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Taking Adaptive Management Seriously: A Case Study of the Endangered Species Act

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I. INTRODUCTION

Two emerging themes of regulatory reform have been building over the past decade to challenge settled practices in natural resources law and policy. One is eco-pragmatism, which fuses ecosystem-level conceptions of natural resource problems with pragmatic approaches to their resolution.¹ Eco-pragmatism demands hard regulatory positions where they are most suitable and balancing approaches where they work best, often striving for an amalgam of many such instruments working together.² A companion theme is adaptive management, which calls for more experimentalism in regulatory implementation.³ Under adaptive management, regulators use models of natural resource systems to develop performance measurements and initial policy choices, but they build into the regulatory implementation framework a process for continuous monitoring, evaluation, and adjustment of decisions and practices.⁴ These two themes often go hand-in-hand under the umbrella of

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1. See DANIEL A. FARBER, *ECO-PRAGMATISM* (1999); THE JURISDYNAMICS OF ENVIRONMENTAL PROTECTION: CHANGE AND THE PRAGMATIC VOICE IN ENVIRONMENTAL LAW (Jim Chen ed., 2003); Symposium, *The Pragmatic Ecologist: Environmental Protection as a Jurisdynamic Experience*, 87 MINN. L. REV. 847 (2003).

2. I have described these features of eco-pragmatism in more detail elsewhere. See, e.g., J.B. Ruhl, *Working Both (Positivist) Ends Toward a New (Pragmatist) Middle in Environmental Law*, 68 GEO. WASH. L. REV. 522, 537-40 (2000) (explaining eco-pragmatism).

3. Adaptive management theory traces its origins to C.S. Holling's influential work written in the late 1970s, *ADAPTIVE ENVIRONMENTAL ASSESSMENT AND MANAGEMENT* (Crawford S. Holling ed., 1978). See, e.g., Kai N. Lee & Jody Lawrence, *Adaptive Management: Learning from the Columbia River Basin Fish and Wildlife Program*, 16 ENVTL. L. 431, 442 n.45 (1986) (tracing the term "adaptive management" to Holling's book). For further details, see *infra* text accompanying notes 62-64.

4. The biologist Simon Levin recently defined adaptive management concisely as "maintaining flexibility in management structures and adjusting rules and regimes on the basis of monitoring and other sources of new data." SIMON LEVIN, *FRAGILE DOMINION* 200 (1999). See also Simon A. Levin, *Towards a Science of Ecological Management*, 3 CONSERVATION ECOLOGY 6, A3 (Aug. 6,

“ecosystem management,” which itself has swept through natural resources management policy since the early 1990s to become the dominant model of regulatory practice.⁵ Ecosystem management is exactly what it sounds like—managing ecosystem-level problems through ecosystem-level approaches—and it almost always calls for creative and adaptive use of policy instruments as varied as inflexible commands at one extreme to generous incentives at the other.⁶

The challenge for ecosystem management, however, is that it is working for the most part with laws enacted over twenty years ago—laws not designed with the benefit of the developed theories and approaches of eco-pragmatism and adaptive management. A case in point is the Endangered Species Act (ESA), our nation’s premier species protection law, which was enacted in 1973 and has not been updated meaningfully since 1982.⁷ As many others have observed, although the ESA

1999) (discussing Holling’s arguments), at <http://www.consecol.org/vol3/iss2/art6>. A more detailed description is found in a recent report by the National Academy of Science’s research arm, the National Research Council, in its investigation of the Missouri River ecosystem:

The concept of adaptive management promotes the notion that management policies should be flexible and should incorporate new information as it becomes available. New management actions should build upon the results of previous experiments in an iterative process. It stresses the continuous use of scientific information and monitoring to help organizations and policies change appropriately to achieve specific environmental and social objectives.

COMM. ON MO. RIVER ECOSYSTEM SCI., WATER SCI. & TECH. BD., DIV. ON EARTH & LIFE STUDIES, NATIONAL RESEARCH COUNCIL, THE MISSOURI RIVER ECOSYSTEM: EXPLORING THE PROSPECTS FOR RECOVERY 18–19 (2002), available at <http://books.nap.edu/books/0309083141/html/18.html#pagetop> [hereinafter MISSOURI RIVER ECOSYSTEM].

5. See JOHN COPELAND NAGLE & J.B. RUHL, *THE LAW OF BIODIVERSITY AND ECOSYSTEM MANAGEMENT* 302–79 (2002) (describing ecosystem management and its history).

6. See, e.g., THE NEPA TASK FORCE REPORT TO THE COUNCIL ON ENVTL. QUALITY, MODERNIZING NEPA IMPLEMENTATION (2003) (explaining the need for adaptive management frameworks in the implementation of environmental impact assessments), available at <http://ceq.eh.doe.gov/ntf/report/pdf/toc.html> [hereinafter THE NEPA TASK FORCE]; MISSOURI RIVER ECOSYSTEM, *supra* note 4, at 107–12 (explaining the need for adaptive management frameworks in the restoration of the Missouri River basin ecosystem). There is broad consensus today among resource managers and academics that adaptive management is the only practical way to implement ecosystem management policy. See Ronald D. Brunner & Tim W. Clark, *A Practice-Based Approach to Ecosystem Management*, 11 CONSERVATION BIOLOGY 48 (1997); Anne E. Heissbuttel, *Ecosystem Management—Principles for Practical Application*, 6 ECOLOGICAL APPLICATIONS 730 (1996); Paul L. Ringold et al., *Adaptive Monitoring Design for Ecosystem Management*, 6 ECOLOGICAL APPLICATIONS 745 (1996). Indeed, the Ecological Society of America’s comprehensive study of ecosystem management treats the use of adaptive management methods as a given. See Norman L. Christensen et al., *The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management*, 6 ECOLOGICAL APPLICATIONS 665 (1996).

7. Endangered Species Act of 1973, 16 U.S.C. §§ 1531–44 (1999). This Article is not intended to provide a comprehensive overview of the ESA. Rather, it focuses attention on the realized and potential use of adaptive management principles and techniques for implementation of the statute’s key programs and features of the statute. For comprehensive treatments of the ESA, several of

explicitly recognizes the importance of ecosystem integrity to imperiled species,⁸ its species-focused statutory structure does little to address that connection in any positive law sense.⁹ Our understanding of the complexities of species decline and its relation to ecosystem change has advanced tremendously since the early 1980s, and increasingly, we are finding the ESA ill-equipped to handle the task for which it was intended.

With Congress unlikely to update the ESA anytime soon to reflect current wisdom, regulators, practitioners, and scholars committed to advancing ecosystem management policy have been working hard to suggest ways to get the most out of the ESA given its inherent structural limitations. In this respect, the ESA has been a success story unsurpassed in natural resources law. If one compares the way in which the ESA was implemented in 1982 to the way it is today, the list of differences would far outweigh the similarities.¹⁰ Indeed, the ESA has been transformed so much through administrative reform toward the ecosystem management model, I have dared to suggest elsewhere that it has earned the seal of *eco-pragmatism*.¹¹

In this Article, I explore the related question such an assertion necessarily begs—has the ESA also earned the seal of *adaptive management*?

which are referred to frequently *infra*, see LAWRENCE R. LIEBESMAN & RAFFAEL PETERSEN, ENDANGERED SPECIES DESKBOOK (2003); ENDANGERED SPECIES ACT: LAW, POLICY, AND PERSPECTIVES (Donald C. Baur & Wm. Robert Irvin eds., 2002); STANFORD ENVIRONMENTAL LAW SOCIETY, THE ENDANGERED SPECIES ACT (2001) [hereinafter SELS]; TONY A. SULLINS, ENDANGERED SPECIES ACT (2001); and MICHAEL J. BEAN & MELANIE J. ROWLAND, THE EVOLUTION OF NATIONAL WILDLIFE LAW (3d ed. 1997).

8. One purpose of the ESA is to provide “a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved.” 16 U.S.C. § 1531(b) (1999).

9. See J.B. Ruhl, *Ecosystem Management, the ESA, and the Seven Degrees of Relevance*, 14 NAT. RESOURCES & ENV'T 156 (2000) (discussing how to apply ecosystem management even while a substantial body of “hard law” is lacking). The case of efforts to recover the San Clemente Loggerhead Shrike, a small endangered bird found on San Clemente Island, California, presents a stunning example of how the ESA's species-centric quality can lead to a departure from sound ecosystem management practice. One of the two principal recovery actions for the shrike has been to kill its main predator—native and non-native species of foxes. Although this has not led to a significant improvement in the status of the shrike, researchers recently have determined that it has led to the endangerment of the foxes. This is most likely *not* what resource managers have in mind when they think of ecosystem management. See generally Gary W. Roemer & Robert K. Wayne, *Conservation in Conflict: The Tale of Two Endangered Species*, 17 CONSERVATION BIOLOGY 1251 (2003), available at <http://www.blackwell-synergy.com/servlet/useragent?func=showissues&code=cbi&open=2003#C2003>.

10. The inventory of changes was impressive as early as 1998. See J.B. Ruhl, *Who Needs Congress? An Agenda for Administrative Reform of the Endangered Species Act*, 6 N.Y.U. ENVTL. L.J. 367 (1998) (reviewing administrative implementation reforms). The process of administrative reform has continued to this day. See *infra* Part III.B.

11. See J.B. Ruhl, *Is the Endangered Species Act Ecopragmatic?*, 87 MINN. L. REV. 885 (2003) (discussing eco-pragmatism and the ESA).

To approach this inquiry, I employ the model Professors Sidney Shapiro and Rob Glicksman have constructed in their path-breaking body of work on pragmatism and regulatory reform.¹² Their work demonstrates the folly of attempts “to perfect regulation on the ‘front end’ by subjecting proposed policies to careful scrutiny using cost-benefit analysis and other similar techniques,” arguing instead for methods that “improve policy on the ‘back end’ by engaging in incremental adjustments of policy as new information is obtained about how the policy affects the real world.”¹³ This “front end/back end” distinction captures the essence of adaptive management and, thus, can be used to identify the provisions of the ESA (or any law) that hold potential for adaptive management implementation. The more a provision directs administrative action toward fixing long-term policies and decisions based on pre-regulatory analysis, the more “front end” it is. Adaptive management requires institutionalization of monitoring-adjustment frameworks that allow incremental policy and decision adjustments at the post-regulatory “back end,” where performance results can be evaluated and the new information can be fed back into the ongoing regulatory process.¹⁴ The seal of adaptive management thus focuses on how any statute balances and uses front end and back end regulatory instruments.

Part I of the Article provides the legal and ecological background necessary to appreciate the need for ecosystem management, and thus adaptive management, in matters of ESA implementation. Part II applies the “front end/back end” test to the ESA statutory structure, demonstrating that the statute contains a mish-mash of both styles that falls well short of a comprehensive adaptive management regime. Part III explores ways in which the “back end” component of the ESA has been and could be implemented so as to maximize the statute’s adaptive potential. Some remarkable strides have been made in that regard already, but there is the room and the need to evolve implementation of the statute even more toward adaptive management.

