LOW POWER, BIG PROBLEMS
How Low-Power Hydropower Dams Hurt Rivers

HYDROPOWER REFORM COALITION
Putting water, wildlife, and people back in rivers.

Whether it is in response to the environmental crisis of climate change or our over-reliance on imported fuels, it is clear that America needs to act quickly to replace fossil fuel energy technologies with renewable energy. It is equally imperative, however, that we do not destroy the environment we are trying to save by blindly rushing to develop low-emissions energy sources that will result in serious environmental harm. We will not solve our energy problems by building new dams – especially inefficient low-power dams where the energy benefits fail to outweigh the environmental impacts – but we will cause irreparable harm to our rivers.

The impact of hydropower dams on river ecosystems is significant and well documented. Dams disrupt flows, degrade water quality, block the movement of a river's vital nutrients and sediment, destroy fish and wildlife habitat, impede migration of fish and other aquatic species, and eliminate recreational opportunities. Reservoirs slow and broaden rivers, making them warmer. The environmental footprint of a dam and reservoir may extend well beyond the inundated area. Dams cause physical impacts and chemical changes to flows, sediment and water quality that can extend for many miles, affecting drinking water, recreation, fisheries, wildlife, and wastewater disposal. In the case of highly migratory fish, such as salmon, shad and eel, the environmental impacts of a single hydropower project may be felt from the mountains to the ocean. In many cases, dams have decimated the local, mostly rural, economies that depend on these recreation and fishery resources. Yet despite hydropower's long track record of environmental impacts, the quest for low-carbon energy is leading to a renewed call for building new hydropower dams.

Conventional hydropower is a mature technology that has changed very little since the early 20th century. The available number of potential hydropower dam sites is limited by geography, and in the United States, the most viable sites have already been developed. The few sites that remain will provide only marginal power benefits while putting additional strain on aquatic ecosystems that are already stressed by a changing climate. As a result, there have been very few new hydropower dams built in the past two decades. Recent dam proposals take advantage of some common misconceptions about hydropower in an attempt to downplay the environmental impacts of building a dam. Much of what the industry describes as "small," "run-of-the-river," or "micro" hydropower would, if built, cause serious environmental harm while generating very little power in return.

"Small" Hydropower Isn't Always Small

The terms "small," "incremental" and "micro" hydropower might evoke images of covered bridges, water wheels, and mill dams, but the reality is quite different. While there is no one definition for any of these terms, it usually refers to the dam's nameplate generating capacity and not to the size or environmental footprint of the dam or reservoir. For example, the state of California considers any hydropower facility that generates less than 30 megawatts to be small; but other descriptions can range from 1 to 50 megawatts. A more accurate description of most of these projects would be "low-power," as the dams themselves are often quite large. For example, based on capacity each of the following dams can be described as "small" hydro:

Ashlu Creek, Squamish B.C.

- The 14.7 MW Condit Dam on Washington's White Salmon River is 125 feet high and 471 feet wide.
- The 13.3 MW Glines Canyon Dam on Washington's Elwha River is 210 feet high.
- The 3.5 MW Edwards Dam on Maine's Kennebec River was 917 feet wide and 25 feet high. Its removal allowed more than 2 million shad, striped bass, alewives, sturgeon, and Atlantic salmon to return to their historic spawning grounds.

These small dams often produce substantially less power than advertised: hydropower facilities rarely if ever generate at their full nameplate capacity. Hydropower dams are typically capable of an output that is only 40-50% of their stated nameplate capacity. The output of low-power hydropower dams is even further constrained by seasonal water availability. In many areas, rivers flow at their highest in the winter and the spring, when the demand for power is at its lowest. On many streams, the flows needed to sustain full generating capacity are available only rarely, following storms or during periods of high spring snow melt. On other streams located in colder climates, or at higher elevations where below freezing temperatures reduce water flow during much of the winter, hydropower dams cannot produce power consistently for much of the year. Many low-power projects also cannot reliably generate power when it is most badly needed: during summer months, when the demand for power is highest, river levels are at their lowest.

