Volume 1
Renewing the Conservation Promise

Volume 2
Conserving Biodiversity in Human-Dominated Landscapes

The Endangered Species Act at Thirty

Renewing the Conservation Promise
Volume 1

Edited by
Dale D. Goble · J. Michael Scott
Frank W. Davis

ISLANDPRESS
Washington • Covelo • London

I Introduction

J. Michael Scott, Dale D. Goble, and Frank W. Davis

Conserving the biological infrastructure that makes life possible is crucial to the survival of the human species. Providing the material requirements of the human population is a fundamental imperative. This is the dilemma of our time: how do we reconcile the preservation of nature with increasing human population and consumption?

This book examines one legislative effort to resolve the dilemma, the Endangered Species Act of 1973 (ESA 1973). The ESA was an idealistic and perhaps naive attempt to preserve humanity by preserving other species in the ecological support system that makes life possible. In the words of the House report accompanying the bill:

> A certain humility, and a sense of urgency seem indicated. . . . One might analogize the case to one in which one copy of all the books ever printed were gathered together in one huge building. The position in which we find ourselves today is that of custodians of this building, and our choice is between exercising our responsibilities and ignoring them. If these theoretical custodians were to permit a madman to enter, build a bonfire and throw in at random any volume he selected, one might with justification suggest that others be found, or at least that they be censored and told to be more careful in the future. So it is with mankind. Like it or not, we are our brothers' keepers, and we are also keepers of the rest of the house. (U.S. Congress 1973, 4–5)

Species conservation was already a difficult challenge in 1973. The human population of the United States had increased from less than 4 million in the first census of 1790 to roughly 212 million by 1973 (Census Bureau 2000). This increase was accompanied by even more dramatic increases in per capita consumption of resources. The combination of population growth and increased consumption has driven a precipitous loss of nonhuman species that continues today: more than five hundred species formerly found in the United

States are presumed to be extinct and an additional 47 percent of the species unique to this country are at risk (Master et al. 2000).

It has been thirty years since the ESA was signed into law on December 28, 1973, and the task of conserving at-risk species is more complex than ever. Societal pressures on wildlife habitat have increased. The U.S. population has increased nearly 40 percent since 1973 to 293 million (Doremus, this volume), and our gross domestic product is nearly eight times greater (Census Bureau 2004a). These increases have resulted in additional habitat loss and increased numbers of invasive, nonnative species, the two biggest threats to endangered species (Wilcove et al. 1998; Wilcove et al. 2000; Cox 1999).

The thirty years have produced a record that allows a preliminary evaluation of the extent to which the act's goals have been achieved. This book begins with an examination of what the Endangered Species Act has protected, focusing on species listed as either threatened or endangered. The second part, "Achieving On-the-Ground Conservation," examines the act's record viewed through the lenses of different land use systems and institutional actors. The third part, "Prospects," offers several perspectives on how the ESA could be strengthened while reducing its negative social impact.

First, however, we briefly review the evolution of at-risk species conservation and the legal requirements of the ESA.

The Evolution of the Conservation of At-Risk Species

The Endangered Species Act stands at the confluence of two strands of wildlife protection law. The first is nearly a millennium of common and statutory law intended to conserve game species. This is the traditional "hook-and-bullet" wildlife management that relies on take restrictions, such as closed seasons and bag limits, to maintain huntable populations of game species (Goble and Freyfogle 2002; Bean and Rowland 1997). The second strand of law—habitat protection—is equally ancient. Both the king in Parliament and colonial American legislatures routinely restricted land uses to conserve wildlife habitat (Goble and Freyfogle 2002). Although the tools—take restrictions and habitat protection—are ancient, the act's objectives are not. Indeed, the idea that it is important to save all the pieces is, in the sweep of things, a new perspective—and one that remains intensely contested.

From Game Protection to Endangered Species Preservation

Although legal protection of wildlife in the United States dates back to the colonial period (Goble and Freyfogle 2002), the post–Civil War period—with the near-extermination of the American buffalo (*Bison bison*) and the looming extinction of the passenger pigeon (*Ectopistes migratorius*)—produced a new urgency (Hornaday 1889). The massive, often-wasteful slaughter of wildlife that characterized the end of the nineteenth century produced a coalition of scientists, Audubon societies, and hunters that sought to conserve wildlife by closing down markets (Barrow 1998; Dorsey 1998; Doughty 1975; Dunlap 1988). Congress responded by enacting the Lacey Act, the first federal wildlife protection statute, in 1900 (Act of May 25, 1900). When that proved insufficient, the federal government negotiated a treaty with Great Britain (acting for Canada) to protect migratory birds (Dorsey 1998). Congress ratified the treaty (Convention with Great Britain for the Protection of Migratory Birds 1916) and enacted the Migratory Bird Treaty Act (Act of July 3, 1918), imposing a federal regulatory scheme for hunting migratory birds, and the Migratory Bird Conservation Act (Act of February 18, 1929), authorizing the creation of a refuge system for migratory birds. Apart from migratory birds—and a 1940 statute nominally protecting the bald eagle (*Haliaeetus leucocephalus*) (Act of June 8, 1940)—the federal government remained largely uninvolved in wildlife conservation; the wildlife management system created during the Progressive Era lasted until the 1960s.

This wildlife management system was focused primarily on game species. There was, however, some recognition that species threatened with extinction also required special management. In 1936, Aldo Leopold—as always, at least a step ahead—published a short article entitled "Threatened Species" in which he argued that preservation of species such as the grizzly bear (*Ursus arctos horribilis*) and the ivory-billed woodpecker (*Campephilus principalis*) was "a prime duty of the conservation movement" (Leopold 1936, 230). In 1937, the Bureau of Biological Survey—enjoying a brief golden age of funding under the leadership of J. N. "Ding" Darling—acquired the Aransas National Wildlife Refuge in Texas to protect the wintering grounds of the critically imperiled whooping crane (*Grus americana*) (Allen 1952; McNulty 1966). And in 1942, a committee drawn from the U.S. Fish and Wildlife Service (USFWS) and the National Park Service produced a book entitled *Fading Trails: The Story of Endangered American Wildlife*. The book was written

> to show how certain forms of wildlife have approached the brink of extinction. . . . It attempts to explain the poor economy of allowing any wildlife species to pass completely from being, if it is possible for such disaster to be averted. All forms of animal life, whether they be game species, fur bearers, predators, or what, are valuable in nature's enduring battle for perfection. Each form of life does its bit to help maintain the elusive "balance" between all living things. (Beard et al. 1942, ix)

A gangly looking but graceful bird emerged as a potent symbol of a species on the brink. The whooping crane had been in trouble since the end of the

nineteenth century as a result of agriculture, drainage, settlement, and hunting: by 1912 its population numbered fewer than ninety birds; ten years later it was less than half that number; by 1938, when the Aransas Refuge was established, there were fewer than twenty remaining (Allen 1952, 80; Lewis 1995). Only then did the whooping crane's perilous situation catch the attention of the public, symbolizing what America stood to lose by ignoring the growing numbers of endangered native species. By the middle of the 1950s, the USFWS was holding press conferences and newspapers were reporting the annual count of whooping cranes (McNulty 1966), which gradually rebounded to 325 birds in the summer of 2005 (Tom Stehn, USFWS whooping crane coordinator, pers. comm.). The cranes contributed to the broadly based environmental consciousness that was beginning to stir in the United States.

Two decades after the publication of *Fading Trails*, the Department of the Interior created the Committee on Rare and Endangered Wildlife Species (Yaffee 1982). Two years later in 1966, the committee published a preliminary list of 331 species divided into three categories of concern: 130 species considered either rare or endangered; 74 species at the edge of their range (and therefore at risk); and 127 species of "undetermined" status (Committee on Rare and Endangered Wildlife Species 1966). This list, known as the Redbook, lacked any legal force; indeed, it contained one species, the Utah prairie dog (*Cynomys parvidens*), that another federal agency was trying to eradicate. The Redbook did, however, increase awareness of the risk of extinction.

The first legislative response to increasing public concern for endangered wildlife came in 1963. Acknowledging that habitat loss was a significant cause of extinction, Congress included a provision in the Land and Water Conservation Fund Act (Act of May 28, 1963) allowing monies to be used in "the acquisition of land, waters, or interests in land or waters . . . [f]or any national area which may be authorized for the preservation of species of fish or wildlife that are threatened with extinction" (Act of May 28, 1963, sec. 460*l*-9(a)(1)). This language embodied two fundamental changes that reflected the increased scientific and popular awareness of ecology: first, it provided for the *preservation* of wildlife rather than the *management* of game species and, second, it specified that protection was to be accomplished through *habitat preservation* rather than *take regulation*. Zoo specimens—like the Victorian curio cabinet—were no longer sufficient: wildlife was to be preserved in the wild.

The first federal endangered species act was the Endangered Species Preservation Act of 1966 (ESPA 1966). As with the Land and Water Conservation Fund, the ESPA focused on habitat protection. This focus on habitat, however, ignored the impact of taking and commercial activities on wildlife populations. It also ignored the international aspect of extinction: the American market was often the cause of problems elsewhere in the world. The failure to

regulate these activities was partially remedied in 1969 when Congress extensively supplemented the ESPA and renamed the combined statute the Endangered Species Conservation Act (ESCA 1969). The ESCA provided a more comprehensive but still limited program that emphasized the regulation of interstate and foreign commerce in species listed by the secretary of the interior as endangered.

