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The Endangered Species Act: What We Talk about When We Talk about Recovery

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ABSTRACT

The objective of the Endangered Species Act is to recover species that are at risk of extinction. The drafters of the Act shared a widely held assumption that recovery would follow an orderly progression: species at risk of extinction would be identified, the factors placing them at risk would be determined, the conservation methods needed to eliminate the threats would be determined and implemented at the biologically relevant scale, and the species would be recovered to a point at which it could be delisted as a self-sustaining wild population. The only protection the species might continue to require would be available through already existing regulatory mechanisms. The reality has proved far more complex. Conceptually, recovery requires an assessment of the risk (the probability of extinction over some period of time) facing the species and an ethical/policy judgment on the acceptability of that risk. The federal wildlife agencies have only recently begun to address these factors explicitly. As a result, the best information of what "recovery" means are the decisions delisting species as recovered. The pattern that emerges from an examination of delisting decisions reveals two distinguishable factors. The first is a biological or demographic component that is met when a species has sufficient numbers and is sufficiently dispersed to reduce the risk from stochastic events to a reasonable level. The second factor focuses on risk management: are there sufficient conservation-management mechanisms to provide reasonable assurances that the removal of the Endangered Species Act's protection will not jeopardize the species? The agency implicitly evaluates the acceptability of both elements of risk under a reasonableness rubric. The application of these standards in delisting decisions has become increasingly minimalistic over the past eight years.

INTRODUCTION

Recovery is an elusive concept.

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Under the Endangered Species Act (ESA),[1] the concept is defined through terms—like all words—that are inevitably imprecise and ambiguous. This linguistic ambiguity is compounded by the equally unavoidable uncertainty of the science underpinning the decision making. The combination of linguistic and scientific uncertainty haunts both the fundamental ethical/policy choice and the daunting risk-management issues presented by the Act's mandate that the nation recover species at risk of extinction.

The ESA's purpose is to "conserve" at-risk species and the ecosystems upon which these species depend.[2] This is a demanding objective because the term "conservation" and its cognates are defined as the affirmative duty to "use . . . all methods and procedures which are necessary to bring any [listed] species to the point at which the measures provided pursuant to this Act are no longer necessary."[3] Successful conservation thus is recovery—an equivalence that the agencies responsible for implementing the Act (the Fish and Wildlife Service (USFWS) in the Department of the Interior and the National Oceanic and Atmospheric Administration-Fisheries (NOAA) in the Department of Commerce)[4] first made explicit in 1980.[5]

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1. Endangered Species Act of 1973, 16 U.S.C. §§ 1533–44 (2006).

2. "The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such endangered species and threatened species." *Id.* § 1531(b). *Cf. id.* § 1536(a)(1) ("All federal agencies shall . . . utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of [listed] species.") (alterations in original).

3. *Id.* § 1532(3). In 1988, Congress linked recovery to conservation in requiring the Secretary to "implement a system . . . to monitor . . . the status of all species which have recovered to the point at which the measures provided pursuant to this Act are no longer necessary" and which have therefore been delisted. Endangered Species Amendments of 1988, Pub. L. No. 100-478, § 1004, 102 Stat. 2306, 2307 (1988) (codified at 16 U.S.C. § 1533(g)).

4. As with most federal statutes, the ESA delegates power to a cabinet-level officer, in this case generally either the Secretary of the Interior or the Secretary of Commerce. 16 U.S.C. § 1532(15) (2006). The Secretary of the Interior has delegated his statutory authority to the USFWS, and the Secretary of Commerce has delegated his authority to the NOAA (formerly the Marine Fisheries Service (NMFS)). *See id.*

5. Rules for Listing Endangered and Threatened Species, Designating Critical Habitat, and Maintaining the Lists, 45 Fed. Reg. 13,010, 13,023 (Jan. 25, 1980) (codified at 50 C.F.R. § 424.11(d)(2) (2009)) (providing that a species can be delisted as recovered when "the evidence shows that it is no longer Endangered or Threatened."). The term "recovery" was formally defined in joint USFWS and NOAA regulations in 1986 to mean the "improvement in the status of listed species to the point at which the listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act." Interagency Cooperation–Endangered Species Act of 1973, as Amended; Final Rule, 51 Fed. Reg. 19,926, 19,958 (June 3, 1986) (codified at 50 C.F.R. § 402.02 (2009)). *See also* U.S. FISH & WILDLIFE

The drafters of the ESA wrote what they envisioned to be an orderly progression from listing through recovery. The first step is a *risk assessment*. The Act requires the agencies to assess a species' risk of extinction by evaluating the threats it faces. If the responsible agency determines that the species is sufficiently at risk of extinction, it is to be listed as either endangered or threatened. Once a species is listed, the Act's *risk-management* provisions come into play. These provisions can be divided into two functional groups. The first group is focused on *preventing extinction:* these provisions include tools that are intended to protect the listed species from activities that threaten its continued existence.[6] The second group of risk-management provisions consists of *recovery ac-*

SERV., POLICY AND GUIDELINES FOR PLANNING AND COORDINATING RECOVERY OF ENDANGERED AND THREATENED SPECIES 1 (1990), *available at* http://www.fws.gov/endangered/pdfs/Recovery/90guide.pdf [hereinafter USFWS POLICY AND GUIDELINES]; NAT'L MARINE FISHERIES SERV., INTERIM ENDANGERED AND THREATENED SPECIES RECOVERY PLANNING GUIDANCE 1.1-1 (July 2006), *available at* http://www.nmfs.noaa.gov/pr/pdfs/recovery/guidance.pdf.

6. The Act's primary extinction-prevention provisions include:

1. The consultation mandate of section 7(a)(2) which requires federal agencies that propose an action (including funding or permitting private action) to consult with the federal wildlife agency to "insure that [the] action . . . is not likely to jeopardize the continued existence" of the species or "result in the destruction or adverse modification" of its critical habitat. 16 U.S.C. § 1536(a)(2) (2006); *see generally* Thomas v. Peterson, 753 F.2d 754 (9th Cir. 1985); *see also* Sierra Club v. U.S. Fish & Wildlife Serv., 245 F.3d 434 (5th Cir. 2001); Defenders of Wildlife v. Babbitt, 130 F. Supp. 2d 121 (D.D.C. 2001).

2. The civil and criminal sanctions in sections 9 and 11 prohibit any person (broadly defined to include governmental and business entities, 16 U.S.C. § 1532(13) (2006)) from taking (broadly defined to include harassing or harming, *id.* § 1532(19)) or engaging in commerce in endangered species. *Id.* § 1539(a)(1). Threatened species are protected by regulations adopted under section 4(d). *See id.* §§ 1539(a)(1)(G), 1533(d). Section 11 contains civil and criminal penalties applicable to violations of the prohibitions. 16 U.S.C. § 1540 (2006). *See generally* United States v. McKittrick, 142 F.3d 1170 (9th Cir. 1998); Christy v. Hodel, 857 F.2d 1324 (9th Cir. 1988), *cert. denied sub nom.*, Christy v. Lujan, 490 U.S. 1114 (1989).

3. The habitat conservation planning requirements for obtaining an incidental take permit in section 10(a)(1)(B) operate as a limit on the take prohibition of section 9 by permitting take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." 16 U.S.C. § 1539(a)(1)(B) (2006). Before issuing an incidental take permit, however, the wildlife agency must find that the permitted actions "will not appreciably reduce the likelihood of the survival *and recovery* of the species in the wild." *Id.* § 1539(a)(2)(B)(iv) (emphasis added). Similarly, the incidental take statement provision in section 7(b)(4) requires compliance with the standards in section 7(a)(2). *Id.* § 1536(b)(4)(B). *See generally* Nat'l Wildlife Fed'n v. Babbitt, 128 F. Supp. 2d 1274 (E.D. Cal. 2000).

tions. Again, the Act provides USFWS and NOAA with several statutory tools to assist in conserving listed species.[7] In theory, the use of both

7. Recovery actions include:

1. An (under-enforced) affirmative obligation imposed on all federal agencies by section 7(a)(1) to "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of [listed] species." 16 U.S.C. § 1536(a)(1) (2006) (alternation in original). *See generally* Pyramid Lake Paiute Tribe of Indians v. U.S. Dep't of Navy, 898 F.2d 1410 (9th Cir. 1990); House v. U.S. Forest Serv., 974 F. Supp. 1022 (E.D. Ky. 1997); J.B. Ruhl, *Section 7(a)(1) of the "New" Endangered Species Act: Rediscovering and Redefining the Untapped Power of Federal Agencies' Duty to Conserve*, 25 ENVTL. L. 1107 (1995).

2. The requirement that federal action agencies "insure that [their] action . . . is not likely to jeopardize the continued existence" of a listed species and the regulation implementing the consultation mandate of section 7(a)(2) that "requires [the federal wildlife agencies] to consider both recovery and survival impacts" on listed species. Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv., 524 F.3d 917, 931 (9th Cir. 2008) (citing Gifford Pinchot Task Force v. U.S. Fish & Wildlife Serv., 378 F.3d 1059, 1069 (9th Cir. 2004)); *see* 50 C.F.R. § 402.02 (2008).

3. The authority to issue recovery permits under section 10(a)(1)(A). The permits are intended "to enhance the . . . survival of the affected species." 16 U.S.C. § 1539(a)(1)(A) (2006).

4. The habitat conservation planning requirements in section 10(a)(1)(B) which (as noted) require the wildlife agency to find that the permitted actions "will not appreciably reduce the likelihood of the survival *and recovery* of the species in the wild." *Id.* § 1539(a)(2)(B)(iv) (emphasis added). *See also id.* § 1536(b)(4)(B). *See generally* Nat'l Wildlife Fed'n v. Babbitt, 128 F. Supp. 2d 1274 (E.D. Cal. 2000).

5. The authority to introduce experimental populations of listed species under section 10(j). *Id.* § 1539(j). *See generally* Wyo. Farm Bureau Fed'n v. Babbitt, 199 F.3d 1224 (10th Cir. 2000); Dale D. Goble, *Experimental Populations: Reintroducing the Missing Parts*, *in* THE ENDANGERED SPECIES ACT 379 (Donald C. Baur & Wm. Robert Irvin eds., 2002) [hereinafter Goble, *Experimental Populations*].

6. The obligation to designate critical habitat under section 4(a)(3). 16 U.S.C. § 1533(a)(3) (2006). Fred Cheever has made a convincing case that the designation of critical habitat is in fact a recovery action. *See* Federico Cheever, *The Road to Recovery: A New Way of Thinking about the Endangered Species Act*, 23 ECOLOGY L.Q. 1, 56–58 (1996). His conclusions are supported by the available empirical data. *See* Kieran Suckling & Martin Taylor, *Critical Habitat and Recovery*, *in* 1 THE ENDANGERED SPECIES ACT AT THIRTY: RENEWING THE CONSERVATION PROMISE 75 (Dale D. Goble et al. eds., 2006).

7. Finally, and most fundamentally, the Act's definition of "conservation" authorizes the wildlife agencies to use "methods and procedure [that] include, but are not limited to, *all* activities associated with scientific resource management such as research, census, law enforcement, habitat

types of risk-management tools is guided by the species' recovery plan.[8] Once the threats are eliminated, the species' population recovers, and the listing agency initiates the delisting process, employing the same risk-assessment standards and procedures used in the initial decision to list the species.[9] After delisting, the Act's drafters appear to have assumed that the species would thrive because the threats to its existence had been eliminated.[10]

Implementing the Act has proved far more complex. In part, this reflects the fact that the Act itself has altered our understanding of species conservation.[11] In part, it is also the result of the compounding im-

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acquisition and maintenance, propagation, live trapping, and transplantation." 16 U.S.C. § 1532(3) (2006) (emphasis added).

8. The USFWS has described recovery plans as "the 'umbrella' that . . . guides all [conservation] activities." Proposed Designation of Critical Habitat for the Pacific Coast Population of Western Snowy Plover, 60 Fed. Reg. 11,768, 11,770 (Mar. 2, 1995) (referring to the requirement that federal actions do not jeopardize listed species, to the prohibition on taking listed species, and to the limitations imposed on permits based on habitat conservation plans). The statutory requirements for recovery planning are set out in section 4(f). 16 U.S.C. § 1533(f) (2006); *see generally* Defenders of Wildlife v. Babbitt, 130 F. Supp. 2d 121 (D.D.C. 2001); Cheever, *supra* note 7 (suggesting that recovery planning has fallen short of its potential).

9. The Act mandates an elaborate process for listing a species that includes a petition procedure, evidentiary findings, public notice, and opportunities for comment in addition to statutory deadlines for the various steps. Critical habitat is also to be designated at the time of listing. *See generally* 16 U.S.C. §§ 1533(a)–(c) (2006); U.S. FISH & WILDLIFE SERV., DEP'T OF THE INTERIOR, ENDANGERED SPECIES LISTING HANDBOOK (4th ed. 1994).

10. It was not until 1988, for example, that the Act was amended to include a requirement that the Secretary monitor the status of species delisted as recovered for at least five years. *See* Endangered Species Act Amendments of 1988, Pub. L. No. 100-478, tit. I, § 1004(a), 102 Stat. 2306, 2307 (codified at 16 U.S.C. § 1533(g) (2006)).

11. In defining "conserve," the drafters of the Act conceived the statute to be an ambitious project in planned obsolescence: its goal, after all, is to bring at-risk species to the point "at which the measures provided pursuant to this Act are no longer necessary." 16 U.S.C. § 1532(3) (2006). Instead, the ESA has turned out to be a technology-forcing statute: the Act created powerful incentives that have helped to transform fundamentally our understanding of ecosystems—a process that has revealed the Act's naiveté.

In 1973, ecosystems were conceived as static, equilibria systems: remove the disturbing cause and the system would return to a steady state. The ESA reflects this perspective; it is built upon the assumption that at-risk species face threats that are remediable in the sense that they can be eliminated, restoring equilibrium. *See, e.g.*, 16 U.S.C. §§ 1533(a)(1)(A)–(E) (2006).

Ecologists, however, have increasingly recognized that ecosystems are not equilibria systems, but rather are "complex systems that are dynamic and unpredictable across space and time." Tabatha J. Wallington et al., *Implications of Current Ecological Thinking for Biodiversity Conservation: A Review of the Salient Issues*, 10(1) ECOLOGY & SOC'Y 15, 15 (2005), *available at* http://www.ecologyandsociety.org/vol10/iss1/art15. In Daniel Botkin's metaphor, nature is a discordant harmony: "We see a landscape that is always in flux, changing over many scales of time and space, changing with individual births and deaths, local dis-

pacts of the drivers of extinction.[12] To flesh out what we are talking about when we talk about "recovery," this article begins with the risk of extinction—the probability that a species will become extinct over some period of time—and the acceptability of that risk. Against this background, the article turns to the Act's decision-making structure, which requires that the risk and acceptability decisions be made through a status determination that focuses on the threats facing a species. After outlining the process, the article discusses several of the decisions by the federal wildlife agencies to delist species as recovered. This article concludes that the agencies—at least prior to the administration of George W. Bush and his Secretaries of the Interior Gale Norton and Dirk Kempthorne—have op-

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ruptions and recoveries, larger scale responses to climate from one glacial age to another, and to the slower alterations of soils, and yet larger variations between glacial ages." DANIEL B. BOTKIN, DISCORDANT HARMONIES: A NEW ECOLOGY FOR THE TWENTY-FIRST CENTURY 62 (1990). Ecology, in other words, is an historical science because both species and ecosystems are artifacts that reflect the events that have occurred in and to them.