12. *E.g.*, SIDNEY A. SHAPIRO & ROBERT L. GLICKSMAN, *RISK REGULATION AT RISK: RESTORING A PRAGMATIC APPROACH* (2003); Sidney A. Shapiro, *Administrative Law After the Counter-Reformation: Restoring Faith in Pragmatic Government*, 48 U. KAN. L. REV. 689 (2000); Sidney A. Shapiro & Robert L. Glicksman, *The Missing Perspective*, ENVTL. F., Mar.–Apr. 2003, at 42.

13. Shapiro & Glicksman, *The Missing Perspective*, *supra* note 12, at 43.

14. *See* THE NEPA TASK FORCE, *supra* note 6, at 44–45; MISSOURI RIVER ECOSYSTEM, *supra* note 4, at 110–12.

II. THE COMPLEX ADAPTIVE NATURE OF THE ESA'S SUBJECT MATTER

As noted above, the ESA acknowledges the importance of ecosystems to species;¹⁵ however, its statutory structure focuses on identifying imperiled *species*, identifying critical habitat of such *species*, devising plans for recovering such *species*, and regulating land use and other activities that may put such *species* at further risk. Regulatory decision making even for these species-specific questions is exceedingly difficult given how much scientific content lies behind them and how seldom we have all the information necessary for making robust scientific conclusions. But the real challenge—what makes ESA decision making *really* hard—is that the principal driver behind the imperilment of species is the condition of the ecosystems upon which species depend for their survival. That is where ecosystem management comes into play. But by no means does the discipline of ecosystem management suggest that it has unlocked the complexities of its subject matter. If anything, ecosystem management is premised on having to deal with perpetual change and uncertainty.

A. *The Legal Framework of a Science-Driven Law*¹⁶

The ESA requires the Secretary of the Interior, who acts through the Fish and Wildlife Service (FWS), and the Secretary of Commerce, who acts through the National Marine Fisheries Service (NMFS), to make various decisions about the status and protection of animal and plant species.¹⁷ The FWS and the NMFS administer several core programs in that regard, the details of which are explored more fully later in the Article:

15. See *supra* note 8 and accompanying text.

16. I have had the pleasure of being asked to make presentations and write commentary for publication about the ESA more than several times. Out of necessity, the materials in the legal background section of this Article are a variation, tailored for the instant purposes, of a template I have used and will continue to use. Similar treatments, in other words, appear elsewhere, so that readers may access the descriptive material necessary to evaluate the particular analytical topic of each article without having to consult a series of other articles.

17. 16 U.S.C. § 1533 (2000); *id.* § 1532(15) (defining *Secretary*); 50 C.F.R. § 424.01 (2003) (explaining that the rules in section 424 “interpret and implement those portions of the [ESA] . . . that pertain to the listing of species and the determination of critical habitats”). The FWS generally is responsible for terrestrial and freshwater species, while the NMFS is responsible for marine and anadromous species. The NMFS is also known as National Oceanic and Atmospheric Administration (NOAA)-Fisheries.

- Section 4's so-called "listing" function¹⁸ authorizes the FWS and the NMFS to identify "endangered" and "threatened" species and then to designate their "critical habitat."¹⁹
- Section 4 also requires the FWS and the NMFS to develop a "recovery plan" for a species once the agency has listed the species.²⁰
- Section 7 requires all federal agencies to ensure that the actions they carry out, fund, or authorize do not "jeopardize" the continued existence of listed species or result in "adverse modification" of their critical habitat.²¹
- Section 9 requires that all persons, including all private and public entities subject to federal jurisdiction, avoid committing "take" of listed species of fish and wildlife.²²
- Sections 7 (for federal actions) and 10 (for actions not subject to section 7) establish a procedure and criteria for the FWS and the NMFS to approve "incidental take" of listed species.²³

18. 16 U.S.C. § 1533(a)(1). For a description of the listing process, see SELS, *supra* note 7, at 38–58; LIEBESMAN & PETERSEN, *supra* note 7, at 15–20; SULLINS, *supra* note 7, at 11–25; and J.B. Ruhl, *Section 4 of the ESA: The Keystone of Species Protection Law*, in LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 19.

19. 16 U.S.C. § 1533(a)(3). For a description of the critical habitat designation process, see SELS, *supra* note 7, at 59–69; LIEBESMAN & PETERSEN, *supra* note 7, at 20–24; SULLINS, *supra* note 7, at 26–28; Federico Cheever, *Endangered Species Act: Critical Habitat*, in LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 47; and Murray D. Feldman & Michael J. Brennan, *The Growing Importance of Critical Habitat for Species Conservation*, 16 NAT. RESOURCES & ENV'T 88 (2001).

20. 16 U.S.C. § 1533(f). For a description of the recovery plan process, see SELS, *supra* note 7, at 71–77; LIEBESMAN & PETERSEN, *supra* note 7, at 24–26; SULLINS, *supra* note 7, at 34–38; and John M. Volkman, *Recovery Planning*, in LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 71.

21. 16 U.S.C. § 1536(a)(2) (2000). For a description of the consultation process, see SELS, *supra* note 7, at 83–103; LIEBESMAN & PETERSEN, *supra* note 7, at 27–39; SULLINS, *supra* note 7, at 59–86; and Marilyn Averill, *Protecting Species through Interagency Cooperation*, in LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 87.

22. 16 U.S.C. § 1538(a)(1)(B). For a description of the cases developing the legal standards for what constitutes "take," see SELS, *supra* note 7, at 104–12; LIEBESMAN & PETERSEN, *supra* note 7, at 39–46; SULLINS, *supra* note 7, at 44–54; Gina Guy, *Take Prohibitions and Section 9*, in LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 191; Steven P. Quarles & Thomas R. Lundquist, *When Do Land Use Activities "Take" Listed Wildlife Under ESA Section 9 and the "Harm" Regulation?*, in LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 207; and Alan M. Glen & Craig M. Douglas, *Taking Species: Difficult Questions of Proximity and Degree*, 16 NAT. RESOURCES & ENV'T 65 (2001).

23. 16 U.S.C. §§ 1536(b)(4), 1539(a)(1). "Incidental take," although not the subject of a specific statutory definition provision, is described elsewhere in the statute as a take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." *Id.* § 1539(a)(1)(B). The FWS and the NMFS have adopted this meaning for purposes of the regulations implementing section 7. 50 C.F.R. § 402.02 (2003). For a description of the incidental take authorization procedures, see SELS, *supra* note 7, at 127–73; LIEBESMAN & PETERSEN, *supra* note 7, at 46–50; and SULLINS, *supra* note 7, at 87–102.

A reader unfamiliar with the ESA may find its structure quite simple and its application quite straightforward. Indeed, by comparison to other federal environmental laws, the ESA is lean.²⁴ And the core programs seem to fit together logically: identify problem species and their essential habitat areas; stop public and private actions from further significantly deteriorating their condition; allow actions that kill or injure species' members only under strict permitting guidelines; and figure out ways to help them recover to sustainable populations. As is often the case with seemingly uncomplicated statutes, however, the devil is in the details. Each of the administrative programs outlined above involves an intersection between the decision making demands of legal standards and a multitude of scientific determinations that involve very fluid, unpredictable, and often unascertainable ecological conditions. Consider the following inventory of some of the science-driven legal decisions the FWS and the NMFS are required to make under the ESA:

24. In one unannotated collection of environmental statutes, the ESA takes up 34 pages compared to 177 pages for the Clean Water Act and 306 pages for the Clean Air Act. ROBERT V. PERCIVAL, ENVIRONMENTAL LAW: STATUTORY SUPPLEMENT AND INTERNET GUIDE 1181-215, 921-1098, 609-915 (2002).

Program	Legal Standard	Science Questions
Section 4 listing	Is the species in danger of extinction throughout all or a significant portion of its range (endangered) or likely to become so in the foreseeable future (threatened)? ²⁵	Is it a species? ²⁶ What is its range? What are the present and threatened injuries to its habitat? ²⁷ Is it being overutilized for commercial or other purposes? Is it threatened by disease or predation? Overall, are these threats enough to cause it to go extinct? When? What is the probability?
Section 4 critical habitat designation	What habitat is essential to the conservation of the species and are special management considerations required? ²⁸	How much space does the species need for individual and population growth? ²⁹ What are its food, water, air, light, mineral, shelter, and other nutritional and physiological requirements? Where does it breed, reproduce, and rear offspring? What are the constitutive elements of habitat serving these functions and needs? Where is such habitat? How much of it does the species require?

25. These are the definitions of endangered species and threatened species, respectively. 16 U.S.C. § 1532(6), (20).

26. To complicate this question, the ESA defines species as including “any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.” *Id.* § 1532(16).

27. This and the remaining questions posed for the listing function are taken from the statutory criteria. *See id.* § 1533(a)(1)(A)–(E).

28. This is taken from the definition of critical habitat. *See id.* § 1532(5).

29. This and the other critical habitat designation questions are summarized in the agency regulations. *See* 50 C.F.R. § 424.12(b)(1)–(5) (2003).

Program	Legal Standard	Science Questions
Section 4 recovery planning	What measures are necessary to bring the species to the point at which it is no longer endangered or threatened, and by what objective, measurable criteria can that determination be made? ³⁰	What site-specific and general management actions can reduce the threats that caused the species to be listed? How will we measure the magnitude of those benefits? When will the benefits have reached the point that we can justify removing the species from the lists? ³¹
Section 7 jeopardy prohibitions	Will the direct and indirect effects of the federal action jeopardize the continued existence of the species ³² by appreciably reducing its chances of recovery and survival in the wild? ³³	What are the impacts of the action on reproduction, numbers, or distribution of the species? How much do such impacts reduce the chances of the species surviving and recovering in the wild? ³⁴
Section 7 adverse modification prohibition	Will the direct and indirect effects of the federal action result in the destruction or adverse modification of critical habitat of the species ³⁵ by appreciably diminishing the value of the habitat for the survival and recovery of the species? ³⁶	How does the action alter any of the physical and biological features that were the basis for determining the habitat to be critical? How much do such impacts reduce the chances of the species surviving and recovering in the wild? ³⁷

30. This is taken from the definition of "conservation," which is what recovery plans are supposed to accomplish. See 16 U.S.C. § 1532(3) (defining conservation); *id.* § 1533(f) (stating that recovery plans are for conservation of species).

31. These questions are from the statutory procedure for recovery plan development. See *id.* § 1533(f)(1)(B)(i)-(iii).

32. This is the statutory prohibition of jeopardy. *Id.* § 1536(a)(2).

33. The agency regulations elaborate on the statute with this definition of "jeopardize." See 50 C.F.R. § 402.02.

34. These are the criteria set forth in the regulatory definition. *Id.*

35. This is the statutory prohibition of adverse modification. 16 U.S.C. § 1536(a)(2).

36. The agency regulations elaborate on the statute with this definition of "destruction or adverse modification." 50 C.F.R. § 402.02.