In the ESCA, Congress instructed the secretaries of the interior and state to call an international conference on protecting endangered species. The conference finally convened in Washington, D.C., in February 1973 and drafted the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973), a multilateral treaty that was signed in March 1973. CITES established an international system of import and export permits that created a control structure to regulate international commerce in species designated for protection.

The enactment of the ESA reflected a broad consensus that existing federal law was inadequate to preserve at-risk species. In his 1972 environmental message, President Richard Nixon concluded that federal law "simply does not provide the kind of management tools needed to act early enough to save vanishing species" (Nixon 1972, 223–24); congressional leaders offered a similar analysis (Dingell 1973). The act was among the least controversial bills enacted by Congress in 1973: the bill was passed by the Senate 92–0; an even more stringent bill passed the House 390–12. Following a conference to resolve the differences, the Senate passed the bill without dissent on a voice vote and the House adopted it by an overwhelming 355–4 (Yaffee 1982).

The Endangered Species Acts

The central substantive and procedural requirements of the Endangered Species Act are set out in five sections:

- *Section 4* establishes procedures for listing species as either threatened or endangered, for designating critical habitat, and for preparing recovery plans for listed species.
- *Section 7* requires federal agencies that authorize, fund, or carry out an action—"federal action agencies"—to consult with the U.S. Fish and Wildlife Service in the Department of the Interior or with the National Marine Fisheries Service in the Department of Commerce—the "federal fish and wildlife agencies"—to "insure that actions authorized, funded or carried out by them do not jeopardize the continued existence" of listed species.
- *Section 9* prohibits any person from taking or engaging in commerce in endangered species.

- *Section 10* provides exemptions, permits, and exceptions to section 9's prohibitions.
- *Section 11* specifies the civil and criminal penalties applicable to the violations enumerated in section 9.

As this outline suggests, the ESA envisions a linear process: when a species is at risk of extinction, it is listed as either endangered or threatened and its critical habitat is designated. The USFWS prepares a recovery plan for the species that specifies how the threats to its continued existence will be removed or mitigated so that the species no longer requires protection under the act. In the interim, the species is protected under the provisions of sections 7 and 9 from all activities not exempted or permitted pursuant to sections 10 and 11.

The act also includes a "cooperative federalism" provision in section 6(c) that authorizes the secretary to enter into a cooperative agreement with any state that established "an adequate and active program for the conservation of" listed species that is "in accordance with" the act and a list of criteria (ESA sec. 6(c)). Despite the breadth of the provision, it has had little impact on the evolution of the protection at-risk species. In part, this reflects state reticence, since most species that reach the point of being listed have been subject to long periods of state management. In part, it also reflects the continuous underfunding of conservation in this country.

The ESA in its first incarnation embodied "prohibitive policy"—in Steve Yaffee's apt phrase (Yaffee 1982). For instance, in *Tennessee Valley Authority v. Hill* (1978, 74), the Supreme Court noted that the prohibitions on jeopardizing a listed species "admit to no exception"; the Court could have written the same phrase about the prohibition against "take," which was defined far more expansively than "kill" (ESA sec. 3(18)). While people continue to speak of the "Endangered Species Act of 1973," the current version of the act is markedly different than the original. It is useful to think of these changes as embodying four ESAs—the original 1973 version, the ESA that emerged from the 1978 and 1979 amendments, the ESA of the 1982 amendments, and the fourth version, the product of the administrative amendments of the 1990s. This combination of legislative and administrative amendments has transformed the act from a prohibitive law into a flexible, permitting statute (Houck 1993; Fischman and Hall-Rivera 2002; Greenwald et al., this volume; Suckling and Taylor, this volume), as demonstrated by the following three examples.

In 1978, the Supreme Court's decision *Tennessee Valley Authority v. Hill* made the snail darter (*Percina tanasi*) a national symbol that was assigned diametrically different meanings by different groups. Congress responded to the ensuing controversy by amending the ESA. While leaving the act's substantive standards generally intact, Congress significantly modified its procedures to increase its flexibility. "No," in another words, became "maybe."

The 1978 amendments to the listing process clearly show the act's transformation from prohibitive to permissive. Congress amended—or, perhaps more accurately, burdened—the listing process by substantially expanding the procedural requirements to list a species: it imposed additional notice provisions, required local hearings, and mandated the designation of critical habitat as part of the listing determination. While increasing the complexity of the listing procedures, the amendments also placed a two-year time limit on the process: listings that had not been completed within two years were to be withdrawn. The effect of these legislative changes was dramatic: less than 5 percent of the more than two thousand species that had been formally proposed for listing in November 1978 were listed; and on December 10, 1979, the USFWS withdrew proposals to list 1,876 species (USFWS 1979).

In the 1978 amendments, Congress focused on procedure: what had been a relatively simple statute became procedurally complex. Much of an administrative lawyer's craft is focused on procedure because an agency is far more likely to err procedurally than substantively. Procedure, in other words, empowers those opposed to an agency's decisions. By modifying the procedures, Congress was able to restructure the act without changing its substantive standards. In the process, the statute's original prohibitive severity was substantially softened.

The second example is drawn from the amendments of 1982. If the theme of the 1978 and 1979 amendments was "flexibility," the dominant concern in 1982 was "discretion." Congress again tinkered with the listing procedures. When James Watt became secretary of the interior in 1981, listing virtually ceased after the Reagan administration added a requirement that listings be economically justified (Executive Order 12291 1981; Greenwald et al., this volume). Congress responded by restricting the secretary's discretion, specifying that the listing determination was to be made "*solely* on the basis of the best scientific and commercial data available"; economics were not to be considered in determining whether a species was threatened or endangered.

But the most significant amendments in 1982 were to section 10. Before 1982, the ESA's take prohibition (in section 9) applied to all "persons"—a term defined broadly to include not only individuals but also all business organizations and agencies of the federal and state governments (ESA sec. 3(8)). As a result, prohibited takes could occur both within the context of an agency action subject to consultation under section 7 (which includes "private" actions that require a federal permit) and on private lands whose owner had no need of a federal permit and who thus was not required to consult. In 1982, however,

Congress amended the act to permit "incidental" takes in both situations. For actions requiring consultation under section 7—actions that have some federal involvement, such as the issuance of a permit—Congress added a provision authorizing the wildlife agency to include an "incidental take statement" permitting take as long as it would not jeopardize the continued existence of the species (ESA sec. 7(b)(4)). And, to "addres[s] the concerns of private landowners who are faced with having otherwise lawful actions not requiring Federal permits prevented by section 9 prohibitions against taking," Congress adopted an "incidental take permit" under section 10 (U.S. Congress 1982a, 29). It authorized the issuance of the permits in conjunction with the development of a "conservation plan" prepared by the applicant (ESA sec. 10(a)(2)(A)); the secretary was required to find that the take incidental to the plan would not "appreciably reduce the likelihood of the survival and recovery of the species in the wild" (ESA sec. 10(a)(2)(B)).

The third example comes from the chaotic nineties. Much of the transformation of the ESA from prohibitive to permitting is a result of administrative rather than legislative actions. Following Republican congressional victories in 1994, ideologically divisive politics increased debate on the ESA. In response to the hostility to endangered species that was openly expressed by some members of Congress and to several bills that would have fundamentally reduced protection for at-risk species (Goble, forthcoming), Secretary of the Interior Bruce Babbitt "resolve[d] to save the Endangered Species Act by implementing a series of reforms on the implementation of the Act from top to bottom, particularly as it applied to private lands" (Barry 1998, 131). To achieve this objective, the secretary advocated "incentive-based strategies to try and reconcile endangered species conservation with economic development" (Barry 1998, 131). The centerpiece of this incentive-based initiative was a series of permits—habitat conservation plans (HCPs) (USFWS and NOAA 1996), candidate conservation agreements (CCAs) (USFWS and NOAA 1999), and safe harbor agreements (SHAs) (USFWS 1999a)—that were available to private landowners and included assurances from the USFWS and the National Marine Fisheries Service that the agencies would impose no additional restrictions on land uses—the "no surprises" policy (USFWS and NOAA 1998; *Spirit of the Sage Council v. Norton* 2003). Although details of the agreements varied, the agreements and assurances were intended to make the ESA more developer friendly by balancing two competing goals: flexibility (to adapt to changing biological circumstances and new information) and certainty (to allow the permittee to make economic decisions) (Thompson, this volume).

The combination of legislative amendments and administrative revisions has produced a dramatically different ESA than that of thirty years ago. The absolute take prohibition of the 1973 statute has been conditioned by the flexible incidental take permit that—in J. B. Ruhl's phrase—authorizes a landowner to kill endangered species, legally (Ruhl 1999).

Proponents have justified each successive revision of the act by citing its increased efficiency. The first part of this book examines the statistical record behind these claims.

What Have We Protected?