One result of our shifting understanding is that the Act is designed to address threats that often do not reflect the predominant problems facing declining species. Removing a disturbance through take restrictions and refuge creation is insufficient to recover most species because most species have not been put at risk by discrete causes such as over-harvest or the effects of DDT. Instead, most species are imperiled by the incidental effects of habitat degradation and invasive species. One study, for example, found that 60 percent of the listed species in the United States are imperiled by either disruption of natural fire disturbance regimes or the spread of non-native species. David S. Wilcove & Linus Y. Chen, *Management Costs for Endangered Species*, 12 CONSERVATION BIOLOGY 1405 (1998); *see generally* David S. Wilcove et al., *Leading Threats to Biodiversity: What's Imperiling U.S. Species*, *in* PRECIOUS HERITAGE 239 (Bruce A. Stein et al. eds., 2000) [hereinafter Wilcove et al., *Leading Threats*]; David S. Wilcove et al., *Quantifying Threats to Imperiled Species in the United States: Assessing the Relative Importance of Habitat Destruction, Alien Species, Pollution, Overexploitation, and Disease*, 48 BIOSCI. 607 (1998) [hereinafter Wilcove et al., *Quantifying Threats*].

12. Although it has become politically incorrect to note, the ultimate driver of the loss of biodiversity is the growth in our species' numbers and appetite. *See* Oliver Houck, *Sisyphus on a Roll: Society Faces the High Price of Capitalism*, ENVTL. FORUM, Nov./Dec. 2008, at 6; *see generally* David Ehrenfeld, *Neoliberalization of Conservation*, 22 CONSERVATION BIOLOGY 1091 (2008). The population of the United States was 212 million when Richard Nixon signed the ESA in the waning days of 1973—nearly 45 percent less than the current 306 million. *See generally* Holly Doremus, *Lessons Learned*, *in* THE ENDANGERED SPECIES ACT AT THIRTY, *supra* note 7, at 195; U.S. Census Bureau, U.S. POPClock Projection, http://www.census.gov/population/www/popclockus.html (last visited Jan. 15, 2009, so the number is greater today). The growth of our appetites has been even more dramatic. The nation's gross national product (GNP) has increased nearly 10 times, from $1464 billion to $14539.6 billion. U.S. Dep't of Commerce, Gross National Product, http://research.stlouisfed.org/fred2/data/GNP.txt (last visited Jan. 15, 2009). These domestic changes are compounded by the emerging drivers of global change such as economic globalization and climate change. *See generally* MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND HUMAN WELL-BEING: SYNTHESIS, fig. B, at vii (2005), *available at* http://www.millenniumassessment.org (representing a schematic of the drivers of ecosystem change).

erationally defined recovery to require both biological and legal assurances that delisting a species will not place it again at risk of extinction.

I. THE COORDINATES OF RECOVERY: PROBABILITY, TIME, AND ACCEPTABILITY

The decision that a species has recovered requires an assessment of the risk of extinction facing the species. As first-year torts students quickly discover, "risk" is the probability that something bad may happen.[13] Under the ESA, the bad is the extinction of a species. Unlike a barge collision, however, the extinction of a species is nearly always a process rather than a calamitous event. The assessment of a species' extinction risk therefore also includes a temporal horizon: it is the probability of extinction over some period of time. At least in principle—and subject to often-substantial uncertainty—the question of the risk facing the species is scientifically determinable. Determining the magnitude of this risk does not, however, resolve the ultimate assessment issue: is the risk acceptable?

A. Probability and Time: The Science of Extinction

The ESA provides standards for assessing the risk of extinction—that is, the probability that a species will become extinct over some period of time. The standards are set out in the Act's interlocking definitions of "endangered" (i.e., "in danger of extinction"[14]) and "threatened" (i.e., "likely to become . . . endangered . . . within the foreseeable future"[15]). These definitions address both the probability of extinction (i.e., "in danger" and "likely to become" in danger) and the temporal period over which such extinction may occur (i.e., "foreseeable future"). This guidance, obviously, is far from precise—how much probability is required to be "in danger?" How long is "the foreseeable future?" The one seemingly clear point is that the difference between endangered and threatened is a difference in time: an endangered species is "in danger" *now* while a threatened species is "likely to become" in danger within the foreseeable future.

The lack of clarity in the ESA's risk assessment standards can be traced to at least three difficulties. In part, the lack of clear standards

13. *See, e.g.*, United States v. Carroll Towing Co., 159 F.2d 169, 173 (2d Cir. 1947).

14. "The term 'endangered species' means any species which is in danger of extinction throughout all or a significant portion of its range." 16 U.S.C. § 1532(6) (2006).

15. "The term 'threatened species' means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." *Id.* § 1532(20).

reflects the inherent fuzziness of language.[16] In part, it reflects the dramatic increase in knowledge about the science of extinction since the enactment of the ESA in 1973.[17] And in part—by focusing on threats—the Act's structure has obscured the inherent risk analysis that the Act requires.[18] Nonetheless, even if the agencies were to adopt more quantitative regulatory definitions of the Act's terms, the most that could be achieved would be a reduction in linguistic uncertainty and an increased emphasis on inherent and unavoidable scientific uncertainty.[19]

The scientific uncertainty surrounding extinction is exemplified by population viability analysis (PVA), a method frequently employed by conservation biologists to assign values to the probability and time components of risk.[20] PVAs are demographic population models that, like other such models, begin with a mathematical description of a species or population that is built upon data on mortality rates, recruitment

16. It would, of course, be possible to define the risk with far greater precision. The International Union for the Conservation of Nature (IUCN) publishes a *Red List of Threatened Species* that divides at-risk species into five categories: extinct in the wild, critically endangered, endangered, vulnerable, and near threatened. Its definition of "critically endangered" runs two and one-half pages and there are an additional 12 pages of introductory discussion and definitions. The significant difference between the ESA's approach and the IUCN's is that the latter is quantitative. For example, one element of the definition of "critically endangered" specifies that "[a]n observed, estimated, inferred or suspected population size reduction of >80% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on [five alternative types of measurements]." IUCN RED LIST CATEGORIES AND CRITERIA: VERSION 3.1 at 16 (2001), *available at* http://www.iucnredlist.org/documents/redlist_cats_crit_en_v1223290226.pdf.

17. *See supra* text accompanying note 11.

18. The ESA requires the Secretary to determine whether a species is endangered or threatened as a result of five types of threats. *See* 16 U.S.C. § 1533(a)(1) (2006).

19. Not only is information on basic life history traits of at-risk species often lacking, but our knowledge of the factors that may lead to extinction is also incomplete. *See, e.g.*, Helen M. Regan et al., *A Taxonomy and Treatment of Uncertainty for Ecology and Conservation Biology*, 12 ECOLOGICAL APPLICATIONS 618 (2002). The story of the extinction of the heath hen provides an example of the interplay of these factors. *See* CHRISTOPHER COKINOS, HOPE IS A THING WITH FEATHERS: A PERSONAL CHRONICLE OF VANISHED BIRDS 121–93 (2000).

20. This description of population viability analysis is based upon Steven R. Beissinger & M. Ian Westphal, *On the Use of Demographic Models of Population Viability in Endangered Species Management*, 62 J. WILDLIFE MGMT. 821 (1998); Mark S. Boyce, *Population Viability Analysis*, 23 ANN. REV. ECOLOGY & SYSTEMATICS 481 (1992); D. DEMASTER ET AL., NAT'L OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, SEATTLE NOAA, TECH. MEMO. NMFS-F/SPO-67, RECOMMENDATIONS TO NOAA FISHERIES: ESA LISTING CRITERIA BY THE QUANTITATIVE WORKING GROUP 5, 39–40 (2004), *available at* http://spo.nwr.noaa.gov/tm/tm67.pdf; Hugh P. Possingham et al., *Population Viability Analysis*, *in* ENCYCLOPEDIA OF BIODIVERSITY 831, 831 (Simon A. Levin ed., 2001). It is important to note that there is no single PVA model. Rather, the term refers to the approach. Beissinger & Westphal, *supra* note 20, at 822–29.

rates, and the age distribution of the population. They differ from other demographic models by focusing on extinction and including estimates of the four stochastic (i.e., random) processes believed to impact extinction significantly: demographic stochasticity ("chance events in the survival and reproductive success of a finite number of individuals"), environmental stochasticity ("temporal variation of habitat parameters and the population of competitors, parasites, and diseases"), genetic stochasticity ("changes in gene frequencies due to founder effect, random fixation, or inbreeding"), and natural catastrophes ("floods, fires, droughts, etc., which may occur at random intervals through time").[21] PVA models thus allow the relative importance of different threats to be evaluated by varying the data and comparing the output, the probability of extinction of a species or population over a specified period.[22]

For example, NOAA relied in part on a PVA prepared by a biological review team in deciding to list the orca population in Puget Sound (the Southern Resident killer whale distinct population segment (DPS)).[23] The PVA evaluated the probability that the DPS would go extinct given its small population size, the range of threats it faced,[24] and its slowly declining population trend. Depending upon whether the model

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21. Mark L. Shaffer, *Minimum Population Sizes for Species Conservation*, 31 BIOSCI. 131, 132 (1981) [hereinafter Shaffer, *Minimum Population Sizes*]. These four types of risks are examined in more detail in Boyce, *supra* note 20, at 483–95; COMM. ON SCIENTIFIC ISSUES IN THE ENDANGERED SPECIES ACT, NAT'L RESEARCH COUNCIL, SCIENCE AND THE ENDANGERED SPECIES ACT 124–43 (1995); Possingham et al., *supra* note 20, at 832–35.

22. In the seminal paper, Shaffer calculated the risk of extinction of Yellowstone population of grizzly bears. Shaffer, *supra* note 21, at 133. For a more complete example, see David B. Lindenmayer & Hugh P. Possingham, *Ranking Conservation and Timber Management Options for Leadbetter's Possum in Southeastern Australia Using Population Viability Analysis*, 10 CONSERVATION BIOLOGY 235 (1996).

23. *See* Endangered and Threatened Species; Endangered Status Southern Resident Killer Whales, 70 Fed. Reg. 69,903, 69,909 (Nov. 18, 2005).

The ESA defines "species" to include "any distinct population segment of any species of vertebrate fish or wildlife." 16 U.S.C. § 1532(16) (2006). In 1996, USFWS and NOAA adopted a policy that described a process for designating DPS. Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Endangered Species Act, 61 Fed. Reg. 4722 (Feb. 7, 1996). The policy specifies three elements to be considered in designating DPS: "(1) Discreteness of the population segment in relation to the remainder of the species to which it belongs; (2) The significance of the population segment to the species to which it belongs; and (3) The population segment's conservation status in relation to the Act's standards for listing." *Id.* at 4725.

24. Among the threats facing the species are habitat modification (e.g., agriculture, hydropower, and urban development have substantially reduced salmon populations in Puget Sound, thus reducing prey availability; the persistence of chemical compounds such as PCBs, DDT, and PDBEs that have physiological effects on the species; and expanded commercial shipping, whale watching, ferry operations, and recreational boating that may affect the species in several poorly understood ways), overutilization (i.e., whale watching),

employed the most recent population trends (which were less optimistic numbers) or a more lengthy (and optimistic) data set, the extinction probability varied from the least optimistic projection of "39 to 67 percent in 100 years to 76 to 98 percent in 300 years [and to the most optimistic of] less than 0.1 to 3 percent in 100 years and 2 to 42 percent in 300 years."[25] Noting that, even under the most optimistic iteration of the model, the probabilities of extinction "were low, but not insignificant," the agency concluded that the species was "at risk of extinction" and listed it as endangered.[26]

A second example is the USFWS's decision not to list the cerulean warbler.[27] In assessing the risk facing the warbler, the agency concluded that the best available science indicated first, that the estimated total population of the species was 390,000 individuals in 2006 (plus or minus 50 percent, i.e., between 145,000 and 535,000) and second, that the population trend of the species was an annual decline of 3.2 percent (between 4.2 and 2.0 percent with a 90 percent certainty).[28] This data suggested that the population would decline by nearly one-half to 200,000 individuals in 20 years, 80,000 individuals in 50 years, and 15,000 individuals in 100 years. As the agency noted, however, "the farther into the future we attempt to predict, the less confident we can be that the historical trend will persist. Future population sizes will vary due to a variety of factors, both random events and progressive changes in causal environmental factors that we cannot foresee at this time."[29] The agency therefore concluded that the species was not at risk of extinction in the foreseeable future and refused to list it as threatened.[30]

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and other factors (e.g., the potential for oil spills). Endangered and Threatened Species; Endangered Status Southern Resident Killer Whales, 70 Fed. Reg. at 69,908.

25. *Id.* at 69,909.

26. *Id.* The DPS's population decreased dramatically in 2008. Seven whales—nearly 8 percent of the DPS's population—disappeared, most likely having starved to death. Phuong Le, *Scientists Try to Uncover the Danger to Orcas*, Seattlepi.com, Dec. 21, 2008, http://seattlepi.nwsource.com/national/1110ap_killer_whales.html (last visited Jan. 18, 2009); Robert McClure, *Are the Orcas Starving? As Salmon Runs Decline, Killer Whale Numbers Take Hardest Hit since 1990s*, Seattlepi.com, http://seattlepi.nwsource.com/local/384854_orcas25.html (last visited Nov. 24, 2008); Cornelia Dean, *Scientist at Work—Alexandra Morton—Saving Wild Salmon, in Hopes of Saving the Orca*, N.Y. TIMES, Nov. 4, 2008 at D1, *available at* http://www.nytimes.com/2008/11/04/science/04prof.html?_r=1&scp=1&sq=Alexandra Morton&st=cse&oref=slogin.

27. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Cerulean Warbler (*Dendroica cerluea*) as Threatened with Critical Habitat, 71 Fed. Reg. 70,717, 70,718 (Dec. 6, 2006).

28. *Id.* at 70,731, 70,723.

29. *Id.* at 70,731.

30. *Id.* at 70,731–32. In contrast, in its decision not to list slickspot peppergrass, the USFWS argued that a 64–82 percent chance of extinction within 100 years was not a "fore-

As the cerulean warbler decision indicates, the limitations on PVAs in part reflect the epistemic uncertainty of the science. Extinction is a complex, poorly understood *probabilistic* process. Thus, the science of extinction would be indeterminate even if we had complete knowledge of all the factors that affect the process—and our knowledge is far from complete.[31] When even basic facts, such as the number of warblers, are only known within an enormous range—between 535,000 and 145,000 individuals—our ability to quantify the risk of extinction faced by a species is limited. Acknowledging this inherent uncertainty is not an argument for rejecting PVAs out of hand—they are, after all, part of "the best scientific . . . data *available*."[32] Rather, it is an argument for explicitly ac-

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seeable" event; an assertion that prompted the federal district court to respond—understandably—that the agency's decision "defies common sense." W. Watersheds Project v. Foss, 2005 WL 2002473, at *14–15 (D. Idaho Aug. 19, 2005). In the Federal Register notice withdrawing the proposed rule to list the species (the decision prompting the judicial decision), the agency had not reported the numerical estimates, preferring to focus on the species' improved chance of survival (to 36 percent) with the proposed conservation measures. Endangered and Threatened Wildlife and Plants; Withdrawal of Proposed Rule to List *Lepidium papilliferum* (Slickspot peppergrass) as Endangered, 69 Fed. Reg. 3094, 3100 (Jan. 22, 2004). This approach brings to mind the old joke about lies, damn lies, and statistics.

