ecological benefits also underpin some state funding programs, such as California’s Fisheries Habitat Restoration Grant Program, which has funded dam removals to improve salmon and steelhead passage, or Ohio’s Water Resource Restoration Sponsor Program, which funds dam removals to restore rivers for water quality improvements.⁶

Removing aging and deficient dams can provide safety benefits, eliminating the risk of downstream flooding should the dam breach. This is the motivation behind Wisconsin’s longstanding dam repair and removal grant program and the Massachusetts Dam and Seawall Repair or Removal Fund. In some local communities, dam removal is one component of a larger investment in river access and other complementary recreational amenities, and local governments have financially contributed, sometimes using creative local tax financing. The town of Elkhart, Indiana, for example, used tax-increment financing to pay for revitalization of a river district at the confluence of the Elkhart and St. Joseph Rivers, which included removing a low-head dam on the Elkhart River.

We will discuss these federal, state, and local government programs in more detail in two forthcoming companion issue briefs.

3 Some states, such as California and Ohio, already make dam owners pay fees, but the fee revenues are not used in the way we are suggesting here, in a trust fund model.

4 <https://www.fws.gov/fisheries/fish-passage.html> and <https://www.fisheries.noaa.gov/national/habitat-conservation/community-based-habitat-restoration>.

5 <https://www.epa.gov/great-lakes-funding/great-lakes-restoration-initiative-glri>.

6 <https://wildlife.ca.gov/Grants/FRGP> and <https://epa.ohio.gov/defa/wrrsp>.

2.3. NRD RPs and CWA 404 Permittees Pay

Funds collected from NRD RPs or CWA Section 404 permittees could be used to pay for dam removals. NRD RPs, under federal or state laws, have a legal obligation to offset damage they caused to the aquatic environment (most often as a result of chemical or oil spills). Regulations require federal or state trustees to complete an assessment of damages and then require the RP to pay for projects that the trustees conclude will compensate for these damages. RPs either undertake a project or pay another entity to do so, and trustees have sometimes approved dam removal to offset damages to aquatic habitat. The Bloede Dam removal project, on the Patapsco River in Maryland, for example, received \$9 million of NRD funds managed by NOAA from a Superfund site in Elkton, Maryland.⁷ Duke Energy provided \$1 million to remove the Power Dam in Virginia as compensation for a 2014 coal ash spill in the Dan River (Stephenson 2019).

Any discharge of fill to Waters of the United States requires a permit issued by the US Army Corps of Engineers under Section 404 of the CWA, and the permittee is responsible for securing compensatory mitigation to replace the wetland or stream habitat type lost to the permitted fill. Most often, credits that can be used for compensatory mitigation are created by entities other than the permittee near the location of the fill. If a permittee expects to need compensatory mitigation for future projects, it may invest in creating credits for its own use; this is a single-user mitigation bank. Commercial mitigation bankers invest in creating credits and recover costs of the projects by selling the credits to permittees. If no commercial bank credits are available, the permittee can make a payment to an in-lieu fee program that accumulates these payments and then invests in credit creation (Stephenson and Tutko 2018). The Virginia Aquatic Resources Trust Fund, operated by the Nature Conservancy, is one example.⁸ In some cases, dam removal has

facilitated restoration of hydrologic conditions so that compensatory mitigation credits can be produced.⁹

2.4. Other Possibilities

FERC relicensing of hydroelectric facilities can provide funding for dam removal in some cases. Most hydroelectric facilities come up for relicensing every 30 years. As part of the process, FERC is charged with balancing economic interests—the value of the electric power produced—with environmental concerns, including harm the dam poses to aquatic species. Sometimes, modifying a dam is required as a condition of the relicensing. If those modifications—often to improve fish passage—are too costly, the dam owner will remove the dam instead, as with the Condit Dam. Sometimes, FERC will order a dam to be removed if the environmental benefits of removal are deemed to outweigh the benefits of the hydropower production. This happened with the Edwards Dam in Maine (Austin 2019). FERC can also broker a deal in which dams are removed in exchange for issuing a new license elsewhere. This happened on the Penobscot River in Maine, where two dams were removed and a fish bypass installed at a third, in exchange for increased power production at other hydroelectric facilities in the watershed (US Fish and Wildlife Service 2016).

