The Role of Scientists in Conservation Planning on Private Lands

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The nexus of advocacy and science has been a recurring discussion theme since the earliest days of the Society for Conservation Biology. When Michael Soulé defined conservation as a "mission-oriented discipline," he succinctly captured the issue. He and others have asked whether biologists on a mission to save ecosystems, ecological communities, species, and populations can provide the value-free and independent science that conservation planning requires. Should conservation biologists be required to check their philosophy and morals at the door when entering an arena fraught with political angst and economic implications? Does a commitment to saving biological diversity necessarily obviate a scientist's opportunities to contribute his or her professional skills to land and resource planning when objectives other than conservation are included? Although this dilemma has not been solved, the debate has taken a different turn. Some conservation biologists question whether their colleagues can provide value-neutral science to land-use planning and resource management where private lands, land developers, resource extraction, and compensated consultation are involved. In the context of inescapable trade-offs, can conservation biologists be trusted to deliver professional judgment without bias? Can they be anything but accomplices to the loss of habitats where species will be taken and bulldozers will roll?

We think conservation biologists can and should participate in land-use planning. Nevertheless, based on our involvement in a number of the most controversial conservation planning efforts in the United States, we recognize that acknowledgement and incorporation of trade-offs can be accompanied by significant professional condemnation. Where conservation planning is adjunct to land development and extractive activities (e.g., timber harvest, mining, grazing), participating scientists are often viewed as simply providing scientific input that meets the expectations of private interests facing restrictive policies and costly regulations. Some of our colleagues believe that involvement in land-use planning that includes private interests is in itself an abdication of a commitment to protecting nature. We think this position and the attendant debate arise from some basic misunderstandings about how science and scientists are typically engaged in the context of habitat conservation plans and similar private land and resource-planning efforts. We believe that many of our colleagues simply cannot imagine being involved in planning processes that offer constrained decision spaces, in which saving it all is not an option; where natural lands will be lost, but exactly how much will be lost and where losses will occur has not been resolved. We believe that conservation biologists must be engaged wherever possible in land-use planning when natural systems and the species they support are at risk, even if planning outcomes include the loss of individuals of species both common and rare. If losses of natural lands and the species they support is certain, decisions concerning the locations and quality of lands being evaluated for preservation becomes crucial.

It is not clear how goals for conserving the biotic diversity of the United States can possibly be met without protection and stewardship of species on private lands. The raw numbers are compelling. For example, the species-rich state of Texas is 98% privately owned; certainly any imperiled species program there must focus on initiatives and planning efforts that encourage conservation on private lands. But even at extremes of public land ownership, successful protection of species can be utterly dependent on conservation of the limited private holdings. Nearly 88% of Nevada, for example, is under federal control, but many of the state's wetlands, springs, and other water sources, which sustain most of its endemic and narrowly distributed species, are privately owned. Nationwide, at least part of the distributional ranges of nearly three-quarters of federally listed threatened and

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endangered species are privately owned. Moreover, as much as a one-third of this country's at-risk species are found exclusively on private land.

Our scientific contributions can make a difference in private lands planning. For instance, scientists can inform reserve design, exactly the process that most of us picture as the critical application of reliable knowledge to meet conservation objectives. But increasingly, the locations and elements of the design of spaces that will be conserved on private lands are highly constrained or have been decided outright absent scientific input. Scientists are less frequently being involved, upfront, in the very early stages of private lands planning. Instead they are more often being asked to develop adaptive management plans, effectiveness monitoring schemes, sampling designs for postimplementation data collection, or population management or habitat enhancement strategies, after boundary lines have been drawn on maps. Nonetheless, we believe our contributions can be independent and not biased in all of these pursuits. We believe we can avoid or greatly reduce the appearance, and potential reality, of bias or conflict of interest. We suggest that this can be accomplished by unwavering adherence to 10 basic rules of conduct, which apply to all conservation-planning engagements but take on special significance when conservation biologists work in the arena of private land development.

Rule 1

Limit advice and recommendations to matters informed by scientific knowledge. Land-use decisions address a wide range of issues including economic tradeoffs, timing constraints, political feasibility, competing values systems, and scientific defensibility. Although all of these factors are relevant to decision making, scientific input should be limited to the synthesis and interpretation of scientific knowledge. Useful sources of knowledge can be broadly defined to include empirical data and expert opinion from diverse sources, as well as model-based predictions, which may be used to inform policy decisions.