37. These are the criteria set forth in the regulatory definition. See *id.* § 402.02.

Program	Legal Standard	Science Questions
Section 9 take prohibition	Will a person's action harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any individuals of the species? ³⁸	Does the action actually kill or injure wildlife? For the "harm" determination, does the action modify or degrade habitat so as to impair behavioral patterns such as breeding, feeding, or sheltering, and if so, has that killed or injured individuals of the species? ³⁹
Section 7 incidental take permitting	What reasonable and prudent measures are necessary or appropriate to minimize the impact of the incidental taking? ⁴⁰	What is the nature and magnitude of the take being authorized, and by what measures and magnitude has the agency minimized such take?
Section 10 incidental take permitting	Has the applicant minimized and mitigated the impacts of the incidental taking to the maximum extent practicable and not appreciably reduced the likelihood of the survival and recovery of the species? ⁴¹	What is the nature and magnitude of the take being authorized, and by what measures and magnitude has the applicant minimized and mitigated such take? What is the net effect of the take, as minimized and mitigated, on the ability of the species to survive and recover?

Any one of the questions embedded in the ESA's science-driven legal framework could be unpacked to reveal a wealth of additional inquiries that press even harder on the question of how to make decisions un-

38. This is the statutory definition of "take." 16 U.S.C. § 1532(19).

39. This is the regulatory definition of "harm." 50 C.F.R. § 17.3. For a recent summary of the history of this administrative interpretation of "harm" and the case law construing it, see generally Steven G. Davison, *The Aftermath of Sweet Home Chapter: Modification of Wildlife Habitat as a Prohibited Taking in Violation of the Endangered Species Act*, 27 WM. & MARY ENVTL. L. & POL'Y REV. 541 (2003) and Glen & Douglas, *supra* note 22.

40. This is the statutory standard for issuance of a section 7 incidental take statement. 16 U.S.C. § 1536(b)(4).

41. These are the statutory criteria for issuance of a section 10 incidental take permit. *Id.* § 1539(a)(2).

der the applicable legal standard. For many species, the series of scientific questions the ESA raises could be the foundation for years of research by a university or agency scientist, and even with ample time and resources, conclusive answers would remain elusive.⁴² Seen from this scientist's perspective, the sharp yes/no character of the ESA regulatory decisions must seem preposterous.⁴³

B. *The Complexity of an Ecosystem-Driven Science*

What makes the science underlying the ESA so hard? In a word, it is *ecosystems*, a term the Oxford ecologist Sir Alfred George Tansley first introduced in 1935 to describe the basic functional unit in the study of ecology.⁴⁴ Through the efforts of ecologists such as Eugene P. Odum in the 1950s, the ecosystem model evolved into the building block of modern ecology research.⁴⁵ And with ecosystems becoming firmly embedded as the subject matter of ecology, our understanding and description of their functions and sustaining forces began to influence how we designed policy and law to manage them.⁴⁶

Initially, however, many ecologists took a "homeostasis" view of ecosystems, portraying nature in a delicate balance,⁴⁷ which would favor "front end" regulatory approaches designed to map regulated actions onto the homeostatic state. But research gradually led to understanding of ecosystems that surpassed the homeostasis thesis and forged the theory of "nature as flux."⁴⁸ According to this view, the richness and diver-

42. For example, even the threshold question of whether a species really is a species in the legal and scientific sense has sparked intense debate. See LIEBESMAN & PETERSEN, *supra* note 7, at 11–15 (discussing the meaning of "species" under the ESA); SULLINS, *supra* note 7, at 6–11 (noting that the criteria used to define a species are imprecise); SELS, *supra* note 7, at 31–38 (stating that "the meaning of the word species is not yet entirely settled"). Several cases turn on whether the FWS or the NMFS has correctly defined what constitutes a species within the meaning of the statute. See LIEBESMAN & PETERSEN, *supra* note 7, at 11–15 (reviewing cases).

43. As two close observers of the ESA have put it, "[t]he ESA requires scientists to provide clear answers to fuzzy questions that many scientists do not define as 'scientific,' such as whether a species is endangered or whether a specific project is likely to cause jeopardy." Holly Doremus & A. Dan Tarlock, *Fish, Farms, and the Clash of Cultures in the Klamath Basin*, 30 *ECOLOGY L.Q.* 279, 325 (2003).

44. Fred P. Bosselman & A. Dan Tarlock, *The Influence of Ecological Science on American Law: An Introduction*, 69 *CHI.-KENT L. REV.* 847, 861 (1994).

45. *Id.* at 862–63.

46. For my more extensive discussion of the topic of ecosystem complexity and the ESA, see J.B. Ruhl, *A Manifesto for the Radical Middle*, 38 *IDAHO L. REV.* 385, 394–98 (2002).

47. Bossleman & Tarlock, *supra* note 44, at 866 (quoting EUGENE P. ODUM, *FUNDAMENTALS OF ECOLOGY* 25 (2d ed. 1959)).

48. For example, Odum wrote that:

[E]quilibrium between organisms and environment may also be maintained by factors which resist change in the system as a whole. Much has been written about this "balance

sity of ecological systems in the environment will forever defy our full grasp, as they are “continually in flux and exhibit a wondrous panoply of interactions such as mutualism, parasitism, biological arms races, and mimicry Matter, energy, and information are shunted around in complex cycles.”⁴⁹ In other words, the environment’s stability derives from a tendency toward disorder through complex, and even organized, pathways.

Indeed, ecologists are beginning to understand that the disorder—the “chaos” that is inherent in the environment—is its means of sustainability.⁵⁰ They increasingly have turned to complexity theory, the science of complex adaptive systems, to improve their understanding of this quality of ecosystem dynamics.⁵¹ Complex systems are composed of many heterogeneous units interacting together to produce sustaining, adaptive behavior over the long run.

Several important behavioral qualities enable complex systems to balance stability and change in sustainable unison.⁵² First, they exhibit large-scale behaviors that emerge at “higher” system levels from the aggregate of interactions taking place on “lower” system levels, as in the way a forest is compiled of aggregates of many different combinations of species and physical attributes. Second, the patterns of behavior at all scales of the system exhibit nonlinear relationships incapable of easy plotting and prediction, as in the complex dynamics of predator-prey populations. Third, the system thrives and evolves on the variable inputs and flows of energy and information across and between system levels, as in the way the input of solar energy is a driver of energy flows in a lake system. Fourth, complex systems tend to exhibit diversity and variety of components as a means of reducing the possibility that external perturbations will disrupt the entire system, as in the way a forest includes many species that depend on, rather than die from, fire.

of nature” but only with the recent development of good methods for measuring rates of function of whole systems has a beginning been made in the understanding of the mechanisms involved.

Id. at 866.

49. JOHN H. HOLLAND, *HIDDEN ORDER: HOW ADAPTATION BUILDS COMPLEXITY* 3 (1995).

50. *See id.* at 4, 27–29; William Stolzenburg, *Building a Better Refuge*, *NATURE CONSERVANCY*, Jan.–Feb. 1996, at 18, 21 (arguing that ecology is “mothballing the old notion of a ‘balance of nature’ and unveiling a vibrant new replacement focusing on flux”).

51. For a more extended discussion of complexity theory in the context of ecosystems and the ESA, see J.B. Ruhl, *Thinking of Environmental Law as a Complex Adaptive System: How to Clean Up the Environment by Making a Mess of Environmental Law*, 34 *HOUS. L. REV.* 933 (1997).

52. For an elegant explanation of the qualities summarized here, see HOLLAND, *supra* note 49, at 15–31.

These qualities lead complex systems toward “critical state” behavior at which change is an essential component of the stability of the system.⁵³ What may look like a forest “in balance” is actually a forest “in flux.” Our mistake in the past was to assume that fire, floods, wind, and other “natural disasters” are “bad” for forests, when in fact a forest system may have reached its critical, sustainable state *because of* those agents of change. As one group of researchers recently explained:

To many ecologists, natural disturbances are key ecosystem processes rather than ecological disasters that require human repair. Recent ecological paradigms emphasize the dynamic, nonequilibrium nature of ecological systems in which disturbance is a normal feature . . . and how natural disturbance regimes and the maintenance of biodiversity and productivity are interrelated.⁵⁴

A classic and well-documented example is our policy toward fire, which for decades sought to keep fire out of forests lest it upset the snapshot we admired of the forest in balance. Today we appreciate the role fire plays in sustaining forest ecosystems and struggle to find ways to reintroduce fire to forests after having allowed fuel mass to build up in the forest understory and having allowed human habitation to encroach into fire zones.⁵⁵

No forest—no ecosystem—is ever done changing. Humans cannot stop the change, but humans can change how the change occurs. The “nature as flux” model of ecosystems as complex adaptive systems thus presents a challenge for natural resources policy: if nature will change relentlessly, with or without human intervention, what are we supposed to do? Eco-pragmatism offers a fundamental policy theme in response:

There are two lessons here: we need to think of human society as firmly embedded in nature, and we need to think of nature as a flux rather than a balance. So environmentalism cannot take the form of a “Berlin wall” keeping humans out and the animals in. Instead, we must envision long-term connections between humans and nature, requiring continual change and adaptation on both sides.⁵⁶

53. See PER BAK, *HOW NATURE WORKS* 9–32 (1996).

54. David B. Lindenmayer et al., *Salvage Harvesting Policies After Natural Disturbance*, 303 *SCIENCE* 1303, 1303 (2004).

55. See NAGLE & RUHL, *supra* note 5, at 399–401.

56. FARBER, *supra* note 1, at 205.

Similarly, Simon Levin advises us that:

To manage the Earth's systems and ensure our survival, we have to harness the natural forces that organize the biosphere rather than fruitlessly try to resist them. The biosphere is a complex adaptive system whose essential structure has emerged in large part from adaptive changes that were mediated at local levels rather than at the level of the whole system. Humanity's program must therefore be to understand those changes, the forces that have shaped them, and their consequences at the larger level, and then to put that knowledge to work in determining where the pressure points are for effecting changes that will preserve critical ecosystem services.⁵⁷

The study of ecosystem dynamics thus led directly to the new policy of ecosystem management as an emerging force in environmental policy and law.⁵⁸ Ecosystem management has quickly become a coordinating habitat conservation policy for many federal, state, and local agencies as well as private conservation groups.⁵⁹ It has recently, albeit very cautiously, even begun to find form in the law.⁶⁰ Hence, with the "nature as flux" model firmly in place as the foundation of ecosystem management theory and a rationale for expressions of policy, the challenge is to "pioneer the practical implementation of an ecosystem approach."⁶¹ This is the task facing the ESA if it is to remain relevant.

57. LEVIN, *supra* note 4, at 15.

58. For recent treatments of the relation between advancement of ecology research and its use in ecosystem management policy, see generally John M. Blair et al., *Ecosystems as Functional Units in Nature*, 14 NAT. RESOURCES & ENV'T 150 (2000); Symposium, *Beyond the Balance of Nature: Environmental Law Faces the New Ecology*, 7 DUKE ENVTL. L. & POL'Y F. 1 (1996); and Symposium, *Ecology and the Law*, 69 CHI. KENT L. REV. 847 (1994).

59. See STEVEN L. YAFFEE ET AL., ECOSYSTEM MANAGEMENT IN THE UNITED STATES (1996) (giving an overview of 105 ecosystem management projects and information on an additional 500).