The ESA's linear process begins with the listing of a species at risk of extinction as either endangered or threatened. Listing triggers the act's safeguards, the taking prohibition, and the consultation requirements. What has been listed?

The original list of endangered species named only 78 species (Wilcove and McMillan, this volume), all vertebrates. Thirty years later, the list has increased more than sixteenfold to 1,260 domestic species (USFWS 2003a), including 516 animals (179 of which are invertebrates) and 744 plants (USFWS 2003a). Even so, the list is still not representative of the taxonomic diversity of the country (Kareiva et al., this volume; Scott, Goble, et al., this volume) nor of the diversity of at-risk species (Master et al. 2000). For example, as Armsworth and his colleagues (this volume) note, relatively few marine species have been listed (70 of 1,855 taxa worldwide) despite severe population reductions for many. Greenwald and his coauthors provide a detailed history of the listing program.

Listing is only the beginning of the process; recovery—"conserving" a species so that "the measures provided by this Act are no longer necessary" (ESA sec. 3(3))—is the goal. One of the recurring criticisms of the Endangered Species Act is that it has failed to adequately recover species (National Wilderness Institute 1994). To date, only thirty-six U.S. species have been delisted, and only thirteen due to recovery; the USFWS recently proposed delisting eastern populations of gray wolves (*Canis lupus*) (Scott, Goble, et al., this volume). Another twenty-one species have been reclassified from endangered to threatened (Scott, Goble, et al., this volume).

There are questions, however, of whether recovery is the proper measure of success (avoiding extinction is an apparent alternative) (Schwartz 1999), whether three decades has been sufficient time to recover species that have been declining for decades or centuries (Doremus, this volume), and whether recovery is even possible for some species (Doremus and Pagel 2001). It is also apparent that some risks (such as overharvest) are more remediable than others (such as habitat loss or invasive species) (Scott, Goble, et al., this volume). Wilcove and McMillan (this volume) put a more specific face on these questions with their examination of the fates of the members of the first endangered species list. Of the seventy-eight species in the "Class of '67," two have recovered, one population of a third species has been delisted, four have been reclassified from

endangered to threatened, three are extinct and were removed from the list, and, with the recent sighting of the ivory-billed woodpecker (*Campephilus principalis*) (Gallagher 2005), eight others are presumed extinct but remain on the list. These statistics do not bode well for the current list of species.

DeShazo and Freeman provide different perspective on recovery; based on their research they conclude that extinction may turn more on the preferences of members of Congress than on the statute's criteria.

On-the-Ground Conservation

A second metric for evaluating the Endangered Species Act is its on-the-ground outcomes: Does the ESA work in a variety of landscapes? How well does it bring together the various potential actors, such as states, local governments, tribes, private landowners, and nongovernmental organizations?

Again, the data are mixed. Several authors suggest that we are not taking advantage of conservation tools now available. Suckling and Taylor, for example, see a positive correlation between designating critical habitat and a species status. Davison and his colleagues argue that the national wildlife refuge system could play a larger role in the conservation of at-risk species. Thompson and Tarlock examine the use of HCPs, the former on working landscapes and the latter on urbanizing landscapes. Finally, Swain—who directs both the Archbold Biological Station and the MacArthur Agro-ecology Research Center in Florida and its associated orchards and grazing lands—provides a reality check that comes from having worked with a number of regulatory tools. Three common themes emerge from these diverse perspectives. First, we have failed to develop tools that are useful to many different types of land users; for example, while HCPs work well for land developers, they are of little use to ranchers. Second, the assumptions built into the different tools are largely untested; we simply do not know if they are really accomplishing what is intended. Finally, the tools are too complex and time consuming to implement.

On-the-ground conservation involves not only tools but also actors. The authors of these chapters are generally hopeful. Niles and Korth summarize state wildlife conservation programs; Behan reports on the Sonoran Desert Conservation Plan developed by Pima County, Arizona, to create ecologically based land use planning; Rodgers discusses three Indian tribes that have played dynamic roles in conserving at-risk species; Kareiva and his colleagues suggest that nongovernmental organizations can potentially play a significant role. These authors paint a picture of a growing constituency for at-risk species in the states and counties—where the decisions are made about land use practices.

Prospects

It is clear that the thirty years since the passage of the Endangered Species Act have changed the way we think about and manage wildlife. Where once the focus was on single species of recreational or commercial value, today management is concerned with the full range of species. States have written endangered species laws reflecting these new interests and responsibilities (Goble et al. 1999; Center for Wildlife Law and Defenders of Wildlife 1996, 1998). At the same time, however, the act continues to be a lightning rod—particularly for those opposed to restrictions on the use of land.

The authors in the final part are in broad agreement on at least two points—the act is successful in preventing extinctions, but it could be made more efficient. Doremus introduces these recurrent themes, providing a concise overview of several of the key lessons from the history of implementing the act, focusing on the interface of law and biology; her conclusions counsel against simplistic approaches, noting for example the complex relationship between flexibility and accountability. Rosenzweig also urges the reader to look beyond the current reserve-based strategies for species conservation. Noting that reserves can slow but not prevent the loss of species, he argues that we must better reconcile human activities with native species through more deliberate planning and management. This will require a change in popular beliefs and attitudes toward nature. Yaffee believes that the ESA has broadly changed natural resource decision making by creating new processes, influencing existing processes, and changing the dynamics of negotiations by empowering new participants. He concludes with an analysis of several collaborative approaches that he finds encouraging. The chapters by Clark and Wallace and by Burnham and his colleagues from the Peregrine Fund also advocate increased collaboration, although they differ on the details. Clark and Wallace draw upon several case studies to support their proposal for the use of an adaptive management approach that relies on iterative, practice-based, and structured decision making. Burnham and his colleagues also reflect a hands-on perspective to species recovery. They offer perhaps the most radical restructuring proposal, arguing that stakeholder groups should be the primary recovery managers.

One recurrent debate is over the relative merits of incentives versus command. Parkhurst and Shogren provide a catalogue of incentives and a discussion of their strengths and weaknesses. Bean, who favors an incentive-based approach, argues that we must find simpler and more expeditious agreements if "second-generation" tools such as habitat conservation plans, candidate conservation agreements, and safe harbor agreements are to fulfill their potential. Shaffer and his colleagues also focus on next-generation options beyond the current ESA. They outline the scientific, political, and economic lessons to be

learned from the ESA implementation record and conclude that the necessary degree of habitat conservation cannot be achieved through regulation alone. Instead, they propose a proactive, state-based incentive policy that could be incorporated into comprehensive state wildlife conservation plans currently being developed.

Some Preliminary Conclusions

For over three decades the Endangered Species Act has transformed the conservation of nature in America, preventing the extinction of hundreds of species and directly or indirectly protecting millions of acres of terrestrial and aquatic ecosystems. At the same time, the ESA has imposed high costs and forced marked changes in the design and practice of economic activities such as housing, transportation, farming, ranching, logging, and fishing. Not surprisingly, debate over the efficacy of the law remains polarized, with environmental groups touting its successes and industry and property rights groups emphasizing its costs. The authors in this volume provide a more measured analysis of "the Endangered Species Act at thirty." A surprising degree of consensus emerges from their chapters, although contentious issues remain. There are three pervasive themes: the role of the federal government, the emergence of new actors and institutional relationships responding to the challenges of ESA and reshaping conservation of the American landscape, and the limits of the ESA as a biodiversity conservation policy.

Despite many conservation successes, the federal government is not meeting the intent of the ESA. To do so would take significantly increased federal funding along with some limited administrative and perhaps regulatory reforms. If increased funds are not forthcoming, the act could still be operated more effectively with expedited listing procedures, clearer guidelines and priority setting for species recovery, greater consultation and coordination with state and local agencies, and more attractive incentive programs for private landowners.

The political geography of conservation under the ESA continues to evolve. The act has exposed gaps and shortcomings in state conservation laws and practices, and in doing so it has catalyzed reforms at all levels of government. The act has also affected the daily lives and livelihoods of many private landowners; in response, property rights groups have organized effectively to limit the reach of the act. Nonetheless, new political relationships and processes have emerged in many areas of the country in response to the challenges posed by the ESA. These relationships and the new planning processes they have created are producing viable local and regional conservation solutions.

The act has done some things very well. Most notably, it has reduced extinctions substantially (Scott, Goble, et al., this volume). But the ESA is an at-risk *species* act—it is not a comprehensive *biodiversity preservation* act. It is also a statute from the 1970s with that decade's emphasis on command and control. Although the act has been amended to provide limited incentives—primarily through limiting its take prohibition—it has not been brought forward into the twenty-first century. One of the surprising areas of consensus at the discussions in Santa Barbara was not only the need to do so but also the need to maintain powerful restrictions on actions that put species at risk.

Ultimately, however, the ESA is a tool of last resort that can slow but not prevent the accelerating loss of biodiversity from the American landscape. Simply put, it comes into play too late. To prevent species from becoming endangered and thereby conserve our nation's biological infrastructure, we must look beyond the ESA and craft ways to accommodate more native species in the areas where we live, work, and recreate.