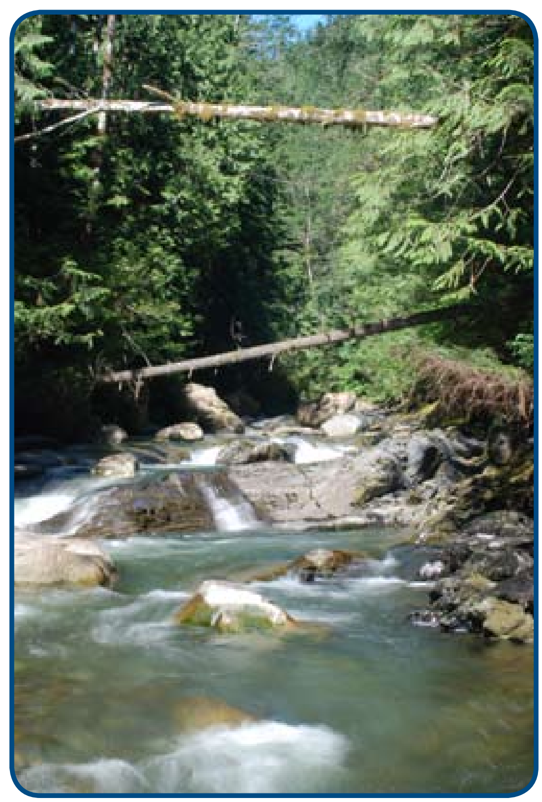
Elwha Dam, WA

For example, in 2005 the Federal Energy Regulatory Commission (FERC) denied a new license for a proposed hydropower dam on Clearwater Creek in Washington's Nooksack watershed due to the applicant's failure to provide a timely response to FERC's request for additional information about the project. It was estimated that the high water season on the Nooksack ran for only six weeks per year; as a result, the dam's proposed 9.7 MW of nameplate capacity was a highly inflated representation of the energy it would have actually been able to produce.

Even Small Dams Hurt Rivers

While many so-called "small" hydropower projects require large dams, others do involve smaller dams. But even a small dam has significant impacts on the environment. All dams, regardless of size, degrade water quality, harm river-dependent species, and limit downstream recreational opportunities. This is especially true when a dam is located on a small, sensitive headwater stream, or where the watershed is already degraded by other dams. Dams require major construction, leading to deforestation, new roads, buildings, and other infrastructure. All of these have impacts on rivers and streams. The assertion that small hydropower dams are by nature less harmful than large ones is simply not true.

Some projects requiring dams are described as "run-of-river" projects. In the United States, "run-of-river" typically means "inflow generally equals outflow," and there is very little correlation to the degree of impact on the river or the size of the project. While large, high-capacity storage dams do typically alter a river's hydrology more than a run-of-river project, run-of-river projects are by no means impact-free. Many hydropower projects described as "run-of-river," "modified-run-of-river," or some other variation involve "bypassed



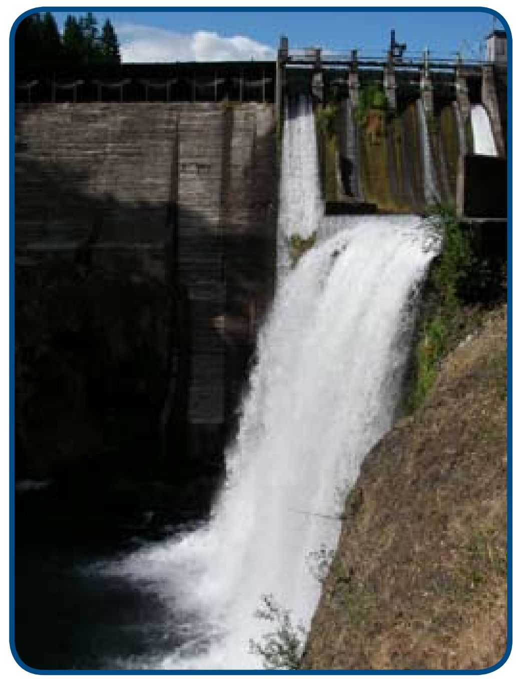
Clearwater Creek, WA

reaches" (river sections with no flow due to hydropower operations) or unnatural daily flow fluctuations that can harm rivers. Other projects simply cause harm by being in the river. Washington's Elwha, Glines Canyon, and Condit dams are all run-of-river projects and all three dams are slated for removal because the owners of the dams determined that the value of the power they produced did not justify the costs associated with the environmental impacts.

Terms like "small," "run-of-river," and "damless" are often used in a highly misleading manner. For example, a developer recently applied for a permit for an eight to nine dam "run-of-river" hydropower project on Oregon's McKenzie River, claiming that it would employ "damless" technology by using 8 to 9 "weirs" instead of dams, and "head ponds" instead of reservoirs. This description was little more than marketing: these terms are essentially interchangeable. The New Oxford American Dictionary defines "weir" as "a low dam built across a river to raise the level of water upstream or regulate its flow," and a "headpond" is a term that refers to reservoirs used for hydropower generation. The permit for this project was rejected by Federal regulators due to deficiencies in the application.

