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Independent Scientific Review in Natural Resource Management

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Introduction

Public policy issues involving natural resource management and conservation increasingly have become controversial and politicized. Protecting air and water quality, removing toxic wastes, recovering endangered species, and protecting old-growth forests and threatened biological communities are just some of the complex environmental policy issues that challenge us to devise scientifically appropriate and politically acceptable solutions. Making well-informed decisions regarding the use and protection of natural resources requires that we fully consider and employ the most reliable and accurate scientific information and judgment available. Calls for inclusion of "the best available science" and independent analyses or review of environmental policy and decision making repeatedly are heard from Congress, the Executive Branch, and other interests. We agree that such participation by the nation's scientific community in the form of independent scientific review can contribute to better-informed environmental policy and decision making. Toward the goal of improved integration of scientific information into environmental decision making, we address a series of questions that are critical to understanding the need for rigorous scientific review. We also suggest how such review might proceed expeditiously and economically.

Pertinent Questions

Why Is Independent Scientific Review Needed?

Independent scientific review (ISR) can help ensure that environmental decisions and policy making reflect the best scientific knowledge of the day. Most environmental issues are burdened with historical momentum, economic implications, and cultural values that may dominate decision making in the absence of scientific information. An ISR can help decision makers focus on the oxbjective, scientific variables apart from economic, historical, or cultural factors and to interpret issues in the context of great ecological complexity and uncertainty. Also ISR can raise the level of public trust in the process, alleviating fears that industries, environmental protection organizations, or government agencies are simply promoting their own interests or moving ahead without benefit of relevant scientific information. But the main reason for an ISR is that without one any claim of objectivity and scientific validity may be suspect.

What Are the Goals of ISR?

An ISR can help ensure that (1) the best available scientific knowledge is brought into the decision- or policy-making process; (2) the influences of bias and special interests are minimized in environmentally relevant decisions or policy making; (3) science is separated clearly from nonscientific issues; (4) decisions or policies are achieved in an open and transparent manner; (5) all relevant information is considered and evaluated; (6) all conclusions drawn are consistent with the available scientific information, and assumptions are made explicit; and (7) the risks associated with different interpretations of data or alternative management decisions are articulated.

What Constitutes an Appropriate "Independent Reviewer?"

A qualified independent reviewer is one who (1) has little personal stake in the nature of the outcome of decisions

or policies, in terms of financial gain or loss, career advancement, or personal or professional relationships; (2) can perform the review tasks free of intimidation or forceful persuasion by others associated with the decision process; (3) has demonstrable competence in the subject as evidenced by formal training (e.g., an advanced degree in the appropriate discipline) or experience (e.g., research and publication within their field); (4) is willing to use his or her scientific expertise to reach objective conclusions that may be discordant with his or her value systems or personal biases; and (5) is willing and able to help identify internal and external costs and benefits—both social and ecological—of alternative decisions. Typically, such a person is associated with a recognized scientific society or is otherwise an established professional in a particular field as evidenced by *independent* scholarly achievement and the respect of peers.

Under What Circumstances Should ISR Be Conducted?

An effective ISR should ensure that high-quality scientific input informs government decision makers without creating another bureaucratic, expensive process that delays decisions and drains away limited resources from agencies. We recognize that overuse of ISR can delay or even destroy decision processes and needlessly use up limited staff time and funds. It is possible that unnecessary calls for ISR could be used to mire regulatory agencies in a host of new procedural requirements that would make the task of promulgating regulations even more difficult, sidetrack policy, or stall decisions. Thus, ISR should be employed principally when an agency decision rests, or is likely to rest, on scientific judgments or management actions that are controversial, seriously disputed, or arguably insufficient, especially in cases where the decision carries the risk of creating lasting negative effects on environmental quality, nature, the economy, or communities. An ISR should be employed in a flexible manner appropriate to each situation; a prescribed, centralized, "one-size-fits-all" approach is unlikely to improve good decision making and may in fact hinder it.

Among issues that might be appropriate for ISR are the following: habitat conservation plans; "no surprises" agreements proposed for the Endangered Species Act; some Endangered Species Act listings, delistings, and recovery plans; long-term or large-scale forest management plans; major restoration and remediation activities; biological assessments or impact studies of water projects such as dams or diversions; mining operations that might significantly impact federal land or resources; significant changes in federal rules or regulations bearing on natural resource management; regional ecosystem management planning involving multiple agencies; and other changes in land use and management that may have social or ecological costs not reflected in current market evaluations.

When in the Process Should ISR Be Conducted?