2 By the Numbers

J. Michael Scott, Dale D. Goble, Leona K. Svancara, and Anna Pidgorna

The current endangered species list has its administrative beginnings in 1964 when the Department of the Interior's Committee on Rare and Endangered Wildlife Species published a preliminary list of 62 species at risk of extinction (Goble, forthcoming). Following the enactment of the Endangered Species Preservation Act of 1966 (ESPA), the secretary of the interior in 1967 published the first official list of 78 "native fish and wildlife threatened with extinction" (ESPA sec. 1(c); U.S. Department of the Interior 1967; Wilcove and McMillan, this volume). By the time the Endangered Species Act (ESA) was adopted in 1973, there were 392 species on the list (Yaffee 1982). These first lists included only vertebrate species. On the thirtieth anniversary of the ESA, the number stood at 1,260 domestic species and 558 foreign species (USFWS 2003a), with plant and invertebrate species outnumbering vertebrates.

This chapter presents a graphical summary encapsulating thirty years of species protection and restoration under the ESA. The summary reveals both gains and losses. For some species, such as the Aleutian Canada goose (*Branta canadensis leucopareia*), the process worked as it was meant to, reversing decline and restoring populations to healthy levels (USFWS 2001a); for others, such as the dusky seaside sparrow (*Ammodramus maritimus nigrescens*), the process failed, and despite being listed the species continued to spiral toward eventual extinction (USFWS 1983; Walters 1992).

What follows is an assessment of the state of species protection as it has evolved under the ESA. This includes the taxonomic and demographic distribution of listed species, and the number of critical habitat designations. We also examine newer legal tools for conserving habitat on private land (such as habitat conservation plans), various measures of the act's success, and funding levels for species protection.

The Endangered Species List

The first step in recovery of a threatened and endangered species is listing it under the Endangered Species Act. The growth of the endangered species list from 78 species in 1967 to 1,260 at the end of 2003 is in part the result of expansion of the range of taxa that could be included on the list and in part the result of nonbiological factors such as litigation (Greenwald et al., this volume). An additional point should be noted: the number of listed species (1,260) is misleading. For example, the list groups together separate populations of a species listed as both endangered and threatened, infers that several species represent entire genera or families, and leaves out distinct population segments of some species. These assumptions about taxonomic diversity and species categorization, definition, and distribution are explained below.

Taxonomic Diversity

The most significant reason for the increase in the number of species listed has been an increase in the species eligible for listing (figs. 2.1 and 2.2). The 1967 list was compiled under the Endangered Species Preservation Act, which covered only "native fish and wildlife" (ESPA sec. 1(c)). In 1969, Congress expanded

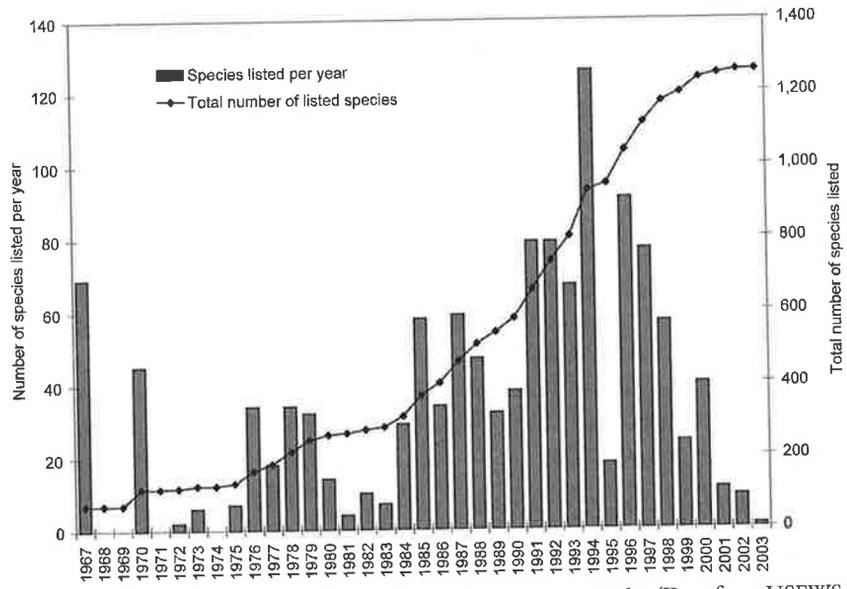

Figure 2.1. Listings of threatened and endangered species since 1967. (Data from USFWS 2004a.)

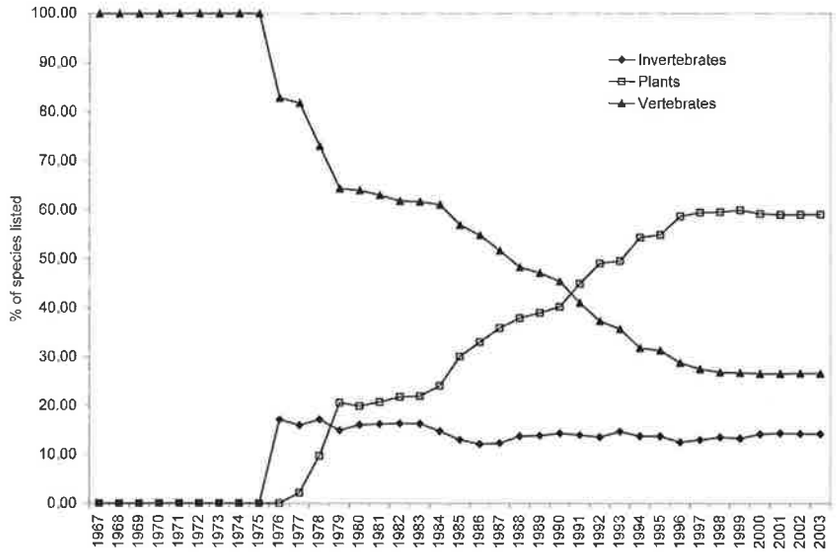

Figure 2.2. Taxonomic breakdown of listed species over time. (Data from USFWS 2004a.)

coverage in the Endangered Species Conservation Act (ESCA) to include mollusks, crustaceans, foreign species, and subspecies (ESCA secs. 3(a), 12(a)). Finally, in 1973, Congress expanded the definition of "species" to include plants, insects, "or smaller taxa." The ESA also created a new category of risk, "threatened" (ESA secs. 3(5), (11), (15), (4)(a)). At the end of 2003, there were 923 species of plants and invertebrates listed (73.3 percent); plants alone accounted for 59 percent of listed species.

Species Categorization

At the end of 2003, 78.2 percent of listed species were categorized as endangered. The ratio of endangered to threatened species has varied over time (fig. 2.3) and also varies among major taxa (table 2.1). Because species are threatened before they are endangered, the fact that most species are listed as endangered suggests that we are failing to get ahead of the risk curve.

Species Definition

As originally enacted, the ESA defined "species" as "any subspecies or smaller taxa." In 1978, the act was amended to include "any distinct population segment of any species of vertebrate." This allows the listing of three taxonomic categories only for vertebrates: species, subspecies, and *distinct population segments*. Species comprise 75.5 percent of the list, subspecies 21.1 percent, and distinct population segments 5.6 percent (table 2.2).

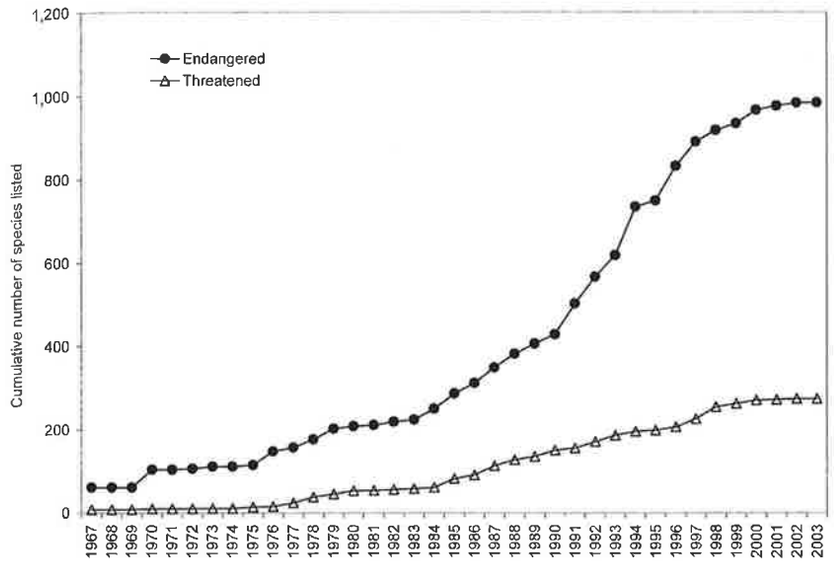

Figure 2.3. Proportion of threatened and endangered species over time in the United States. (Data from USFWS 2004a.)

TABLE 2.1. Number and percentage of threatened and endangered listings by taxonomic groups

Group	*Threatened*	*Endangered*
Vertebrates	94 (27.65)	246 (72.35)
Invertebrates	31 (17.32)	148 (82.68)
Plants	147 (19.76)	597 (80.24)

Note: Percentages given in parentheses.

The listing of subspecies and distinct population segments is not consistent with their occurrence within taxa. Wilcove and his colleagues (1993) found that approximately 80 percent of taxa added to the list were full species. They also found, however, that more subspecies and populations than full species were listed for birds and mammals.

