

Develop statistical approaches and strategies for monitoring and evaluation

Problem Statement

Because of poor data and enormous uncertainty about how different management actions will impact salmon survival, many recovery efforts are being undertaken without empirical evidence that they will work. This situation demands that effective monitoring and evaluation programs be in place so that management policies can be modified as better data and improved understanding concerning species requirements for survival become available.

Critical Factors

- Environmental variation, population trends and sampling error must be estimated before monitoring and evaluation of species at risk for extinction can begin.
- Once these estimates have been made, state-of-the art statistical research and computer simulations will be used to design sampling protocols that have the greatest likelihood of detecting a change in a species survival in response to a change in management practices.
- Many factors thought to effect salmon productivity co-vary. Therefore, covariation should be explicitly considered when designing management plans and monitoring protocols. For example, cattle grazing is usually associated with granitic geologies. Salmon productivity seems to be lower in regions with granitic geologies and heavy cattle grazing. Management experiments coupled with effective monitoring can determine if reductions in cattle grazing will substantially foster salmon recovery only if the design of those experiments and the monitoring protocols disentangle geology and grazing.
- Measures of stream, ecosystem, or salmon health other than smolt-to-adult return rates are needed. Research will be conducted to determine such measures by examining PIT-tag data related to individual fish fitness and other environmental variables.

Status of Research

The development of statistical approaches that will lead to improved monitoring and evaluation of threatened or endangered species is still in its infancy. Much work is needed to establish the robustness of estimates associated with variation in environmental parameters, population trends, and sampling error. The research will require more mathematical analysis and sophisticated computer simulations than is generally recognized, even among biologists. Once completed, however, monitoring and evaluation protocols will necessitate implementation of a system for data management and data documentation that presently does not exist in the western United States for salmonids and their habitats. Therefore, efforts are simultaneously underway at the Northwest Fisheries Science Center (NWFSC) and regionally to address this data management problem.

Future Considerations

In general, monitoring and evaluation of threatened and endangered species are poorly done. Moreover, approaches that seem plausibly effective could, in fact, fail because of confounding factors. As a result, without successful case studies from which to learn, attempts to design monitoring programs for rare salmonids are likely to proceed slowly at first and will offer formidable challenges. In particular, since the National Marine Fisheries Service (NMFS) cannot do all monitoring itself, a great deal of outreach effort will be required to gain the cooperation of state, tribal, county, and federal partners in this crucial work.

Key Players

Cumulative Risk Initiative (CRI) Team, Science Directorate (SD), NWFSC

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