60. See generally Oliver A. Houck, *On the Law of Biodiversity and Ecosystem Management*, 81 MINN. L. REV. 869 (1997) (surveying ecosystem management principles as applied under the Endangered Species Act, National Forest Management Act, and other resource protection statutes); Symposium, *Ecosystem Management*, 14 NAT. RESOURCES & ENV'T 147 (2000) (explaining the current role of ecosystem management in a variety of legal settings).

61. Jamie Rappaport Clark, *The Ecosystem Approach from a Practical Point of View*, 13 CONSERVATION BIOLOGY 679, 679 (1999) (reporting that the director of the U.S. Fish and Wildlife Service called for the union of ecosystem dynamics science and ecosystem management policy in the administration of the Endangered Species Act).

III. IS THE ESA ADAPTIVE?

In their path-breaking work on the topic of adaptive management, *Adaptive Environmental Assessment and Management*,⁶² C.S. Holling and his fellow researchers described conventional environmental management methods as being inconsistent with the “nature as flux” model of ecosystems as complex adaptive systems.⁶³ Because the unexpected can happen in ecosystems, making it difficult to predict when, where, and to what degree policy outcomes will depart from expectations, management policy must put a premium on collecting information, establishing measurements of success, monitoring outcomes, using new information to adjust existing approaches, and instilling an ethic of willingness to change. Whereas “front end” regulatory instruments lock in positions through fixed rules and standards,⁶⁴ an adaptive management framework is more experimentalist, relying on monitoring-adjustment “loops” of goal determination, performance standard setting, outcome monitoring, and standard recalibration. Yet, while it remains a flexible, and at times an amorphous decision-making framework, this brand of natural resources management has evolved well beyond a theory. Adaptive management is the only practical way to implement ecosystem management policy.⁶⁵ As such, it is also the only practical way to implement the ESA.

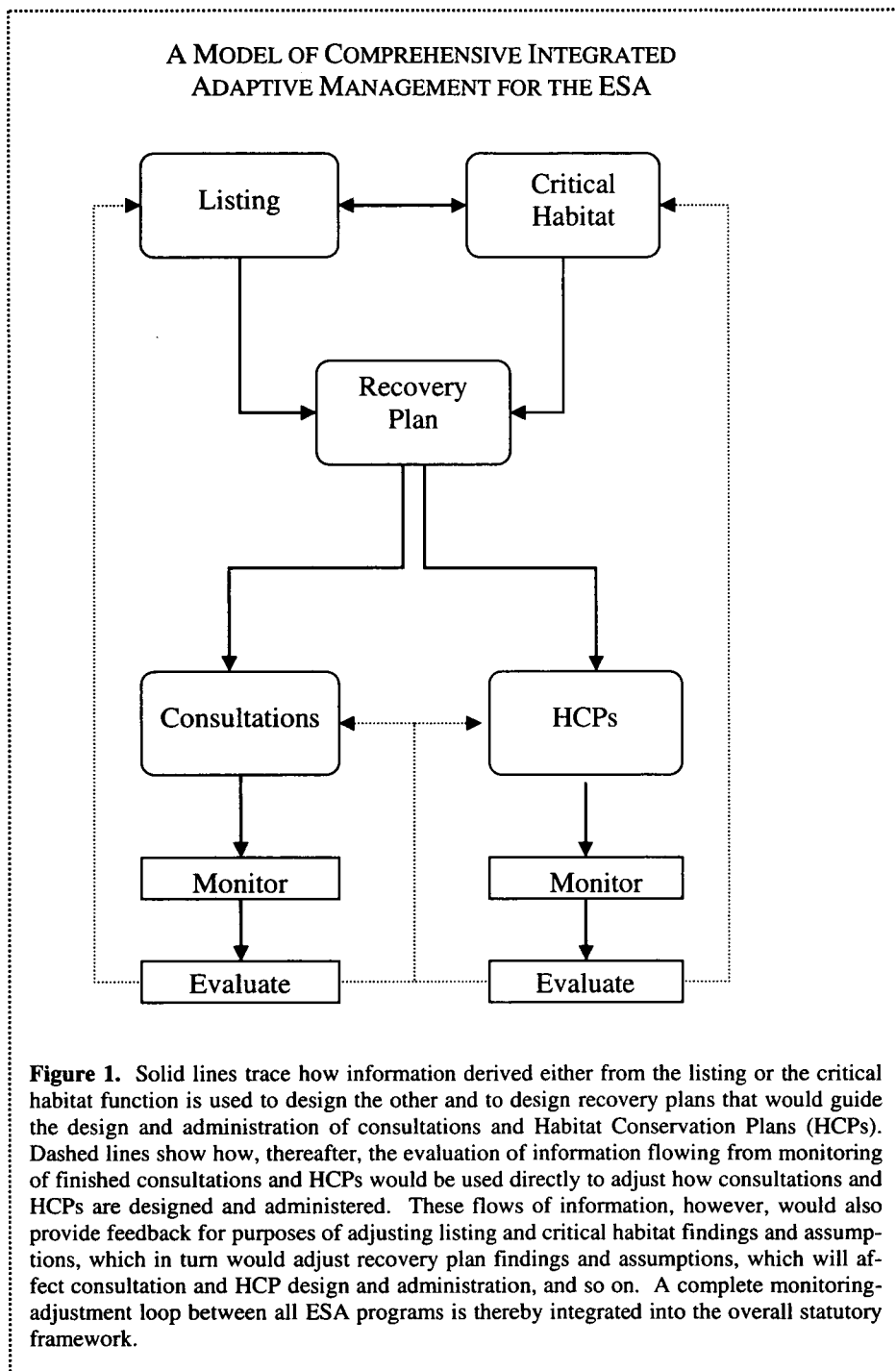
Ideally, this approach would be mapped onto the ESA through a comprehensive framework in which all programs of the statute are inter-related sources and receptors of information in adaptive management’s monitoring-adjustment loop. Figure 1 depicts this kind of integrated structure:

62. ADAPTIVE ENVIRONMENTAL ASSESSMENT AND MANAGEMENT (Crawford S. Holling ed., 1978). See, e.g., Kai N. Lee & Jody Lawrence, *Adaptive Management: Learning from the Columbia River Basin Fish and Wildlife Program*, 16 ENVTL. L. 431, 442 n.45 (1986) (tracing the term “adaptive management” to Holling’s book).

63. For more background on Holling’s contribution to the discipline of adaptive management, see NAGLE & RUHL, *supra* note 5, at 334–38.

64. See generally Dan Tarlock, *The Future of Environmental “Rule of Law” Litigation*, 17 PACE ENVTL. L. REV. 237 (2000).

65. See *supra* note 6.



Alas, the ESA's statutory structure does not always match up well with the adaptive management model. Indeed, our overall system of laws for managing the health of species presents no coordinated opportunity for adaptive management. The ESA's very name suggests that its authorities focus on species at the tail of decline, leaving open the question of whether and how adaptive management might come into play *before* that imperiled state is reached. An entire species does not reach "endangered" status overnight, yet the ESA establishes no framework for slowing or reversing species decline when signs of decline first become apparent, and no other law or set of laws fills that void. Admittedly, this raises a topic much larger in scope than I can address fully here. Still, whether we attempt management of species health through one law or a seamless network of laws, the one spot on the spectrum of species decline we ought to hope and expect to find adaptive management at work is at the point when we think a species might very well become extinct. If we do not practice adaptive management at that stage, what is the point of doing anything?

The encouraging news is that the ESA does, at its most general level, follow a logical structure conducive to the adaptive management approach. Information and planning programs such as listing, critical habitat, and recovery plans identify imperiled species and their important habitat and craft a plan for recovering them to a healthier status. Regulatory programs then regulate public and private actions to promote that recovery goal. An adaptive management specialist would look at this structure as presenting a perfect setting for implementing the sequence of adaptive management components. The initial species and habitat identification supplies information that feeds directly into the recovery plan formulation process. The finished recovery plan provides information guiding initial decisions about regulation of public and private actors and establishes the criteria for monitoring the effects of those actions on the species. Regulated actions are monitored and the results are evaluated for purposes of adjusting the status of the species, the identification of its critical habitat, and the criteria and content of the recovery plan. Those adjustments then lead to adjustments of regulatory treatment of public and private actions. Once this monitoring-adjustment loop is established, it continues until the species recovers.

Our specialist would be disappointed, however, to find how things actually work under the ESA. Even many years after Hollings laid out the blueprint of adaptive management, the statutory text still never mentions adaptive management—otherwise, I would have mentioned that by now. One must extract an adaptive management framework from the statute by implication. When all the pieces are construed and arranged as

best as one can for those purposes, the statute does an adequate job of establishing the initial set of information, criteria, and decisions, but it still does a poor job of establishing the monitoring-adjustment loop that is necessary to move the statute from “front end” to “back end” in approach. The monitoring is there, but the adjusting is not, and without both there is no loop.

A. *Information and Planning Programs*

Adaptive management thrives on information—information derived at the initiation of a management regime’s implementation decisions and information gathered through longer-term monitoring of the regime’s implementation performance. In this respect, the ESA establishes several monitoring and adjustment functions in its information source provisions that correspond to the demands of adaptive management.

1. Species Listing and Critical Habitat Designation

The life of a species under the ESA begins, ironically, when it is listed as threatened or endangered with extinction. The process established under section 4 for identifying species and their critical habitat triggers the ESA’s regulatory programs but also, from the adaptive management perspective, generates an initial slug of information useful for designing the programmatic architecture necessary for implementing the monitoring-adjustment loop. In that regard, section 4 takes the additional step of building an internal monitoring-adjustment process by requiring the FWS and the NMFS to “conduct, at least once every five years, a review of all [listed] species” and determine whether their ESA status should be changed.⁶⁶ This monitoring-adjustment step is essential for the ESA to make any general claim to taking a “back end” approach. Given how much the ESA’s regulatory programs depend on species listing and habitat designation information, any hope of using adaptive management in those programs will depend on the reliability of information about species status. Thus, regular status reassessment is a minimum necessity in the statute.

At least on paper, section 4 appears to take a meaningful step toward adaptive management. Unfortunately—and get used to hearing this—the

66. 16 U.S.C. § 1533(c)(2) (2000). When the FWS or the NMFS removes a species from the list of protected species based on a finding of recovery, the statute requires the agency to monitor the status of the species for five years and act to protect the species should its status degrade. *Id.* § 1533(g).

FWS and the NMFS regularly fail to conduct status monitoring and adjustment. Recently, for example, the FWS settled litigation after conceding that no status review had been conducted for the delta smelt, a small fish found in the Bay-Delta Estuary of California that was listed in 1993.⁶⁷ The review the agency agreed to undertake in the settlement of the claims alleging failure to fulfill its statutory duty sounds very much like what adaptive management demands:

[T]he five-year review will consider information that has become available since the original listing determination, such as population and demographic trend data; studies of dispersal and habitat use; genetics and species competition investigations; surveys of habitat amount, quality, and distribution; adequacy of existing regulatory mechanisms; and management and conservation planning information.⁶⁸

Putting aside the reasons for and magnitude of the agencies' failure to implement the species review provision generally, the delta smelt settlement agreement suggests that the monitoring-adjustment provision in section 4 contemplates precisely what adaptive management requires for practical implementation—a stream of information. Section 4 thus not only initiates an internal monitoring-adjustment loop, but through this internal step, it also supplies monitoring information downstream for other ESA programs to use as inputs to their respective adjustment processes. This is a good start for building adaptive management into a statutory architecture.

