





# Salmon

## of the Pacific Northwest

Life is not easy for salmon in the Pacific Northwest. They're born inland, usually in a stream far from the ocean. Then, when they're old enough, they have to swim all the way to the ocean, hopefully timing it right so there will be plenty to eat when they arrive. Some years later, if they've managed to avoid the Pacific's predators, they have to retrace that journey to return to where they were born so they can mate. And then they die.

Unfortunately, that already difficult existence is likely to become even more grueling in the years to come as climate change is expected to alter stream flows, increase water temperatures, and flush fry and young smolts toward the ocean before they're ready.

Salmon in the Pacific Northwest aren't strangers to challenges posed by humans and our environmental alterations. Dams built in the early 1900s along the Elwha River, which originates in the mountains of **Olympic** National Park, have stood in the way of salmon migrations for years, as have dams throughout the Columbia River drainage. Over-fishing has strained salmon populations since the start of industrial harvest in the 19th century, as have pollution, logging, development, and agricultural demands for water. Conditions for salmon were so tough during the 20th century that by the time the 21st century rolled around salmon in the

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Various predictive scenarios agree that a warming climate will result in more winter rains and fewer winter snows in the Northwest. The snow that does fall is expected to melt earlier in the year, likely leading to sooner-than-usual peak stream flows that could wash salmon fry down to the Pacific Ocean before the nutrient base (i.e., plankton blooms) the fish depend upon is in place. A review of the winter storm projections made to date shows that it also wouldn't be surprising to see more devastating downpours, such as those that raked **Olympic, Mount Rainier, and North**

**Cascades** national parks in November 2006 and again in the fall of 2007. Those storms blew out roads, washed away campgrounds, obliterated hiking trails, and scoured out rivers and streams.

Beyond such storm scenarios, increased stream water temperatures created by a combination of higher air temperatures, shallower streams that flow more slowly, and the release of warm, stagnant waters from reservoirs behind dams could prove deadly to salmon. Studies have shown that sustained exposure to waters that are 70 degrees Fahrenheit or above is usually fatal to salmon.

Water politics in the western United States have long been contentious;

climate change and its effects promise to further complicate matters by reducing already low summertime flows. Concerns about reduced stream flows could lead to calls for more water storage facilities — projects that, if approved, would further threaten salmon.

The combination of all of these factors has led scientists to predict that suitable salmon habitat in Washington state alone could shrink by about 22 percent by 2090 due to climate change.

## SOLUTIONS

Confronting the effects of climate change won't be easy, but it's not impossible. There are ways to mitigate the effects of climate change. In the past, land management agencies have been slow to act to address the future effects climate change will have on water resources. Now is the time to factor climate change into management policies, including recovery plans for threatened and endangered species. While many public land managers in the Pacific Northwest have had to create habitat conservation plans for one or more salmon species that have been listed as threatened or endangered under the Endangered Species Act, at present none appear to have factored climate change into their plans. Doing so could be as simple as realizing that it's necessary to sustainably manage fisheries to promote the most species diversity possible.

Ensuring that fisheries maintain healthy stocks of the various salmon populations, while carefully managing habitat needs, could be key in confronting climate change. Park Service managers at **Olympic** and **Mount Rainier** National Parks, which contain the headwaters for a number of salmon-bearing streams, will play critical roles ensuring salmon persist in the face of climate change. The

National Park Service will also need to work closely with other management agencies because salmon migrate through waters that fall under various jurisdictions.

In the case of warming waters, efforts to preserve trees on stream banks could help cool rivers and streams. Dam removal also helps lower temperatures by allowing more natural stream flows, and it restores access to salmon habitat. Already, the Park Service is part of the largest dam removal project in history. The Elwha Dam and the Glines Canyon Dam, both on the Elwha River, will be removed in stages beginning in 2011. This will restore access to more than 70 miles of salmon habitat. When dam removal isn't feasible, releasing cool water from the bottom of reservoirs could help lower river and stream temperatures.

Other ways to help salmon cope with the effects of climate change include working to maintain stream flows for salmon during anticipated periods of low flow; improving existing in-stream habitat by maintaining or restoring riparian areas, decreasing pollution and sedimentation, and adding woody debris where appropriate; acquiring new habitat; protecting groundwater recharge; and removing obstacles to up- and downstream migrations. Preserving naturally occurring springs, which provide an influx of cool water to streams, is also important.

## We Can Safeguard Salmon from Climate Change

### Stop contributing to climate change

Salmon could decline even further if we fail to reduce carbon dioxide pollution and global warming that is causing heavier spring floods and warmer water detrimental to salmon.

### Reduce and eliminate existing harms that make salmon more vulnerable to climate change

Dam removal, restoration of riparian lands, and reduction of pollution and sedimentation will help restore and improve salmon habitat and help salmon cope with the additional stresses resulting from climate change.

### Adopt "climate smart" management practices

By factoring climate change into the numerous existing plans to preserve salmon and their habitat, resource managers for the Park Service and throughout the Pacific Northwest can develop and implement strategies that attempt to compensate for the damaging effects of climate change on salmon populations, including warmer water and heavier spring floods.