Logic suggests that the lower-ranking taxonomic units would be at risk earlier than higher-ranking units. Thus, individuals are lost from populations and populations from subspecies, and subspecies are extirpated prior to the loss of a species (Lomolino and Channell 1995; Hughes et al. 1997; Channell and Lomolino 2000; Cebellos and Ehrlich 2002). This process is well documented

TABLE 2.2. Number and percentage of threatened and endangered species, subspecies and distinct population segments (DPS) among different taxonomic groups

Taxonomic group	*Number listed*	*Number DPS*	*Number species*	*Number subspecies*	*% dps*	*% species*	*% subspecies*
PLANTS							
Conifers and cycads	3	N/A	2	1	N/A	66.7	33.3
Ferns and allies	26	N/A	23	3	N/A	88.5	11.5
Flowering plants	713	N/A	593	120	N/A	83.2	16.8
Lichens	2	N/A	2	0	N/A	100.0	0.0
Subtotal	744	N/A	620	124	N/A	83.3	16.7
INVERTEBRATES							
Arachnids	12	N/A	12	0	N/A	100.0	0.0
Clams	70	N/A	61	9	N/A	87.1	12.9
Crustaceans	21	N/A	21	0	N/A	100.0	0.0
Insects	44	N/A	20	24	N/A	45.5	54.6
Snails	32	N/A	30	2	N/A	93.8	6.3
Subtotal	179	N/A	144	35	N/A	80.5	19.6
VERTEBRATES							
Amphibians	21	5	15	2	23.8	71.4	9.5
Birds	91	16	44	35	17.6	48.4	38.5
Fishes	114	30	83	21	26.3	72.8	18.4
Mammals	78	13	28	40	16.7	35.9	51.3
Reptiles	36	7	20	10	19.4	55.6	27.8
Subtotal	340	71	190	108	20.9	55.9	31.8
Total	1,263	71	954	267	5.6	75.5	21.1

for the passenger pigeon (*Ectopistes migratorius*) (Schorger 1955) and is likely occurring with other species (e.g., greater prairie chicken [*Tympanuchus cupido*]). Although listing a species protects all biological units beneath it, most species are not listable until they have lost a substantial portion of their population, and thus it is likely that some lower taxa have already been lost. To the extent that the act's objective is to conserve the genetic potential of the species, such losses are evolutionarily significant.

Species Distribution

Geographically, listed species are not distributed uniformly across the United States. Instead, some 72 percent occur in just six states: California, Hawaii, Florida, Alabama, Tennessee, and Texas (fig. 2.4).

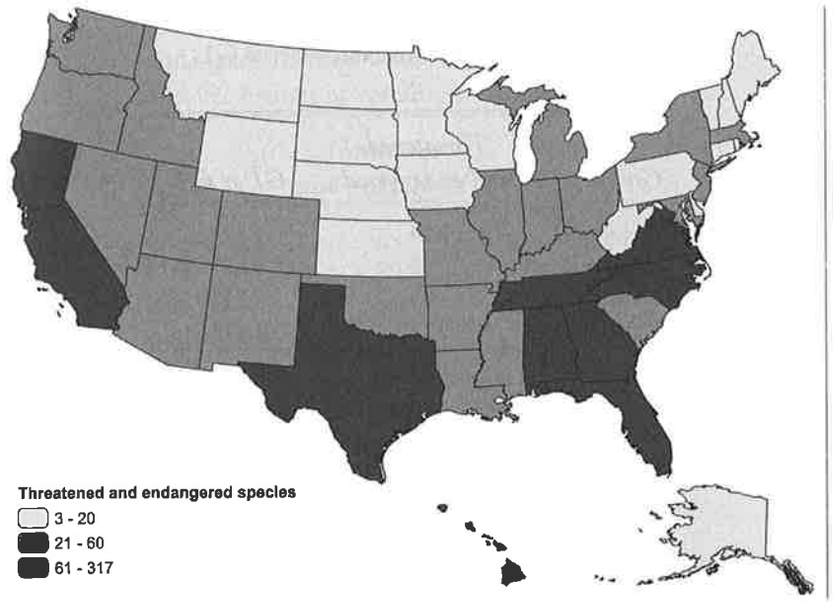

Figure 2.4. Geographic distribution of threatened and endangered species in the United States as of April 1, 2004. (Data from USFWS 2004a.)

Demographics

The Endangered Species Act specifies that a species is "endangered" when it is "in danger of extinction throughout all or a significant portion of its range"; a species is "threatened" when it "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." These definitions do not specify demographic guidelines; thus, the act lacks explicit criteria for determining population thresholds (individuals and populations), risk of extinction, and demographic trends. This is reflected in the published listing decisions. Wilcove and colleagues (1993) found that the median population size at the time of listing was fewer than 1,075 individuals for vertebrates, 999 for invertebrates, and fewer than 120 for plants. Population sizes at the time of listing varied by more than two orders of magnitude, even for species in the same taxonomic group (Wilcove et al. 1993).

Other groups identify species at risk of extinction with more quantitative thresholds. The World Conservation Union maintains a global "red list" that is based on population size, number of populations, trends, and threats (Mace and Lande 1991; IUCN 2003). NatureServe uses similar standards with emphasis on species in the United States (Master et al. 2000). Using the data of Master et al. (2000), we found that 3,122 species were identified in 1999 as either "criti-

TABLE 2.3. Comparison of threatened and endangered listings with NatureServe G1 and G2 species

Group	*Threatened and endangered*	*G1 or G2*
Vertebrates	324	324
Invertebrates	159	387
All animals	483	711
Plants	721	2,411

Source: Data for G1 and G2 species are taken from Master et al. (2000); those from the endangered species list are from the December 31, 1999, boxscore (USFWS 1999b).

cally imperiled" (G1) or "imperiled" (G2) within the United States. This is nearly three times more than the 1,204 species listed by the federal government as endangered or threatened species that year. More plants and invertebrates categorized as G1 or G2 were listed than were vertebrates in the same categories (table 2.3) (Stein et al. 2000). Although the same number of vertebrates were listed as were characterized as imperiled (324), mammals, birds, and reptiles were more likely to be listed than characterized as imperiled (table 2.4).

Assuming all G1 and G2 species in the United States are endangered or threatened, the backlog of unlisted species is a minimum of 6,029 (the number of unlisted G1 and G2 species as of November 2003). The number, however, is likely even larger since 35 percent of listed species (as of November 2003) were not ranked as G1 and G2 by NatureServe. Thus, an additional 2,552 species may be at risk. This would bring the number of potentially listed species to more than 9,000—a daunting number and one that suggests the workload for endangered species biologists will not lighten in the near future.

There is concern that species are listed unnecessarily or that species which should be listed are ignored because nonbiological factors are introduced into listing decisions (GAO 1993, 2003; Scott et al. 1995; National Wilderness Institute 1994). But the small numbers of individuals and populations at the time of listing suggest not that we list species without biological justification but rather that we face a backlog of unlisted at-risk species. That 78 percent of species are characterized as endangered at the time of listing supports this conclusion. Bluntly stated: we are not getting ahead of the extinction curve.

TABLE 2.4. Comparison of threatened and endangered listings with NatureServe G1 and G2 listings of vertebrate groups

Group	*Threatened and endangered*	*G1 or G2*
Mammals	69	29
Birds	89	47
Reptiles	36	21
Amphibians	17	49
Total	324	324

Source: Data for G1 and G2 species are taken from Master et al. (2000); those from the endangered species list are from the December 31, 1999, boxscore (USFWS 1999b).

Critical Habitat Designations

Although the Endangered Species Act requires that critical habitat be designated concurrent with the decision to list a species (ESA sec. 4(b)(6)(c)), often, this does not happen (Suckling and Taylor, this volume). The number of designations per year since 1973 varies from 0 to 25, except for a single large increase (278) that occurred in 2003. As of April 2004, critical habitat has been designated for 450 species (35.6 percent of all listed species), but these designations are taxonomically (table 2.5) and geographically (fig. 2.5) uneven. For instance, critical habitat has been designated for nearly half of all fish species but for only 0.2 percent of insect species, and most designations are in Hawaii and California. These patterns are explained elsewhere in this volume (Suckling and Taylor).

Despite the statutory requirement for designation at the time of listing, there have been significant delays in designating critical habitat for species (Greenwald et al., this volume). The time between listing and critical habitat designation was greatest for plants and least for reptiles and invertebrates (fig. 2.6).

