

Adaptive Management, the Endangered Species Act, and the Institutional Challenges of “New Age” Environmental Protection

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As Professor Sax points out in his thoughtful paper,¹ the Endangered Species Act (ESA)² has been in many respects at the leading edge of environmental law for the last few years. From its humble beginnings as an uncontroversial expression of concern for charismatic species, the ESA has metamorphosed into a lightning rod for conflict and a case study in political experimentation. That should be no surprise because the ESA, for better or worse, is at the center of our efforts to resolve the most difficult question in environmental policy: how much room should we leave for nature? Related questions that have proven nearly as daunting include who should decide what protective actions we take and how we should distribute the costs of those actions. In recent years, the ESA has become a focal point for broad societal debates over such fundamental issues as the limits of regulatory power over private property;³ the respective roles of local, state, and federal governments in environmental protection;⁴ and the extent to which individual citizens should be able to influence environmental policy.⁵

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1. Joseph L. Sax, *The New Age of Environmental Restoration*, 41 WASHBURN L.J. 1 (2001).

2. 16 U.S.C. §§ 1531-1544 (1999).

3. See, e.g., *Tulare Lake Basin Water Storage Dist. v. United States*, 49 Fed. Cl. 313 (Fed. Cl. 2001); Bruce Babbitt, *The Endangered Species Act and “Takings”: A Call for Innovation Within the Terms of the Act*, 24 ENVTL. L. 355 (1994); Hope Babcock, *Should Lucas v. South Carolina Coastal Council Protect Where the Wild Things Are? Of Beavers, Bob-o-links and Other Things that Go Bump in the Night*, 85 IOWA L. REV. 297 (1995); Oliver A. Houck, *Why Do We Protect Endangered Species, and What Does That Say About Whether Restrictions on Private Property to Protect Them Constitute “Takings”?*, 80 IOWA L. REV. 297 (1995); Andrew P. Morris & Richard L. Stroup, *Quartering Species: The “Living Constitution,” The Third Amendment, and the Endangered Species Act*, 30 ENVTL. L. 769 (2000); Mark Sagoff, *Muddle or Muddle Through? Takings Jurisprudence Meets the Endangered Species Act*, 38 WM. & MARY L. REV. 825 (1997); Stuart L. Somach, *What Outrages Me About the Endangered Species Act*, 24 ENVTL. L. 801 (1994); Barton H. Thompson, Jr., *The Endangered Species Act: A Case Study in Takings and Incentives*, 49 STAN. L. REV. 305 (1997).

4. See *Gibbs v. Babbitt*, 214 F.3d 483 (4th Cir. 2000); *National Ass'n of Home Builders v. Babbitt*, 130 F.3d 1041 (D.C. Cir. 1997); John Copeland Nagle, *The Commerce Clause Meets the Delhi Sands Flower-Loving Fly*, 97 MICH. L. REV. 174 (1998); A. Dan Tarlock, *Local Government Protection of Biodiversity: What Is Its Niche?*, 60 U. CHI. L. REV. 555 (1993).

5. Listing determinations have often led to litigation, by both proponents and opponents of vigorous species protection. Critics, including some within the environmental community and many within the agencies, have charged that the flurry of litigation has complicated efforts to set sensible priorities, while citizen suit supporters argue that those suits are needed to prod the

Buffeted by the winds of controversy, in the mid-1990s the ESA seemed in danger of snapping. Under the creative guidance of Bruce Babbitt's Interior Department (with significant help from Professor Sax),⁶ though, the ESA proved far more flexible than either its fans or its detractors had believed.⁷ The jury, as Professor Sax notes, is still out on the extent to which the many innovations developed during that period will succeed in protecting our biotic resources or helping us forge a more sustainable long-term relationship with nature.⁸ Professor Sax accurately identifies institutional design as a keystone to success, emphasizing in his paper the need for institutions to reflect the biological reality of linkages across the landscape, rather than merely political and property boundaries.

In this paper, I focus on another set of institutional concerns. In order to successfully conserve nature over meaningful lengths of time, we must develop management institutions suited to the efficient and effective production, identification and integration of new scientific knowledge into our natural resource management decisions. Like crossing landscape boundaries, improving our ability to incorporate scientific advances into our decisions will require significant institutional evolution.

