

# Adaptive Management in Hydropower Regulation

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## Editors' Summary

Hydropower dams play a critical role in the health of river ecosystems throughout the United States, and hundreds of these dams will be relicensed by the Federal Energy Regulatory Commission (FERC) in the coming years. Such licenses lock in the operating and environmental protection requirements of such dams for periods of up to 50 years. Given the complex, dynamic nature of river ecosystems, as well as the impacts of climate change, there is pervasive scientific uncertainty about how to best manage dams for power production while protecting and enhancing environmental values such as water quality and fisheries. Unless dams are managed adaptively, with licenses that provide pathways for gathering and applying new knowledge and responding to changing conditions, we run the risk of locking in mistaken approaches and stymieing environmental improvements on our rivers for the next half century.

Dams have drastically altered rivers throughout the United States, often transforming them from ecosystems regulated by natural forces into systems intensively managed by humans for power generation, flood control, and navigation. The resulting environmental harms are numerous. Dams physically cut off fish populations from habitat and spawning areas, while impoundment of water in reservoirs floods riparian forests. Alterations in the timing and quantity of flows dramatically change water quality by raising water temperature, turbidity, and algal growth; reducing dissolved oxygen levels, and increasing siltation, to name but a few effects.<sup>1</sup> Fisheries and other biological communities are completely altered or destroyed, and downstream recreational uses severely impaired.

Public values have changed greatly since the inception of federal hydropower regulation in 1920, and we are now in an era where few dams are built and there is a widespread interest in restoring river ecosystems and undoing some of the damage dams have caused. This Article concerns an important subset of the nation's dams, those privately operated hydropower dams regulated by FERC. FERC issues licenses for such dams that can lock into place the regulatory requirements for their operations for several decades at a time. Such a static approach is inconsistent with a contemporary understanding of ecosystems as dynamic, complex, and subject to considerable scientific uncertainty. This Article argues that adaptive management should be employed more widely in regulating these dams in order to build flexibility and learning into licenses and help restore river ecosystems.

In this Article, I will first describe the nature of adaptive management and the rationale for applying it to hydropower licensing. I will then provide a framework for describing and classifying the varying approaches to adaptive management. Although there is considerable variation among the different approaches, all are based on the goal of reducing the risks associated with forward-looking planning and decisionmaking under conditions of scientific uncertainty. However, in reducing the risks of scientific uncertainty, adaptive management often increases a variety of risks associated with regulatory uncertainty. Drawing upon licensing documents, published literature, and interviews with experts, I discuss these trade offs and how they affect the incentives of participants in hydropower licensing, and how they create challenges for implementation of adaptive management.

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*Author's Note: This Article was written prior to the author's employment with the U.S. Department of Justice and none of the views expressed are those of the Department. Any views expressed are those of the author.*

1. Andrew H. Sawyer, *Rock Creek Revisited: State Water Quality Certification of Hydroelectric Projects in California*, 25 PAC. L.J. 973, 975 (1994); Trout Unlimited, Brief Amicus Curiae of Trout Unlimited et al., in Support of Respondent Maine Department of Environmental Protection (2006), 15-16.