67. See *Federal Courts Accept Settlement Agreements in Delta Smelt Lawsuits*, 13 CAL. WATER L. & POL'Y REPORTER 328, 328 (2003) (reporting that the FWS agreed to begin a status review of the delta smelt as part of settlement agreements in two cases: *Cal. Farm Bureau Fed'n v. Badgley*, No. 1:02CV0238 (D.C. Cir. filed Nov. 22, 2002) and *San Luis & Delta-Mendota Water Auth. v. U.S. Dep't of the Interior*, No. F-02-6461 (E.D. Cal. filed Nov. 22, 2002)); USFWS, *News Release Service to Conduct Review of Threatened Delta Smelt* (Aug. 1, 2003), available at <http://news.fws.gov/NewsReleases/R1/72EB4E20-34F3-4342-B6AF23F0750BAE13.html> (announcing that the FWS would begin conducting a five-year review of the delta smelt).

68. See U.S. FISH & WILDLIFE SERV., *Frequently Asked Questions About the Delta-Smelt Five-Year Review*, available at <http://pacific.fws.gov/news/2003/77/faq.pdf> (last visited Feb. 24, 2004).

2. Recovery Planning

The ESA logically includes the recovery plan step in section 4 alongside the listing and critical habitat functions. Given its forward-looking mission, information derived from those functions ought to flow directly into the recovery plan development process. The criteria and goals used in the initial recovery plan, though, may need adjustment as the flow of species status monitoring information begins (in theory) to come on line. Wisely, therefore, Congress built a monitoring step into the recovery plan process as well. The FWS and the NMFS must “report every two years to [Congress] on the status of efforts to develop and implement recovery plans.”⁶⁹

Unfortunately, the agencies typically have submitted short, program-wide assessments of the recovery plan function with superficial assessments of each species’ recovery status presented in table format.⁷⁰ Clearly, this approach falls well short of what adaptive management would have in mind. Nevertheless, the point, for my purposes, is that the agencies could use this provision as statutory authority for engaging in regular and far more probing analyses of each recovery plan, in essence building an internal monitoring-adjustment loop for the recovery plan program.

B. Regulatory Programs

The information and planning programs establish the initial conditions of threat and recovery for species—listing, critical habitat, and recovery plans—and thus seem well-suited to adaptive management. These programs could operate internally in a fluid environment of continuous assessment and adjustment and could be the wellspring of information for the regulatory programs—federal agency consultations and incidental take permitting—to use in their respective adaptive management frameworks.

Readers familiar with the ESA know this is a pipe dream. Adaptive management in the ESA, for all practical purposes, stops with the information source programs. No formal statutory monitoring-adjustment

69. 16 U.S.C. § 1533(f)(3).

70. *E.g.*, U.S. FISH & WILDLIFE SERV., RECOVERY REPORT TO CONGRESS: FISCAL YEARS 1997–98 AND 1999–2000 (June 2003); U.S. FISH & WILDLIFE SERV., REPORT TO CONGRESS ON THE RECOVERY PROGRAM FOR THREATENED AND ENDANGERED SPECIES: 1996 (1998).

links exist between them and the regulatory programs,⁷¹ and the regulatory programs establish no monitoring-adjustment loops for their own use.

1. Federal Agency Consultations

Section 7 establishes an elaborate procedure for enforcing the requirement that each federal agency “insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of [listed species] or result in the destruction or adverse modification of [critical] habitat of such species.”⁷² Yet the procedure, known as consultation, is classically “front end” in approach. The agency proposing the action must “consult” with the FWS and the NMFS through a series of steps designed to predict the impact of the action on listed species.⁷³ The ultimate product of the consultation is a “biological opinion” from the FWS or the NMFS “setting forth the [agency’s] opinion, and a summary of the information on which the opinion is based, detailing how the agency action affects the species or its critical habitat.”⁷⁴

If we have learned anything from the complex adaptive systems model of ecosystems, however, it is that predicting causal relationships between human intervention and ecosystem dynamics is difficult at best, particularly over long time frames. While the FWS and the NMFS can load whatever information is available about a species and its habitat into a biological opinion, that information may be quite unreliable as a basis for predicting what impact a specific agency project may have on the species in, say, ten years.

Of course, that is the very point of adaptive management—that we address the unreliability of long-run predictions through continuous monitoring and adjustment. But there is no such monitoring-adjustment loop explicitly built into the consultation process. In theory, the consultation duty continues as long as the action agency is funding, authorizing, or carrying out the action. The FWS and the NMFS thus have adopted a regulation requiring agencies to “reinitiate” consultations “if new information reveals effects of the action that may affect listed species or criti-

71. The exception to this general assertion is when the status of a species changes as a result of the section 4 monitoring-adjustment loop, which affects the overall application of the regulatory programs. Beyond this effect, however, the statute establishes no regularized, continuous feedback between the two sets of programs.

72. 16 U.S.C. § 1536(a)(2).

73. *Id.* § 1536(a).

74. *Id.* § 1536(b)(3)(A).

cal habitat in a manner or to an extent not previously considered” or “if a new species is listed or critical habitat designated that may be affected by the identified action.”⁷⁵ Yet two limitations substantially prevent this approach from accomplishing adaptive management of the consultation process. First, nothing in the ESA or its implementing regulations establishes an affirmative duty to seek out new information pertinent to the context of particular actions that were in the past the subject of a consultation.⁷⁶ Reinitiation, in other words, includes the adjustment side of the loop but not the monitoring side. A limited exception to this generalization applies when the action will cause some take of a listed species, in which case the action agency must obtain an “incidental take statement” from the FWS or the NMFS to approve the take and to allow the FWS or the NMFS to “set forth the terms and conditions (including, but not limited to, reporting requirements).”⁷⁷ In those cases, but only those cases, the FWS and the NMFS could build adaptive management monitoring into the action agency’s long term project agenda.

Even where such information becomes available, however, a more definitive constraint is that reinitiation is limited to contexts in which “discretionary Federal involvement or control over the action has been retained or is authorized by law.”⁷⁸ For example, if a federal agency funded, authorized, or constructed a roadway, building, or other facility with a long operational lifetime, the opportunity for reinitiation could evaporate once the facility is operational if the federal agency no longer is exercising discretionary involvement or control.⁷⁹ New information about the impacts of operation would not trigger any opportunity for adaptive management under section 7 in those circumstances. Section 7, in other words, is long on “front end” process and decision making but short on the “back end” monitoring-adjustment loop.

75. 50 C.F.R. § 402.16(b), (d) (2000).

76. LIEBESMAN & PETERSEN, *supra* note 7, at 38.

77. 50 C.F.R. § 402.14(i).

78. *Id.* § 402.16.

79. *See, e.g.,* *Env'tl. Prot. Info. Ctr., Inc. v. Simpson Timber Co.*, No. C 98-3740 CRB, 1999 WL 183606, at *6 (N.D. Cal. Mar. 30, 1999) (finding the degree of federal agency involvement in logging operations after issuance of permit insufficient to trigger reinitiation to consider impacts on newly listed species).

2. Incidental Take Permitting

Much like the section 7 consultation process, section 10 establishes an “incidental take permit” procedure under which the FWS and the NMFS may approve take of listed species otherwise prohibited under section 9. The mechanism for evaluating actions for which such approval is sought is the Habitat Conservation Plan, or HCP, through which the applicant describes the project and its impacts on the species.⁸⁰ To approve the permit, the agency must find that the HCP ensures that “the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking,” and that “the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.”⁸¹

Once again, therefore, we find the ESA’s structure designed around a “front end” process designed to reach long-term predictions about project impacts on species. As with the section 7 consultation process, the FWS and the NMFS may impose “terms and conditions” in the permit, “including, but not limited to, such reporting requirements as the [agency] deems necessary for determining whether such terms and conditions are being complied with.”⁸² It should not be difficult for the FWS and the NMFS to embed adaptive management monitoring and reporting into permits through this authority. Yet in many cases, as with projects subject to section 7 consultation, the take that prompted the permit might occur only in the construction phase of a project. It is not clear from the statutory structure how the FWS or the NMFS could exercise adaptive management adjustments based on new information becoming available in the operational phase of such a project. Overall, therefore, the statutory version of the HCP program, like the section 7 consultation program, leaves much to be desired when it comes to establishing a cohesive adaptive management framework.

IV. CAN THE ESA BECOME MORE ADAPTIVE?

The previous sections establish two propositions about the ESA. First, the ESA uses species-specific authorities to make what are fundamentally complex ecosystem-level policy decisions. Second, it constrains adaptive management principally to information gathering and

80. 16 U.S.C. § 1539(a)(2)(A).

81. *Id.* § 1539(a)(2)(B)(ii), (iv).

82. *Id.* § 1539(a)(2)(B).

recovery planning functions, leaving a visible chasm between those programs and the principal regulatory programs. Indeed, even in the information and planning programs, monitoring-adjustment loops are isolated within each program rather than bridging between programs. In short, the statute is not a good start for ecosystem management.

On the other hand, when one methodically examines the statutory text of the ESA as I have attempted to do above, it is possible to identify provisions here and there that could, if construed the right way, become a patchwork foundation for ecosystem management. Congress seems in no hurry to reinforce that impression with stronger language in the statute, but its bout of ESA reform paralysis may also prevent it from stopping an upwelling of ecosystem management policy and implementation from within the agencies.

Indeed, administrative-led efforts to steer the ESA toward ecosystem management began in the 1990s under Bruce Babbitt's tenure as Secretary of the Interior.⁸³ For example, in 1994 the FWS released *An Ecosystem Approach to Fish and Wildlife Conservation*, which the agency portrayed as its road map for applying "the concept of managing and protecting ecosystems to everything the Service does."⁸⁴ The FWS announced through this publication that, where it can, it will attempt to use its powers to manage on the ecosystem level for protection of the ecosystem dynamics and thereby promote conservation of all the assembled species and environmental qualities.⁸⁵

Shortly thereafter, the FWS and the NMFS adopted a series of significant policies designed to take the new focus on ecosystem dynamics straight to the ESA. The engine behind the agencies' new approach for the ESA was the realization that, whereas the agencies do not have the discretion to transform the ESA into an ecosystem protection statute, nothing in the statute prevents the agencies from considering ecosystem factors in making species-specific decisions. For example, the agencies announced that they would "promote healthy ecosystems through activities undertaken by the Service under authority of the Endangered Species Act" by, among other things, incorporating ecosystem-level considera-

83. For my more extensive history of the rise of ecosystem management under ESA, see Ruhl, *supra* note 9. For comprehensive and thoughtful "insider" accounts of Secretary Babbitt's tenure at the Department of the Interior, see John D. Leshy, *The Babbitt Legacy at the Department of the Interior: A Preliminary View*, 31 ENVTL. L. 199 (2001) and Joseph L. Sax, *Environmental Law at the Turn of the Century: A Reportorial Fragment of Contemporary History*, 88 CAL. L. REV. 2375 (2000).

