
Socioeconomics and the Recovery of Endangered Species: Biological Assessment in a Political World

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Murphy et al. (1994) recently articulated 12 reasons for a strong and effective Endangered Species Act (ESA). At the same time, they pointed to the threats facing reauthorization of the ESA. These conflicts between conservation mandates and the political climate bring us to the sticky question: What role should politics play in endangered species management?

The ESA states that the determination of a species' status as threatened or endangered is to be made "solely on basis of the best scientific and commercial data available . . ." (ESA § 4(b)(1)(A), emphasis added). In addition, recovery plans are to provide "objective, measurable criteria" by which a species could be delisted (ESA § 4(f)(1)(B)(ii)). However, the strict emphasis on biological criteria to establish recovery goals can result in goals that are not necessarily achievable, practical, politically acceptable, or even expedient. While it is inevitable that politics, economics, psychology, and sociology also play a role in establishing and implementing recovery plan goals for endangered species, it is not clear how these "nonbiological" concerns should be incorporated into the biological decision making process.

A conflict of opinion has emerged from this uncertainty, whereby some argue for incorporating socioeconomic and political realities into recovery goals, while others urge species recovery based strictly on biological criteria. In addition, lack of distinction between "political" and biological goals has been suggested as a reason for setting low recovery goals (Tear et al. 1993). Similar debates have surfaced with such high-profile species as the Northern Spotted Owl (Thomas & Verner 1992; Yaffee 1994), the Red-cockaded Woodpecker (McFarlane 1992), and the Dusky Seaside Sparrow (Walters 1992). This issue over how to incorporate biological and non-

biological factors may also lie at the center of the current debate over whether to accept or reject the 1993 revision of the grizzly bear recovery plan.

All involved in the conservation of endangered species would agree on the most basic of points: recover the species rather than compromise its chances for survival. Common ground must be sought between the opposing points of view that pit biological estimates of viability against the constraints of social, political, and economic realities. Toward that end improvements have been made in the recovery process evident in the 1988 "recovery plan amendments" (Fitzgerald 1989) and policy guidelines (U.S. Fish and Wildlife Service 1990a). The following suggestions are based on the premise that the separate but relative influences of biological and socioeconomic factors should be explicitly stated when a species' probable path to recovery is estimated.

Recovery plans are supposed to provide estimates of the time and expense of achieving recovery (USFWS 1990a). We recognize that forecasting the future of any species is a difficult task. However, some guidelines for making informed predictions have emerged from population viability analysis (PVA) which may help improve the process. We start with the suggestion that recovery goals be considered for both the short- and long-term. Establishing a specific time frame for each of these levels will vary among and within taxonomic groups. For example, large mammal recovery efforts might target 10–20 years for the short-term and 100 years or so for long-term goals, while much shorter intervals might be more applicable for invertebrates.

Second, the recovery team will need to agree on some acceptable probability of persistence for each time period in order to evaluate and compare recovery options. In addition to the traditional extinction threshold of zero individuals, we recommend that other thresh-

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olds be considered. For example, there may be some management threshold or thresholds below which current conservation strategies would be altered, such as population size at which a threatened species would be reclassified as endangered (see Ginzburg et al. [1990] for discussion of quasiextinction thresholds). It is important to acknowledge that these two key but subjective decisions ("acceptable" time periods and probabilities of persistence) may be guided by science but are essentially rooted in society's values (Shaffer 1987). Therefore, the criteria used by the recovery team to reach these initial decisions should be identified and clearly stated.

Short- and long-term recovery goals will differ in the way that nonbiological considerations are handled, and these differences will be reflected in the specified probabilities of persistence. First, long-term recovery goals will be based solely on biological considerations (see Schemske et al. 1994), including habitat restoration and protection (Murphy et al. 1994; Noss & Cooperrider 1994). Predictive models will have relatively low precision at these longer time scales, a problem exacerbated by limited, variable information available for most threatened and endangered species. Consequently, we propose that long-term viability assessment of management options could tolerate reduced probabilities of persistence in comparison with most currently being suggested. For example, 80–90% probability of persistence (as opposed to the conventional 95–99%) for more than 100 years might be adequate for many large vertebrates. Reducing the probability of persistence to this degree could decrease the minimum population sizes estimated to meet recovery criteria, which in turn might decrease the number of tasks identified or the sequence of implementation reported in recovery plans.

In contrast to a single, long-term goal based solely on biological considerations, the short-term, or interim, management goals would be presented as a range of options. Foremost would be a biologically based goal which led to a high probability of persistence in the short-term (e.g., for large mammals a 99% probability of persistence above a management threshold over 10–20 years). In addition, nonbiological influences would be recognized in an explicit fashion by presenting a set of alternative strategies that show how probabilities of extinction change as social/political/economic factors are incorporated. For example, the biologically based viability assessment might determine that 100 individuals were required for the desired probability of persistence. However, social/political/economic considerations might indicate that a lower population size was more immediately achievable. All else being equal, the probability of persistence for the lower population size would consequently decrease, perhaps below the desired level. Thus, more "politically feasible" scenarios

are presented as alternatives to the short-term biologically based one, with the biological costs clearly presented as a change in expected persistence probability. Formal sensitivity analysis, which is a method for determining the effect of changes in survival and fecundity on a population's growth rate, will help in developing such alternatives because it can identify the variables that will provide the greatest probability of recovery with the least increase in management effort or social cost (Crouse et al. 1987; Wootton & Bell 1992; Schemske et al. 1994).

Importantly, the chosen interim plan is next compared with the long-term, biologically based goal. Under this procedure, short-term recovery goals are evaluated with respect to how well they are proceeding toward the ultimate goal of recovery, which is "to restore listed species to a point where they are viable, self-sustaining components of their ecosystem" (USFWS 1990*b*). In essence, public input is incorporated into choosing short-term management strategies, but the ultimate success of the interim strategies is judged against the yardstick of the long-term, biologically-based goal (Harrison et al. 1993). Reassessing the validity of initial biologically-based, long-term predictions encourages the incorporation of new information obtained during the recovery process.

It is important to realize that detailed information for this sort of viability analysis is available for only a handful of species (Dennis et al. 1991; Foley 1994). As the quality and quantity of data increase, so too do the reliability of population forecasting attempts and the subsequent assessment of recovery potential. In these cases, adopting more generalized criteria, such as those developed for the World Conservation Union threatened categories of the International Union for the Conservation of Nature and Natural Resources (Mace & Lande 1991), provides one alternate means for assessing probability of recovery. For those species for which population estimates are not even possible, expert systems and decision analysis (see Maguire & Servheen 1992) or model simulation (Foin & Brenchley-Jackson 1991) may provide some measure of probability of persistence. In all cases, it is crucial that two distinct recovery goals are established that separate biology from politics—a long-term, biological goal that estimates viability of the species, and a short-term, interim goal that considers socioeconomics en route to attaining viability.

Why should we consider going through this more detailed process? First, by clearly discussing biological and socioeconomic factors in an open forum—the recovery plan—we can be more realistic in our assessments, more informed in our choices, and more confident in our actions. Second, by distinguishing between the effects of biological and nonbiological factors (in-

cluding socioeconomic concerns and political realities) on the recovery of a species, we will be better able to evaluate the reasons behind the success and failure of recovery efforts. In this way we can gain insight into the relationship between the science of viability assessment and the effects of management decisions on the survival of endangered species. By following this approach, biologists may begin to bridge the perplexing and potentially divisive gulf between biological expectations and social, economic, and political realities.

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