31. Possingham et al., *supra* note 20, at 831; *see generally* Brian Dennis et al., *Estimation of Growth and Extinction Parameters for Endangered Species*, 61 ECOLOGICAL MONOGRAPHS 115, 115–16 (1991); Kathleen LoGiudice, *Toward a Synthetic View of Extinction: A History Lesson from a North American Rodent*, 56 BIOSCI. 687 (2006). For example, it is uncertain why the passenger pigeon, once the most common terrestrial animal, became extinct. One theory is that the population collapsed because the killing focused on the species' colonial nestings where the density of the birds made the work much easier. Hunters could simply shake the trees and picked up the squabs (the unfledged nestlings) as they fell from the nests. In its dense nesting colonies, it was possible to kill almost every squab. Furthermore, shooting near colonies caused pigeons to abandon their nests and nestlings. The massive killing coupled with the low rate of reproduction (one egg per nesting), led to a failure to recruit new members into the aging population and doomed the species. David E. Blockstein & Harrison B. Tordoff, *A Contemporary Look at the Extinction of the Passenger Pigeon*, 39 AM. BIRDS 845, 850 (1985); Etta S. Wilson, *Personal Recollections of the Passenger Pigeon*, 51 AUK 157, 165–66 (1934). Alternatively, it has been argued that the species required high population densities to breed. Once the population fell below that threshold, most pigeons ceased to breed. I.L. Brisbin, *The Passenger Pigeon: A Study in the Ecology of Extinction*, MODERN GAME BREEDING, Oct. 1968, at 13, 19–20; T.R. Halliday, *The Extinction of the Passenger Pigeon,* Ectopistes migratorius, *and Its Relevance to Contemporary Conservation*, 17 BIOLOGICAL CONSERVATION 157 (1980); J. Michael Reed, *The Role of Behavior in Recent Avian Extinctions and Endangerment*, 13 CONSERVATION BIOLOGY 232 (1999). Others have suggested that habitat fragmentation and diseases were contributing causes. *See generally, e.g.*, Norman Myers, *The Extinction Spasm Impending: Synergisms at Work*, 1 CONSERVATION BIOLOGY 14 (1987); Katherine F. Smith et al., *Evidence for the Role of Infectious Disease in Species Extinctions and Endangerment*, 20 CONSERVATION BIOLOGY 1349 (2006).

32. 16 U.S.C. § 1533(b)(1)(A) (2006) (emphasis added). *See also id.* § (b)(2) (designating critical habitat); *id.* § (b)(7) (emergency listing); *id.* § 1536(a)(2) (determining jeopardy); *id.*

knowledging the limitations of both the data and our understanding of the underlying processes.

Ultimately, however, determining that a species is either endangered or threatened is not a scientific decision.[33] It is, instead, an ethical/policy decision on the acceptability of the risk the species faces.

B. Acceptability: The Ethics of Extinction

Beyond the question of risk (that is, the probability of extinction over some temporal scale), is a fundamental *ethical/policy* question: What risk is *acceptable*? Although science can inform this judgment (by shedding light on the risk), it cannot—given the gap between the descriptive and the prescriptive—make the actual acceptability decision.

The distinction between the science and ethics of extinction can be highlighted by considering a variation on a thought experiment proposed by Daniel Goodman.[34] Goodman assumed that 5,000 years ago our species adopted a global policy of managing the environment to ensure an 85 percent probability that no species of mammal would go extinct within 100 years. The probability that any 1 of the approximately 4,400 mammals then in existence would survive to the present would be 0.0003 per species. Assuming that the dynamics of each species was independent of all other mammal species, the probability is 27 percent that no mammals would remain (unless our species was not the last to go extinct). The probability that more than 3 species of mammals would remain is only 4 percent.

In contrast, consider the approach of Mark Shaffer who "arbitrarily propose[d] [a definition of acceptable risk as] a 99% chance of remaining extant for 1,000 years despite the foreseeable effects of demographic, environmental, and genetic stochasticity, and natural catastrophes."[35] Us-

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§ (c)(1) (requiring biological assessment); *id.* § (h)(2)(B)(i) (determining exemption); *id.* § 1539(j)(2)(B) (designating experimental population as nonessential).

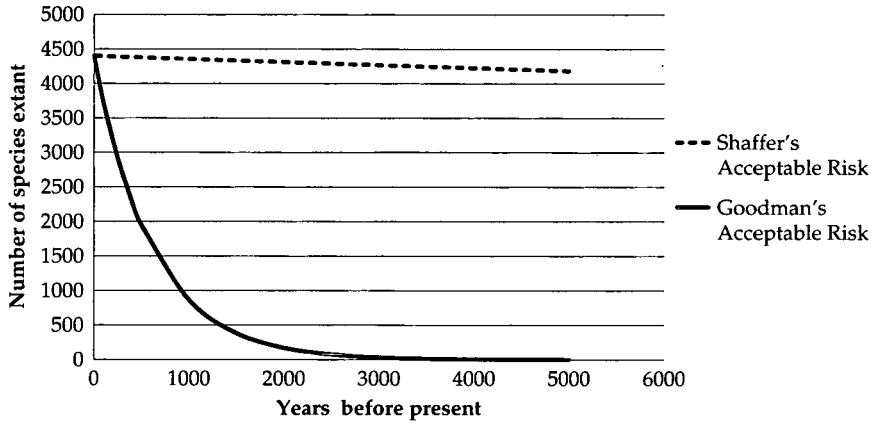
33. Holly Doremus, *Listing Decisions under the Endangered Species Act: Why Better Science Isn't Always Better Policy*, 75 WASH. U. L.Q. 1029, 1088 (1997). *See also* DEMASTER ET AL., *supra* note 20, at 2–3; Robin S. Waples et al., *A Biological Framework for Evaluating Whether a Species is Threatened or Endangered in a Significant Portion of Its Range*, 21 CONSERVATION BIOLOGY 964, 965 (2007).

34. Daniel Goodman, *Predictive Bayesian Population Viability Analysis: A Logic for Listing Criteria, Delisting Criteria, and Recovery Plans*, *in* POPULATION VIABILITY ANALYSIS 447, 454 (Steven R. Beissinger & Dale R. McCullough eds., 2002).

35. Shaffer, *supra* note 21, at 132. Shaffer describes his choices as "arbitrary." It is, however, more accurate to label them "ethical" or "policy" positions rather than "scientific" statements. *See also* Boyce, *supra* note 20, at 482 ("Definitions and criteria for viability, persistence, and extinction are arbitrary, e.g., ensuring a 95% probability of surviving for at least 100 years.").

ing Shaffer's metric, the probability of any one of the 4,400 mammals surviving to the present would be 95 percent per species—4,184 species of mammals would probably survive. Although the results of these approaches obviously differ dramatically (see Figure 1, below), neither Goodman's nor Shaffer's standard is more "scientific" than the other—both turn instead on an ethical/policy decision of what is an *acceptable* risk.

Figure 1



As with the probability and time components of the risk assessment, the ESA's authors provided some guidance on the acceptability question. The fundamental ethical/policy decision in the ESA is that no species should—except in the most unusual circumstances[36]—be allowed to go extinct. As the Supreme Court noted in *Tennessee Valley Authority v. Hill*, "[t]he plain intent of Congress in enacting th[e] statute was to halt and reverse the trend toward extinction, *whatever the cost*."[37] To that end, Congress drafted a statute that "admits of no exceptions."[38] The Act, of course, is no longer what it was. A combination of legislative and administrative amendments have transformed the ESA from a no-exceptions law into a more traditional and flexible permitting statute.[39] Nonetheless,

36. 16 U.S.C. §§ 1536(e)–(o) (2006).

37. Tenn. Valley Auth. v. Hill, 437 U.S. 153, 184 (1978) (emphasis added).

38. *Id.* at 173.

39. *See* Dale D. Goble, *The Evolution of At-Risk Species Protection*, *in* 2 THE ENDANGERED SPECIES ACT AT THIRTY: CONSERVING BIODIVERSITY IN HUMAN-DOMINATED LANDSCAPES 6, 17–23 (J. Michael Scott et al. eds., 2006); Oliver A. Houck, *The Endangered Species Act and Its Implementation by the U.S. Departments of the Interior and Commerce*, 64 U. COLO. L. REV. 277 (1993).

the Act retains its "overarching purpose[:] to protect a species and its habitat from extinction."[40]

Thus, in sum, the ESA requires USFWS and NOAA to assess the risk of extinction that a species faces. This requirement has both scientific and ethical/policy elements. The scientific issues focus on determining the probability that a species will go extinct within some period of time. Since our understanding of the causes and processes of extinction is limited, this determination is subject to uncertainty—and this uncertainty is in turn compounded by the highly variable nature of nature. Thus, science can only provide expansive and fuzzy boundaries to quantifying the risk of extinction faced by a species. Ultimately, the decision turns on tolerance for—or allocation of—risk: should species or human activities bear the risk of error?[41] This is an ethical/policy judgment, rather than a scientific question.

II. STATUS REVIEWS: ASSESSING THE THREATS FACING A SPECIES

The elements of a risk assessment, i.e., uncertainty, time, and acceptability, have been obscured in part by the ESA's requirement that the assessment of the risk of extinction and the determination of the acceptability of that risk be made through a status determination that evaluates the threats potentially affecting the species. The Act specifies five categories of threats that the agency must evaluate in making decisions to list, reclassify (i.e., change the species' status from endangered to threatened or vice versa), or delist a species:

> (A) the present or threatened destruction, modification, or curtailment of its habitat or range;
> (B) overutilization for commercial, recreational, scientific, or educational purposes;
> (C) disease or predation;
> (D) the inadequacy of existing regulatory mechanisms; or
> (E) other natural or manmade factors affecting its continued existence.[42]

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40. Nat'l Wildlife Fed'n v. Norton, 386 F. Supp. 2d 553, 565 (D. Vt. 2005).

41. *See* Am. Rivers v. Nat'l Marine Fisheries Serv., 1997 WL 33797790 at *9 (D. Or. Apr. 3, 1997).

42. 16 U.S.C. § 1533(a)(1) (2006). The first three of these factors—habitat loss, overutilization, and predation or disease—are the primary extrinsic drivers of extinction; the fourth factor focuses on the existing regulatory mechanisms available to control the three extinction factors; the final factor is a precautionary catch-all. The inclusion of "natural causes" emphasizes the congressional conclusion that at-risk species are to be protected regardless of the source of the immediate risk: the hall of mirrors of causation—proximate

The analysis of these five factors is the centerpiece of an increasingly detailed case-by-case assessment. The strength of this approach is that it permits an extended examination of the specific threats facing a species given what is known about its life history traits.[43] Indeed, the USFWS has argued that this focus is unavoidable because "the circumstances applying to most species are individualistic enough as to be incapable of precise definition or quantification."[44] As a result, the agency has adopted a qualitative approach that emphasizes the magnitude (high to low) and immediacy (imminent and non-imminent) of the threats facing the species as the key determinants.[45]

This case-by-case approach does not, however, distinguish between risk (probability and time), on the one hand, and the acceptability of that risk on the other. Instead, the approach blends decisions on the likelihood of extinction over some duration, with the judgment that this (unstated) risk is acceptable. This reduces the transparency of the listing process and doubtless results in inconsistent decisions on the status of different species. Although the USFWS and NOAA[46] have begun to examine these issues as their use of tools such as PVA increase, the agencies have not adopted a policy specifying how the elements of risk (i.e., probability and time) should be determined and the ethical/policy question of acceptability should be evaluated. In the absence of a more explicit quantification of these elements and a specification of the degree of risk that is ethically acceptable, the qualitative discussions in previous agency decisions delisting species as recovered provide the best available information on what "recovery" means.

A. The Path Up and the Path Down

The decision to delist a species as recovered is made through an evaluation of the threats facing the species that employs the same procedural and substantive standards as the decision to list the species: both require an evaluation of the species' status under the five statutory threat

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or otherwise—thus was ruled out of bounds. The fact that a potential *coup de grace* is a "natural" event does not require a parsing of the contribution of human actions.

43. *See generally, e.g.*, Katherine Ralls et al., *Developing Criteria for Delisting the Southern Sea Otter Under the U.S. Endangered Species Act*, 10 CONSERVATION BIOLOGY 1528 (1996).

44. Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 Fed. Reg. 43,098, 43,100 (Sept. 21, 1983).

45. *Id.* The correlation of magnitude and immediacy to probability and time horizon is apparent. Unfortunately, however, the agency provides neither its conclusion nor its reasoning on either of the elements in making delisting decisions—thus preserving its discretion.

46. NOAA has convened a quantitative working group to consider the issues in the context of listing decisions. *See* DEMASTER ET AL., *supra* note 20.

factors.[47] Contrary to Heraclitus' famous admonition, however, the path up is not the same as the path down.[48] Two differences between listing and delisting are particularly noteworthy. The first is the amount of information available to the decision maker. Generally, when a species is proposed for listing, relatively little is known about it. By the time it is proposed for delisting, on the other hand, there is a body of information on the species and the management actions that have proven to be successful in recovering the species. The second difference is that the decision to delist a species removes the species-specific risk management provided by the ESA. As a result, the assessment required in a delisting decision necessarily must include an evaluation of the risk management that will be available if the species were delisted. That is, the agency must decide not only that the species is no longer sufficiently at risk to be classified as "threatened" (i.e., that the probability of extinction over the foreseeable future is acceptable), but also that removing the ESA's risk-management mechanisms will not render the species again at risk.[49] In other words, is the ESA all that is preventing the species' downward spiral into extinction?

This second difference highlights the irony of the ESA: the Act is a powerful, focused statute that can bring species back from the brink of extinction, but this power can itself make the statute irreplaceable because neither federal nor state law provides significant, focused protection—particularly against the most common threats facing listed species:

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47. "[T]he same five statutory factors must be addressed in delisting as in listing." Defenders of Wildlife v. Babbitt, 130 F. Supp. 2d 121, 133 (D.D.C. 2001) (quoting Fund for Animals v. Babbitt, 903 F. Supp. 96, 111 (D.D.C. 1995)). *See also* Nat'l Wildlife Fed'n v. Norton, 386 F. Supp. 2d 553, 558 (D. Vt. 2005). The threat factors are listed at 16 U.S.C. § 1533(a)(1) (2006).

48. *See* G.S. KIRK ET AL., THE PRESOCRATIC PHILOSOPHERS 188 (2d ed. 1983) ("The path up and down is one and the same."). The USFWS and NOAA have acknowledged this difference in adopting the "Policy for Evaluation of Conservation Efforts when Making Listing Decisions." Policy for Evaluation of Conservation Efforts when Making Listing Decisions, 68 Fed. Reg. 15,100 (Mar. 28, 2003). In response to the suggestion of several commentators that the draft Policy be applied to all decisions, the agencies stated that "a recovery plan is the appropriate vehicle to provide guidance on actions necessary to delist a species." *Id.* at 15,101. Similarly, the NOAA quantitative working group was divided on whether the standards for listing should also be applied to delisting and reclassification decisions and therefore recommended considering those criteria separately. DEMASTER ET AL., *supra* note 20, at 5.