New Low-Power Dams Will Compound The Environmental Impacts of Climate Change

One of the first places the lives of ordinary Americans are being directly and unambiguously affected by the reality of climate change is in our supply and use of water.[1] Climate change alters fundamental patterns in rain and river flow, how water is used, and the ecosystems upon which humans, fish and wildlife depend. For example, in the West, winter snow stores water for the dry summer; but with climate change reducing snowpack and melting it earlier, summers will be longer and dryer with less dependable river flows for agriculture and cities.[2] Across the country, more intense storms are predicted, changing flood intensity and frequency.[3]



Condit Dam, WA

Fish and wildlife face a particular challenge. As climate shifts, so does habitat; it is already disappearing rapidly. Some animals and plants will be able to migrate to find suitable habitat. But for river-dependent species, the way is often blocked by dams, culverts, water of the wrong temperature, or other barriers. These species are already in trouble because of the extensive development of water projects, water quality impairment and excessive water withdrawals.

Hydropower already plays a significant role in this habitat degradation. Diversion and use of water has altered flow patterns in rivers, causing serious water quality and temperature problems for fish and wildlife. In some cases, the complete dewatering of river reaches has impacted fish and wildlife. It makes no sense to build new dams that will compound the effects of climate change, especially when those dams cannot make a meaningful contribution towards reducing the carbon emissions that are causing much of the damage. In addition, the predicted impacts of climate change are remarkably similar to the impacts that dams have already had on the Northwest's rivers:

[1] CCSP, 2008: The effects of climate change on agriculture, land resources, water resources, and biodiversity. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. U.S. Environmental Protection Agency, Washington, DC., USA, 362 pp

[2] Cohen, Stewart et al. "North America." Climate Change 2001: Impacts, Adaptation, and Vulnerability. IPCC. Cambridge: Cambridge University Press, 2001.

[3] Kundzewicz, Zbigniew et al. "Freshwater Resources and their Management." Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry et al. Eds., Cambridge: Cambridge University Press, 2007

- Reduced resiliency by disturbing habitats and altering the amount and timing of stream flow
- An increase in water temperature
- A decrease in water quality & quantity
- Reduced fish migration
- Species extinction

Unlike new emerging technologies, building low-power dams will not provide the new and innovative solutions, jobs, research, science, and investment needed to address the affects of a changing climate.

New Hydropower Dams Shouldn't Need Handouts

The Hydropower Reform Coalition is extremely concerned about the environmental and social impacts of global climate change, and we are committed to finding solutions to these problems. We expect that hydropower will continue to be a part of our nation's low-emission energy supply, and we support projects that improve efficiency at existing dams or that add generating capacity without additional impacts by placing turbines at existing non-power dams that already serve other useful purposes. However, we strongly believe that the construction of new hydropower dams will do far more harm than good, and it is not in the public interest to encourage such development. Under no circumstances should developers receive subsidies – whether in the form of tax credits, direct government spending, or inclusion in a Renewable Energy Standard – to build new hydropower dams where there are significant impacts to the watershed environment, including public recreation, health and other social values.

Public investments in energy should focus on developing and improving new technologies that will drive further investment down the road. Conventional hydropower dams do not represent this kind of smart investment: the technology is mature, so tax dollars spent on developing hydropower projects will not lead to additional advances in technology that will drive further energy production. Instead, subsidies for low-power dams would be used to build dams on sites that were previously passed over because they could not be developed economically. Public investments in energy should drive innovation, not encourage the development of bottom-of-the-barrel projects.

In the late 1970s, our nation faced an energy crisis with rapid increases in the price of oil and concerns over the adequacy and security of the nation's energy supplies. The unfortunate policy response was a mix of financial incentives and regulatory and environmental streamlining that led to hundreds of permits and small dam development.[4] Of the projects that were initiated, many failed to maintain economic value and were abandoned or fell into disrepair.[5]

The Hydropower Reform Coalition

The Hydropower Reform Coalition represents more than 140 outdoor recreation and conservation organizations nationwide, and engages and supports over one million anglers, paddlers, birding enthusiasts, and environmentalists who are concerned with, and inspired by, wild rivers. More information about the Coalition, and on rivers and hydropower, is available at www.hydroreform.org.

[4] See Implementing PURPA: Renewable Resource Development in the Pacific Northwest, July 1990. "One Hundred and twelve small hydroelectric projects… were built during the 1980s in the Pacific Northwest." "Permitting procedures were streamlined and, in some cases, simplified." See also: Dammed Deregulation, Public Citizen, 1999. "The number of new hydro facilities grew at a disproportionately high rate; between 1979 and 1991, 955 plants came on line, with 711 entering service between 1982 and 1988 inclusive."

[5] Examples include Harvell and Battersea dams in Virginia, and Oakland Dam in Pennsylvania.