84. U.S. FISH & WILDLIFE SERV., *An Ecosystem Approach to Fish and Wildlife Conservation: An Approach to More Effectively Conserve the Nation's Biodiversity* 5 (March 1994).

85. *Id.*

tions into species listings and recovery planning under section 4 of the Act.⁸⁶ Perhaps the biggest score for ecosystem management, however, took place under the previously little-utilized program for HCPs.

Indeed, the HCP has been so much at center stage in the process of administrative reform of the ESA, now that it is a mature ecosystem management program one must ask where we turn next under the ESA for more ecosystem management energy. The answer to that question, as shown below, is that general reform opportunities have for the most part been cut off by narrow judicial and administrative interpretations of other ESA provisions, leaving adaptive management in the position of coming to the rescue only in crisis-led contexts where Congress or the agencies use it as part of a special fix for discrete problems.

A. *The Habitat Conservation Plan Program*

Bruce Babbitt took charge of the ESA at a time when the statute's reputation had reached a low point in the Republican-controlled Congress.⁸⁷ At the same time, many extreme environmental protection interest groups were poised to condemn any effort that would weaken the statute in their view. Caught between a rock and a hard place, Babbitt blended eco-pragmatism and adaptive management into a two-part agenda focused on enhancing species conservation through greater emphasis of ecosystems and on providing greater balance to landowners on whose property the imperiled species are found.⁸⁸ This double-barreled agenda took many forms and led to numerous regulatory innovations.⁸⁹

The most prominent example of the impact his approach had on the ESA is the HCP program, which, after Babbitt's work was done, has been lauded as "a sweeping new approach to protecting endangered species."⁹⁰ As described above, landowners prepare HCPs as part of the application for incidental take permits under section 10(a)(1) of the ESA. Although Congress added the so-called "HCP permit" program to the

86. Notice of Interagency Cooperative Policy for the Ecosystem Approach to the Endangered Species Act, 59 Fed. Reg. 34,273 (July 1, 1994).

87. For a more thorough account of the political factors that set the stage, see Leshy, *supra* note 83, at 208–12.

88. See Ruhl, *supra* note 10, at 388–400 (providing a survey of policies serving this purpose). Once again, for an insider's account providing a thoughtful perspective on the strategic approach the Babbitt administration took, see Leshy, *supra* note 83, at 212–14.

89. For a summary of the status at the time the Bush Administration took over the various regulatory innovations attributable to the Babbitt era, see EUGENE H. BUCK ET AL., CONGRESSIONAL RESEARCH SERV. ISSUE BRIEF NO. IB10072, ENDANGERED SPECIES: DIFFICULT CHOICES 9–12 (June 19, 2002).

90. Daniel A. Farber, *A Tale of Two Cases*, 20 VA. ENVTL. L.J. 33, 38 (2001).

ESA in 1982,⁹¹ only a handful of HCP permits had been requested and issued by 1990.⁹² Babbitt turned to it, however, as a process with sufficient “back end” qualities for resolving the ever-increasing instances of collision between the ESA take prohibition and urban growth. The number of HCP permits began to grow in the early 1990s,⁹³ and with experience, the agency added structure and standards to the program while retaining the flexibility to accommodate the changing needs of species and landowners.⁹⁴ Landowners increasingly participated in HCP negotiations as a practical means of resolving ESA issues with lasting certainty⁹⁵ while the agency increasingly promoted the ecosystem scale of the program.⁹⁶ Although not universally popular,⁹⁷ HCP permits began to proliferate under Babbitt’s tenure, with several hundred having been approved by the end of his term.⁹⁸

91. Congress intended the 1982 amendment to provide landowners incentives to participate in endangered species conservation. H.R. CONF. REP. NO. 97-835, at 28–31 (1982), *reprinted in* 1982 U.S.C.C.A.N. 2807, 2828–31.

92. By 1992, for example, the FWS had issued only twelve HCP permits, whereas it had issued 225 by October 1, 1997. LAURA C. HOOD, *FRAYED SAFETY NETS: CONSERVATION PLANNING UNDER THE ENDANGERED SPECIES ACT* vi–xiii (1998), available at <http://www.defenders.org/pubs/hcp02.html>. For background on these developments and the HCP program in general, see Shi-Ling Hsu, *The Potential and the Pitfalls of Habitat Conservation Planning Under the Endangered Species Act*, 29 ENVTL. L. REP. 10,592 (1999); Albert C. Lin, *Participants’ Experiences with Habitat Conservation Plans and Suggestions for Streamlining the Process*, 23 ECOLOGY L.Q. 369 (1996); J.B. Ruhl, *How to Kill Endangered Species, Legally: The Nuts and Bolts of Endangered Species Act “HCP” Permits for Real Estate Development*, 5 ENVTL. LAW. 345 (1999); Barton H. Thompson, Jr., *The Endangered Species Act: A Case Study in Takings & Incentives*, 49 STAN. L. REV. 305 (1997); Robert D. Thornton, *Habitat Conservation Plans: Frayed Safety Nets or Creative Partnerships?*, 16 NAT. RESOURCES & ENV’T 94 (2001); and Eric Fisher, Comment, *Habitat Conservation Planning Under the Endangered Species Act: No Surprises & the Quest for Certainty*, 67 U. COLO. L. REV. 371 (1996).

93. See Thornton, *supra* note 92, at 94–95 (discussing the southern California experience).

94. For example, the FWS has published a lengthy handbook describing the steps required to obtain an HCP permit. FISH AND WILDLIFE SERVICE & NATIONAL MARINE FISHERIES SERVICE, *ENDANGERED SPECIES HABITAT CONSERVATION PLANNING HANDBOOK* (1996).

95. Several commentators have stressed the negotiation-based character of the HCP program. See Daniel A. Farber, *A Tale of Two Cases*, 20 VA. ENVTL. L.J. 33, 43 (2001); Hsu, *supra* note 92, at 10,594–600 (describing the HCP negotiation process between agency and applicant); Ruhl, *supra* note 92, at 391–96 (describing the HCP mitigation negotiation process).

96. Thornton, *supra* note 92, at 94–95.

97. See, e.g., HOOD, *supra* note 92, at vi–xiii (presenting a pessimistic assessment of the HCP program); John Kostyack, *Surprise!*, 15 ENVTL. F., Mar.–Apr. 1998, at 19, 19–24 (attorney for National Wildlife Federation presents extensive criticism of the Babbitt administration’s HCP reforms); see generally Thornton, *supra* note 92, at 95–96 (describing other organizations’ criticisms).

98. U.S. FISH & WILDLIFE SERV., *Habitat Conservation Plans: Section 10 of the Endangered Species Act*, Feb. 2002, at http://endangered.fws.gov/hcp/HCP_Incidental_Take.pdf (last visited Nov. 4, 2003). For a running count, see U.S. FISH & WILDLIFE SERV., *Endangered Species Habitat Conservation Planning*, at <http://endangered.fws.gov/hcp/index.html> (last visited Nov. 4, 2003); U.S. FISH & WILDLIFE SERV., *General Statistics for Endangered Species*, at http://ecos.fws.gov/tess_public/TessStatReport (last visited Nov. 4, 2003). For an excellent statistical summary of the 208 HCP permits that the FWS had issued nationally by August 1997, including

Babbitt not only stuck to the pragmatic HCP program reforms in the face of intense opposition from preservationists,⁹⁹ he broadened them through an incentive-based set of instruments. As his administration wound down, it adopted the Candidate Conservation Agreement mechanism to provide incentives to landowners to conserve the habitat of candidate species¹⁰⁰ and developed the Safe Harbors mechanism to provide incentives to promote the introduction of habitat of species already listed.¹⁰¹ With flexible innovations such as these in place, the agencies could more reasonably hope to find combinations of regulatory instruments to meet the particular circumstances of different real-world landowner and species configurations.¹⁰²

Given the success of the HCP program, the Bush Administration has worked to solidify the reforms and defend them against challenges. For example, recently the agency proposed policies and regulations strengthening the Candidate Conservation Agreement and Safe Harbor programs.¹⁰³ Also, the FWS recently developed a policy for “banking” of endangered species habitat¹⁰⁴ modeled on the more mature version of habitat banking found in the wetlands protection program under section

acreage statistics, see NATIONAL CENTER FOR ECOLOGICAL ANALYSIS AND SYNTHESIS & AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES, USING SCIENCE IN HABITAT CONSERVATION PLANS (1999), available at <http://www2.nceas.ucsb.edu/projects/2049/hcp-1999-01-14.pdf>.

99. Indeed, some environmental groups have successfully challenged certain limited aspects of the contract-based HCP reform movement. See *infra* note 115.

100. Announcement of Final Policy for Candidate Conservation Agreements with Assurances, 64 Fed. Reg. 32,726 (June 17, 1999). Candidate Conservation Agreements allow a landowner to take conservation steps on behalf of species that are candidates for listing in return for an assurance that, if the species is later listed, the landowner has in place the necessary incidental take authorization to allow continuation of land uses covered under the agreement.

101. Announcement of Final Safe Harbor Policy, 64 Fed. Reg. 32,717 (June 17, 1999). Safe Harbor agreements allow a landowner to foster conditions suitable for listed species for determined periods of time in return for an assurance that later development will be allowed on the property to a level that returns the species to its “baseline” conditions existing on the property at the time of the agreement.

102. For a discussion of how the realigned incentives began producing positive endangered species outcomes, see Michael J. Bean, *Overcoming Unintended Consequences of Endangered Species Regulation*, 38 IDAHO L. REV. 409, 414–20 (2002).

103. See Draft Handbook for Candidate Conservation Agreements with Assurances and Enhancement of Survival Permit Processing, 68 Fed. Reg. 37,170 (June 23, 2003) (announcing availability of a draft document providing internal guidance for conducting permit program) (handbook available for download at <http://endangered.fws.gov/candidates/ccaahandbook.html>) (last visited Feb. 27, 2003); Revisions to the Regulations Applicable to Permits Issued Under the Endangered Species Act, 68 Fed. Reg. 53,327 (Sept. 10, 2003) (proposing revisions that will refine and clarify the application requirements and issuance criteria for permits), Safe Harbor Agreements and Candidate Conservation Agreements with Assurances; Revisions to the Regulations, 68 Fed. Reg. 53,320 (Sept. 10, 2003) (revising the current implementing regulations for permits).

104. Guidance for the Establishment, Use, and Operation of Conservation Banks, 68 Fed. Reg. 24,753, 24, 753 (May 8, 2003) (guidance document available for download at <http://endangered.fws.gov>).

404 of the Clean Water Act.¹⁰⁵ As a logical extension of the HCP program, habitat banking uses a market-based approach to allow some landowners to assemble significant holdings of prime habitat for listed species and market “credits” in the habitat to other landowners in need of mitigation habitat to satisfy their HCP permit conditions. Although there has yet to be any substantial experience under the new program, it appears that the FWS has developed a flexible framework for habitat banking that meets the expectations of many environmentalists and landowners and thus has the feel of eco-pragmatism.¹⁰⁶

The history of HCP program development thus speaks volumes about the eco-pragmatic potential of the ESA. But the program and its siblings are still young, and their eco-pragmatic origin does not answer the related but longer-term question I explore here—are they also *adaptive*?