49. *See* 16 U.S.C. § 1533(a)(1)(D) (2006) (providing that delisting must consider "the inadequacy of existing regulatory mechanisms"); *see also id.* § 1536(a)(2) ("Each Federal agency shall . . . insure that any action . . . carried out by such agency . . . is not likely to jeopardize the continued existence of any [listed] species.").

habitat degradation and competition or predation by invasive species.[50] Although other, generally applicable statutes protect habitat (e.g., the Clean Water Act[51] and local zoning regulations), such statutes are unlikely to be sufficient to protect most listed species because they only incidentally protect habitat in the process of advancing other objectives (such as obtaining clean water). As a result, these statutes do not provide assurances of ongoing, species-specific management. Statutes on invasive species (e.g., the Nonindigenous Aquatic Nuisance Prevention and Control Act[52] and state noxious weed control programs) are also insufficiently tailored to be of much assistance. The problem is that specific species face specific, often place-based threats, threats that generally require continuing monitoring and risk management—actions that are unavailable under generally applicable statutes such as the Clean Water Act.[53]

A review of the decisions to delist species as recovered reveals that recovery has two elements. The first is *demographic*: both the species' population size and dispersal must have increased to (or at least stabilized at[54]) the point where the risk that the species will be extinguished by stochastic events and mechanistic trends has been reduced to a *reasonable* level. The second requirement is *risk management*: there must be sufficient regulatory or other conservation mechanisms in place to provide

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50. *See generally* Wilcove et al., *Leading Threats*, *supra* note 11; Wilcove et al., *Quantifying Threats*, *supra* note 11.

51. 33 U.S.C. §§ 1251–1387 (2006).

52. 16 U.S.C. §§ 4701–41 (2006).

53. *See* Holly Doremus, *Delisting Endangered Species: An Aspirational Goal, Not a Realistic Expectation*, 30 Envtl. L. Rep. 10,434 (2000) [hereinafter Doremus, *Delisting Endangered Species*]; Holly Doremus & Joel E. Pagel, *Why Listing May Be Forever: Perspectives on Delisting Under the U.S. Endangered Species Act*, 15 CONSERVATION BIOLOGY 1258 (2001) [hereinafter Doremus & Pagel, *Why Listing May Be Forever*]; Dale D. Goble & J. Michael Scott, *Recovery Management Agreements Offer Alternative to Continuing ESA Listings*, 31(1) FISHERIES 35 (2006); Jack E. Williams et al., *Prospects for Recovering Endemic Fishes Pursuant to the U.S. Endangered Species Act*, 30(6) FISHERIES 24, 24 (2005).

54. If a species' population has stabilized, the species may have recovered if there is ongoing, effective risk management. This reflects the statute's focus on the five threat factors: technically, delisting requires a determination that the threats that led to the listing of the species have been ameliorated. As the USFWS stated in its definition of "recovery," this is "the process by which the decline of an endangered or threatened species is arrested or reversed, *and threats to its survival are neutralized*, so that its long-term survival in nature can be ensured." USFWS POLICY AND GUIDELINES, *supra* note 5, at 1 (emphasis added). Generally, of course, an increase in both the number of individuals and the number of populations will reflect an amelioration of the threats that led to the listing of the species and thus will provide evidence that the biological threshold for delisting the species as recovered has been met. For this reason, recovery plans generally specify population targets—although they are, in fact, only surrogates for threat amelioration.

reasonable assurances that the species will not be again placed at risk if the ESA's protection is removed. The "reasonable" qualification in both statements is, of course, the ethical/policy judgment that the remaining risk of extinction is acceptable.

B. Defining "Recovery" Operationally: Case Studies

Currently, there are 1,318 U.S. species listed as either threatened or endangered;[55] 16 species have been delisted as recovered.[56] The delisted species fall along a continuum defined by the type of risk management that was required to address the post-delisting threats the species faced. At one end of the continuum are species such as the Aleutian cackling goose, which can be adequately protected by previously existing state and federal regulatory and monitoring mechanisms. At the other end are species, typified by Robbins' cinquefoil and the Columbian white-tailed deer, which require the development of new species-specific risk-management programs.

1. Geese and Whales, Alligators and Falcons

The Aleutian cackling goose was listed as endangered in 1967 as a result of population declines largely caused by the introduction of a predator (foxes) onto its nesting grounds, several of the Aleutian Islands off the coast of Alaska.[57] Removal of the foxes from these islands, rein-

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55. This number is current as of Jan. 15, 2009. U.S. Fish & Wildlife Serv., Box Score, http://ecos.fws.gov/tess_public/Boxscore.do (last visited Jan. 15, 2009). Of these, 1009 are listed as endangered and 309 as threatened. *Id.* The total, worldwide list contains 1892 species. *Id.*

56. The 16 species (and the date on which they were delisted) are: American alligator (June 4, 1987), brown pelican (Feb. 4, 1985), Palau fantail flycatcher (Sept. 12, 1985), Palau ground dove (Sept. 12, 1985), Palau owl (Sept. 12, 1985), gray whale (June 16, 1994), arctic peregrine falcon (Oct. 5, 1994), American peregrine falcon (Aug. 25, 1999), Aleutian cackling (Canada) goose (Mar. 20, 2001), Robbins' cinquefoil (Aug. 27, 2002), Columbia white-tailed deer [Douglas County DPS] (July 24, 2003), Hoover's woolly-star (Oct. 7, 2003), Eggert's sunflower (Aug. 18, 2005), grizzly bear [Yellowstone Ecosystem DPS] (Mar. 29, 2007), bald eagle (July 9, 2007), and Virginia northern flying squirrel (Aug. 26, 2008). *See* Species that Have Been Delisted, http://ecos.fws.gov/tess_public/DelistingReport.do (last visited Jan. 15, 2009).

57. The species was listed under the Endangered Species Preservation Act of 1966 (ESPA), a predecessor of the ESA. Endangered Species Preservation Act, Pub. L. No. 89-669, 80 Stat. 926, *repealed by* Endangered Species Act of 1973, Pub. L. No. 93-205, § 14, 87 Stat. 884, 903 (1973). Native Fish and Wildlife: Endangered Species, 32 Fed. Reg. 4001 (Mar. 11, 1967). Under the ESPA, the Secretary was not required to discuss the risk factors affecting the species; that discussion can be found in the proposal to reclassify the species from endangered to threatened in 1989. *See* Endangered and Threatened Wildlife and Plants; Proposed Reclassification of the Aleutian Canada Goose from Endangered to Threatened,

troduction of the geese onto the now fox-free islands, as well as hunting closures and habitat acquisition on the species' wintering grounds in Oregon and California, allowed the goose population to climb from 790 individuals in 1975 to 5,800 individuals in 1989 (when it was reclassified as threatened[58]) to 36,978 individuals in 2000 (just before the species was delisted in 2001[59]). During the same period, the goose breeding range increased from one to at least six islands.[60] This population increase and dispersal reduced the threat that a stochastic event would extinguish the species to an acceptable level, thus meeting the demographic threshold requirement.

Although increased population is a necessary condition for delisting, it is not in itself sufficient. If the ESA's focused protection is all that is preventing the species from being foreseeably at risk of extinction, it cannot be delisted. Thus, the second prong of the delisting inquiry: are there sufficient risk-management mechanisms in place to assure that delisting the species will not unreasonably risk its extinction?

Since the goose is a "weedy" species—a relatively prolific breeder that thrives in the types of disturbed habitats that humans create[61]—crafting a risk-management regime for the goose requires little beyond continued monitoring of the population because species-specific management tools are available. The species' nesting grounds are on the Alaska Maritime National Wildlife Refuge[62] and the USFWS therefore has the authority to take any management actions necessary to maintain the species' numbers and distribution.[63] Additionally, feeding and roosting habitat on the species' wintering grounds is conserved through a combination of fee interests and conservation easements.[64] Finally, and

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54 Fed. Reg. 40,142 (Sept. 29, 1989). The species' name has recently been changed from Aleutian Canada goose to Aleutian cackling goose.

58. Proposed Reclassification of the Aleutian Canada Goose From Endangered to Threatened, 54 Fed. Reg. at 40,142.

59. Final Rule to Remove the Aleutian Canada Goose from the Federal List of Endangered and Threatened Wildlife, 66 Fed. Reg. 15,643, 15,645 (Mar. 20, 2001) [hereinafter cited as Goose Delisting].

60. *Id.*

61. For example, the species grazes on grasses in places such as parks and agricultural lands. Cornell Lab of Ornithology, All about Birds: Cackling Goose, http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/Cackling_Goose_dtl.html (last visited Nov. 8, 2008).

62. *See* U.S. Fish & Wildlife Serv.—Alaska, Alaska Maritime National Wildlife Refuge, http://alaska.fws.gov/nwr/akmar/index.htm (last visited Jan. 24, 2006).

63. *See* 16 U.S.C. §§ 668dd–668ee (2006). *See also* U.S. Fish & Wildlife Serv.—Alaska, Wildlife: Alien / Invasive Species, http://alaska.fws.gov/nwr/akmar/wildlife-wildlands/nonnative/alien.htm (last visited Jan. 24, 2006).

64. Goose Delisting, 66 Fed. Reg. at 15,651–52.

most significantly, the species' status is monitored and take is managed by the Pacific Flyway Council,[65] a regulatory entity established under the Migratory Bird Treaty Act (MBTA) that includes constituents from federal, state, and provincial governments.[66]

The Aleutian cackling goose thus could be delisted because the threats that led to its listing were addressed at a biologically relevant scale and, as a result, its numbers increased[67] and its population dispersed sufficiently to reduce the risk of stochastic events and mechanistic trends to an acceptable level. Additionally, a conservation-management system was created that had sufficient regulatory power to prevent the species from slipping back into an at-risk status.

Many of the species that have been delisted share two crucial characteristics with the goose. First, their decline was primarily the result of a specific, remediable threat. Second, the risk-management structure necessary to prevent a recurrence of the threats was minimal and could be provided through existing regulatory mechanisms. For example:

> • The gray whale was listed as a result of severe depletion due to excessive hunting, particularly shore-based whaling operations.[68] Following listing and implementation of take prohibitions, the species' population increased. The monitoring and conservation management necessary to guard against recurrence of the demographic threat posed by overharvest is provided primarily by the International Whaling Commission[69] and the Marine Mammal Protection Act (MMPA).[70]

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65. The Council is a regional body established under the Migratory Bird Treaty Act to represent federal, state, and provincial fish and game agencies. The Pacific Flyway council is composed of the western states and provinces. *See* Pacific Flyway Council, Coordinated Management, http://pacificflyway.gov/Index.asp (last visited Apr. 22, 2009). The Council has prepared a management plan for the Aleutian Canada goose. *See* Pacific Flyway Council, Pacific Flyway Management Plan for the Aleutian Canada Goose (July 30, 1999), *available at* http://pacificflyway.gov/Abstracts.asp#acg (unpublished report).

66. 16 U.S.C. §§ 703–11 (2006). The MBTA federalized the conservation of migratory birds. *See id.*

67. Indeed, the goose is a poster child for recovery: its population has increased to the point that it cannot only be hunted, but actually has become a nuisance species in some locations. *See* Mad River Biologists, Aleutian Cackling Goose Agricultural Depredation Management Plan: Del Norte County, 2005–2006, http://www.pcjv.org/ca-pcjv/pdfs/DelNorteAleutian Plan_Final9-2006.pdf (last visited Nov. 8, 2008).

68. Endangered Fish and Wildlife; Gray Whale, 58 Fed. Reg. 3121, 3125 (Jan. 7, 1993) (providing notice of determination to delist the gray whale).

69. The International Whaling Commission was created under the International Convention for the Regulation of Whaling, Dec. 2, 1946, 10 U.S.T. 952, 161 U.N.T.S. 72.

70. 16 U.S.C. §§ 1361–1407 (2006).

- The American alligator was listed "due to concern over poorly regulated or unregulated harvests."[71] Since delisting, the alligator has continued to be monitored and managed pursuant to a special rule promulgated under the ESA's similarity of appearance provisions (since most other crocodilians are still listed).[72] In addition, the species is listed under Appendix I of the Convention on International Trade in Endangered Species of Fauna and Flora (CITES)[73] and interstate transportation regulated under the Lacey Act.[74] The USFWS concluded that these "federally enforced laws and regulations provide adequate regulation, since they . . . require that any harvest options by States meet certain minimum conditions to insure against a recurrence of the original problems which prompted listing, i.e., excessive take."[75]
- The American peregrine falcon, arctic peregrine falcon, and brown pelican were at risk of extinction due to exposure to organochlorine pesticides (e.g., DDT).[76] Populations of these

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71. Reclassification of American Alligator as Threatened Due to Similarity of Appearance Throughout the Remainder of Its Range, 52 Fed. Reg. 21,059, 21,059 (June 8, 1987).

72. 50 C.F.R. § 17.42 (2004). For the statutory provisions, see 16 U.S.C. § 1533(e) (2006).

73. Convention on International Trade in Endangered Species of Wild Fauna and Flora, Mar. 3, 1973, 27 U.S.T. 1087, 993 U.N.T.S. 243. The Convention embodies a system of import and export permits that provide the basis for a control structure to regulate international commerce in species designated for protection in one of the Convention's three appendices. *Id.* arts. II, §§ 1–3, III, §§ 2–4, IV, § 2. Appendix I includes "all species threatened with extinction, which are, or may be affected by trade," *id.* art. II, § 1; species listed in Appendix I may not be traded for commercial purposes. Appendix II species are those that may become threatened with extinction "unless trade in specimens of such species is subject to strict regulation" or species that closely resemble other Appendix II species, *id.* art. II, § 2; these species may be traded subject to restrictions. Appendix III includes all species that have been identified by a party to Convention as subject to regulation within its jurisdiction. *Id.* art. II, § 3.

74. 16 U.S.C. §§ 701, 3371–78 (2006) (prohibiting interstate shipment of wildlife taken contrary to state or federal law).

75. Reclassification of American Alligator as Threatened Due to Similarity of Appearance Throughout the Remainder of Its Range, 52 Fed. Reg. at 21,062.