3. Summary

This issue brief describes the three types of entities who may pay, in full or in part, for dam removal. Dam owners themselves rarely pay the full cost of removal, unless those costs are modest or, in some limited cases, when the owner is a utility. When advocates for dam removal have stressed its benefits to local communities that own dams, especially improved river safety for recreationists, this has often motivated local government contributions. As explained in Walls (2020), greater emphasis on the option of removal by

7 The total project cost was \$17 million. See <https://www.americanrivers.org/patapsco/index.html> for more about the Bloede Dam and [https://darrp.noaa.gov/hazardous-waste/spectron for information on the NRD settlement](https://darrp.noaa.gov/hazardous-waste/spectron-for-information-on-the-nrd-settlement).

8 <https://www.nature.org/en-us/about-us/where-we-work/united-states/virginia/stories-in-virginia/virginia-aquatic-resources-trust-fund/>.

9 There are two kinds of credits, stream and wetland. We discuss both in our companion report, including the obstacles to using dam removals to generate credits.

state dam safety programs and stricter enforcement of dam safety standards might increase removals and owners' financial contributions to the costs.

Having beneficiaries pay for dam removal may be logical and can be accomplished through multiple federal, state, and local channels. We address these options in depth in our two companion reports, one focused on federal funding programs and one on state and local options. Although some federal programs, such as the US FWS's Fish Passage Program, routinely fund dam removals, others have been used in only a limited number of cases. We discuss the possibilities for modifications to some federal programs to better incorporate removals in a forthcoming companion issue brief.

The biggest hurdle at the state and local levels is often finding a revenue source for a new state or local government expenditure. We describe the programs in operation in some states and also discuss, in general terms, the various options for dedicated revenue sources. These include dedicated excise taxes on particular goods and services, resource extraction taxes and fees, voluntary contributions, and user fees. We discuss some of the merits and drawbacks of these different options. At the local government level, alternatives are more limited, but we discuss two approaches, tax-increment financing and special tax districts.

Finally, dam removal may be paid for through more vigorous advocacy with NRD trustees. While NRD payments have been substantial in some dam removal projects, the option applies only in limited settings. The same is true of mitigation under Section 404 of the CWA, which also faces many procedural hurdles. These two options will be discussed in more detail in a forthcoming companion issue brief.

References

- American Rivers. 2000. Paying for Dam Removal: A Guide to Selected Funding Sources. October. https://www.michigan.gov/documents/dnr/Paying-Dam-Removal_513758_7.pdf. Accessed September 20, 2020.
- Austin, Abigail. 2019. On 20-Year Anniversary of Edwards Dam Removal, Kennebec River Brimming with Life. *Kennebec Journal*. June 29. <https://www.centralmaine.com/2019/06/29/on-20-year-anniversary-of-edwards-dam-removal-kennebec-now-acting-like-a-river-with-an-artery-of-life/>.
- Born, Stephen, Kenneth D. Genskow, Timothy L. Filbert, Nuria Hernandez-Mora, Matthew L. Keefer, and Kimberly A. White. 1998. Socioeconomic and Institutional Dimensions of Dam Removals: The Wisconsin Experience. *Environmental Management* 22(3): 359–70.
- Brewitt, Peter. 2019. *Same River Twice: The Politics of Dam Removal and River Restoration*. Corvallis, OR: Oregon State University Press.
- Gonzales, Vincent, and Margaret Walls. 2020. Dams and Dam Removals in the United States. Resources for the Future Report. October 22. Washington, DC: Resources for the Future. <https://www.rff.org/publications/reports/dams-and-dam-removals-united-states/>.
- ICF Consulting. 2005. A Summary of Existing Research on Low-Head Dam Removal Projects. A Report for American Association of State Highway and Transportation Officials. September. [http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/25-25\(14\)_FR.pdf](http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/25-25(14)_FR.pdf). Accessed July 17, 2020.
- Massachusetts Division of Ecological Restoration. 2015. Economic & Community Benefits from Stream Barrier Removal Projects in Massachusetts: Report & Summary. March. <https://www.mass.gov/files/documents/2016/08/wq/phase-iii-benefits-from-stream-barrier-removal-projects.pdf>. Accessed January 15, 2020.
- Massachusetts Executive Office of Energy and Environmental Affairs. 2007. Dam Removal in Massachusetts: A Basic Guide for Project Proponents. December. <https://www.mass.gov/files/documents/2016/08/xb/eea-dam-removal-guidance.pdf>. Accessed January 15, 2020.
- New York State Department of Environmental Conservation. n.d. Dam Removal and Barrier Mitigation in New York State. Final Draft of the New York Barrier Mitigation Forum of the New York State Nonpoint Source Hydrologic and Habitat Modification Workgroup. https://www.dec.ny.gov/docs/remediation_hudson_pdf/damremoval.pdf.
- Stavins, Robert N. 2003. Experience with Market-Based Environmental Policy Instruments, in *Handbook of Environmental Economics*, Karl-Göran Mäler and Jeffrey Vincent, eds. 1:355–435. Amsterdam, Netherlands: Elsevier Science. <https://scholar.harvard.edu/stavins/publications/experience-market-based-environmental-policy-instruments>

