



A sustainable path for dams and fishes

A restoration project along Maine's Penobscot River will increase fish populations, keep energy generation constant and provide an example for other projects to follow

Jeff Opperman for the Guardian Professional Network
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Male Atlantic Salmon (*Salmo salar*) trying to clear a waterfall. Photograph: Keith Ringland/Getty Images/Oxford Scientific

The prodigal son. Narnia. Animal Farm.

All are famous allegories, stories that use symbols to convey a meaning deeper than the literal narrative.

Alongside The Ants and the Grasshopper, add The Dams and the Fishes.

First, here's the literal narrative, which is pretty powerful on its own.

Last week, along Maine's Penobscot River, excavators emerged like brontosaurus from the forested riverbank and lumbered ponderously out on to the Great Works Dam. Their long yellow necks swayed across the structure and, on a signal, they began to nibble away at its ancient concrete.

In so doing, the mechanical dinosaurs began the process of freeing the Penobscot from more than a century of confinement and launched one of the most ambitious river restoration projects ever.

The Penobscot was once the most important river in the US for Atlantic salmon, supporting a productive fishery and providing the cultural and economic foundation of

the Penobscot Indian Nation. Dams constructed more than a century ago blocked most Atlantic salmon from reaching their spawning habitat and salmon populations, along with those of 10 other migratory fish, declined dramatically.

In 2005, the owner of the Penobscot dams negotiated a groundbreaking agreement with the Penobscot Indian Nation, conservation organisations and state and federal agencies. The resulting Penobscot River Restoration Project will result in the removal of two hydropower dams, along with the addition of state-of-the-art fish-passage structures to two other dams.

After project completion, fisheries biologists predict that fish swimming up from the ocean will be able to reach 1000 additional miles of habitat for spawning. Fish populations are forecasted to respond with exuberance: Atlantic salmon are predicted to increase from a few thousand spawners to approximately 12,000. The projected increase for shad is even more impressive: from a few thousand today to over two million after dam removal.

These are impressive numbers. But it gets more interesting: through capacity upgrades and operational changes at the Penobscot's remaining hydropower dams, total energy generated from the river will remain constant, and likely even increase, from pre-project levels.

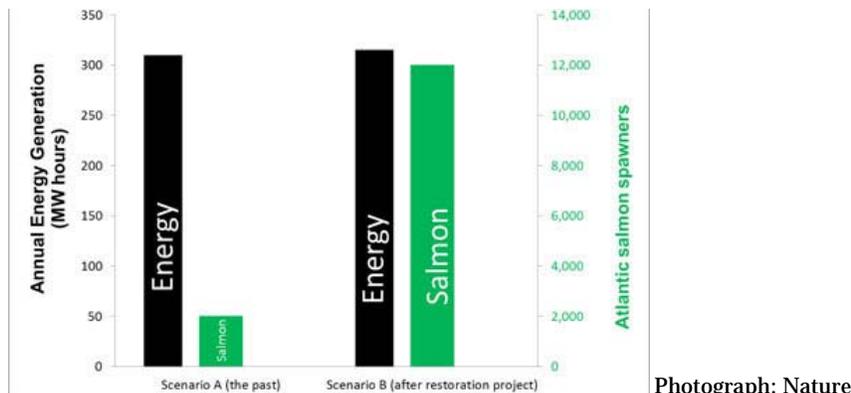
Dramatic restoration coupled with equal or greater energy seems almost too good to be true. And this is where we get into talking-lion territory.

Although this project will produce significant gains for salmon, the Penobscot Indian Nation and the people of Maine, its significance can ripple out far beyond its literal geography.

Throughout the world, governments and companies are planning or building thousands of dams. While hydropower dams can provide a low-carbon source of energy, they can also dramatically degrade or eliminate a broad variety of other resources and values that people need or cherish, as illustrated by the Penobscot's previous century.

The Penobscot Project didn't involve new dams, and the dams themselves are pretty small. But for those trying to find a more sustainable path for hydropower, one clear lesson from the Penobscot shines like a beacon: there is more than one way to achieve a given energy output, and these alternatives can have dramatically different environmental impacts.

Consider the chart below. On the left is "scenario A," showing the Penobscot's production of energy and salmon throughout the last century.



Conservancy

Photograph: Nature

On the right is "scenario B," showing the production of energy and salmon after project completion.

Same energy output. Dramatically different environmental impacts.

The value of the Penobscot as allegory lies with how Scenario B emerged.

For decades, the dams' various owners, the Penobscot Indian Nation, resource agencies and conservation groups engaged in heated debates about how to balance fish habitat and energy production. But these debates focused on individual dams and, at this scale, balancing energy and fish can be a zero-sum game.

Last decade, the power company [PPL Corporation](#), purchased all the dams in the Penobscot River basin. This reopened the old debate, but this time it unfolded at the scale of the whole system of dams. Broadening the focus of the debate also broadened the set of potential solutions, giving rise to one that included removal of some dams and increased energy generation at others.

Not all attempts at balancing energy with other river resources will achieve results as clear as the Penobscot, but there are solutions to be found. They can only be found by planing or managing hydropower at the scale of entire river basins or regions, not by considering each dam in isolation.

Balance requires options and options arise when working at a large scale. Options are elusive when the planning frame shrinks to a single dam.

Countries undergoing hydropower expansion have the opportunity to understand their alternative scenarios from the beginning, and have the chance to select "Scenario B" the first time. The organisation I work for, The Nature Conservancy, is now working with government agencies in Mexico and Colombia to identify alternatives that balance conservation and hydropower at the scale of whole river basins or regions. In short, we're helping them find Penobscot-like solutions.

Though the Penobscot waited more than a century for its better alternative to emerge, its example sheds light on a more sustainable path for energy development around the world.

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