76. Exposure to DDT (dicholoro-diphenyl-trichloroethane) caused peregrine egg-shell thinning and precluded successful nesting. Final Rule to Remove the American Peregrine Falcon from the Federal List of Endangered and Threatened Wildlife, and To Remove the Similarity of Appearance Provision for Free-Flying Peregrines in the Conterminous United States, 64 Fed. Reg. 46,542, 46,452 (Aug. 25, 1999); Removal of Arctic Peregrine Falcon from the List of Endangered and Threatened Wildlife, 59 Fed. Reg. 50,796 (Oct. 5, 1994). Chemicals in this class do not break down readily in the environment and thus become increasingly concentrated as they move up the food chain. Thus, concentrations of the primary metabolite of DDT (dichlorophenyl-dicholorophenylene [DDE]) were produced in the fatty tissues of the birds, which in females impaired calcium release for egg shell formation. Although the use of DDT was banned in the United States on December 31, 1972, organochlorines remain a problem due to the chemicals' persistence in the environment. En-

> species recovered as a result of a ban on DDT. The falcons also benefitted from an intensive reintroduction program that reflected their status as a charismatic species.[77] An additional benefit of this status is that the species' populations are monitored by birders and falconers. Should population declines occur, both the MBTA[78] and CITES[79] authorize regulation of the take and commerce in falcons (e.g., for use in falconry). Similarly, in delisting the brown pelican, the USFWS cited several existing regulatory mechanisms, including the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA),[80] the MBTA, and resource management statutes which gave the managing agencies sufficient authority to protect the species' habitat.[81]

This is the basic pattern: Recovery has both demographic and risk-management requirements. The species not only must have recovered biologically—that is, the threats to its existence must have been ameliorated on the biologically relevant scale—it must also be protected for the foreseeable future against known threats to its existence. For those species that were driven to the brink of extinction by overharvesting or other well-defined threats (such as pesticides), the requisite risk management can often be provided through traditional conservation tools such as take prohibitions or other common regulatory mechanisms. Once the threat has been eliminated, continuing monitoring of the species' population becomes the primary need so that, if there is a population decline, it will be noted and a regulatory response initiated. There is another factor at work that may have trumped the rest: Geese, falcons, and pelicans are habitat generalists that can flourish in human-impacted environments—the author's most recent peregrine sighting was in Washington, D.C.

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dangered and Threatened Wildlife and Plants; Final Rule to Reclassify the Bald Eagle from Endangered to Threatened in All of the Lower 48 States, 60 Fed. Reg. 35,999, 36,000 (July 12, 1995). In addition to egg-shell thinning that precludes successful nesting, organochlorine pesticides are directly toxic to pelicans. Removal of the Brown Pelican in the Southeastern United States from the List of Endangered and Threatened Wildlife, 50 Fed. Reg. 4938, 4938 (Feb. 4, 1985).

77. *See generally* William Burnham et al., *Hands-On Restoration*, *in* 2 THE ENDANGERED SPECIES ACT AT THIRTY, *supra* note 7, at 237.

78. 16 U.S.C. §§ 703–12 (2006).

79. Convention on International Trade in Endangered Species of Wild Fauna and Flora, *supra* note 73.

80. 7 U.S.C. §§ 136–136(y) (2006) (delegating the Environmental Protection Agency sufficient authority to screen chemicals to prevent the re-introduction of organochlorines).

81. The agency cited the Estuary Protection Act, 16 U.S.C. §§ 1221–26 (2006), the National Wildlife Refuge System statutes, and state regulatory systems. Removal of the Brown Pelican in the Southeastern United States from the List of Endangered and Threatened Wildlife, 50 Fed. Reg. at 4941–42.

Unfortunately, most species are not like peregrine falcons—they cannot be securely delisted based only on the protection provided by general statutes such as the MBTA. Most species are not at risk due to the types of threats—take and commercial activities—that the MBTA prohibits. Instead, most species are at risk due to habitat loss and competition from or predation by invasive species[82]—and these are threats that cannot be eliminated, only managed. Species facing such risks require continuing conservation management and a species-specific risk-management mechanism. These species demonstrate the irony of the ESA because removal of the ESA's species-focused management is likely to place the species again at risk of extinction. Delisting these species thus requires a different approach to risk management—and offers a more nuanced and broadly applicable understanding of recovery.

2. Robbins' Cinquefoil

Robbins' cinquefoil is a long-lived, dwarf member of the rose family. Historically, the species was restricted to three sites in the White Mountains of New Hampshire and Vermont. At the time of listing, however, the species had been reduced to a single population in New Hampshire. Unfortunately, that site was bisected by the Appalachian Trail and the species' abundance had been substantially reduced by trampling and habitat destruction caused by hikers.[83] This type of threat differs from those faced by the goose or the whale: while removing foxes from an island and enforcing prohibitions against killing whales will remove the threats that led to their near extinction, if the Appalachian Trail is to remain open to hikers, the cinquefoil will require continual and carefully structured management.

Following the listing of Robbins' cinquefoil in 1980, three additional populations of the species were established and the total number of individuals grew from less than 2,000 to more than 14,000 specimens in the four separate populations.[84] The increased number of individuals

82. *See generally* Wilcove & Chen, *supra* note 11; Wilcove et al., *Leading Threats*, *supra* note 11; Wilcove et al., *Quantifying Threats*, *supra* note 11.

83. Determination of Pontententilla [sic] robbinsiana to Be an Endangered Species, with Critical Habitat, 45 Fed. Reg. 61,944, 61,945 (Sept. 17, 1980). In addition, the species had been the object of intense collection activities: a detailed study found "over 850 plants in herbaria collections worldwide, which represents one of the most extensive collections known for a single species." Removal of *Potentilla robbinsiana* (Robbins' cinquefoil) from the Federal List of Endangered and Threatened Plants, 67 Fed. Reg. 54,968, 54,973 (Aug. 27, 2002) [hereinafter Cinquefoil Delisting]. Commercial collecting activities ended in the early 1900s and scientific collecting decreased as scientists became more aware of the impacts of their activities. *Id.*

84. Cinquefoil Delisting, 67 Fed. Reg. at 54,973.

and the physical separation of the populations made the species less susceptible to stochastic events, meeting the threshold demographic requirement.

The risk-management component of recovery was satisfied through a series of actions that secured cinquefoil habitat and assured ongoing management of that habitat to meet the species' biological needs. The USFWS, the land manager—United States Forest Service (USFS)—and a conservation organization—the Appalachian Mountain Club—took several steps to reduce the impact of hikers. The trail was rerouted away from the original population, and a wall was constructed around that population and posted with "closed entry" signs. In addition—and more importantly—a series of conservation-management agreements provided for ongoing monitoring and risk management for the population.[85] A Club naturalist is present during the hiking season at a hut near the population, and along with other staff at the hut, monitors human interaction with the population and provides education on the species' status and requirements.[86] The USFWS and the USFS also entered into a memorandum of understanding (MOU) for the conservation of the species under which the USFS agreed to continue to monitor and manage the populations after delisting.[87]

Robbins' cinquefoil thus was delisted because (1) translocation and habitat restoration had increased the number of individuals and populations sufficiently to provide *reasonable* assurance against stochastic risk; and (2) the threats requiring continuing risk management—trampling and habitat destruction by hikers—had also been reduced to a *reasonable* level (a) through an agreement with a conservation organization to provide monitoring and ongoing educational activities, and (b) through an MOU with the land-management agency that the habitat would be managed to maintain its biological value to the species.[88]

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85. *Id.*

86. *Id.* at 54,970, 54,972–73.

87. The USFS agreed to provide "long-term protection in the Forest irrespective of the species' standing under the Endangered Species Act." U.S. Forest Serv. and U.S. Fish & Wildlife Serv., Memorandum of Understanding for the Conservation of Robbins' Cinquefoil (*Potentilla robbinsiana*) 1 (Dec. 2, 1994). The USFWS agreed to maintain the Monroe Flats habitat, "vigorously protect[ ]" the species from take through human disturbance, to train personnel, and to provide educational and interpretational information to visitors to the forest. *Id.* at 3.

88. The Hoover's woolly-star offers a variation on the cinquefoil pattern—albeit, a far more minimalist variation. The species is an annual herb in the phlox family that grows in the San Joaquin and Cuyama Valleys in California. Land conversion (oil, gas, and agricultural development, and urbanization) had extirpated several populations and left the remaining populations at risk. Determination of Endangered or Threatened Status for Five Plants from the Southern San Joaquin Valley, 55 Fed. Reg. 29,361, 29,368, 29,363–64 (July 19,

Again, the conclusions on "reasonableness" reflect an ethical/policy judgment that the risk faced by the species faces was acceptable.

3. Columbian White-Tailed Deer

The Columbian white-tailed deer further illustrates the range of conservation-management activities that may be required following delisting. The species was once common in the bottomlands and prairie woodlands of the lower Columbia, Willamette, and Umpqua River basins in western Oregon and southwestern Washington. It declined rapidly following Euro-American settlement as a result of habitat loss, uncontrolled sport and commercial hunting, and "perhaps other factors."[89] By the early 1900s, the species had been reduced to two disjunct populations: one along the lower Columbia River and the other in the Umpqua Valley of Douglas County in southern Oregon. Following its listing under a predecessor of the ESA in 1967,[90] the Douglas County deer population increased from an estimated 400–500 animals in 1970[91] to more than 6,000 animals in 2002 as a result of recovery activities undertaken pursuant to the ESA.[92] Since the Columbia River population had not increased significantly, the USFWS designated the two populations as DPS and delisted the Douglas County DPS as recovered.[93] Al-

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1990). The species was also threatened by the federal land-managing agencies' practices such as introducing nonnative grasses to stabilize soil. *Id.* at 29,365.

The threats requiring continuing conservation management—oil and gas development, urbanization, grazing, agricultural conversion—were reduced to a *reasonable* level through (1) an extensive reserve network of secure habitats under federal, state, and private management, coupled with (2) commitment by the primary land-managing agency to "ensure that actions they authorize, fund, or carry out do not contribute to the need to relist the species." Removing Eriastrum hooveri (Hoover's woolly-star) from the Federal List of Endangered and Threatened Species, 68 Fed. Reg. 57,829, 57,832 (Oct. 7, 2003); *see also id.* at 57,835–36.

In delisting the woolly-star, the USFWS accepted a far less robust risk-management structure. For example, the agency did not enter into a formal MOU with the land-managing agency, concluding instead that "management practices of, and commitments by, the U.S. Bureau of Land Management, on whose land a substantial number of new populations have been found, will afford adequate protection to the species upon delisting." *Id.* at 57,829.

89. Final Rule to Remove the Douglas County Distinct Population Segment of Columbian White-Tailed Deer from the Federal List of Endangered and Threatened Wildlife, 68 Fed. Reg. 43,647, 43,647 (July 24, 2003) [hereinafter Deer Delisting].

90. Native Fish and Wildlife; Endangered Species, 32 Fed. Reg. 4001 (Mar. 11, 1967).

91. Endangered and Threatened Wildlife and Plants; Proposed Rule to Delist the Douglas County Population of Columbian White-Tailed Deer, 64 Fed. Reg. 25,623, 25,264 (May 12, 1999).

92. Deer Delisting, 68 Fed. Reg. at 43,648.

93. *Id.*

though there was only a single population in each DPS,[94] the increased number of individuals and the concomitant range expansion of the DPS in Douglas County led the agency to conclude that the DPS faced a substantially reduced—and acceptable—risk from a stochastic event such as fire.

The deer's specific risk-management requirements were met through a variety of regulatory and other conservation mechanisms. Threat factors such as overutilization from hunting were addressed through traditional game management tools such as take prohibitions (as was the case with both the goose and the whale). The threat of habitat loss through land conversion to agriculture and residential home sites, however, differs from traditional wildlife management in at least two relevant ways. First, given human demographic trends, the threat is likely to intensify over the foreseeable future. Second, it is not a question of removing a predator or a poison. Even if land were set aside permanently, habitat fragmentation and loss requires ongoing monitoring and management because nature is not static—particularly in an age of global climate change.[95] There were, however, no existing risk-management mechanisms—such as the Pacific Flyway Council under the MBTA that was available to monitor the status of the goose[96]—that could monitor and manage the range of risks facing the deer from the modification of its habitat. Something more was required.

The USFWS addressed this need by requiring at least 5,000 acres of "secure habitat" as a recovery requirement. The agency defined "secure" as "areas that are protected from adverse human activities . . . in the foreseeable future, and that are relatively safe from natural phenomena that would destroy their value to the subspecies."[97] This definition, it is important to note, has both a legal and a biological component: The habitat must be legally protected, and it must be managed to continue to meet the biological requirements of the species.

The legal component could be satisfied, the agency concluded, through "zoning ordinances, land-use planning, parks and greenbelts, agreements, memoranda of understanding, and other mechanisms available to local jurisdictions,"[98] as well as public ownership of the land or protection of habitat by private conservation organizations through

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94. Although multiple populations increase a species' likelihood of survival, the USFWS summarily rejected public comments contending that a third population should be established prior to delisting. *Id.* at 43,652–53.

95. *See generally, e.g.*, Douglas Fox, *Back to the No-Analog Future?*, 316 SCI. 823 (2007).

96. *See* Pacific Flyway Council, *supra* note 65.

97. Deer Delisting, 68 Fed. Reg. at 43,651.

98. *Id.*

"easements, leases, acquisitions, donations, or trusts."[99] In response, public entities (primarily the Bureau of Land Management (BLM) and the county) acquired over 7,000 acres of habitat.[100] The county also adopted a Columbian White-Tailed Deer Habitat Protection Program that imposed land-use controls, including minimum lot sizes and set-back requirements in deer habitat.[101]

Simply setting aside habitat is insufficient, however, because there must also be legal assurances that that habitat will be managed to continue to meet the biological needs of the species. Risk management, in other words, requires *management*. For the Columbian white-tailed deer, the largest publicly owned parcel of habitat is the BLM-managed North Bank Habitat Management Area, a 7,000-acre former cattle ranch that the BLM acquired to provide habitat for the species.[102] The BLM management plan for the Area includes controlled burns, grazing modifications, and restoration activities to increase the quality of habitat to the deer.[103] In addition, the Douglas County Parks Department manages a 1,100-acre park as a wildlife refuge and a working ranch in part to provide habitat for the species.[104]

The Douglas County population of Columbian white-tailed deer thus was delisted because (1) its population and distribution had increased to the point that the risk from stochastic events and mechanistic trends was reduced to a *reasonable* level, thus satisfying the threshold demographic requirement; and (2) the threat facing the species that required continuing risk management—maintenance of sufficient suitable habitat—was also reduced to a *reasonable* level through (a) legal protection of the habitat, and (b) agreements with the landowners or managers of that habitat to ensure that it would be managed to maintain its biological value to the species.

4. Bald Eagle

The delisting of the bald eagle is a striking example of the success of the ESA. Since its listing in 1967, the species' population has increased

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99. *Id.* The security of these various tools may vary widely. Federal acquisition of land is probably the most secure; acquisition by private conservation organizations is also likely to be relatively secure (depending upon funding); local politics, on the other hand, may be hostile to the conservation needs of the species or prove to be unwilling to expend the necessary funds.

100. *Id.* at 43,653–54.

101. *Id.* at 43,654–55.

102. Deer Delisting, 68 Fed. Reg. at 43,653.

103. *Id.* at 43,653–54.

104. *Id.* at 43,654. The Nature Conservancy also manages a 35-acre site in part to provide deer habitat. *Id.*

significantly: the number of breeding pairs grew from approximately 500 to 5,748 (in 1998) and then to 9,789 (in 2007).[105] In proposing to delist the species in 1999, the USFWS noted that "[t]he bald eagle population has essentially doubled every 7 to 8 years during the past 30 years."[106] In addition, the population increases were broadly distributed across four of the five recovery regions.[107] This increased population and distribution satisfied the demographic element of recovery. Indeed, most recovery regions met their population goals in the early 1990s.

The problem that delayed delisting the species was securing the necessary risk management. Delisting the bald eagle—a species with continent-wide distribution—raises difficulties that were not present with such narrowly distributed species as Robbins' cinquefoil or the Columbian white-tailed deer. While it is possible to provide specific, place-based risk management for all of the existing populations of the cinquefoil and the deer; to do the same for the existing populations of eagles is

105. Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States From the List of Endangered and Threatened Wildlife, 72 Fed. Reg. 37,346, 37,347–48 (July 9, 2007).