Rule 2

Review and consider all pertinent data and integrate them into analyses, the interpretation of which is understandable to participating interests and the informed public. The key guidepost here is an exhaustive consideration of all relevant information. And, certainly, some preliminary discussion as to what is relevant may be required. But no pertinent data should be excluded, and all relevant data or analyses must be considered exhaustively in initial stages of conservation planning. Adherence to this rule requires a full vetting of the planning issue by the participating scientists, with all possible sources of information subject to discussion and critical evaluation.

Rule 3

Explicitly acknowledge the uncertainties associated with available data and models, and incorporate estimates of uncertainty into conservation advice and recommendations. All understandings in science are provisional and conditional on current sources of knowledge. Moreover, nature is inherently probabilistic, making it impossible to project the consequences of land-use decisions with complete certainty. Nevertheless, imperfect knowledge and an unknown future should not justify decision making in the absence of the best technical information available or default to the status quo. Scientists must explain and justify the use of incomplete information, describe the implications of data shortfalls and shortcomings, and state clearly the justification for making decisions based on imperfect knowledge. Application of this rule gives scientists an opportunity to explain the value of monitoring and adaptive management, to update understandings of species responses to management, and to reduce incrementally the uncertainties associated with conservation decisions.

Rule 4

Weight and prioritize data to reflect its reliability based on its source and how it was collected. In general greater weight should be given to peer-reviewed empirical data and models, as opposed to gray literature and unsubstantiated observations. Some sources of knowledge will be more reliable than others, and it is appropriate to assign greater weight to information with narrower confidence intervals. As a guideline, assertions made by any party during the planning process should require justification, to the extent possible, by providing the explicit information that supports a given conclusion. In this way, weights of credibility are informally assigned to various sources of information. It is, however, important not to overzealously apply a peer-review filter, because inevitably some of the most useful information for conservation planning on private lands will emerge from state fish and game agency documents, federal reports and assessments, and other synthetic treatments of biological information from parties that may not have ready access to peer-reviewed publication outlets.

Rule 5

Interpret information in an appropriate spatial and temporal context. One of the most important ecological insights gained in the last 2 decades is an appreciation

that most ecological systems are open, and are usually affected by environmental drivers that originate outside the boundaries of individual planning units, as well as by internal factors. It is therefore necessary that the context for most conservation strategies not be constrained by ownership boundaries. To meet conservation objectives, planning must consider neighboring land-use practices and others that may extend well beyond the immediate development footprint and the time horizon of development activities. This reality requires that scientists explicitly deliberate on project impacts in a broad-scale landscape context, integrate cumulative effects into analyses, and anticipate temporal lags in species and community responses to management.

Rule 6

Make transparent all steps and links from data collection, to data analysis, to inferences drawn from data and models, to weighting criteria. All participants in land and resource-planning processes must be availed of the opportunity to understand fully the information and logical arguments that contribute to a conservation strategy, the trade-offs that are entailed, and the anticipated land-use outcome. No pivotal, plan-shaping activities should occur without fully informed deliberations and common understandings. Transparency is essential to the credibility and acceptance of a land-use plan. As an adjunct, subjecting the approach and recommendations of a draft conservation strategy to external peer review can add greatly to process transparency and substantially decrease the likelihood that critical information is overlooked or misinterpreted.

Rule 7

Use ecological data to inform cost-benefit analyses and trade-offs. Economic gain, rather than nature conservation, almost invariably is the driving objective of planning on private land. The science brought to land-use planning must explicitly address landowner values, economics, and legal authorities, as well as ecological issues. Analyses should compare alternative development scenarios, open-space allocations, and resource-management options—assessing discrete planning outcomes in terms of both monetary cost and probabilities of species persistence (or other measures of conservation success). A negotiation atmosphere often prevails in which conservation efforts are viewed by development proponents as too expensive. The participating scientists may need to take the lead in insisting that cost-benefit analyses consider nonmarket goods and services, and ensure that cost-benefit analyses are conducted over appropriate time horizons. Arguing for more ecologically informed cost-benefit analyses should be done carefully because such arguments often invoke the concept of intergenerational equity, which some argue is not within the purview of science.

Rule 8

Cast conclusions and recommendations as contingent probabilities. Adherence to this rule will often be met with resistance because most landowners seek certainty in any conservation agreement; however, no single conservation outcome can be assured from even the most ambitious land-protection and management scheme. By explicitly acknowledging the uncertainty associated with any set of conservation recommendations, the need for adaptive management, monitoring, and possible plan adjustment becomes obvious. Unanticipated events that require an adaptive response may occur both within, and external to, the conservation planning unit. As a result a conservation strategy must retain flexibility to change should it prove inadequate to reach its conservation objectives. Because such a requirement is often in conflict with landowner desires for certainty in the planning process, participating scientists may need to assert repeatedly that adaptive management and monitoring are meaningful only if the plan is sufficiently flexible to incorporate needed changes.