To be most effective and constructive, ISR should be built into processes of planning and decision making. In most cases, this could be done via a predictable sequence of steps toward obtaining early and appropriate input from independent scientists, before positions become set and considerable time and effort are invested in elaborating plans. Early review is especially critical when policies dictate consideration of diverse factors and when scientific rationale may be obscured in later drafts or final documents. Most environmental planning already occurs under a suite of laws designed to allow public access to information and input at particular stages of planning and implementation. Although our previous comments call for flexibility, we recommend inserting ISR into these existing processes at three distinct points: (1) informal or formal review of early ideas and initial (pre-release) draft plans; (2) formal written review once official draft plans or policies are released to the public; and (3) formal final review once final plans are released.

An ISR can result in decisions that are more scientifically defensible when it is employed at the beginning *as an integral part of planning, not as an afterthought*. It should periodically review progress and help inform decisions throughout planning or decision processes in an adaptive manner. Given that uncertainty exists in all environmental resource management decisions, emphasis should be placed on a flexible, adaptive approach in which new information can be used to improve decision making in both the short and long term.

Who Should Coordinate the ISR Process in Individual Cases?

Selecting scientists for ISR raises questions about criteria for suitable reviewers. We understand that limitations of money and time prohibit complete separation of ISR from the auspices of the organizations or individuals involved in the issue being reviewed. Indeed, there are many excellent, talented, and appropriate scientists working within governmental and other participating industrial and environmental organizations who can provide good ISR. Pragmatically not all ISR can be conducted under ideal conditions of absolute impartiality, and we cannot assure removal of all bias. The major criterion is to assure that all individuals conducting ISR truly are independent from the immediate issue. Thus, for example, if a program of the U.S. Forest Service or the U.S. Fish and Wildlife Service is being reviewed, it sometimes may be appropriate for individual scientists of those agencies to participate in the review. In such cases, however, we recommend that the following specific guidelines be developed regarding their involvement: (1) they do not constitute a majority of the ISR team; (2) they have particular and special expertise in the subject under review and are not selected simply for organizational representa-

tion; and (3) they have or have had no direct involvement in the particular actions under review and are independent of supervisors or colleagues with involvement in the actions under review. That is, scientists who are writing or who will carry out the plan should not be part of the ISR process—they are de facto not independent.

Given these limitations, we believe that coordination of individual ISRs can be done by any appropriate individuals or groups. The selection of reviewers might be managed by scientific organizations such as the Ecological Society of America, the Society for Conservation Biology, the American Institute of Biological Sciences, The Wildlife Society, the American Fisheries Society, the Society of American Foresters, or the National Academy of Sciences, or by governmental agencies—provided the individuals selected have not been involved in the issues being addressed, as defined above, and are unlikely to benefit directly by their participation.

What Is a Good Format for ISRs?

We offer no single recommended or standardized format for good ISR because circumstances vary greatly by issue; in fact, we strongly caution against a set format. The depth of review will differ among issues and at different stages of each issue. Possible formats range from informal "checks" with established authorities on particular points in question (which should be formally recorded as having occurred), to independent and formal commentary on proposals or other documents by reviewers, to major workshops that convene reviewers for interchange and debate.

We also note that scientific participation and oversight are not equivalent to ISR. Often, scientists are members of a team or task group responsible for planning. Such scientists cannot be expected to be as objective as those outside the process. Similarly, scientists who are brought in frequently to provide oversight may develop a sense of ownership in the process and should not be given the task of final ISR.

Should Reviewers Be Compensated?

It is important to recognize that ISR requires skill, experience, and, above all, time. Reviewing the work of others is widely acknowledged to be a critical component of the scientific process, and most scientists take it seriously. Some universities consider ISR to be a form of community service, and ISR is often performed gratis. But, the demands placed on busy, successful, and prestigious scientists can be overwhelming, and many scientists must turn away many requests for comment and review. Consequently, monetary compensation is sometimes offered as an inducement, as it is for experts in most professional fields. There are benefits and disadvantages to such incentives, but their use may ensure timeliness and responsiveness from reviewers.

As the scientific and political complexity of environmental issues increases, the importance of quality ISR also will increase, but nongovernment scientists may not be able to accept ever-increasing ISR workloads without compensation. Therefore, we suggest that budgets for environmental projects should include funds for ISR. The costs would be marginal, particularly when considering the value gained for agencies by efficient and expert review, and they could prevent larger agency costs later in the process. At the same time, institutions that employ scientists—particularly universities and research institutes—should consider the performance of ISR to be worthy of greater weight in decisions about promotion and tenure, thereby encouraging their scientists to provide society with these critical services at little or no cost.

Conclusion

When calls go out for "the best," "credible," "rigorous," or "objective" science, the most appropriate response is virtually always an independent review of the work. If the science is found wanting, subsequent steps are usually obvious as a result of the review. Although it is true that calls for review can delay action, there are ways to ensure promptness and efficiency. In critical or controversial policy issues that can be informed by rigorous science, there is no substitute for a penetrating critique. Thus, the Society for Conservation Biology urges that governmental decisions and policy related to the environment be made in an independent manner with the best available science.

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