106. Endangered and Threatened Wildlife and Plants; Proposed Rule to Remove the Bald Eagle from the List of Endangered and Threatened Wildlife, 64 Fed. Reg. 36,454, 36,457 (July 6, 1999).

107. The Chesapeake Recovery Region had over 800 breeding pairs in 2003; the recovery goal (300 nesting pairs) was met in 1992. Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States From the List of Endangered and Threatened Wildlife, 71 Fed. Reg. 8238, 8241–42 (Feb. 16, 2006). The Northern States Recovery Region had 2559 occupied breeding areas in 2000; the recovery goal of 1200 occupied areas was met in 1991. *Id.* at 8242. The Pacific Recovery Region had 1627 breeding pairs in 2001; the recovery goal of 800 pairs was met in 1990. *Id.* The Southeastern Recovery Region had 1500 occupied breeding areas in 2000; the recovery goal (1500 occupied areas) was met in 1997–2000. *Id.* The agency's discussion of the Southwestern Recovery Region was anomalous. After noting that the 1982 recovery plan did not include recovery goals—it instead contained a downlisting goal—the agency simply states "[t]he goal established in the recovery plan has been exceeded." *Id.* at 8242. In contrast to the other recovery regions, the discussion of the Southwestern Region was notably conclusory. The decision to delist the Southwestern Recovery Region population was challenged by the Center for Biological Diversity and the Maricopa Audubon Society. The district court held that the USFWS had acted arbitrarily and capriciously and remanded the delisting. Center for Biological Diversity v. Kempthorne, 2008 WL 659822 (D. Ariz. Mar. 6, 2008). On May 1, 2008, the agency relisted the population as threatened. Endangered and Threatened Wildlife and Plants; Listing the Potential Sonoran Desert Bald Eagle Distinct Population Segment as Threatened under the Endangered Species Act, 73 Fed. Reg. 23,966 (May 1, 2008). On May 20, the USFWS initiated a status review of the population. Endangered and Threatened Wildlife and Plants; Initiation of Status Review for the Bald Eagle (Haliaeetus leucocephalus) in the Sonoran Desert Area of Central Arizona and Northwestern Mexico, 73 Fed. Reg. 29,096 (May 20, 2008).

a far more complex task. But—like the deer—the dominant threat facing the eagle is habitat loss, a threat that can be managed but not eliminated.

One difficulty inherent in managing habitat is the "Tragedy of Fragmentation"—a threat caused by diffuse, local decision making.[108] Boundaries—be they political or proprietary—often produce myopic decisions that can aggregate into a large decision that is never explicitly acknowledged and decided. Although the "Tragedy of the Commons" is better known,[109] it is the "Tragedy of Fragmentation" that poses a far greater risk to biodiversity. Consider, for example, coastal wetlands. Between 1950 and 1970, nearly 50 percent of the wetlands along the coasts of Connecticut and Massachusetts were destroyed, not as a result of a conscious decision, but through the conversion of hundreds of small tracts.[110] The fragmentation of land ownership and political jurisdiction to make land-use decisions resulted in a focus on individual parcels that obscured the cumulative impact of these small decisions. This is the problem facing the eagle: the habitat preferences of the eagle parallel those of our species, and decisions to permit the construction of a home are made in a setting that is unlikely to value eagles equally with increased tax revenue and the multiple economic advantages of "development." The decision to delist the eagle is noteworthy because of the agency's response to the twinned problem of continental distribution and local decision making.

In re-listing the eagle in 1978,[111] the USFWS concluded that it was at risk of extinction as a result of three of the five threat factors. First, breeding habitat "ha[d] been considerably reduced [due to h]uman activities, such as logging, housing developments, and recreation."[112] Second,

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108. *See generally* Alfred E. Kahn, *The Tyranny of Small Decisions: Market Failures, Imperfections, and the Limits of Economics*, 19 KYKLOS 23 (1966); DALE D. GOBLE & ERIC T. FREYFOGLE, WILDLIFE LAW 1363–65 (2002); Dale D. Goble, *The Property Clause—as if Biodiversity Mattered*, 75 U. COLO. L. REV. 1196 (2004).

109. *See generally* Garret Hardin, *The Tragedy of the Commons*, 162 SCI. 1243 (1968).

110. William E. Odum, *Environmental Degradation and the Tyranny of Small Decisions*, 32 BIOSCI. 728, 728 (1982).

111. The "southern bald eagle" was listed as endangered on March 11, 1967. Native Fish and Wildlife; Endangered Species, 32 Fed. Reg. 4001, 4001 (Mar. 11, 1967). Following enactment of the ESA, USFWS listed the entire species as endangered throughout the conterminous 48 states except in Washington, Oregon, Minnesota, Wisconsin, and Michigan where it was listed as threatened. Determination of Certain Bald Eagle Populations as Endangered or Threatened, 43 Fed. Reg. 6230 (Feb. 14, 1978).

112. Determination of Certain Bald Eagle Populations as Endangered or Threatened, 43 Fed. Reg. at 6232.

the species continued to be killed illegally.[113] Third, organochlorine pesticides contributed to reproductive failure because of their presence in the environment, particularly in the Northeast.[114] When the agency reexamined these threats in re-proposing to delist the species in 2006, it noted that eagles were still being poached and that some populations continued to experience depressed breeding success due to organochlorines.[115] The agency nonetheless concluded that neither factor was a serious threat to the species since neither had prevented the species' dramatic population increases.[116]

Once again, however, habitat loss presented a more intractable problem. Since eagles depend upon large trees within two miles of water for nesting and will abandon nests if disturbed by human activity, the species is vulnerable to water-associated development and to human disturbances caused by water-based recreation.[117] Although the agency concluded that habitat loss was not currently a limiting factor, it did acknowledge that eagle habitat is often subject to development pressures and, therefore, that habitat loss may limit future growth of some populations. Nonetheless, in re-proposing delisting the species the agency was optimistic: "Despite these potential limitations . . . numerous factors ensure the bald eagle is not likely to become endangered in the foreseeable future by loss of suitable habitat."[118] The most important of these factors was the substantial amount of habitat on protected lands (e.g., national wildlife refuges, national parks, national forests, state and private con-

113. *Id.* ("Shooting continues to be the leading cause of direct mortality in adult and immature bald eagles, accounting for 40 to 50 percent of the birds picked up by field personnel.").

114. *Id.*

115. Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States from the List of Endangered and Threatened Wildlife, 71 Fed. Reg. 8238, 8246, 8249 (Feb. 16, 2006).

116. The agency noted that, although a low level of illegal shooting and trade in eagle feathers continues, these activities can be controlled under the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. §§ 668–668d (2006), and the MBTA, *id.* §§ 703–11. Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States from the List of Endangered and Threatened Wildlife, 71 Fed. Reg. at 8246.

117. Endangered and Threatened Wildlife and Plants; Reclassify the Bald Eagle from Endangered to Threatened in Most of the Lower 48 States, 59 Fed. Reg. 35,584, 35,589–90 (July 12, 1994); Endangered and Threatened Wildlife and Plants; Final Rule to Reclassify the Bald Eagle from Endangered to Threatened in All of the Lower 48 States, 60 Fed. Reg. 36,000, 36,006 (July 12, 1995).

118. Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States from the List of Endangered and Threatened Wildlife, 71 Fed. Reg. at 8246. The reach of "foreseeable future" was left unspecified. *See id.*

servation lands) and the numerous federal laws that "will remain in place after delisting to ensure the continued recovery of the eagle."[119]

Although the *Federal Register* notices cite a remarkably long list of federal statutes that will continue to protect the species after delisting,[120] there are two significant difficulties that the agency failed to acknowledge. First, the most powerful and specifically applicable of the statutes—the MBTA (enacted in 1918) and the Bald and Golden Eagle Protection Act (BGEPA) (enacted in 1940)—were in place long before the listing of the bald eagle under the ESA and thus, demonstrably had failed to prevent the species' slide toward extinction. Given this track record, the agency's renewed faith in the statutes is curious. Second, none of the statutes in the lengthy list protect habitat. Given that habitat loss is the most serious threat facing the species, the lack of legal authority to protect habitat is a significant impediment to delisting the species as recovered, despite its demographic recovery.

To overcome this difficulty, the USFWS adopted a new, narrowly focused regulatory program.[121] Under BGEPA, it is illegal to "take . . . at any time or in any manner" a bald or golden eagle.[122] The Act subsequently defines "take" to "include[ ] . . . pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or *disturb*."[123] The inclusion of the term "disturb" broadens the concept,[124] arguably to include

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119. *Id.* at 8249; *see also* Endangered and Threatened Wildlife and Plants; Proposed Rule to Remove the Bald Eagle from the List of Endangered and Threatened Wildlife, 64 Fed. Reg. 36,454, 36,458 (July 6, 1999).

120. *See generally* Endangered and Threatened Wildlife and Plants; Proposed Rule to Remove the Bald Eagle from the List of Endangered and Threatened Wildlife, 64 Fed. Reg. at 36,459; Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States From the List of Endangered and Threatened Wildlife, 72 Fed. Reg. 37,346, 37,347–48 (July 20, 2007). The list includes: the BGEPA, which prohibits take, possession, and commercial activities, 16 U.S.C. §§ 668–668d (2006); the MBTA, which also prohibits take, possession, and commercial activities, 16 U.S.C. §§ 703–11 (2006); the Lacey Act, which criminalizes interstate shipment of illegally acquired birds and (more commonly) bird parts, 16 U.S.C. § 3372 (2006) and 18 U.S.C. §§ 42–44 (2006); Convention on International Trade in Endangered Species of Wild Fauna and Flora, *supra* note 73; FIFRA, 7 U.S.C. §§ 136–136(y) (2006); and the Fish and Wildlife Coordination Act, which requires consideration of wildlife in water resource development projects, 16 U.S.C. §§ 661–661(c) (2006).

121. Protection of Eagles; Definition of "Disturb," 72 Fed. Reg. 31,132 (June 5, 2007); U.S. FISH & WILDLIFE SERV., NATIONAL BALD EAGLE MANAGEMENT GUIDELINES (May 2007), *available at* http://www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf [hereinafter EAGLE MANAGEMENT GUIDELINES].

122. 16 U.S.C. § 668 (2006).

123. *Id.* § 668(c) (emphasis added).

124. The expansiveness of "disturb" is tempered by the culpability standard, which requires the actor to act "knowingly, or with wanton disregard for the consequences of his act." *Id.* § 668. Inclusion of the term "disturb" also distinguishes the BGEPA from the MBTA. The courts have resisted extending the MBTA's prohibitions to habitat modifying

habitat-affecting activities. In preparing to delist the species, the USFWS promulgated a regulation defining "disturb" as:

> [T]o agitate or bother a bald or golden eagle to the degree that causes, or is likely to cause, based on the best scientific evidence available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.[125]

The preamble to the *Federal Register* notice emphasized that the phrase "is likely to cause" was included so that actual injury, death, or nest abandonment did not have to be documented "since death or injury will almost always occur at a later date and sometimes a different location."[126] The agency also noted that "injury" need not include wounding or killing an eagle but extended to a "decrease in its productivity."[127]

Simultaneously with promulgating the regulatory definition of "disturb," the agency issued *National Bald Eagle Management Guidelines*[128] to "[a]dvise landowners, land managers, and the general public of the potential for various human activities to disturb bald eagles."[129] The *Guidelines* state:

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activities such as logging. *See, e.g.*, Newton County Wildlife Ass'n v. U.S. Forest Serv., 113 F.3d 110 (8th Cir. 1997); Sierra Club v. Martin, 110 F.3d 1551 (11th Cir. 1997); Seattle Audubon Soc'y v. Evans, 952 F.2d 297 (9th Cir. 1991); Mahler v. U.S. Forest Serv., 927 F. Supp. 1559 (S.D. Ind. 1996).

125. Protection of Eagles; Definition of "Disturb," 72 Fed. Reg. at 31,132. In its discussion of the regulation, the agency noted that the only court that had considered the relationship between the ESA and BGEPA had concluded that "[t]he plain meaning of the term 'disturb' is at least as broad as the term 'harm' and both terms are broad enough to include adverse habitat modification." *Id.* at 31,133 (quoting Contoski v. Scarlett, 2006 WL 2331180, at *3 (D. Minn. Aug. 10, 2006)). *Cf.* 50 C.F.R. § 17.3 (2008) ("*Harm* in the definition of 'take' in the [Endangered Species] Act means an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.") (emphasis added); *see also* Babbitt v. Sweet Home Chapter, 515 U.S. 687 (1995) (upholding the regulatory definition of "harm" with potentially significant causation-based limitations).

126. Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States From the List of Endangered and Threatened Wildlife, 72 Fed. Reg. at 31,132.

127. *Id.* at 31,133.

128. EAGLE MANAGEMENT GUIDELINES, *supra* note 121.

129. *Id.* at 1. One of the ironies of the ESA in contrast to BGEPA is that the latter is a much less flexible statute since it does not contain incidental take provisions. As the agency stated, "[a]lthough it is not possible to absolve individuals and entities from liability under the Eagle Act or the MBTA, the Service exercises enforcement discretion to focus on those

> In addition to immediate impacts, th[e new regulatory] definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.[130]

The definition of "disturb" and the *Guidelines* are an attempt to overcome the "Tragedy of Fragmentation" and to manage the threats to habitat for a species with a continent-wide range. The agency's position is that tying the habitat protection provisions of the proposed definition of "disturb" through the *Guidelines* to existing and alternate nest sites[131] overcomes the difficulties both in defining the specific habitat to be protected and in specifying how that habitat should be managed. The agency argues that this approach provides reasonable assurance of the necessary risk management. If it is successful in protecting sufficient individual nest and roosting sites, it will be because of the ESA: By protecting individual nest and roosting sites, the Act identifies these sites so that they will continue to receive protection into the future. Unfortunately, however, local pressure to develop is insistent and the national perspective is easily distracted by newer goals.

5. Gray Wolf

The recently departed Bush administration's Department of the Interior tried three times to delist most wolves in the United States; it was twice rebuffed by the courts and the success of the third attempt remains uncertain.[132] This article's focus is limited to the second failed

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individuals, companies, or agencies that take migratory birds without regard for the consequences of their actions and the law, especially when conservation measures, such as these Guidelines, are available, but have not been implemented. The Service will prioritize its enforcement efforts to focus on those individuals or entities who take bald eagles or their parts, eggs, or nests without implementing appropriate measures recommended by the Guidelines." *Id.*

130. *Id.* at 2. The Guidelines also note that activities that impact migrating and winter roost sites fall within the definition of "disturb" because such activities may interfere with feeding. *Id.* at 8–9. The protection for such sites is less, however. The interference must cause injury or death because, although the proposed definition includes "nest abandonment" as a prohibited result, it does not include roost abandonment.

131. *Id.* at 7–8, 11.

132. The result is a complicated history. For the period through the current (third) attempt, see Dale D. Goble, *Recovery in a Cynical Time–With Apologies to Eric Arthur Blair*, 82 U. WASH. L. REV. 581 (2007) [hereinafter Goble, *Recovery in a Cynical Time*]; *see also* Humane Soc'y v. Kempthorne, 579 F. Supp. 2d 7 (D.D.C. 2008).

attempt to delist wolves in the northern Rocky Mountains. This attempt provides a useful example that brings together many of the points previously discussed.

