The Fire/Fish Risk Management Problem

BY JAY O'LAUGHLIN

"Increased fuel buildup from a century of fire suppression has led to fires of unnaturally high intensity, burning hundreds of thousands of acres of forest that could have provided timber for the economy and habitat for wildlife. Water quality and biological diversity have suffered, adding to poor ecosystem health. The challenge of forest managers, especially on public lands, is to remedy both forest health problems—excessive fuel buildup and watershed degradation—without exacerbating either one."

Rocky Barker. 1997. "New forestry in the next West," Pages 25-44, in *The Next West: Public Lands, Community, and Economy in the American West,* John A. Baden and Donald Snow, editors. Island Press, Washington, DC.

Fish habitat is affected adversely or beneficially by disturbance events on land areas adjacent to waterbodies. Wildfire removes vegetation, exposing soil to erosion and processes that deliver sediment to streams, filling spaces between gravel and adversely affecting spawning habitat and aquatic insect production. The severity of post-fire effects is related to fire intensity, which is heightened where fuels have accumulated to uncharacteristically high levels. This problem is widespread.

In the interior Columbia River basin region, for example, half the area of federal forests is subject to lethal or stand-replacing fires, whereas a century ago only 20 percent of the area was. Lethal fires put fish and wildlife habitat and other values at risk. Forests in the eastern Cascades and Klamath River basin face a comparable situation.

Pre-fire treatment of hazardous fuels can reduce wildfire intensity, thereby reducing erosion potential and sediment pollution. Fuel treatments can cause additional sediment, but only a small fraction of the sediment pulse following wildfire. Analysis to support fuel treatment decisions is multi-dimensional. Effective problem solving depends on defining the problem thoroughly, understanding social and decision contexts, and using multiple methods to generate and analyze solution alternatives.

Problem Definition and Context

What's the problem? Rocky Barker, a Boise environmental journalist, stated it earlier without risk terminology, which sometimes confuses the issues. Developing effective alternatives for improving this multi-objective problem situation is enhanced by understanding social concerns and decision processes.

Barker described one social consideration: "Environmentalists question whether roads and clearcuts can be engineered well enough to prevent sedimentation in some soil types and in streams heavily damaged by past logging and road building. Science probably won't completely answer their concerns. Environmentalists want risks removed for fish, especially in already degraded areas, until rehabilitation takes place."

Decision processes involve the federal Endangered Species Act (ESA) and state laws requiring best management practices (BMPs) to reduce adverse effects on water quality. Although BMP adequacy is a contentious question, adherence to state forest practices regulations should protect fish habitat adequately. All managers must avoid significant habitat modification that could harm ESA-protected fish. Federal land managers must consult with ESA regulators in the U.S. Fish and Wildlife Service (FWS) or National Marine Fisheries Service (also known as NOAA Fisheries) and demonstrate that proposed actions will not "jeopardize" fish recovery efforts. This is problematic.

PHOTO COURTESY OF DAVE POWELL

A tributary stream on the Umatilla National Forest after the Tower Fire in 1996. The fire ignited during a lightning storm and burned more than 50,000 acres. Fish cannot spawn and rear in conditions like this, but if and when adequate vegetation returns to hold soil in place and provide shade, fish will find their way back.

Risk Assessment and Communication

Risk cannot be managed unless it has been properly assessed and some form of model provides the best assessment process. To support fuel treatment decisions, managers need a model comparing the severity of post-wildfire effects with and without pre-fire fuel treatment. USDA Forest Service Chief Dale Bosworth put it this way: "Managers need to weigh the short-term risks posed by active management against the long-term risks of continued inaction, and communicate these risks meaningfully to the public."

The ecological risk assessment model developed by the U.S. Environmental Protection Agency could help meet these needs. A federal fisheries scientist asked, "If ecological risk assessment is the answer, what is the question?" Others replied, "Which is worse, new fires that may result from past management or new management intended to mitigate those fires?" Science cannot address the "which is worse" question, but managers should. The model requires a risk management hypothesis and graphical depiction of the cause-effect relationship. Both are presented on page 13.

In a guidance memo the FWS director and NOAA Fisheries administrator described a risk hypothesis and encouraged ESA regulators to apply it. They said that restoring natural (historical) fire regimes and native vegetation provides benefits by reducing the

severity of wildfire effects, and that over the long term these benefits may exceed the adverse short-term effects of implementing hazardous fuels reduction treatments.