Critical habitat designations have been controversial (USFWS 2003b; Williams 2001). Suckling and Taylor (this volume) found a positive relationship between critical habitat designation and recovery status. The reasons for this positive relationship are uncertain and the data suggest that critical habitat designation is but one of many possible factors accounting for a species' improved population status. Hoekstra et al. (2002b) concluded that critical habitat provided no positive effects in the recovery planning process. They did

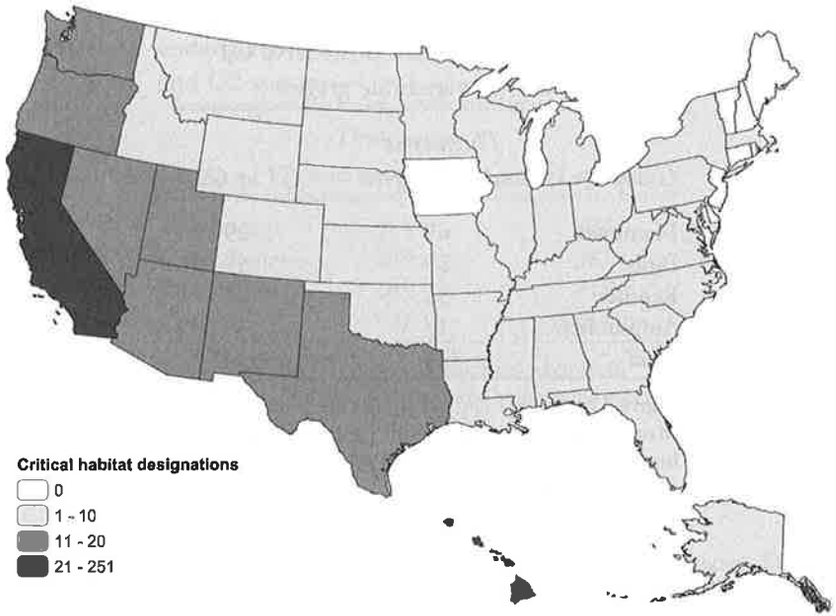

Figure 2.5. Geographic distribution of critical habitat designations in the United States as of April 1, 2004. (Data from USFWS 2004a.)

TABLE 2.5. Critical habitat designations for major taxonomic groups

Taxonomic group	*Species with critical habitat*	*Percentage of listed species*
Mammals	14	17.9
Birds	19	20.6
Amphibians	5	16.1
Reptiles	14	38.9
Fish	56	48.7
Crustaceans	4	19.0
Clams	2	2.9
Snails	2	6.3
Insects	1	0.2
Arachnids	6	8.3
Flowering plants	273	33.6
Ferns and allies	11	39.3

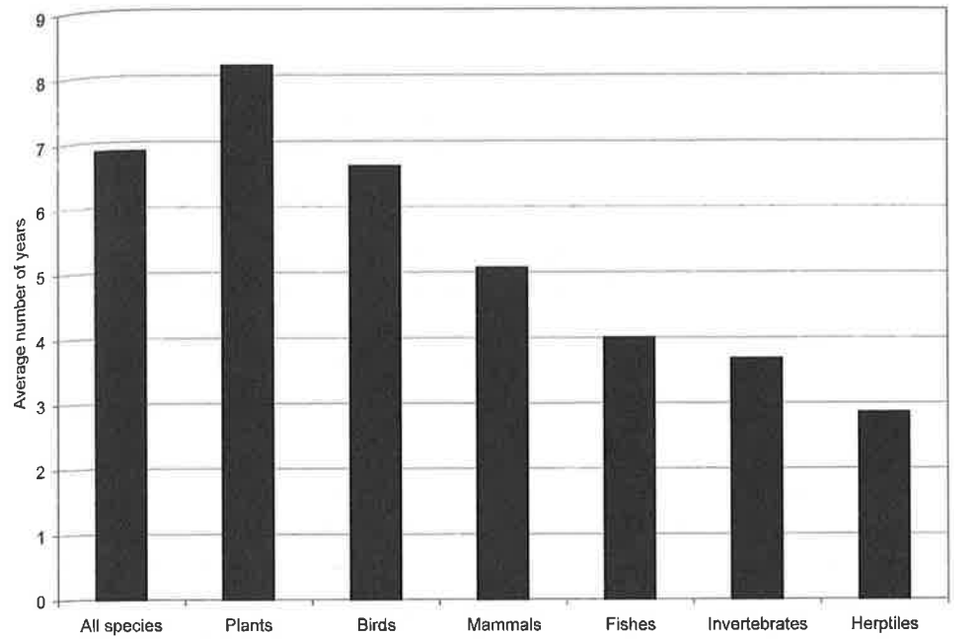

Figure 2.6. Average number of years between listing and designation of critical habitat. (Data from USFWS 2004a.)

not address the question of its influence in species recovery. Thus, in-depth species-by-species assessments may be required.

Conservation Tools for Nonfederal Lands

The U.S. Fish and Wildlife Service (USFWS) has developed three instruments intended to facilitate the conservation of species while providing greater certainty for nonfederal landowners. The statutory authority for these instruments is found in 10(a) of the Endangered Species Act, which authorizes the secretary to issue permits for the incidental taking of listed species (ESA sec. 10(a)(1)(B)) when the secretary has approved a "conservation plan" that meets enumerated criteria (ESA sec. 10(a)(2)). The USFWS has embroidered on the "conservation plan" provisions to create three categories: (1) candidate conservation agreements (*Code of Federal Regulations* 50:17.22(d)); (2) habitat conservation plans (*Code of Federal Regulations* 50:17.22(b)); and (3) safe harbor agreements (*Code of Federal Regulations* 50:17.22(c)).

Candidate Conservation Agreements

A *candidate conservation agreement* (CCA) is a voluntary agreement between the USFWS and a landowner under which the landowner agrees to specified actions to conserve "[p]roposed or candidate species [or] other unlisted species that are likely to become a candidate or proposed species" (USFWS 1999a). CCAs reflect the idea that implementing conservation measures before a species is listed may provide sufficient conservation to make it unnecessary to list the species. CCAs may be issued "with assurances," that is, with a promise that a nonfederal landowner will not be subjected to future regulatory obligations in excess of those agreed to at the time the landowner enters into the agreement.

As of April 1, 2004, there were 104 CCAs nationwide; only 7 CCAs included assurances. CCAs were distributed unevenly geographically (fig. 2.7) and taxonomically. The most commonly included taxa was vertebrates (71), followed by plants (66) and invertebrates (13); 14 CCAs were proposed with no candidate species specified. Of the 104 approved agreements, one addressed more than 25 species and one addressed 117 of the 133 species covered by CCAs, but most (97 plans, or 93 percent) addressed only a single species.

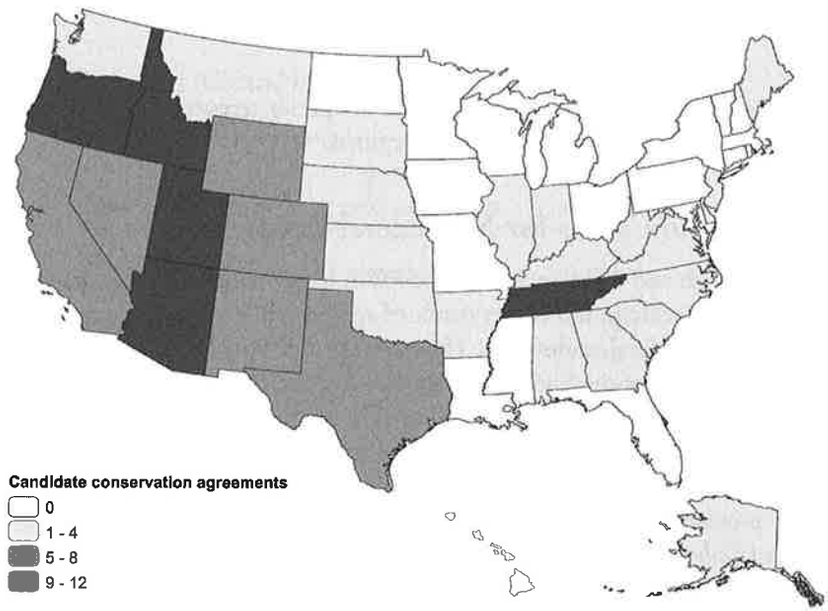

Figure 2.7. Geographic distribution of candidate conservation agreements (CCAs) in the United States as of April 1, 2004. (Data from USFWS 2004a.)

Habitat Conservation Plans

A *habitat conservation plan* (HCP) is a mitigation plan for activities that take listed species; an HCP is required for the issuance of an incidental take permit. Although Congress authorized HCPs in 1982, they remained little used until the Clinton administration: only fourteen HCPs were approved from 1983 to 1992, but by April 1, 2004, there were more than four hundred approved HCPs covering more than 38 million acres (USFWS 2004b). HCPs vary widely in size, ranging from less than 2.5 acres to more than a million acres (fig. 2.8). They also vary widely in the coverage of both the number of species and their taxa. Reptiles as a group have the highest percentage of species addressed by HCPs (44 percent); plants are least represented (5 percent). Of the 356 HCPs in the USFWS ECOS database, 273 (77 percent) addressed a single species; 10 addressed twenty or more species. Geographically, HCPs are unevenly distributed (fig. 2.9).

HCPs have been the focus of a number of studies. Kareiva and colleagues (1998) called for increased efforts to use explicit scientific standards and summaries of available data on the ecology of a species in plans as well as to create centralized databases that are generally accessible and include monitoring data.