Rule 9

Clarify at the outset that scientists are involved to inform the decision-making process, serving as de facto intermediaries between regulatory agencies and the landowner. We envision scientists as active participants in the conservation planning process, often taking the lead in discussions of relevant information, reliability and application of data, and ecological trade-offs and risks associated with alternate courses of action. Scientists, however, should not make final policy decisions. Experience suggests that one of the most useful roles for scientists is to evaluate the possible ecological consequences of alternative policy decisions and to rank the likelihoods of reaching identified conservation objectives from different decision options.

Rule 10

Clarify to all participants that attorney-client privilege does not extend to data or conclusions drawn from data or models. Although presented as the last of our rules, this may be the most encompassing and necessary to assure

trusted and legitimate scientific involvement in private lands planning. The criteria of transparency and openness are paramount and prerequisite for scientist involvement in order to assure rigor and validity in the planning process and for the planning process to be credible. Without such assurances, we recommend that scientists refuse to participate in the planning process.

Although scientists may be brought into land-use planning through multiple venues—on committees convened by diverse stakeholders, as independent advisors invited by regulatory agencies, as adjunct critics solicited by environmental interests, or as representatives engaged by the private interests seeking permits—these rules apply in all cases. They must apply because all the parties in land-use negotiations have their own preconceived, desired outcomes. Pressures on scientists in these circumstances can be subtly applied or starkly obvious. Accordingly, the rules of scientific engagement must be stated upfront and adhered to religiously. Collapsed to their basics, these rules require scientists to stick to the science, use all pertinent information, frame products as probabilities, and offer the planning process the most transparent reasoning possible.

Who would not want scientists to adhere to these rules of engagement? Actually, we believe that many typical stakeholder groups—interest groups (including environmental groups, but perhaps more often resource interests and antienvironmental advocates), regulatory agency staff, and, of course, the regulated landowners—involved in the process of conservation planning on private lands may have reservations. Nevertheless, at a time when scientists may be portrayed as just another special interest group, self-policing and strict rules for engagement must prevail in the negotiation process.

Conservation stakeholder groups are well populated with witnesses to the status of the land and its resources, sources of specialized information and insights, critics of the technical input that will be offered, and challengers to any conclusions that may come from scientists. Excess pressures on scientists are most likely to occur when science is brought in late to deliberations, when short-term economic costs of conservation are high, and when process fatigue might lead weary decision makers to seek prescriptions beyond the strictly advisory. Again, scientific input can help assure that the process is informed by the best available information and clarify the costs and benefits of alternative actions and outcomes; but science seldom offers a result so unusual or certain that it can serve as the lone policy directive. And, frankly, when there is only one obvious solution, planners tend to find it without resorting to the consultation of scientists.

It is some of our own colleagues who appear to least appreciate the realities of conservation planning under constraints of private land ownership and competing value systems, and they have been among the most audibly critical of scientists who engage in conservation planning on private lands. The source of the criticism appears to be the unwillingness by some conservation biologists to accept the reality of the constrained decision space that comes with planning on private lands. Science in habitat conservation plans under the U.S. Endangered Species Act, for example, confronts predetermined planning boundaries, species futures on landscapes subject to multiple uses, and fragmented ecosystems invaded by non-native species. Timber will be harvested, crops will be rotated, and heavy equipment will scrape away natural vegetation. But scientists can help determine the size and distribution of the vegetation left standing, the timing of planting and the condition of fallow fields, and whether those last open spaces capture and sustain the best of the remaining biotic diversity. The importance of the application of science to conservation in this decision space is not lessened because the planning outcome is not solely focused on sustaining biotic diversity.

Can scientists in this challenging land-planning arena be trusted? By following the 10 rules, we believe they can. We also maintain that scientists should be compensated for their efforts. The substantial investment of time and expertise required for a fuller engagement with the private sector can seldom be done pro bono, and compensation for time invested is appropriate. Nevertheless, compensation generates the perception that the scientist is working on behalf of the client—that is, the perception that the scientist has become an advocate for the landowner's goals and objectives at the expense of nature conservation. The perception that scientific integrity has been compromised can put at risk the professional reputation of the participating scientists. We believe this concern has, on many occasions, acted as a significant deterrent to fuller engagement with the private sector by the scientific community. The possibility of flawed perceptions may never be eliminated totally, but we believe that close adherence to the rules discussed above can set the stage for full and honest engagement between scientists, and private landowners and developers. And, although we do not go so far as to refer to conservation science on private lands as a noble calling, it is an absolutely necessary task toward meeting the global challenge of saving our imperiled natural heritage.