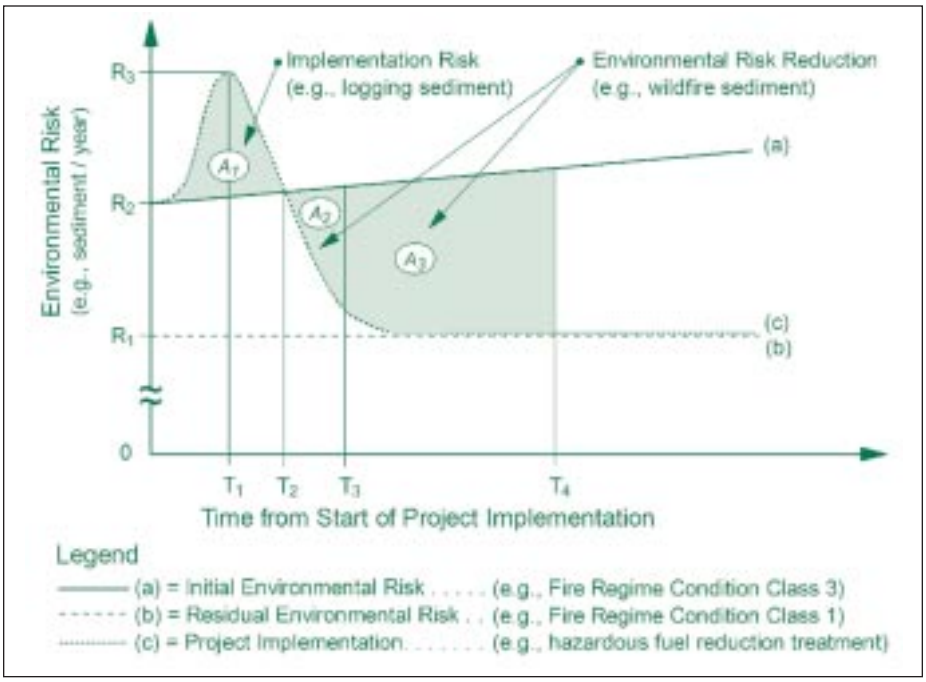
Laws put the onus on forest managers to demonstrate the beneficial and adverse effects of fuel reduction treatments to regulators and the courts. The following steps help with these tasks. First, work with various publics to identify risk assessment endpoints, which are specific ecological entities to be protected. Salmonid spawning and rearing is an appropriate endpoint; vague descriptors like integrity or sustainability are not. Second, identify the stressors affecting the endpoint, such as sediment and/or water temperature. Third, link wildfire, silviculture and other processes to stressors and endpoints, with quantitative data when available. Finally, use professional judgment to compare one alternative (post-fire effects in a treated forest) against another (post-fire effects without treatment).

One hundred years is the minimum analytical timeframe for fish or ESA-protected wildlife, perhaps longer if the fire return interval is more than a century. In fire-adapted forests this assures that a fire will occur at some time during the analysis period, thus eliminating the need to assess fire occurrence probability. By graphing sediment production with and without treatment effects over the entire timeline, the risk manager can compare and communicate the stressor-producing effects of wildfire under the two alternatives (see Graph 1).

The ecological benefit of fuel treatment is that it reduces post-wildfire stressors such as sediment. Graphically, this is the difference in sediment with and without fuel treatment along the timeline [the area between lines (a) and (c)]. Without risk-based analysis, regulators and fish advocates will likely invoke the precautionary principle and not allow fuel treatment because it generates additional sediment and short-term risk to fish, no matter how small. This approach is problematic as it ignores the substantial long-term net benefits of active management that reduces the severity of wildfire effects.

Forest and fish managers are responsible for the resources people value and the risks to those resources. All management decisions involve risk, including the decision not to take action. To generate effective long-term options, managers and regulators need to accept some risk. People make decisions everyday to reduce future risks; for example, changing the oil and filter in your motor vehicle ("pay me now or pay me later"). A graphical risk assessment tool can help managers communicate these ideas. ◆

Graph 1. Model of post-wildfire sediment with and without fuel treatment [lines (c) and (a), respectively].



Fire can occur at any time (horizontal axis) and produce sediment (vertical axis). The management objective is lowering fire regime condition class from line (a) to (b) by treating hazardous fuels and reducing the potential post-fire risk effect from R2 to R1. Pre-fire fuel treatment implementation [line (c)] produces logging sediment (A1). If a fire ignites before time T2 this is as an additional increment to post-fire sediment. The future benefit of fuel treatment is reduced post-fire sediment from a treated forest compared to an untreated condition (A2 + A3). Decision rule: Accept the treatment project if risk-reduction benefits exceed the implementation risk, as they appear to at T4, but perhaps not at T3.

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