Status and Prospects for Success of the Endangered Species Act: A Look at Recovery Plans

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Reauthorization of the 1973 Endangered Species Act (ESA) will occur during a time when the system for protecting threatened and endangered species in the United States is in question (*1*). While some claim that the ESA was originally intended to save just a few of the charismatic megafauna (*2*), others now look to the ESA for the protection of all biological diversity (*3*). To some, the ESA overprotects (*4*), particularly subspecies and populations rather than full species (*1*); to others, the protection is not aggressive enough (*5*) and often results in too little protection too late (*6*).

Our objective was to assess the validity of recent criticisms regarding the level of protection provided by the ESA and the recovery process. We focused on recovery plans because they are a crucial link between classification as an endangered species and actual recovery. We chose to evaluate criticisms that recovery efforts attempt to save too much and that subspecies and populations are overemphasized in recovery efforts. We reviewed all 314 available recovery plans approved by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) as of August 1991 (*7*).

Recovery plans have been required by law since 1978 for all of the ESA's threatened or endangered species. The ESA identifies an endangered species as that "in danger of extinction throughout all or a significant portion of its range" and a threatened species as that "likely to become endangered within the foreseeable future" (*8*). Recovery plans are intended to identify specific tasks necessary to recover a species to a stage where it can be downlisted from endangered to threatened status or removed from threatened status (delisted). The ultimate goal is to "restore the listed species to a point where they are viable, self-sustaining components of their ecosystem" (*9*).

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Setting Recovery Goals: Pinpointing the Target

In order to evaluate the level of protection proposed for threatened or endangered species in the recovery plans, we analyzed the recovery goals for species from original recovery plans that were stated in terms of population size and the number of populations. Out of the 54 threatened and endangered species for which population size data were available, 15 (28%) had recovery goals set at or below the existing population size at the time the plan was written. For example, the original recovery plan for the endangered California condor (*Gymnogyps californianus*) (*10*) estimated that there were 60 birds in the wild and targeted a population of 50 birds for recovery. Only 3 of these 15 species were classified as threatened species under the ESA. Threatened species are not necessarily in immediate danger of extinction because of low population size, an argument used to explain why the recovery plans for the spotted owl (*Strix occidentalis caurina*) (*11*) and desert tortoise (*Gopherus agassizii*) (*12*) set population size goals lower than the current population size estimates. However, for the remaining 12 endangered species this argument is not valid, as endangered species are at immediate risk of extinction.

Of similar importance to population size in estimating the chances of survival of a species is the number of distinct population groups and their metapopulation structure (*13*). Yet, recovery goals for numbers of populations were even less ambitious than those for population size: 60 out of 163 species (37%) had recovery goals set at or below the existing number of populations, whereas only 28% had recovery goals set at or below the current population size. With the exception of invertebrates, these high proportions occurred in all taxonomic groups.

In some cases, habitat destruction may have been so severe that recovery goals within the existing habitat were set below viability. For example, loss of habitat was so extreme in the case of the Morro Bay kangaroo rat (*Dipodomys heermanni morroensis*) that it was given a "remote chance of recovery" (*14*). If this occurs, more emphasis needs to be placed on early intervention and habitat restoration to ensure that there is enough suitable habitat in the wild for viable populations to be established and maintained.

Few species have actually recovered because of the ESA (*15*). Setting recovery goals for population size and numbers of populations at or below what exists in the wild at the time the recovery plan is written is counterintuitive to the concept of recovery. The ESA requires recovery plans to incorporate "objective, measurable criteria which, when met, would result in a determination . . . that the species be removed from the list" (*16*). Yet, our analysis of recovery goals in relation to current population size implies that roughly 28 to 37% of the threatened and endangered species are being "managed for extinction."

Though no universally accepted criteria for endangerment exist, Mace and Lande developed criteria for ranking levels of extinction risk for vertebrates (*17*). Using their criteria, we calculated that 18 out of 30 (or 60% of the total number of species for which estimates were possible) of the ESA's threatened and endangered vertebrates had recovery goals below what Mace and Lande set for endangered status, the second most risky of their categories. According to these measures, even if population goals were achieved, 60% of the ESA's threatened or endangered vertebrate species would remain in peril, with roughly a 20% probability of extinction within 20 years or 10 generations, whichever is longer.