On this score one must give the Babbitt Administration due credit for thinking ahead.¹⁰⁷ After the HCP permit program had gotten fully on its feet, the FWS announced it would henceforth administer permits under the Endangered Species Act, where gaps in information can run high, by using adaptive management as a means to “examine alternative strategies for meeting measurable biological goals and objectives through research and/or monitoring, and then, if necessary, to adjust future conservation management actions according to what is learned.”¹⁰⁸ The FWS thus

105. See Federal Guidance for the Establishment, Use and Operation of Mitigation Banks, 60 Fed. Reg. 58,605 (Nov. 18, 1995) (clarifying the manner in which mitigation banks may be used to satisfy mitigation requirements of the Clean Water Act). For a comprehensive overview of the wetlands mitigation banking program and comparison of it to endangered species habitat banking approaches, see Michael J. Bean and Lynn E. Dwyer, *Mitigation Banking and an Endangered Species Conservation Tool*, 30 *Envtl. L. Rep.* (Envtl. L. Inst.) 10537 (2000).

106. In 2000, Bean and Dwyer, both of Environmental Defense, offered many thoughtful principles for construction of an endangered species habitat banking program, even drafting a proposed policy, and the program the FWS has developed incorporates many of their guidelines. Compare Bean & Dwyer, *supra* note 105, at 10546–56, with Guidance for the Establishment, Use, and Operation of Conservation Banks, 68 Fed. Reg. at 24,753. To be sure, implementing banking programs, particularly habitat-based banking programs, poses significant challenges to ensure appropriate environmental results, but if carefully constructed and monitored they are promising in that regard. For a thorough review of the promise and pitfalls of habitat banking programs generally, see James Salzman and J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 *STAN. L. REV.* 607 (2000).

107. I have explored the use of adaptive management in HCPs more extensively elsewhere. See Ruhl, *supra* note 11, at 932–37.

108. Notice of Availability of a Draft Addendum to the Final Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, 64 Fed. Reg. 11,485, 11,486 (Mar. 9, 1999). Accordingly, HCPs are acknowledged to be working hypotheses of how species will respond to changes in habitat size, location, configuration, and quality. To truly integrate adaptive management into an HCP, the plan must include a monitoring program to evaluate the performance of mitigation measures and a system that automatically triggers alternative conservation actions in the event that

portrayed adaptive management as an important practical tool that “can assist the Services and the applicant in developing an adequate operating conservation program and improving its effectiveness.”¹⁰⁹ The integration of adaptive management in the HCP process, which is by no means required or even signaled in the statute, is what sealed HCPs as “a system of negotiation rather than one of unilateral federal imposition on landowners.”¹¹⁰ The FWS also intended that adaptive management would foster continuing relations between the parties after issuance of the incidental take permit, which serves the agencies’ goal of promoting long-term, collaborative “conservation partnerships” with landowners.¹¹¹ And for environmentalists, adaptive management, if faithfully implemented, can be used to offset information gaps by building more robust monitoring, evaluation, and revision processes into the permit.¹¹²

Lest I be accused of being Pollyannaish, I am quick to acknowledge that using adaptive management effectively in the HCP program requires more than just saying the magic words. Some of the adaptive manage-

performance fails to meet conservation goals. Gregory A. Thomas, *Where Property Rights and Biodiversity Converge Part III: Incorporating Adaptive Management and the Precautionary Principle into HCP Design*, 18 *ENDANGERED SPECIES UPDATE* 32, 34–35 (2001); George F. Wilhere, *Adaptive Management in Habitat Conservation Plans*, 16 *CONSERVATION BIOLOGY* 20 (2002).

109. Notice of Availability of a Final Addendum to the Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, 65 *Fed. Reg.* 35,242, 35,252 (June 1, 2000). For an in-depth discussion of the integration of adaptive management into the HCP program during Babbitt’s tenure, see Holly Doremus, *Adaptive Management, the Endangered Species Act, and the Institutional Challenges of “New Age” Environmental Protection*, 41 *WASHBURN L.J.* 50, 68–74 (2001).

110. Farber, *supra* note 90, at 43. Other commentators have stressed the negotiation-based character of the HCP program. See Hsu, *supra* note 92, at 10,594–600 (describing the HCP negotiation process between agency and permittee, and concluding that HCPs may provide environmental benefits when “valuable habitat and low-quality development land is exchanged for valuable development land and low-quality habitat”); Ruhl, *supra* note 92, at 391–96 (describing the HCP mitigation negotiation process); Wilhere, *supra* note 108, at 25.

111. As one FWS official has explained:

We will continue to incorporate contingency planning within all types of HCPs. In the future, HCPs will have improved structure in their adaptive management strategies Increased structure in adaptive management strategies will require increased vigilance on the part of permittees and the Service during implementation of long-term plans; this reflects the nature of the conservation partnership created by HCPs.

Marj Nelson, *The Changing Face of HCPs*, *ENDANGERED SPECIES BULL.*, July/Aug 2000, at 4, 7. To be sure, adaptive management, to be implemented, does not *require* establishing collaborative relations between regulators and other interested parties. Most adaptive management advocates, however, portray it as most effective when it is housed in a collaborative framework. See *BIOLOGICAL DIVERSITY: BALANCING INTERESTS THROUGH ADAPTIVE COLLABORATIVE MANAGEMENT* (Louise E. Buck et al. eds., 2001).

112. See Thomas, *supra* note 108, at 36 (suggesting that where information critical to the HCP design is scarce or uncertain, application of the precautionary principle counsels that the HCP should be shorter in duration, cover a smaller area, avoid irreversible impacts, require that mitigation measures be accomplished before take is allowed, include contingencies, and have more rigorous monitoring).

ment provisions in HCPs leave much to be desired in terms of establishing a comprehensible and comprehensive monitoring-adjustment loop. Consider the following provisions from an HCP from the late 1990s:

Any unforeseen circumstances or preserve conditions determined to be detrimental will trigger the need to consult with predetermined scientific personnel . . . for advice on adaptive management. Management must report immediately to USFWS, any site corrections or disturbances found of which it does not possess a ways or means to readily correct The following measures are general procedures for dealing with foreseeable, but unpredictable circumstances that could occur. . . .

f. Surface Land Management Adaptations—There are always possibilities for unforeseen circumstances to occur. In these cases, such circumstances will be assessed for potential impacts and corrective measures implemented, as appropriate, in consultation with the Service to meet the goals of this HCP.¹¹³

This open-ended form of adaptive management raises many concerns. For example, Holly Doremus argues that adaptive management, because of its inherent flexibility, may in practice be subject to politically-motivated abuse in the individualized negotiation framework of HCPs.¹¹⁴ Such opportunities would only be facilitated when the agency uses amorphous adaptive management provisions in the HCP. Of course, this does not distinguish adaptive management from “front end” regulatory instruments—they can be manipulated just as easily between precise and vague to open the possibility of politically-motivated implementation. The point is well taken, however, that the agency’s use of adaptive management itself must be continuously monitored and evaluated to guard against opportunistic abuses. Adaptive management, to be effective, does require institutions that ensure a rigorous implementation policy, meaning that successful adaptive management requires attention to institutional concerns as well to the formulation of adaptive management itself. But this also does not distinguish adaptive management from “front end” regulatory instruments, and it cannot reasonably be expected that the institutions necessary for adaptive management to flourish will be fully in place before adaptive management can be tried and tested.

113. Draft Environmental Assessment/Habitat Conservation Plan for issuance of an Endangered Species Act section 10(a)(1)(B) permit for the incidental take of the tooth cave ground beetle (*Rhadine persephone*) during construction and operation of Buttercup Creek’s section 4 and Phase V and extension of Lakeline Boulevard (438 acres), Williamson County, Texas 36–37 (July 1999).

114. Doremus, *supra* note 109, at 71–74.

Of more widespread concern is how the adaptive management theme coordinates with the parallel objective of providing fairness to landowners, which often is translated into the provision of long-term certainty in the permitting context. Another policy the Babbitt Administration introduced to the HCP process, the so-called "No Surprises" provision, relieves the HCP permit holder of any additional conservation obligations beyond those specified in the HCP with regard to unforeseen circumstances that arise after the HCP is issued.¹¹⁵ Some commentators point out that the No Surprises policy may constrain the use of adaptive management, as it cuts off revision of prior agreements about the HCP's conservation measures.¹¹⁶ On the other hand, one might just as reasonably complain that adaptive management undermines the No Surprises policy, as its very purpose is to ensure the ability to adjust decisions after the HCP is issued.

In fact, the two policies seem to me to be complementary, not conflicting. The No Surprises policy simply defines who is responsible for measures necessary to address unforeseen circumstances, and a comprehensive, criteria-specific adaptive management provision in an HCP negates the argument that matters contemplated as the subject of adaptive management were unforeseen for purposes of the No Surprises policy. It should be in the interests of the agency and the applicant, therefore, to negotiate an adaptive management provision that spells out its scope and subject matter with clarity and precision. Hence, with deliberate attention by the permitting agency to the contours and interplay of the adaptive management and No Surprises provisions of an HCP, the two policies seem perfectly capable of meeting their respective objectives.¹¹⁷ Indeed, more recent HCPs issued after the No Surprises rule had been

115. 63 Fed. Reg. 8,859, 8,860 (Feb. 23, 1998) (codified at 50 C.F.R. § 17(b)(6)). The policy has been described as an essential component of the HCP program, necessary to make HCPs attractive to landowners. Fred P. Bosselman, *The Statutory and Constitutional Mandate for a No Surprises Policy*, 24 *ECOLOGY L.Q.* 707 (1997). Recently, a federal district court identified procedural errors in the agency's promulgation of a component of the No Surprises Rule. See *Spirit of the Sage Council v. Norton*, 294 F. Supp. 2d 67 (D.D.C. 2003). The court found that the FWS did not follow proper notice and comment procedures in promulgating the so-called Permit Revocation Rule, which explains how and when the FWS can revoke a permit when it is evident continued use of the permit would violate the ESA. *Id.* at 92. Because the agency made the Permit Revocation Rule an integral component in its substantive defense of the previously-adopted No Surprises Rule, the court also remanded the No Surprises Rule even though it was adopted through proper notice and comment procedures. *Id.* Yet, the court declined to vacate or enjoin implementation of the No Surprises Rule itself and made no substantive findings on either rule.

116. See Doremus, *supra* note 109, at 72–73.

117. See Jan S. Pauw & James R. Johnston, *Habitat Planning under the ESA on Commercial Forestlands*, 16 *NAT. RES. & ENV'T* 102, 104–105 (2001) (suggesting the two policies are compatible).

put into action contain substantial adaptive management provisions that detail a comprehensive monitoring and adjustment protocol and specify the kinds of events and responses for which adjustments will be made.¹¹⁸

Support for the HCP program, including its adaptive management component, remains deep and broad. Taken together, the Candidate Conservation Agreement, HCP, and Safe Harbor programs present a spectrum of management options that allow the agencies to fit solutions into different contexts, to derive information about the effectiveness of different recovery approaches, and to integrate learning into future permitting decisions. To be sure, a fuller evaluation of the effectiveness of the adaptive management policy will require more time, but with the HCP, Candidate Conservation Agreements, and Safe Harbor programs now firmly on line, attention should turn to how other “back end” programs can be put into action. There, unfortunately, the adaptive management story is less heartening.

