



Hoover dam. Image Source: Matt Kieffer

DAM REMOVAL

WHAT THE OCEANS HAVE TO SAY

KEY POINTS

- Dams provide essential services offering varying economic benefits depending on the location.
- Many existing dams today are old and outdated, requiring structural updates or removal.
- Any structural changes to existing dams will impact marine ecosystems even if the dam is many miles from the coast.
- Cost-benefit analysis is used to rationalize such decisions by assigning monetary value to ecosystem services
- Removing a dam is generally beneficial to anadromous fish and estuarine food webs, which often translated into economic gain.

EXECUTIVE SUMMARY

Decades after the global boom in dam construction, many are now becoming outdated. Decisions must soon be made between installing structural upgrades or removing the dams entirely. It is crucial to consider not only the aquatic and terrestrial habitat surrounding the dam, but also the estuaries many miles downstream. This report outlines the implication of dam removal on marine habitats and provides recommendations for policymakers when faced with a dam removal decision.

INTRODUCTION

Dams provide us with a number of important services, including 'cleaner' energy, flood control, water storage, and reservoir-dependant recreation. Great efforts in construction of large riverine dams emerged around 1970s as dams became a symbol of economic progress and wealth.¹ Many of the dams built then are soon approaching their fifty-year anniversary, meaning that a substantial number of dams are getting outdated. With aging infrastructure, authorities must choose between removing the dam or updating it structurally so it confines to the evolved acts and regulations (e.g. the Endangered Species Act or the Clean Water Act). Although the river ecosystem is extensively considered in the decision-making, the effects on marine environments deserve more attention. Particular focus must be given to dam removal impacts on estuarine food-webs and fish nursery grounds.



Guinea-Bissau. Image Source: USGS/ESA

DAM ASSESSMENTS

An extensive cost-benefit analysis is often used in decision-making regarding large dam projects. When weighing your options, you will likely be challenged to assess the marine and freshwater ecosystem services in an economic sense. It is often difficult to put a price tag on the services provided by these environment, such as water filtration, erosion control, tourism opportunities, and habitat for important species. Nonetheless, it is crucial not to neglect these functions as their loss through habitat degradation can cost governments and taxpayers thousands of dollars.² Thus, removing a large dam and restoring downstream habitat promises a range of socioeconomic benefits.

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IMPACTS ON MARINE ECOSYSTEMS

Marine conservation is seldom closely tied to dam removal issues but must be highly considered. Removing large dams will have extensive short-and long-term effects of downstream habitats including marine estuaries. These estuaries are often sites of rich biodiversity, municipal infrastructure, and a source of unique ecosystem services. Dams directly impact estuarine conditions by altering sediment deposition, nutrient runoff, salinity, and temperature of the water.^{2,3} These conditions are crucial to the health of entire ecosystems and must be thoroughly evaluated. Dam removals allow the passage of anadromous fish migrating between ocean and inland waters, which increases their recruitment.³ For example, salmon are heavily impacted by dams and often experience positive changes to their populations following dam

Estuarine Services

- *Nutrient cycling*
- *Water quality*
- *Habitat for Species at Risk (animals and plants)*
- *Recreation and tourism*
- *Commercial fish stocks*

CASE STUDY: EDWARD'S DAM

Assessment of the Edwards dam in Maine concluded that the cost of installing fish passages was 1.7 times the cost of deconstructing the dam.² In 1999, the dam was removed. Although the dam has been in place for 162 years, species of alewife, eel, bass, and sturgeon were found in the newly accessible upstream reaches only two years later.⁴ Recovery of fish stocks can be just as quick in other locations where dams are removed.



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removals.³ Atlantic wild salmon value is estimated to be \$255 million annually.⁵ Therefore, an increase in their recruitment following dam removal can come with notable economic benefits. Additionally, the health of marine ecosystems closely depends on the survival of salmon populations as they are often a key species of local food webs.² Delaying decisions on dam removal or structural updates for improved fish passage only extends the pressure on economically important fish stocks and marine habitats, while racking up the future costs required for restoration work.

RECOMMENDATIONS

1. **ACT NOW.** Decisions on dam removals are inevitable due to aging infrastructure and new environmental policy. Delaying these decisions can cost more in the future as pressure remains on anadromous fish stocks and important habitats may be continuing to degrade.
2. **CONSIDER** the effects of dam removals on marine ecosystems even if the dams are many miles from the coast. Marine ecosystem services will be enhanced and fish stocks improved when upriver dams are removed. These changes should be considered as part of economic benefits.
3. **CONSULT** all stakeholders on a case-by-case basis. Taxpayers, indigenous peoples, conservation groups, and businesses will be affected by decisions on dam projects.
4. **INVEST** in alternative energy sources. Plan ahead to outdated dams by exploring a number of innovative energy harvesting options, including wind, solar, run-of-the-river, and biofuel.

REFERENCES

1. The Report Of The World Commission On Dams (2016). *Dams and development: A new framework for decision-making - the report of the world commission on dams*. Routledge Ltd. doi:10.4324/9781315541518
2. Heinz Center. (2002). *DAM REMOVAL Science and Decision Making*. Washington D.C.
3. Ligon, F., Dietrich, W., & Trush, W. (1995). Downstream Ecological Effects of Dams. *BioScience*, 45(3), 183-192. doi:10.2307/1312557
4. Lohan, T. (2019, February 11). How Removing One Maine Dam 20 Years Ago Changed Everything. *The Revelator*.
5. Pinfold, G. (2011). *Economic Value of Wild Atlantic Salmon* Atlantic Salmon Federation.