Appendix P

Designing a Monitoring and Evaluation Program to Support Adaptive Management

Introduction

The Northwest Region National Marine Fisheries Service (Portland, Oregon) developed this short summary of *Adaptive Management for Salmon Recovery: Evaluation Framework and Monitoring Guidance* in June 2006 for use in salmon recovery plans.

Designing a Monitoring and Evaluation Program to Support Adaptive Management

Because of the length and complexity of the salmonid life cycle, there are many uncertainties involved in improving salmonid survival. Simply identifying cause-and-effect relationships between any given management action and characteristics of salmon populations can be a scientific challenge. It is essential to design a monitoring and evaluation program that will answer these basic questions: How will we know we are making progress? How will we get the information we need? And how will we use the information in decision making?

As part of implementing the Upper Columbia salmon recovery plan, a detailed monitoring and evaluation program will be designed and incorporated into an adaptive management framework based on the principles and concepts laid out in the NMFS guidance document, *Adaptive Management for Salmon Recovery: Evaluation Framework and Monitoring Guidance* (available at [weblink TBA]).

Adaptive management means taking an experimental approach to a complex task, making one's assumptions clear, and continuously evaluating them in the light of new information. It works best when the collection of performance data and methods of evaluation are designed to get the information managers need to make sound decisions. As outlined in the NMFS *Adaptive Management* guidance document, several types of monitoring are needed: (1) implementation and compliance monitoring, which is used to evaluate whether the recovery plan is being implemented; (2) status and trend monitoring, which assesses changes in the status of an ESU and its component populations, as well as changes in status or significance of the threats to the ESU; and (3) effectiveness monitoring, which tests hypotheses and determines (via research) whether an action is effective and should be continued. In addition, it's important to build in some research to illuminate the many unknowns in salmon recovery—the "critical uncertainties" that make management decisions all the harder. Critical uncertainty research may seem expensive or unnecessary in light of basic information needs; however, in the long run, it may reduce monitoring and implementation costs.

Implementation and compliance monitoring simply check on whether activities were carried out as planned, and whether specified criteria are being met as a direct result of an implemented action. For example, if a fence is planned for 20 miles of stream corridor to keep livestock off the stream banks so that riparian vegetation will rebound, implementation monitoring would verify the presence of the fence. Compliance monitoring would take note of the presence or absence of livestock in the fenced-off area.

Status and trend monitoring is a simple compilation of data-based descriptions of existing conditions. To be useful in decision making, the raw data, or metrics, must be reduced to a more directly applicable form or indicator. For example, if the question is "What is the annual spawning population

size of steelhead in the X River?" the indicator would be total spawning numbers of steelhead over one season for the entire river basin; however, the metric, or directly measured thing, would be something quite different, perhaps steelhead redds sighted on weekly passes over known spawning grounds. Thus, the metric must be processed to translate it from the metric data type (e.g., redds) into the indicator data type (e.g., spawners), and then reduced to generate the indicator required (e.g., list of weekly counts on spawning grounds to annual total for watershed).

Effectiveness monitoring specifically addresses cause-and-effect questions. Demonstrating the direct and indirect impact of management actions requires supporting all steps in the logical chain that connects the action to its expected impact. This chain is rarely short and usually contains several hypotheses. For this reason, it's better to build the effectiveness monitoring into the recovery action strategies, with, for example, pilot-scale tests or other methods carefully thought out beforehand. Monitoring and evaluation will only provide the answers to the questions they were designed to address; they do not provide the framework for revising these questions if they are ill-posed, evaluating the assumptions upon which the strategy was built, or incorporating learning into future decisions on actions and strategies—this is the role of adaptive management.

NMFS' guidance document presents a decision framework that can guide the design of a research, monitoring, and evaluation plan. The framework (Figure 1) contains two basic sorts of questions: (1) questions regarding ESU status (biological viability criteria) and (2) questions regarding statutory listing factors and factors limiting recovery (limiting factor and threats criteria). Evaluating a species for potential delisting requires an explicit analysis of both types of criteria.

The guidance document contains a more detailed discussion of the framework and identifies the specific questions that must be answered to evaluate ESU status. These specific questions take the form of a series of decision-question sets that address the status and change in status of a salmonid ESU and the risks posed by threats to the ESU. The decision-question sets are designed to elicit the information NMFS needs to make delisting decisions. For recovery planners, the framework can guide future decisions about strategies and actions aimed at achieving recovery goals.

Designing an effective monitoring program for salmon recovery involves the following initial steps:

1. Clarify the questions that need to be answered for policy and management decision making. Include the full ESU and the full salmonid life cycle.
2. Identify entity or entities responsible for coordinating development of this program.
3. Identify:
    - Which populations and associated limiting factors to monitor
    - Metrics and indicators
    - Frequency, distribution, and intensity of monitoring
    - Tradeoffs and consequences of these choices
4. Assess the degree to which existing monitoring programs are consistent with NMFS guidance (e.g., Upper Columbia Monitoring Strategy; Okanogan Basin Monitoring and Evaluation Program; Draft Monitoring and Evaluation Plan for PUD Hatchery Programs; FCRPS monitoring actions; estuary monitoring programs).
5. Identify needed adjustments in existing programs, additional monitoring needs, and strategy for filling those needs.
6. Develop a data management plan (See Appendix B of the NMFS guidance document).
7. Prioritize research needs for critical uncertainties, testing assumptions, etc.
8. Identify entities responsible for implementation.

The Upper Columbia monitoring and evaluation program will build on existing programs designed for monitoring tributary habitat in the Upper Columbia, hydropower actions in the Upper Columbia,

Upper Columbia hatchery programs, and actions outside of the Upper Columbia tributary subbasins (e.g., Columbia mainstem hydropower, estuary conditions and salmon use, mainstem and ocean harvest). The Upper Columbia monitoring and evaluation program will provide (1) a clear statement of the metrics and indicators by which progress toward achieving goals can be assessed, (2) a plan for tracking such metrics and indicators, and (3) a decision framework through which new information from monitoring and evaluation can be used to adjust strategies or actions aimed at achieving the plan's goals.

Figure 1