In more recent plans, the tendency to set low recovery goals in relation to current estimates has declined. The number of species with recovery goals at or below existing population levels decreased for population size from 13 of 42 (31%) before 1988 to 2 of 12 (17%) after 1988 and for numbers of populations from 44 of 111 (40%) to 16 of 52 (31%). The same temporal trend held with Mace and Lande's criteria; the percentage of plans for vertebrates with recovery goals that would leave the species endangered decreased from 63% before 1988 (15 of 24) to 50% after 1988 (3 of 6).

Therefore, our analysis does not show that recovery plans attempt to save too much, but instead that recovery goals have often been set that risk extinction rather than ensure survival. Crucial to the success of the recovery process is that recovery goals depict biologically defensible estimates that will ensure population viability. Apparently, this has not been done in many cases. Such discrepancies suggest that political, social, or economic considerations may have been operating that reduced recovery goals so that they were below what might have been set if they had been developed strictly on biologically based estimates. This issue has been identified in such landmark cases as the northern spotted owl (*18*) and the red-cockaded woodpecker (*Picoides borealis*) (*19*). We suggest that it occurs more often than previously believed and represents a fundamental problem in recovery efforts.

The Protection of Species, Subspecies, and Populations

We found the criticism that recovery plans overprotect subspecies and populations (*4*) unwarranted. The ratio of subspecies to full species in North America is approximately 6.9:1 for mammals (*20*) and 4.9:1 for birds (*21*). However, the ratio of subspecies to species in recovery plans is 1.28:1 for mammals and 0.49:1 for birds. Underemphasis of recovery efforts for subspecies may be even greater than these numbers suggest, as we expect populations and subspecies will become jeopardized before full species. In fact, we found that median population size (M) in subspecies and population-level plans was significantly smaller ($M = 630$) ($P = 0.0177$) than in species-level plans ($M = 1552$), which suggests that this expectation is correct.

However, concerns that the inclusion of populations and subspecies could overwhelm the ESA are well based. For example, 22 different subspecies of the pocket gopher (*Thomomys umbrinus*) and 15 subspecies of tui chub fish (*Gila bicolor*) are currently proposed for protective status. Such large numbers of distinct taxonomic units provide a compelling reason to protect species, subspecies, and populations within ecosystems while they are still common, rather than singly as we discover that they are at risk of extinction.

Improving the Recovery Process

Recovery plans all too often "manage for extinction" rather than for survival. If the ESA is to be effective, we need to be more realistic in setting biologically defensible recovery goals. We suggest that, as a first priority, USFWS and NMFS establish guidelines in terms of population size, number, and probabilities of persistence over specific periods for use in distinguishing between threatened and endangered species and setting recovery goals. Such guidelines may supply the basis for objective, measurable criteria outlined by the ESA. Until this is done, we suggest emphasizing appropriate population goals in relation to current population size and continued support for protection and recovery of populations and subspecies as well as full species. If suitable habitat is severely limited, habitat restoration should be included as a necessary component of recovery efforts to ensure that recovered populations can be large enough to be viable.

The ESA states that species should be recovered within their ecosystems. However, recovery solutions have frequently included translocation (70%) and captive population establishment (64%), which suggests that recovery within an ecosystem often may not be done. Extreme management actions such as translocation and establishment of captive populations suggest that recovery may have been initiated too late, a criticism often directed at the ESA (*1*, *6*). Recognizing that our ability to save endangered taxa is limited, we propose initiating an aggressive, proactive effort to save species while they are still common, viable parts of their self-sustaining natural ecosystems. One step in that direction would be to ensure that a minimum of three viable representatives of each vegetation cover type are preserved in each ecoregion in which they occur (*22*). In this way, viable foundations for terrestrial biodiversity may be set in place before it is necessary to invoke the ESA.

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