B. Searching in Vain for Latent Potential in Other ESA Programs

One advantage Babbitt had in transforming the HCP program was that he got to it before the courts, the agency, or Congress had smothered its adaptive potential through narrow interpretations and policies. Unfortunately, two other promising ESA programs had already been eviscerated before the rise of ecosystem management. One is the recovery plan program provided in section 4(f) of the statute, under which the FWS and the NMFS must “develop and implement plans (hereinafter . . . ‘recovery plans’) for the conservation and survival” of each species they list.¹¹⁹ “Conservation” means “to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary.”¹²⁰ So, recovery planning is designed to have the FWS and the NMFS lay out the conservation game plan. From there, however, recovery plans have been interpreted to have no mandatory

118. *See, e.g.*, *Ctr. for Biological Diversity v. U.S. Fish and Wildlife Serv.*, 202 F. Supp. 2d 594 (W.D. Tex. 2002). This case involved an HCP issued in 2001 to the LaCantera commercial development in San Antonio, Texas. The plaintiff environmental group challenged virtually every aspect of the permit, including the adequacy of the adaptive management provisions, but lost on every claim. The court’s discussion of the adaptive management provisions emphasized the comprehensive and detailed nature of the monitoring and response protocols. *See id.* at 616.

119. *Determination of Endangered Species and Threatened Species*, 16 U.S.C. § 1533(f)(1) (2000).

120. *Id.* § 1532(3).

effect on federal agencies and no regulatory effect on anyone else.¹²¹ They are merely plans—nothing more.¹²² This limitation has seriously limited the potential of recovery plan implementation on behalf of adaptive implementation of the ESA.¹²³

Similarly, section 7(a)(1) of the statute provides that federal agencies “shall . . . utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered and threatened species.”¹²⁴ This provision could be an engine of adaptive management, requiring each agency to build a monitoring-adjustment loop for protected species into their general authorities. But the statute contains no additional implementing provisions for what, on its face, is a rather sweeping command. Perhaps recognizing the potentially boundless implications of this so-called “conservation duty,” the courts have consistently resisted efforts to turn it into a general statement of affirmative behavioral expectations, leaving it to the discretion of each federal agency to determine how far to go with the “duty.”¹²⁵

C. Crisis-Led Adaptive Management

Without sections 4(f) and 7(a)(1) available as statutory leverage for administrative implementation of adaptive management, the prospect of duplicating the HCP story seems dim. Rather, adaptive management’s best hope is through a combination of political will by the FWS and the NMFS, cooperation from other federal and state agencies, and financial support from Congress. How likely is that? Unfortunately, it is most likely when the need for adaptive management has reached crisis stage.

121. *See* *Fund for Animals v. Rice*, 85 F.3d 535, 547 (11th Cir. 1996) (“recovery plans are for guidance purposes only”); *Defenders of Wildlife v. Lujan*, 792 F. Supp. 834 (D.D.C. 1992) (recovery plans are not an “action document”).

122. *See* LIEBESMAN & PETERSEN, *supra* note 7, at 25–26; SELS, *supra* note 7, at 76–77.

123. Professor Frederico Cheever is more optimistic than I about the prospects of Section 4(f). He has meticulously chronicled the failure of recovery planning to amount to anything in terms of force of law, but he has also outlined the case for using recovery plans to guide implementation of the other ESA programs, including those that do have regulatory force. *See* Frederico Cheever, *Recovery Planning, the Courts and the Endangered Species Act*, 16 NAT. RES. & ENV’T 106, 108–10 (2001). He demonstrates the influence recovery plans have had on judicial determinations of such matters as whether an activity causes take, whether an activity jeopardizes a species, and whether a species should be reclassified from endangered to threatened. *Id.* at 110–11, 135. It remains to be seen, however, whether these are isolated instances of a court using recovery plans as a convenient source of evidence, or whether, as Cheever puts it, the courts are building recovery plans into “the context in which all provisions of the ESA will be applied to specific species.” *Id.* at 135.

124. 16 U.S.C. § 1536(a)(1).

125. 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 Species*, 25 ENVTL. L. 1107, 1125 (1995).

For example, the national media have followed the tumultuous events of ESA implementation in the Klamath River Basin, which straddles the Oregon-California border.¹²⁶ There, for over 100 years, the Bureau of Reclamation has operated an irrigation water diversion project at dams impounding Upper Klamath Lake. Over that time, however, two species of sucker fish now inhabiting lake and tributary habitat above the dam and a population of coho salmon inhabiting the river and tributary system below the dam have dwindled in population. They have been listed under the ESA and thus are monitored and protected under the watchful eyes of the FWS (for the suckers) and the NMFS (for the salmon). In 2001, a drought year, the FWS and the NMFS concluded that continued flow of irrigation water out of the system would jeopardize the species in violation of section 7 of the ESA. The Bureau of Reclamation closed the headgates, and hundreds of farms dried to dust. Following the public outcry over this fish-versus-humans saga, the Secretaries of Commerce and the Interior asked the National Academy of Science's National Research Council (NRC) to convene a committee of experts to conduct a scientifically-rigorous peer review of the agencies' respective decisions and to offer advice on how to manage the system in the long run.¹²⁷

As a member of the NRC's Committee on Endangered and Threatened Species of the Klamath River Basin (Klamath Committee),¹²⁸ I saw first hand the difference a comprehensive adaptive management regime could make for the ESA and also how difficult it is to move agencies and Congress into action. The Klamath Committee was high-exposure, however, and the initial results of the Klamath Committee's preliminary peer

126. This brief recitation of the history of events taking place in the Klamath River Basin is not intended to be comprehensive. It is derived from personal knowledge and my work on the National Research Council's Committee on Endangered and Threatened Fishes in the Klamath River Basin, which thoroughly studied the area's land use and water management history. See NATIONAL RESEARCH COUNCIL, ENDANGERED AND THREATENED FISHES IN THE KLAMATH RIVER BASIN: CAUSES OF DECLINE AND STRATEGIES FOR RECOVERY 39-78 (2003) [hereinafter KLAMATH COMMITTEE FINAL REPORT]. Additional detail can be found in Doremus & Tarlock, *supra* note 43; Reed D. Benson, *Giving Suckers (and Salmon) an Even Break: Klamath Basin Water and the Endangered Species Act*, 15 TUL. ENVTL. L.J. 197 (2002); Julia Meudeking, *Taking the Heart of the Klamath Basin: Is it Free?*, 8 DRAKE J. AGRIC. L. 217 (2003); and Cori S. Parobek, *Of Farmers' Takes and Fishes' Takings: Fifth Amendment Compensation Claims When the Endangered Species Act and Western Water Rights Collide*, 27 HARV. ENVTL. L. REV. 177 (2003).

127. The Klamath Committee's initial charge was to "assess whether the [FWS and the NMFS] biological opinions are consistent with the available scientific information." NATIONAL RESEARCH COUNCIL, SCIENTIFIC EVALUATION OF BIOLOGICAL OPINIONS ON ENDANGERED AND THREATENED FISHES IN THE KLAMATH RIVER BASIN—INTERIM REPORT 32 (2002) [hereinafter KLAMATH COMMITTEE INTERIM REPORT].

128. All discussion of the Klamath Committee's work in this Article reflects my personal views and not those of the NRC, the Klamath Committee, or any other member of the Klamath Committee.

review, the so-called *Interim Report*, caught the attention of the three agencies and the other stakeholders.¹²⁹ The Klamath Committee found, based on an independent, objective, scientifically-rigorous review of available information in the available time period, that there was “presently no sound scientific basis” for the two central recommendations that the FWS and the NMFS made regarding the most controversial features of the Klamath Project—namely, effects of lake levels and river flows on the fish.¹³⁰

Not surprisingly, this finding was as dramatic in terms of policy impact as was the closing of the headgates. The Klamath Basin was in ecological and political crisis. The Klamath Committee’s final report thus focused on long-term crisis management options and prescribed a heavy dose of ecosystem management in the form of a watershed-wide focus¹³¹ and adaptive management in the form of more comprehensive agency monitoring and coordination.¹³² Many of the Klamath Committee’s recommendations have found their way into the Bush Administration’s 2005 budget proposals, which call for over \$100 million in funds to implement specific recommendations in the Klamath Basin.¹³³

These developments may be good news for the Klamath Basin, but they are not good news for the long-term prospects of the ESA. The Klamath Basin experience is but one example of the crisis-led nature of the ESA today around the nation. Yet, while the Klamath Basin may become a model of adaptive management, it is not a model of how to get there. If this is what we have to hope for as the means of extracting adaptive management from the ESA, I am not very hopeful. Adaptive management is supposed to be used *regularly*, with the expectation that doing so will minimize and avoid crises, whereas the trend for its imple-

129. See generally KLAMATH COMMITTEE INTERIM REPORT, *supra* note 127, at 3–4 (discussing the various agencies involved in the study and giving a summary of the committees “principal findings”).

130. *Id.* at 3.

131. See KLAMATH COMMITTEE FINAL REPORT, *supra* note 125, at 281 (“The report . . . shows that geographic expansion of restoration efforts beyond the lakes and the main stem of the Klamath River is necessary for recovery of listed species.”).

132. See KLAMATH COMMITTEE FINAL REPORT, *supra* note 125, at 288 (“[M]onitoring and evaluation are the most critical components of adaptive management for measuring the success of any ecosystem-restoration effort and incorporating new knowledge into the management process.”).

133. See News Release, United States Department of the Interior, President’s FY 2005 Budget Calls for Unprecedented Help for Klamath Basin (Jan. 27, 2004). The News Release states:

“As the National Academy of Science’s National Research Council report emphasized, federal agencies should broaden the scope of their recovery plans and more directly encourage stakeholders to take voluntary measures that benefit the fish,” said James Connaughton, chairman of the White House Council on Environmental Quality. “The President’s proposal reflects many of the Council’s recommendations, including improving conditions on Klamath tributaries to address problems on the lower river.”

mentation in the ESA context appears to be to use it only as an *ex post* expedient to mop up after a crisis has passed the boiling point.

V. CONCLUSION

No serious assessment of the ESA fails to conclude that adaptive management, embodied by Professors Shapiro's and Glicksman's "back end" approach to regulation, is the preferred method of implementation. There is no question that scientists, regulators, lawyers, and agency managers take adaptive management seriously for the ESA. But getting there in terms of practical implementation is a different question altogether. The statute as a whole lacks a cohesive adaptive management architecture, thus requiring judicial and administrative interpretations to open the door. In that respect, the HCP program's happy experience of adaptive management integration appears to be a one-time opportunity under the statute, as other programs have had their latent potential for adaptive management stolen by narrow judicial and agency interpretations. The funding and political will to build a comprehensive monitoring-adjustment loop between the information and planning programs and the regulatory programs seems unlikely to appear except in isolated crisis situations. We are, in other words, trying to make the ESA adaptive through a decidedly nonadaptive approach—one crisis at a time.