CASE STUDY 2

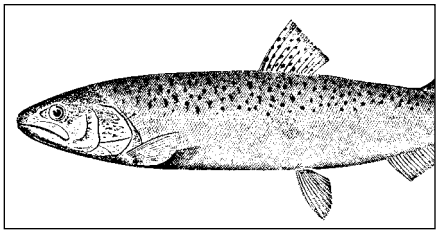
Salmon Habitat Restoration in Alaska

Background

Alaska's salmon fisheries account for sizeable contributions to the state's economy. In 1990, commerical harvests, which were 94 percent of the 733.1 million pounds landed in the United States, were valued at $546.7 million. This amount does not account for the added value of its recreational and subsistence fishing. The health of the salmon fishery, then, is vitally important to economic health. The salmon fishery is influenced by many factors, environmental and human — from highly variable ocean conditions to the timing of harvesting, the levels of that harvesting, the impact of land-use practices on freshwater and estuarine habitats, which can be critical for spawning.

Pacific anadromous salmonids include five species of salmon that are comprised of a large number of stocks originating from specific watersheds. Salmon juveniles or smolts spawned in streams migrate to the ocean and then generally return to their natal streams to spawn. Because forestry practices can directly influence the quality and quantity of freshwater habitat, primarily through harvesting of timber and associated road building activities, their management is particulalry important for the health of salmon returning to their home streams.

Even with salmon health generally high, with record harvest levels, and with a large proportion of the land base relatively undisturbed, specific stocks could still be in decline if forest practices remove too much of the riparian vegetation or degrade channels. Under certain conditions, a given run of salmon could be considered for listing as endangered under the Endangered Species Act, which includes provisions for listing "distinct population segments."



Situation

Harvesting of Alaskan forests can impact salmon habitats and lead directly to reduced spawning of smolts. A hypothethical example is presented in which a proposed regulation calls for a riparian buffer zone along critical stream habitat.

Hypothetical Alaskan Watershed

The following example provides a set of assumptions about the economics of logging and salmon harvests — the exercise then poses a number of questions that consider issues of value. To begin with, suppose that harvesting within the Tough Choices watershed would generate 6,700 million board feet of timber with a pond log value of $401 per million board feet — pond log value reflects not just the price of the standing timber but also the costs incurred in bringing the timber to the mill, for instance, logging, road construction, and transport. Assume that by building the access roads across the watershed and by removing the trees, this timber sale will fragment the riparian habitat into patches and cause a reduction in the full capacity of the spawning ground for the coho stock that inhabits the creek. This stock of salmon would show an expected decline relative to the amount of habitat lost.

The impact of tree clearance would also affect the food web, for example, local bear and eagle populations that depend on salmon stocks could be adversely affected. Such impacts could have ripple effects, for instance, declines in recreational viewing which might be impacted because of tree harvesting and road-building. We will suppose that the only functions attributed to these trees is either commercial harvest or as an input into stream integrity and fish production, or negative effects. The value of the salmon consists of its commercial and recreational value (in current and future fisheries), as well as its subsistence and cultural value to the residents of the State of Alaska.

As part of this hypothetical example, we assume that biologists have developed an expected relationships between land clearance and the capacity of the spawning ground associated with the stream. If all the commercial timber proposed is harvested, then the spawning capacity will be reduced by 90 percent of its original capacity. If only 20 percent of the trees are harvested, a 10 percent reduction in fish capacity is expected. For every 10 percent increase in timber harvest from that level on, there will be a corresponding drop of 10 percent in fish spawning capacity. In addition, consider the following information:

Spawning capacity: 9000
Smolts per spawner: 106
Ocean survival to maturity: 43%
Commercial harvest rate: 47%
Freshwater recreational harvest: 16%
remainder available to spawn for future cycles

Ex-vessel Price: $1.42/lb
Average weight of salmon harvested: 12 lbs
Anglers' WTP: $15.92 per additional fish caught

Exercise

Given the background and information provided above and keeping in mind the various perspectives regarding "value," analyze a proposed regulation calling for a 300-foot riparian buffer zone along critical salmon streams.

Questions to consider include:

1. Are there any additional value associated with the timber and salmon resources not mentioned?

2. What measurement techniques would you employ to determine relevant values?

3. What additional data (aside from that provided) might you need to carry out empirical analysis?

4. What discount rate would be appropriate in the determination of net present value?

5. Society involves many individuals, and projects such as this often affect the welfare of individuals differently. The implicit assumption in constructing the estimates of costs and benefits in this example is that the welfare of all individuals is weighted equally. What if you were to eliminate this assumption and address the issues of equity and fairness? How might your decision change if you take future generations explicitly into consideration? How might you go about doing this?

6. Consider the issue of irreversibility. How might the potential for species extinction change your decision process and recommendation? How might you integrate the potential risk of irreversible outcomes into your analysis?