There were no populations of wolves in the northern Rocky Mountains when the species was listed as endangered in 1973.[133] In 1982, however, a wolf pack from Canada began to occupy the northern reaches of Glacier National Park along the Canadian border. In 1986, the first litter of pups in over 50 years was discovered in the park near the border. The same year another pack denned east of the park on the Blackfeet Indian Reservation.[134]

With the arrival of a breeding population of wolves in the northern Rocky Mountains, the USFWS prepared a revised recovery plan in 1987.[135] The plan set out both biological and risk-management goals. Biologically, the plan called for the establishment of three "viable, self-sustaining populations" in the region: one in northwestern Montana, one in central Idaho, and one in Yellowstone National Park (YNP).[136] To satisfy the legal, risk-management element of recovery, the plan's authors speci-

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133. Between 1967 and 1976, the USFWS listed four subspecies of wolf under the ESA and its predecessors. The "timber wolf" (*Canis lupus lycaon*) was the first subspecies listed when it was determined to be endangered in Minnesota and Michigan in 1967. Native Fish and Wildlife; Endangered Species, 32 Fed. Reg. 4001, 4001 (Mar. 11, 1967). This decision was followed by listings of the "Northern Rocky Mountain wolf" (*Canis lupus irremotus*), Conservation of Endangered Species and Other Fish or Wildlife; Amendments to Lists of Endangered Fish and Wildlife, 38 Fed. Reg. 14,678 (June 4, 1973); the "Mexican wolf" (*Canis lupus baileyi*), Endangered and Threatened Wildlife and Plants; Determination That Two Species of Butterflies Are Threatened Species and Two Species of Mammals Are Endangered Species, 41 Fed. Reg. 17,736 (Apr. 28, 1976); and the "gray wolf" (*Canis lupus monstrabilis*), Endangered and Threatened Wildlife and Plants; Endangered Status for 159 Taxa of Animals, 41 Fed. Reg. 24,062 (June 14, 1976). In 1978, the agency concluded that "the taxonomy of wolves is out of date," abandoned the subspecific designations, and listed the entire species—now denominated simply "gray wolf"—as endangered throughout its range in the conterminous United States and Mexico except in Minnesota and Isle Royal National Park, Michigan, where it was listed as threatened. Endangered and Threatened Wildlife and Plants; Reclassification of the Gray Wolf in the United States and Mexico, with Determination of Critical Habitat in Michigan and Minnesota, 43 Fed. Reg. 9607 (Mar. 9, 1978).

134. Endangered and Threatened Wildlife and Plants; Designating the Northern Rocky Mountain Population of Gray Wolf as a Distinct Population Segment; Removing the Northern Rocky Mountain Distinct Population Segment From the Federal List of Endangered and Threatened Species, 71 Fed Reg. 6634, 6635 (Feb. 8, 2006) [hereinafter Wolf Delisting].

135. *See* U.S. FISH & WILDLIFE SERV., NORTHERN ROCKY MOUNTAIN WOLF RECOVERY PLAN (1987), *available at* http://www.fws.gov/mountain-prairie/species/mammals/wolf/NorthernRockyMountainWolfRecoveryPlan.pdf.

136. *Id.* at 19, 22. The plan indicated that then-current information suggested that this would require "a minimum of 10 breeding pairs in each of three recovery areas for a minimum of 3 successive years." *Id.* at 19.

fied that "[d]elisting . . . will be contingent upon the species being classified as a game animal, furbearer, or other protected status by the States."[137] Although the plan emphasized recovery through dispersal, it acknowledged that the probability of recolonization of YNP through natural dispersal was "remote" and that translocation of individuals would probably be necessary to achieve the goal of establishing three populations.[138] As part of the translocation process, the USFWS issued an environmental impact statement (EIS) in 1994 that evaluated the reintroduction of wolves. Because "[t]he assessment of viability of populations has evolved rapidly since the [recovery] plan was finalized," the agency used the EIS as an opportunity to update the science on biological recovery.[139] The science review concluded that the numerical goal in the 1987 plan—10 breeding pairs in each of three recovery areas for a minimum of three successive years—"was, at best, a minimal recovery goal."[140]

As the number of wolves in the northern Rocky Mountains began to approach the "minimal" numerical recovery goal, the USFWS again updated the science in 2001–02. Based upon a literature review and solicited expert opinion, the agency adopted the 1994 EIS's "more . . . stringent definition of wolf population viability and recovery."[141] The agency acknowledged that:

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137. *Id.* at 19.

138. *Id.* at iv.

139. U.S. FISH & WILDLIFE SERV., THE REINTRODUCTION OF GRAY WOLVES TO YELLOWSTONE NATIONAL PARK AND CENTRAL IDAHO 37 (1994) (Memorandum Regarding a Viable Wolf Population in the Northern Rocky Mountains), *available at* http://www.fws.gov/mountain-prairie/species/mammals/wolf/EIS_1994.pdf [hereinafter WOLF EIS]. The discussion reaffirmed that the fundamental biological goal was "a more or less self sustaining or 'viable' population." *Id.*

140. The quote is the characterization of the conclusion in Wolf Delisting, 71 Fed Reg. at 6635, based on the analysis in the EIS. WOLF EIS, *supra* note 139, at 41–42. Following publication of the EIS, the USFWS designated portions of Idaho, Montana, and Wyoming as two experimental populations. Endangered and Threatened Wildlife and Plants; Establishment of a Nonessential Experimental Population of Gray Wolves in Yellowstone National Park in Wyoming, Idaho, and Montana, 59 Fed. Reg. 60,252 (Nov. 22, 1994); Endangered and Threatened Wildlife and Plants; Establishment of a Nonessential Experimental Population of Gray Wolves in Central Idaho and Southwestern Montana, 59 Fed. Reg. 60,266 (Nov. 22, 1994). On experimental populations, see generally Goble, *Experimental Populations*, *supra* note 7. In 1995 and 1996, the agency released 66 wolves into the two areas, 35 in central Idaho and 31 in YNP. Endangered and Threatened Wildlife and Plants; Regulation for Nonessential Experimental Population Segment of the Western Distinct Population Segment of the Gray Wolf; Final Rule, 70 Fed. Reg. 1286, 1287 (Jan. 6, 2005).

141. Wolf Delisting, 71 Fed Reg. at 6635.

> [T]en breeding pairs in isolation will not comprise a 'viable' population (i.e., have a high probability of survival for a long period without human intervention). Thirty or more breeding pairs comprising some 300+ wolves in a metapopulation (a population that exists as partially isolated sets of subpopulations) . . . with genetic exchange between subpopulations should have a high probability of long-term persistence.[142]

Although the species achieved the recovery plan's numerical goals in 2000,[143] there was no evidence of the required genetic exchange among the three populations.[144] The risk-management element of recovery (state protection of the species) was even more problematic.

In February 2006, the USFWS issued an advanced notice of proposed rulemaking to designate a population of wolves as a Northern Rocky Mountain Distinct Population Segment (NRM DPS) and to delist that NRM DPS.[145] That August, the agency designated the population a DPS but determined that delisting was not warranted. As the agency noted, "[b]ecause the primary threat to the wolf population (human predation and other take) still has the potential to significantly impact wolf populations if not adequately managed, the Service needs regulatory assurances that the States will manage for sustainable mortality levels before we can remove ESA protections."[146] The difficulty, the agency stated, was that "Wyoming State law and its wolf management plan do not provide the necessary regulatory mechanisms to assure that Wyoming's numerical and distributional share of a recovered NRM wolf population would be conserved if the protections of the ESA were removed."[147]

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142. *Id.* (quoting WOLF EIS, *supra* note 139, at 42). *See* Defenders of Wildlife v. Hall, 565 F. Supp. 2d 1160, 1168–69 (D. Mont. 2008).

143. Wolf Delisting, 71 Fed. Reg. at 6635–36.

144. *See Hall*, 565 F. Supp. 2d at 1168–69.

145. Wolf Delisting, 71 Fed. Reg. at 6634.

146. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to Establish the Northern Rocky Mountain Gray Wolf Population (*Canis lupus*) as a Distinct Population Segment To Remove the Northern Rocky Mountain Distinct Population Segment from the Federal List of Endangered and Threatened Wildlife, 71 Fed. Reg. 43,410, 43,426 (Aug. 1, 2006). *See generally id.* at 43,423–24. In January 2004, the USFWS determined that Wyoming's wolf management plan was inadequate. Wyoming's challenge to this decision was dismissed on procedural grounds by the district court, a decision that was affirmed by the Tenth Circuit Court of Appeals. Wyoming v. U.S. Dep't of the Interior, 360 F. Supp. 2d 1214 (D. Wyo. 2005), *aff'd per curiam*, 442 F.3d 1262 (10th Cir. 2006).

147. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to Establish the Northern Rocky Mountain Gray Wolf Population (*Canis lupus*) as a Distinct Population Segment To Remove the Northern Rocky Mountain Distinct Population Segment from the Federal List of Endangered and Threatened Wildlife, 71 Fed. Reg. at 43,430. The USFWS published a second proposed rule to delist the NRM DPS in February 2007.

In February 2008, after Wyoming made minor changes to its wolf management plan, the USFWS delisted the NRM DPS as recovered.[148] In July, the agency's decision was vacated by the Federal District Court of Montana. The court held that the agency had failed to satisfy either prong of the recovery standard.[149] First, the court concluded that the USFWS had failed to establish that the NRM DPS had recovered biologically since there was "no evidence of genetic exchange between wolves in Yellowstone National Park and the northwestern Montana or central Idaho core recovery areas."[150] The court noted that, although the agency had previously concluded that "without ongoing genetic exchange, isolated subpopulations of merely 100 individuals and 10 breeding pairs [the *numerical* recovery goal] will not exhibit genetic diversity sufficient to withstand environmental variability and stochastic events,"[151] in its decision to delist the species the agency simply asserted that genetic exchange was unnecessary. The court reversed the agency's decision because it had failed to provide a reasoned justification.[152] The court also reversed the agency's decision for failing to meet its obligation to provide reasonable assurances that post-delisting risk management would be sufficient to protect the species. The USFWS failed to explain why the Wyoming wolf management plan was sufficient given that there was no significant difference between the state's new plan and the 2003 plan that USFWS had previously determined to be insufficient.[153]

What the court did not note was that both the Idaho and Wyoming plans proposed to reduce the number of individuals in the delisted population, a goal that differed from all other risk-management mechanisms. Idaho's wolf management plan authorized killing more than one-third of the wolves in the state[154] and Wyoming's plan was even more

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Endangered and Threatened Wildlife and Plants; Designating the Northern Rocky Mountain Population of Gray Wolf as a Distinct Population Segment and Removing This Distinct Population Segment From the Federal List of Endangered and Threatened Wildlife, 72 Fed. Reg. 6106 (Feb. 8, 2007). The agency proposed to delist the species in Idaho and Montana and offered to delist the species in Wyoming if that state "adopts a State management plan that is consistent with the requirements . . . that have already been incorporated into Montana's and Idaho's regulatory framework." *Id.* at 6134.

148. Final Rule Designating the Northern Rocky Mountain Population of Gray Wolf as a Distinct Population Segment and Removing This Distinct Population Segment from the Federal List of Endangered and Threatened Wildlife, 73 Fed. Reg. 10,514 (Feb. 27, 2008).

149. *Hall*, 565 F. Supp. 2d at 1163–64.

150. *Id.* at 1168–69.

151. *Id.* at 1168.

152. *Id.* at 1170–71.

153. *Id.* at 1172–75.

154. Roger Phillips, *F&G Rules Could Slash Idaho Wolf Numbers in Half*, IDAHO DAILY STATESMAN, May 23, 2008. The Idaho plan managed the species to maintain at least 518

severe: the state declared the wolf a predator, an unprotected category of wildlife that could be killed by anyone by any method other than poisoning. Since Wyoming does not require a license to kill predators, once the delisting became final, "[h]unters from around the state flocked to rural Sublette County to bag a wolf."[155] The result was the killing of at least 130 wolves prior to the district court's issuance of an injunction in July.[156]

The attempt to delist the NRM DPS raises another, broader question. The agency justified its attempt by relying upon the fact that the number of individual wolves was greater than the number of individuals identified as necessary for recovery in the 1987 recovery plan. In doing so, it implicitly relied on the ESA's requirement that recovery plans include "objective, measurable criteria which, when met, would result in a determination . . . that the species be removed from the list."[157] The inadequacy of the attempted delisting reveals the fundamental problem with focusing on quantifiable recovery goals: "Objective measurable criteria" cannot capture the qualitative issues presented by the need for legally sufficient risk-management mechanisms to replace the ESA when a species is delisted. It is the quality of the protection rather than the number of mechanisms that is crucial. An exclusive emphasis on quantitative recovery criteria thus raises concerns that species such as the NRM DPS might be delisted into a world that provides little assurance of its continued survival.[158]

Like the bald eagle, the NRM DPS demonstrates the crucial role that the risk-management structure plays in delisting species as recovered. Unlike the eagle, however, there is no federal statute that can be used or modified to provide protection against the threats facing the wolf. State management plans thus will be essential to maintaining the

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wolves. IDAHO LEGISLATIVE WOLF OVERSIGHT COMMITTEE, IDAHO WOLF CONSERVATION AND MANAGEMENT PLAN, tbl. 1, at 5 (2002), *available at* http://fishandgame.idaho.gov/cms/wildlife/manage/wolf_plan.pdf. At delisting, there were approximately 824 wolves in the state. Press Release, Idaho Dep't of Fish & Game, Idaho Wolf Management (Jan. 16, 2009), *available at* http://fishandgame.idaho.gov/apps/releases/view.cfm?NewsID=4744. From the state's perspective, 518 wolves was substantially more than the 100 wolves that was its share of the numerical recovery goal. *See* Press Release, Governor C.L. "Butch" Otter, Wolf Delisting, State Management Long Overdue (Jan. 16, 2009), *available at* http://gov.idaho.gov/mediacenter/press/pr2009/prjan09/pr_003.html.

155. *See* Julie Cart, *Delisting Endangers Wolves*, L.A. TIMES, Sept. 28, 2008, *available at* http://articles.latimes.com/2008/sep/28/nation/na-wolf28.

156. *Id.* Nearly 10 percent of the DPS's population was killed. Since Idaho established a hunting season and required licenses, no wolves were killed under Idaho's management plan.

157. 16 U.S.C. § 1533(f)(1)(B)(ii) (2006).

158. *See* Holly Doremus & Joel E. Pagel, *Delisting of Species Under the ESA*, 17 CONSERVATION BIOLOGY 652, 653 (2003).

species' population once biological recovery has been achieved. Given the intense hostility to wolves,[159] the Bush administration's renewed attempt to delist the species in the northern Rocky Mountain remains problematic.[160]

III. RECOVERY: AN ASSESSMENT

Agency decisions to delist species as recovered provide substance to the otherwise elusive concept of recovery. The decisions demonstrate that recovery has both biological and legal components. The Aleutian cackling goose, for example, was delisted because (1) the threats that led to its listing had been addressed at a biologically relevant scale—the introduced predators had been removed from the islands on which the goose breeds—and as a result, its numbers increased and its population dispersed sufficiently to reduce the threats it faced to an *acceptable* level; and (2) a conservation-management mechanism—the Pacific Flyway Council operating under the MBTA—provided both ongoing monitoring and sufficient regulatory power to prevent the species from slipping back into an at-risk status. Thus, delisting the species and removing the ESA's protection did not place the species in jeopardy of extinction.