Stephenson, Kurt, and Benjamin Tutko. 2018. The Role of in Lieu Fee Programs in Wetland/Stream Mitigation: Credit Trading: Illustrations from Virginia and Georgia. *Wetlands* 38: 1211–21.

Stephenson, Morris. 2019. Demolition of Old Power Dam in Rocky Mount Begins. *The Franklin News-Post*. May 16. https://thefranklinnewspost.com/news/demolition-of-old-power-dam-in-rocky-mount-begins/article_5aeb347c-6ee4-11e6-9c82-d7efdd5b2026.html.

US Fish and Wildlife Service. 2008. A Strategy for Removing or Mitigating Dams in New York State and Lessons Learned in the Upper Susquehanna Watershed, Appendix D: Dam Mitigation Funding Guide for New York State. Report prepared for New York State Department of Environmental Conservation. May. https://www.fws.gov/northeast/nyfo/fwc/dam_mitigation.htm. Accessed September 20, 2020.

US Fish and Wildlife Service. 2016. US Fish and Wildlife Service and the Penobscot River Restoration Project: Redesigning A River. June. <https://www.fws.gov/northeast/PDF/usfwspenobscot.pdf>. Accessed September 20, 2020.

Walls, Margaret. 2020. Aligning Dam Removal and Dam Safety: Comparing Policies and Institutions across States. October. 22. <https://www.rff.org/publications/reports/aligning-dam-removal-and-dam-safety/>.

About the Authors

Margaret Walls is a senior fellow at RFF. Her current research focuses on issues related to resilience and adaptation to extreme events, ecosystem services, and conservation, parks and public lands. Walls has written extensively on parks and conservation funding, including options for the US national park system and state parks. In 2008 and 2009, she was the study director for the Outdoor Resources Review Group, a bipartisan commission of experts assessing status and trends in conservation, public lands, and outdoor recreation resources. Walls serves on the board of the Association of Environmental and Resource Economists. From 2010 to 2013, she was the first appointee to the Thomas J. Klutznick Chair at RFF. She was an associate professor in the Department of Economics at Victoria University in Wellington, New Zealand, from 1996 through 2000. Walls has published widely in peer-reviewed journals, including the *Journal of Public Economics*, *National Tax Journal*, *Journal of*

Environmental Economics and Management, *Journal of Urban Economics*, and *Journal of Economic Literature*, among others.

Leonard Shabman is a senior fellow at RFF. He has also held positions at the United States Water Resources Council; as a scientific advisor to the assistant secretary of the Army, Civil Works; as a visiting scholar at the National Academy of Sciences; and as Arthur Maass-Gilbert White Scholar at the Corps of Engineers Institute for Water Resources. In 2004, Shabman was honored to be named an Associate of the National Academies of Science (NAS), and in 2018, he received the Warren Hall medal lifetime achievement award from the Universities Council on Water Resources. Shabman's current work balances time spent in research with advisory activities in order to have a direct bearing on the design and execution of water and related resources policy. His ongoing work focuses on protocols for water development projects and ecosystem restoration programs, design of market-like environmental management programs, and increasing the effectiveness of national flood risk management and disaster aid programs.

Acknowledgements

We are grateful for funding from the August Heid Trust and the William and Flora Hewlett Foundation and for excellent research assistance from Vincent Gonzales.

About RFF

Resources for the Future (RFF) is an independent, nonprofit research institution in Washington, DC. Its mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. RFF is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy.

The views expressed here are those of the individual authors and may differ from those of other RFF experts, its officers, or its directors.

Sharing Our Work

Our work is available for sharing and adaptation under an Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) license. You can copy and redistribute our material in any medium or format; you must give appropriate credit, provide a link to the license, and indicate if changes were made, and you may not apply additional restrictions. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. You may not use the material for commercial purposes. If you remix, transform, or build upon the material, you may not distribute the modified material. For more information, visit <https://creativecommons.org/licenses/by-nc-nd/4.0/>.