ADAPTIVE MANAGEMENT OF CASTLE CREEK

This exercise describes a fictional watershed restoration project that represents a composite sketch of restoration issues in several western river systems. It does not contain all issues or represent all parties involved in restoration activities in the Pacific Northwest. Although the ecological setting and resource management concerns in this case are different from those that NWCOS deals with, the adaptive management dilemmas that the exercise addresses are common to projects in many different ecosystems.

Please prepare by reading the following background information. During the exercise, you will meet in small groups to discuss how you would advise the agencies involved in the case. Specifically, you will be asked to provide advice on three different "situations" or dilemmas that the agencies confront. Each situation will be accompanied by a set of questions to discuss.

BACKGROUND

Castle Creek is a cold water, spring fed tributary of the Stucchi River in western Oregon. The creek's riparian corridor contains some of the best remaining examples of black cottonwood and other riparian woodland types in western Oregon, and the watershed has not been developed extensively. As a result, the Castle Creek watershed is home to numerous plant and animal species. Some of these, such as chinook salmon and the red-legged frog, are state or federally listed as threatened or endangered.

In the 1930s, Oregon Energy, the public utility, built a large dam (the Briarwood Dam) on the Stucchi River and subsequently built smaller ones on Castle Creek to help meet the growing energy needs of the west coast (*see map on page 4*). To offset the effects of the dam on native salmon populations and the recreational fishing industry, the Oregon Department of Fish and Wildlife (ODFW) built the Dana Hatchery at the confluence of the Stucchi River and Castle Creek. Today, the hatchery produces fall and spring runs of chinook salmon as well as steelhead trout, an important game species.

Family cattle ranchers and wood lot owners are the primary landowners in the Castle Creek watershed. Small towns dot the watershed, and residents feel a strong sense of community. Oregon Energy owns some of the land surrounding the dams, and ODFW owns land surrounding the hatchery. The Nature Conservancy has a couple of reserves in the watershed and is in the process of acquiring more.

Once teeming with wild chinook salmon, Castle Creek's runs are a fraction of what they once were. The two upper dams completely block fish from reaching upper creek habitat. Fish ladders allow passage over the lower two dams, but little is known about their effectiveness. Cattle and timber harvesting have degraded riparian habitat, and the increasing number of wells dug to supply water threatens the cold groundwater springs that feed Castle Creek. Although the hatchery was initially constructed to help the salmon populations, some believe that hatchery fish could be harming wild salmon by interbreeding with them, or by competing for their habitat.

Developing a Restoration Program

A debate about how to restore fish habitat on Castle Creek has been ongoing for a decade. Environmental groups first proposed decommissioning the dams in 1990 in response to the

decline in wild chinook runs on Castle Creek and the Stucchi River (decommissioning could range from allowing free flow of water through a dam to removing the dam completely). Although their proposals made headlines, nothing was done. Then in 1995, Oregon populations of chinook salmon were listed as a threatened species by the federal government. With the listing, several agencies, including the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS), began to share the view that Castle Creek could be an ideal place to restore habitat for chinook. Since the re-licensing of the creek's dams was scheduled to take place in just fifteen years, they saw a golden opportunity to pursue dam decommissioning as a viable habitat restoration strategy.

Oregon Energy was determined to keep the dams in operation to meet rising demand for electricity. But with the new listing and the upcoming re-licensing process, the utility's leaders knew they would need to make some concessions to the agencies and environmental interests. They began preparing their case for re-licensing the dams, while instituting improvements to dam operations to ensure enhanced survival of wild chinook in Castle Creek.

A team of the utility's top scientists was assembled to develop models showing the potential negative effects from decommissioning, as well as the benefits that could be derived from modifying dam operations and adding fish ladders to the upper two dams. The utility's scientists also sampled the sediment accumulated behind the dams and found traces of elemental mercury that could be transported downstream if the dams were removed.

As Oregon Energy's scientists went to work, the National Marine Fisheries Service (NMFS) initiated its own effort to demonstrate the potential benefits of decommissioning the dams. As the agency responsible for enforcing the Endangered Species Act for marine and anadromous species, the NMFS was keenly aware of the need to improve habitat conditions in the Stucchi River watershed. In their view, the Castle Creek dams produced an insignificant amount of power, and provided some of the best opportunities to showcase salmon restoration. They also feared lawsuits from environmental groups if dramatic steps were not taken. A team of NMFS scientists was assembled to model the benefits that dam decommissioning would bring.

Beginning in 1997, both Oregon Energy and the NMFS began analyzing the results from their models, and arrived at opposing conclusions. NMFS concluded that decommissioning the dams would not only open up previously unavailable upstream habitat, but would also reintroduce more natural flows and invigorate natural fluvial processes – such as sediment transport, floodplain inundation, and channel migration – that help to create high quality salmon habitat.