In contrast, in seeking to delist the NRM DPS of gray wolf the USFWS (1) failed to provide a reasoned justification for its conclusion that the species' population and dispersal met the demographic requirements for recovery—the three subpopulations in the DPS were too small, "without ongoing genetic exchange . . . [to maintain] genetic diversity sufficient to withstand environmental variability and stochastic events"[161]; and (2) failed to establish that there was a reasonable basis to conclude that the state wolf management plans provided sufficient monitoring and risk-management mechanisms to prevent the species from

159. *See generally* Dale D. Goble, *Of Wolves and Welfare Ranching*, 16 HARV. ENVTL. L. REV. 101 (1992).

160. On October 28, 2008, the USFWS again proposed to delist the species. Endangered and Threatened Wildlife and Plants; Designating the Northern Rocky Mountain Population of Gray Wolf as a Distinct Population Segment and Removing This Distinct Population Segment from the List of Endangered and Threatened Wildlife, 73 Fed. Reg. 63,926 (Oct. 28, 2008). The proposal provided only a 30-day comment period. *Id.* at 63,927. On January 14, 2009, the USFWS announced that it was delisting wolves in Idaho and Montana as recovered; wolves in Wyoming would remain listed because "Wyoming's state law and wolf management plan are not sufficient to conserve Wyoming's portion of recovered northern Rocky Mountain wolf population." Press Release, U.S. Fish & Wildlife Serv., Service Removes Western Great Lakes, Portion of Northern Rocky Mountain Gray Wolf Populations from Endangered Species List (Jan. 14, 2009), *available at* http://www.fws.gov/Midwest/News/Release09-04.html. The Secretary of the Interior during the two most recent delisting attempts was Dirk Kempthorne, the former Governor of Idaho.

161. Defenders of Wildlife v. Hall, 565 F. Supp. 2d 1160, 1163 (D. Mont. 2008).

again being hunted to extinction. Wyoming's plan provided no monitoring of wolf populations and both Idaho and Wyoming planned to reduce the number of individuals in the unconnected populations. As the hunting spree in Wyoming demonstrated, delisting the wolf placed it again at risk of extinction. The difference between the goose and the wolf is the difference between recovered and not.

A. Demographics: The Biological Component of Recovery

The fewer the number of individuals and populations and the more restricted a species' range, the greater the risk of extinction that species faces in any given period of time. If the entire population of a species is located on a single atoll, one catastrophic event (such as a tsunami) can extinguish it.[162] The number of Puerto Rican parrots in the wild, for example, fell from 47 to 22 when hurricane Hugo devastated the Luquillo Experimental Forest.[163] The biologically secure population necessary to meet the demographic component of recovery therefore requires a sufficient number of individuals which are sufficiently dispersed to provide reasonable assurances that the species will not be extinguished by a foreseeable combination of stochastic and mechanistic events such as foreseeable habitat loss.[164]

Most delisting packages have emphasized both the number of individuals and populations. The number of individual Robbins' cinquefoil plants, for example, increased from less than 2,000 to more than 14,000 individuals and the number of populations increased from one to four.[165] Similarly, the number of Aleutian cackling geese increased nearly 50-fold (from 790 individuals to 36,978) and the breeding range increased from one to more than six islands.[166] The USFWS's decision making, however, has become increasingly minimalist and conclusory over the past eight years.[167] For example, in responding to comments arguing that the Douglas County DPS of the Columbian white-tailed deer should not be delisted until at least one additional population had been established, the agency noted that, although translocation "is likely to be an important component of the management of the . . . DPS after delisting,"[168] it

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162. *See, e.g.*, Mark Shaffer, *Minimal Viable Populations: Coping with Uncertainty, in* VIABLE POPULATIONS FOR CONSERVATION 69, 70 (Michael E. Soule ed., 1987).

163. *See* Audubon Watchlist: Puerto Rican Parrot (*Amazona vittata*), http://audubon2.org/watchlist/viewSpecies.jsp?id=168 (last visited Apr. 22, 2009).

164. Shaffer, *Minimum Population Sizes*, *supra* note 21, at 131.

165. Cinquefoil Delisting, 67 Fed. Reg. at 54,973.

166. Goose Delisting, 66 Fed. Reg. at 15,643, 15,645.

167. *See generally* Goble, *Recovery in a Cynical Time*, *supra* note 132.

168. Deer Delisting, 68 Fed. Reg. at 43,652.

was not necessary before delisting because "[a] review of the threats [facing the DPS] shows that it no longer requires protection of the Act."[169] Similarly, although the USFWS acknowledged that the numerical recovery goal for the gray wolf NRM DPS was insufficient without evidence of genetic exchange among the subpopulations,[170] the agency nonetheless sought to delist the NRM DPS despite the lack of any evidence of connectivity between the subpopulations.[171]

The USFWS's approach to the demographic requirements for delisting the wolf also undercuts another purpose of the ESA, "provid[ing] a means whereby the ecosystems upon which [listed] species depend may be conserved."[172] The agency's decision ignores the fact that the wolf plays a disproportionate role in shaping the ecosystems it inhabits.[173] The reintroduction of wolves has fundamentally transformed YNP's natural systems. For example, elk, the primary prey for wolves,[174] responded to the presence of wolves by altering their behavior to avoid areas such as aspen stands that provided wolves cover and thus, the element of surprise.[175] As a result, aspen, cottonwood, and willows, which had declined markedly after wolves were extirpated within the park, have begun to regenerate.[176] This in turn has led to an increase in neotropical bird species (which depend upon such ecosystems for nesting

169. *Id.* at 43,653.

170. *See* Wolf Delisting, 71 Fed Reg. at 6635.

171. Defenders of Wildlife v. Hall, 565 F. Supp. 2d 1160, 1168 (D. Mont. 2008).

172. 16 U.S.C. § 1531(b) (2006).

173. Such species are known as "keystone" or "strongly interacting" species. *See generally* Robert T. Paine, *Food Web Complexity and Species Diversity*, 100 AM. NATURALIST 65 (1966); Michael E. Soule et al., *Strongly Interacting Species: Conservation Policy, Management, and Ethics*, 55 BIOSCI. 168 (2005).

174. Douglas W. Smith et al., *Yellowstone After Wolves*, 53 BIOSCI. 330, 335 (2003) (estimating that elk constitute 92 percent of all wolf kills).

175. *See generally, e.g.*, Daniel Fortin et al., *Wolves Influence Elk Movements: Behavior Shapes a Trophic Cascade in Yellowstone National Park*, 86 ECOLOGY 1320 (2005); John W. Laundre et al., *Wolves, Elk, and Bison: Reestablishing the "Landscape of Fear" in Yellowstone National Park, U.S.A.*, 79 CANADIAN J. ZOOLOGY 1401 (2001); William J. Ripple & Robert L. Beschta, *Wolves and the Ecology of Fear: Can Predation Risk Structure Ecosystems?*, 54 BIOSCI. 755 (2004); Clifford A. White et al., *Predation Risk and the Functional Response of Elk-Aspen Herbivory*, 181 FOREST ECOLOGY & MGMT. 77 (2003); William J. Ripple & Robert L. Beschta, *Restoring Yellowstone's Aspen with Wolves*, 138 BIOLOGICAL CONSERVATION 514 (2007) [hereinafter Ripple & Beschta, *Restoring Yellowstone's Aspen*].

176. *See generally, e.g.*, Robert L. Beschta, *Cottonwoods, Elk, and Wolves in the Lamar Valley of Yellowstone National Park*, 13 ECOLOGICAL APPLICATIONS 1295 (2003); William J. Ripple et al., *Trophic Cascades among Wolves, Elk, and Aspen on Yellowstone National Park's Northern Range*, 102 BIOLOGICAL CONSERVATION 227 (2001); William J. Ripple & Robert L. Beschta, *Wolf Reintroduction, Predation Risk, and Cottonwood Recovery in Yellowstone National Park*, 184 FOREST ECOLOGY & MGMT. 299 (2003); Ripple & Beschta, *Restoring Yellowstone's Aspen*, *supra* note 175.

and feeding habitat) and beaver.[177] The return of riparian vegetation is also modifying hydrological attributes such as stream morphology and water temperature (and thus the presence of cold-water fish such as trout).[178] Wolves have also changed predator[179] and scavenger relationships.[180] To ignore such effects subverts the objectives of the ESA. Congress, after all, specified that both at-risk species and the ecosystems upon which those species depend were to be conserved.[181]

B. Risk Management: The Legal Component of Recovery

In addition to demographic requirements (adequate population size and dispersal), recovery also requires reasonable assurances that the risks a species faces are addressed through ongoing risk-management mechanisms that are sufficient to prevent the species from slipping back into an at-risk status.[182] Risk management must address both the recurrence of the threats that prompted the listing as well as any new threats that have emerged since listing. As demonstrated by the case studies, the most difficult and uncertain problem in recovering the majority of species is crafting species-specific monitoring and risk-management mechanisms. This difficultly reflects two factors.

First, most species are at risk of extinction as a result of threats that cannot be eliminated. One study, for example, found that 60 percent of the listed species in the United States are imperiled by either disruption of natural fire disturbance regimes or the spread of invasive spe-

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177. *See generally* Joel Berger et al., *A Mammalian Predator-Prey Imbalance: Grizzly Bear and Wolf Extinction Affect Avian Neotropical Migrants*, 11 ECOLOGICAL APPLICATIONS 947 (2001); Smith et al., *supra* note 174, at 33–38; Christopher C. Wilmers et al., *Trophic Facilitation by Introduced Top Predators: Grey Wolf Subsidies to Scavengers in Yellowstone National Park*, 72 J. ANIMAL ECOLOGY 909 (2003).

178. *See generally* Robert L. Beschta & W.J. Ripple, *River Channel Dynamics Following Extirpation of Wolves in Northwestern Yellowstone National Park, USA*, 31 EARTH SURFACE PROCESSES & LANDFORMS 1525 (2006).

179. Wolves killed approximately half of the coyote population, which increased the prey available to mid-sized carnivores such as foxes, hawks, owls, badgers, and pine martens. Robert L. Crabtree & Jennifer W. Sheldon, *The Ecological Role of Coyotes on Yellowstone's Northern Range*, 7(2) YELLOWSTONE SCI. 15, 22–23 (1999); Smith et al., *supra* note 174, at 335–36.

180. The carcasses of elk killed by the wolves provide a bonanza for scavengers such as grizzly and black bears, ravens, magpies, and bald and golden eagles. Smith et al., *supra* note 174, at 336; *see also* Daniel Stahler et al., *Common Ravens, Corvus corax, Preferentially Associate with Grey Wolves, Canis lupus, as a Foraging Strategy in Winter*, 64 ANIMAL BEHAVIOR 283 (2002).

181. 16 U.S.C. § 1531(b) (2006).

182. *Id.* § 1533(a)(1)(D) (providing that one threat to be evaluated in status-determination decisions is "the inadequacy of existing regulatory mechanisms").

cies.[183] These threats require ongoing conservation *management*. For example, suitable Kirtland's warbler habitat can be maintained only through selective logging because a natural fire regime is no longer possible in the scattered jack pine stands that remain in the Midwest.[184] Similarly, least Bell's vireo requires continuing trapping of parasitic cowbirds if it is to fledge offspring.[185] Like most species, the warbler and the vireo face threats that require continuing intervention. Recovering such species becomes a question of both securing the necessary habitat and continuing to monitor and manage that habitat to maintain its biological suitability for the species. The problems of securing and managing habitat are likely to be dramatically exacerbated by global climate change.[186]

The second factor likely to make risk management the more difficult problem for recovering listed species is that sufficiently focused regulatory mechanisms are seldom available to mitigate the continuing threats that most species face. For some species, the necessary regulatory mechanisms are available through existing laws. The risk management necessary to recover the Aleutian cackling goose, for example, relied upon the legal authority of the USFWS to manage units of the National Wildlife Refuge System and an existing monitoring and management structure under the MBTA. The goose, however, differs from most listed species for which there is no existing legal mechanism other than the ESA to provide the necessary, specifically targeted legal protection.[187]

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183. Wilcove & Chen, *supra* note 11. The threats facing most species are habitat modification and the presence of nonnative competitors or predators. *See* Wilcove et al., *Leading Threats*, *supra* note 11, at 95; Wilcove et al., *Quantifying Threats*, *supra* note 11. These threats are frequently synergistic because nonnative species often thrive in disturbed habitats.

184. Kirtland's warbler requires prescribed burns to maintain appropriate jack-pine habitat structure. The warbler has exacting habitat requirements: extensive, homogenous stands of young jack pines located on poor soils—a habitat type that was more common when forest fires were more common. Fire suppression and habitat fragmentation reduced this habitat and led to the listing of the species. Conserving the species requires regular burning of habitat to produce the requisite stand structure. *See* U.S. FISH & WILDLIFE SERV., KIRTLAND'S WARBLER RECOVERY PLAN, app. B (1985).

185. The brown-headed cowbird has an unusual reproductive strategy: they lay their eggs in the nests of other species, leaving the host to raise the cowbird young. Cowbirds have evolved to have a quick hatch time and to develop rapidly which allows them to outcompete their fellow nestlings with the result that the host's own young seldom survive. Least Bell's vireo is particularly susceptible to such brood parasitism and controlling cowbirds is a significant recovery goal for the species. U.S. FISH & WILDLIFE SERV., DRAFT RECOVERY PLAN FOR THE LEAST BELL'S VIREO (*Vireo bellii pusillus*) 25–28 (1998).

186. *See, e.g.*, Fox, *supra* note 95.

187. *See generally* Doremus, *Delisting Endangered Species*, *supra* note 53; Doremus & Pagel, *Why Listing May Be Forever*, *supra* note 53; Williams et al., *supra* note 53. This is particularly true for plants and invertebrates which are often entirely without legal protection.

Were Kirtland's warbler delisted, for example, there is no regulatory structure to replace the ESA and ensure that the warbler's habitat would continue to be manipulated to maintain the necessary jack pine stand structure. Conserving species such as the warbler requires the creation of species-specific risk-management protocols. Species such as the Columbian white-tailed deer and the bald eagle could be delisted as recovered only when a sufficiently focused risk-management structure that was capable of providing the intensive ongoing conservation management needed to address the threats facing the species had been constructed. Although the goose, deer, cinquefoil, and eagle all represent points along the continuum of available regulatory mechanisms, the distinction between them is significant. When a species such as the deer or eagle requires a particularized risk-management structure, there is unlikely to be any existing management regime (such as the flyway councils established under the MBTA) available to provide the authority needed to manage the risks faced by the species.[188]

This is the irony of the ESA: It is a powerful statute that can bring species back from the brink of extinction, but the strength of the Act in preventing extinction becomes a deterrent to delisting a species because to do so will frequently remove the protection needed to conserve it, and thus lead to a downward spiral that would necessitate relisting.

188. For one possible alternative, see J. Michael Scott et al., *Recovery of Imperiled Species under the Endangered Species Act: The Need for a New Approach*, 3 FRONTIERS IN ECOLOGY & ENV'T 383 (2005).