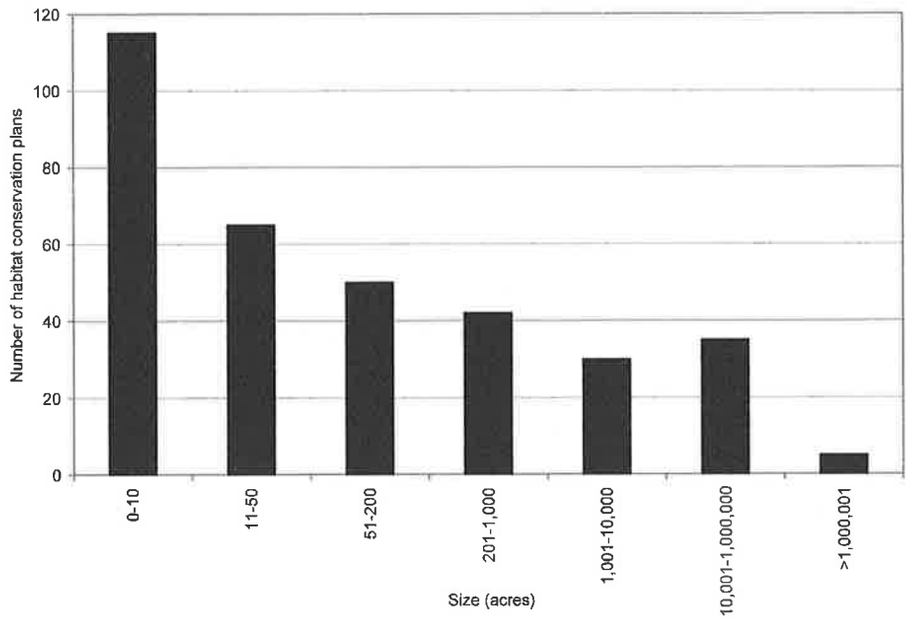

Figure 2.8. Size of habitat conservation plans. (Data from USFWS 2004a.)

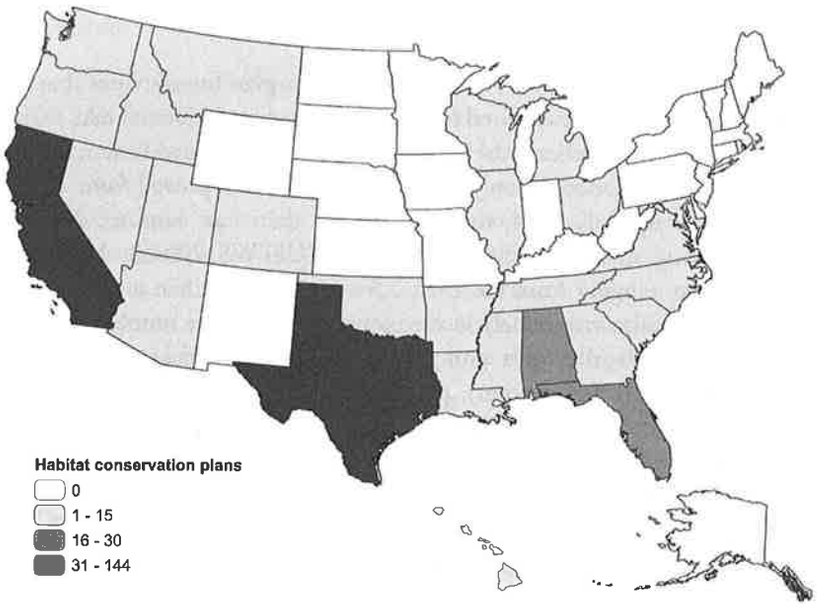

Figure 2.9. Geographic distribution of habitat conservation plans (HCPs) in the United States as of April 1, 2004. (Data from USFWS 2004a.)

Watchman et al. (2001) characterized HCPs as tools of compromise whose benefits to endangered species are yet untested. For a detailed examination of HCPs, see Thompson (this volume).

Safe Harbor Agreements

Safe harbor agreements (SHAs) are based on the principle that people who do good deeds on behalf of endangered species should not be penalized. To that end, a SHA may be issued when it "will provide a net conservation benefit to the affected listed species by contributing to the recovery of the listed species" (*Code of Federal Regulations* 50:17.22(c)(2)). The example most frequently cited activity is "restoring and enhancing habitat for endangered species."

As with CCAs and HCPs, these agreements are unevenly distributed both geographically and taxonomically. Twenty-three SHAs have been approved as of April 1, 2004, that cover twenty-six listed species and range in size from 0.2 to 161,173,776 acres. The number of species covered in SHAs range from one to five; of the twenty-three agreements, fourteen address a single species.

TABLE 2.6. Status of species with experimental populations

Status	*Percentage of all listed species*	*Percentage of experimental species*
Stable	30	8.9
Increasing	9	23.0
Unknown	24	8.9
Declining	34	47.0
Captive	<1	2.9
Presumed extinct	2	8.9

Experimental Populations

Experimental populations are a tool to reestablish threatened or endangered species in their former range (Goble 2002). An experimental population is a population released into an area that is "wholly separate geographically" from all other populations of the same species (ESA sec. 10(c)(j)). Members of an experimental population are treated as threatened even though nonexperimental populations of the same species may be endangered. This allows the USFWS to write less-restrictive rules under section 4(d) of the act. For example, gray wolves (*Canis lupus*) in Yellowstone are classified as an experimental population and depredating animals may be killed—something that would be illegal but for their classification.

Thirty-five experimental populations have been established for thirty-one species of animals. Only the gray wolf, the whooping crane (*Grus americana*), and the yellowfin madtom (*Noturus flavipinnis*) have multiple experimental populations. The statistical data on experimental populations is mixed. Species with experimental populations had higher percentages of both increasing and declining populations than did listed species in general (table 2.6).

Measures of Success

A consistent criticism of the Endangered Species Act is that it has not accomplished its purpose of recovering populations of listed species.

One correlate of recovery is the type of risk facing a species. Recovering species had easily identifiable threats and/or occupied major parts of their historic range (Abbitt and Scott 2001); none of the recovered species were primarily threatened by habitat loss. This suggests that we are recovering species with specific, easily remediable threats but are less successful when confronted with

TABLE 2.7. Changes in percentage of U.S. species by status over time

	Species listed 5 years or less		*Species listed 6–10 years*		*Species listed 11 years or more*	
Status	As of 09/30/98	As of 09/30/00	As of 09/30/98	As of 09/30/00	As of 09/30/98	As of 09/30/00
Stable	15	17	32	27	36	40
Improving	2	3	6	7	15	14
Declining	41	48	23	32	32	27
Uncertain	41	31	39	30	13	15
Captivity	<1	<1	0	<1	<1	<1
Presumed extinct	<1	<1	<1	3	4	3

Source: USFWS 2003c.

habitat loss. Habitat loss, however, is the major cause of endangerment (Wilcove et al. 1998). Abbitt and Scott (2001) found a positive correlation between percentage of historical range occupied at time of listing and achieving recovery. This suggests that targeting habitat for conservation may be a cost-effective way to reduce future listings while also protecting currently listed species (Shaffer et al., this volume). Similarly, targeting at-risk ecosystems (Noss et al. 1995) for conservation efforts before they deteriorate to the point where associated species are at risk is another proactive approach to the endangered species problem.

Beginning in 1990, the secretaries of the interior and commerce have provided biennial status reports to Congress for species under their jurisdiction. The most recent USFWS report covers the period October 1, 2000, to September 30, 2002 (USFWS 2004c); it states that 30 percent of listed species had stable populations, 6 percent were characterized as improving, 21 percent were declining, and 39 percent were characterized as uncertain (USFWS 2004c). Generally, the longer a species was listed the better its status (table 2.7).

The most recent National Marine Fisheries Service (NMFS) report covers the period from October 1, 2000, to September 30, 2002 (NMFS 2002). At the end of that period, NMFS had sole (forty-three species) or joint (seven species) responsibility for fifty species (NMFS 2002). Of these species, 30 percent are increasing, 4 percent have stable populations, 10 percent are "mixed," 34 percent are declining, and 22 percent have an uncertain status (NMFS 2002).

In addition to status trends in biennial reports, there are several other potential measures of the success of the ESA. These include extinctions, prevention of extinctions, reclassifications, and delistings.

Species Presumed Extinct

By the end of 2003, the USFWS (2004a) had delisted nine species presumed extinct. In addition, the agency reported that twenty-eight species (2 percent) were considered extinct as of September 30, 2000. This number was subsequently reduced to twenty-six species after two Hawaiian plants were rediscovered. These numbers are consistent with two other independent estimates of extinction for the same time period (B. Czech, pers. comm. [estimated twenty-seven species]; K. Suckling, pers. comm. [estimated thirty-one species]).

Prevented Species Extinctions

Based on the risk of extinction, Schwartz (1999) found that 192 U.S. species could have been expected to go extinct between passage of the act in 1973 and 1999. Using his logic that 67 percent of species characterized as threatened or endangered would be expected to go extinct in one hundred years, 262 currently listed species could be expected to have gone extinct in the thirty years since passage of the act. Subtracting the 9 species declared to be extinct and 26 assumed to be extinct by the USFWS, we are left with 227 species that the ESA arguably prevented from going extinct.