Oregon Energy rejected these predictions, claiming that the assumptions underlying the models that produced them were flawed. Their models showed dam decommissioning would produce detrimental effects on fish habitat. At one meeting with the NMFS and the USFWS, Oregon Energy argued, "decommissioning or removal of the dams are likely to be the final straw for Castle Creek chinook." They were concerned that mercury in the sediments would be transformed as it moved through downstream wetlands and would bioaccumulate. Their models also suggested that sediment accumulated behind the dams would be transported in large pulses, threatening important downstream spawning habitats with inundation and fine sediment

infiltration. The NMFS science team countered that any habitat damage would be short term and that the ecosystem would rebound. "Our results draw on our many years of experience dealing with comparable situations across the U.S.," noted the NMFS team.

Seeing the battle lines drawn between the NMFS and Oregon Energy, ODFW jumped into the dispute. Agency leaders were concerned about the status of the salmon and supported actions to improve in-stream habitat such as re-vegetation of creek banks. But they also were concerned that decommissioning would cost them their source of clean water used in the hatchery. Fearing the spread of disease from wild populations, ODFW had long been pumping water from the highest diversion dam into the hatchery. They were also afraid that the restoration effort might force changes in hatchery management, and argued that continued hatchery production of salmon and trout were necessary since local sportfishers were an important agency constituent and a significant economic force in the region.

By 1998, the debate reached a head. Frustrated by the length of time it was taking to reach an agreement about what to do with the dams, environmental groups began preparing a lawsuit against the NMFS for failing to enforce the ESA. Eager to avoid a protracted court battle and recognizing that a more direct negotiation was needed between the parties, the NMFS convened an ad hoc group to develop a comprehensive habitat restoration program for Castle Creek. The group included representatives of Oregon Energy, the NMFS, the U.S. Fish and Wildlife Service, ODFW, The Nature Conservancy, and the Biodiversity Council, a local environmental group.

The group met for two years, struggling with sharp disagreements over their objectives and conflicting scientific information. Oregon Energy wanted to keep the focus on channel and riparian restoration in downstream reaches, while conceding some changes in dam operations to improve river habitat conditions. The NMFS maintained the view that dam decommissioning was likely to be the only strategy capable of significantly enhancing the abundance of threatened species in Castle Creek, citing the lack of spawning habitat as the factor most limiting salmon populations. The Nature Conservancy was eager to expand the scope of the restoration program to address other rare species. Protection of remaining streamside woodlands and re-vegetation of the banks would be beneficial to these species as well as to the salmon. The Biodiversity Council argued that the restoration program must take a watershed-scale approach and deal with all threats including changes in regional land use. In their view, significant changes in livestock and timber management were needed to protect stream quality. They were also strong proponents of dam decommissioning.

The impasse appeared as if it might never be resolved. Then in December 2000, the federal and state agencies and Oregon Energy finally signed a Memorandum of Understanding establishing the Castle Creek Fish Habitat Restoration Program. The trump card was the decision to develop an adaptive management program. The agencies and Oregon Energy agreed to implement a range of strategies short of dam decommissioning, on the condition that the results would be closely studied to determine if they were sufficient to recover salmon runs. The initial set of strategies would include restoring riparian corridors on private and public lands, changing flow regimes to better meet the needs of different life history stages of salmon, improving the fish ladders on the lower two dams and adding gravel to the channel to increase spawning habitat.

The decision about whether to decommission the dams would be made in a decade, during the re-licensing process. In the meantime, a robust adaptive management program would allow the agencies and Oregon Energy to evaluate the effectiveness of less risky and less expensive restoration strategies. The NMFS and the USFWS were willing to give these other approaches a chance.

Establishment of the program produced a mixed response among the residents of the Castle Creek watershed. Tension over government land management activities and property rights had long been present in the region. Having heard horror stories of endangered species limiting use of private property, landowners were worried that a re-established chinook population could lead to involuntary restrictions on their creek access, uses of land or cattle ranching practices. In response, the landowners formed the Castle Creek Landowners Association to help mobilize property owners throughout the watershed's communities and lobby for their interests.

No matter how the restoration program proceeds, the parties will have to manage in the face of many scientific uncertainties. For example, no one knows if it will be possible to discern the effects of various restoration strategies. Similarly, no one knows yet whether hatchery fish will stray into the new restored habitat, and compete with wild fish. These and many other questions require credible scientific investigation as part of an adaptive management approach.

The parties are also aware of the many institutional questions they have to resolve. How will the agencies structure and manage the adaptive management effort? How will community groups and interest groups be involved? How will staff explain the adaptive management approach to elected officials, funding agencies, and the public? What will constitute a finding significant enough to warrant a change in direction?