TABLE 2.8. Downlisted species

		Status change	
Common name	*Date downlisted*	*From*	*To*
American alligator	1/10/1977	E	T
Virginia round-leaf birch	11/16/1994	E	T
Missouri bladderpod	10/15/2003	E	T
Siler pincushion cactus	12/27/1993	E	T
Maguire daisy	06/19/1996	E	T
Snail darter	07/05/1984	E	T
Bald eagle (lower 48 states)	07/12/1995	E	T
Arctic peregrine falcon	3/20/1984	E	T
MacFarlane's four-o'clock	03/15/1996	E	T
Alentian Canada goose	12/12/1990	E	T
Tinian monarch	04/06/1987	E	T
Louisiana pearlshell	09/24/1993	E	T
Small whorled pogonia	10/06/1994	E	T

(*continues*)

TABLE 2.8. *Continued*

Common name	*Date downlisted*	*Status change*	
		From	*To*
Utah prairie dog	05/29/1984	E	T
Large-flowered skullcap	01/14/2002	E	T
Apache trout	07/16/1975	E	T
Greenback cutthroat troat	04/18/1978	E	T
Lahontan cutthroat trout	07/16/1975	E	T
Paiute cutthroat trout	07/16/1975	E	T
Gray wolf (western DPS*)	04/01/2003	E	T
Gray wolf (eastern DPS)	03/09/1978, 04/01/2003	E	T

*Distinct population segment.

Downlisted Species

A species is downlisted when its status changes from endangered to threatened. Twenty-two species had been downlisted (table 2.8) by the thirtieth anniversary of the Endangered Species Act. The USFWS has identified twenty-seven species it considers to be on the brink of recovery. Five species are identified as nearly ready to downlist and twenty-two to delist (D. Crouse, pers. comm.).

Delisted Species

A species is delisted when it meets recovery goals and is no longer threatened, that is, no longer "likely to become an endangered species in the foreseeable future" (ESA sec. 3(20)). At the thirtieth anniversary of the ESA, thirty-seven species had been delisted, thirteen due to recovery (fig. 2.10). In addition, the USFWS recently proposed delisting of eastern populations of gray wolves (*New York Times* 2004).

Abbitt and Scott (2001) examined factors associated with delisted species that had been recovered and found a positive relationship between population status and percentage of historical range occupied at the time of listing, as well as with percentage of recovery goals achieved. This suggests that the management actions set out in recovery plans are biologically relevant and, when implemented, can improve the status of the species.

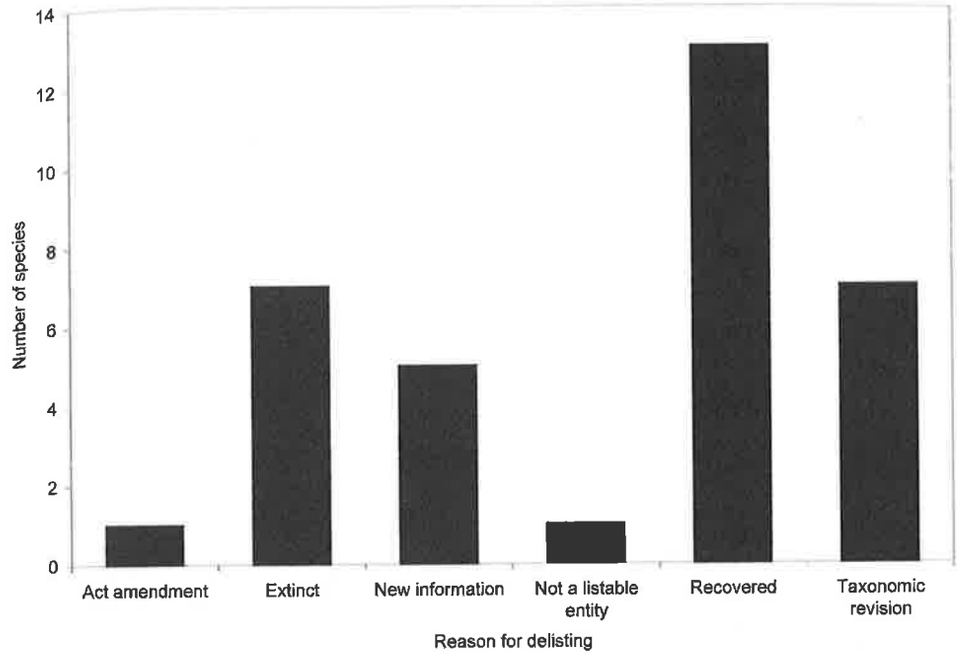

Figure 2.10. Delisted species in the United States and reasons for delisting as of December 31, 2003. The reason for delisting Rydberg milk-vetch (*Astragalus perianus*) has subsequently been changed to "original data in error (new information discovered)." (Data from USFWS 2004a,b.)

Funding

Funding for the endangered species program has varied dramatically since 1973 (fig. 2.11). The expenditure per listed species for all activities—administration, law enforcement, recovery, and others—was greatest four to six years after the act was passed, when it reached $241,000 per species. Figure 2.11 understates total funds because it does not include expenditures by the private sector; such funding often substitutes for direct federal funding (Kareiva et al., this volume). Nonetheless, this funding history suggests a diminished commitment to meeting the act's objectives.

Another measure of the adequacy of funding is to evaluate the percentage of the funds identified in recovery plans as needed to recover a species. Miller and colleagues (2002) found a positive relationship between funding and species recovery. Their findings suggest that recovery plans are identifying tasks that, when implemented, make a difference in the population status of the species. Thus, it would seem that large gains in the number of recovered species

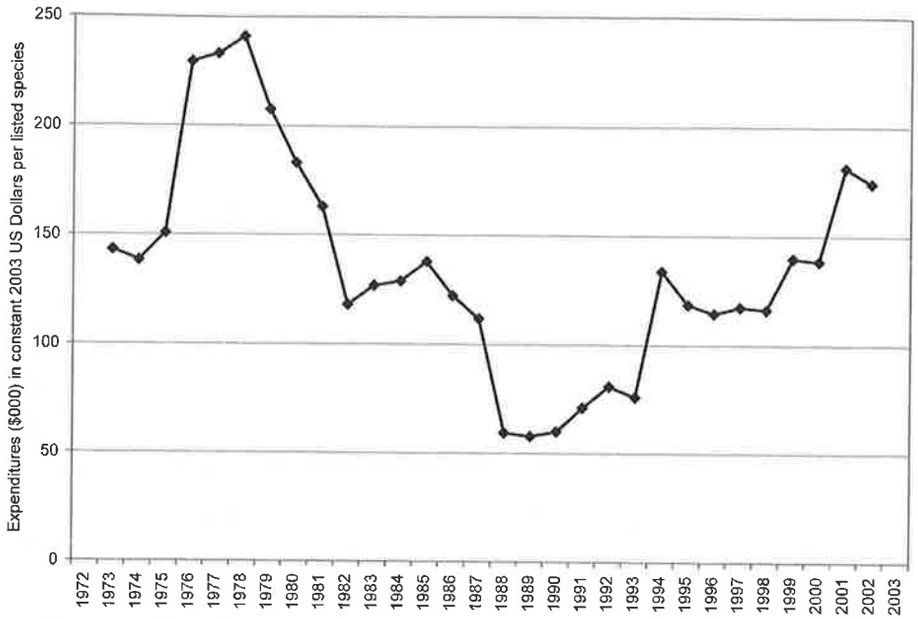

Figure 2.11. Expenditures per listed species in constant 2003 U.S. dollars. (Data from USFWS 2004a.)

could be obtained by increasing recovery expenditures for plants, a group of which only two species have been delisted due to recovery. Restani and Marzluff (2002) also suggested that improving the correlation between USFWS spending and species ranks would increase the number of recovered species.

Conclusion

A review of the numbers generated by thirty years of implementing the Endangered Species Act reveals a checkerboard pattern. Increasing numbers of listed species, with endangered species far outnumbering threatened species in 1973 and in 2003, suggest that listing and recovery planning are implemented when extinction risks have already reached critical levels. This message is reinforced by the number of species that have gone extinct while listed and by the existence of six thousand or more unlisted but apparently imperiled species. Our biggest challenge may lie not in the recovery of endangered species but in preventing imperiled species from becoming endangered.

Reinforcing these conclusions is the fact that, although full species are most often listed, subspecies and populations are likely at risk earlier. These conclusions are also supported by the fact that only a small number of populations

and individuals are present at the time of listing (Wilcove et al. 1993).

A recurring question is, how are we to measure success? Our findings suggest that success is a continuum (J. M. Scott et al., forthcoming) but that delisting or downlisting are widely accepted measures. Our view is that success is incremental: an increase, however small, in the number of individuals, in the number of populations, or in the distribution of a listed species indicates success, as does any reduction in the number or intensity of threats to a listed species. Although each increase by itself may not signal full ecological recovery for a species or restore it to an ecological and evolutionarily viable level, combined they nonetheless are signs that progress is being made. That there is a demonstrated correlation between number of years since a species is listed and improvement in its status (USFWS 2004c) also gives reason for optimism. But it also suggests that it may be several more decades before we can fully assess the success of the Endangered Species Act in preventing the loss of species on this planet.