From its inception, the ESA has been at the center of efforts to make science the touchstone of environmental policy. It was the first of the modern federal conservation statutes to require that decisions rest on the best scientific data available, and has gone further than any other law in explicitly pronouncing the primacy of scientific data over other considerations.⁹ The challenges of integrating science and policy have been apparent throughout the ESA's history, in controversies over listing, critical habitat designation, and jeopardy determinations. Today, they are dramatically illustrated by attempts to incorporate the scientific concept of adaptive management into ESA implementation and the management of imperiled ecosystems. Adaptive management

agencies into action. See, e.g., Lynda Gorov, *Bush Plan Could Narrow Species' Path to Protection*, BOSTON GLOBE, May 16, 2001, at A1; Wendy Williams, *Identifying Critical Habitat in the Halls of Congress*, 51 *BIOSCIENCE* 432 (2001). The extent to which citizens should have a role in HCP decisions has also been the subject of considerable debate. See, e.g., Holly Doremus, *Preserving Citizen Participation in the Era of Reinvention: The Endangered Species Act Example*, 25 *ECOLOGY* L.Q. 707 (1999); John Kostyack, *Habitat Conservation Planning: Time to Give Conservationists and Other Concerned Citizens a Seat at the Table*, 14 *Endangered Species Update* 51 (July/Aug. 1997); Albert Lin, *Participants' Experiences with Habitat Conservation Plans and Suggestions for Streamlining the Process*, 23 *ECOLOGY* L.Q. 369 (1996).

6. Professor Sax was Counselor to the Secretary and Deputy Assistant Secretary for Policy of the Interior Department from 1994 to 1996, during the period when many of the Clinton Administration's ESA initiatives were developed.

7. See generally 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).

8. Sax, *supra* note 1, at 12-13.

9. See Holly Doremus, *Listing Decisions Under the Endangered Species Act: Why Better Science Isn't Always Better Policy*, 75 *WASH. U. L.Q.* 1029, 1042-56 (1997).

is essential to the ultimate success of this new age of environmental restoration. But it runs counter to human nature and the current structure of our management institutions.

Three stories highlight the institutional challenges of adaptive management. The first is the political history of ESA implementation, the second concerns our efforts to date to draw on principles of adaptive management to protect species and ecosystems, and the third deals with the impediments the ESA poses, or appears to pose, to adaptive management of natural resources and ecosystems. The collective lesson of these stories is that our institutions must perform a difficult balancing act, affording agencies the flexibility needed to manage adaptively while maintaining some degree of closure to our decisions and facilitating the public oversight needed to ensure that our societal goals are met.

Our existing management institutions are not well structured to maintain that balance. Changes to counteract systematic political imbalances, distance management decisions from the heat of controversy, and balance flexibility with accountability are essential to realize the promise of adaptive management. Without those changes, adaptive management may become just another smokescreen to cover politically adaptive evasion of agency responsibilities, and the new age of environmental restoration may prove indistinguishable from the old age of environmental destruction.

I. BARRIERS TO ADAPTIVE MANAGEMENT

Like ecosystem management, adaptive management is a highly malleable term. It has been defined and applied in a variety of ways, ranging from highly detailed and rigorous to nearly vacuous.

The essence of adaptive management is clear. Perhaps the best concise definition of adaptive management is simply "learning by doing."¹⁰ More specifically:

[A]daptive management consists of managing according to a plan by which decisions are made and modified as a function of what is known and learned about the system, including information about the effect of previous management actions.¹¹

Beyond the most general level, however, there is no consensus on what adaptive management requires. That imprecision is unavoidable. The details of the adaptive management process can appropriately vary widely depending upon management goals, the extent of (and gaps in) available information, funding and personnel resources

10. Carl J. Walters & C.S. Holling, *Large-Scale Management Experiments and Learning by Doing*, 71 *ECOLOGY* 2060 (1990).

11. Ana M. Parma et al., *What Can Adaptive Management Do for Our Fish, Forests, Food, and Biodiversity?*, 1 *INTEGRATIVE BIOLOGY* 16, 19 (1998).

available, and other factors. Scientists have tended to emphasize formal experimentation, with replicates, controls and extensive monitoring programs.¹² Rigorously experimental adaptive management should maximize the rate and extent of learning from management actions.

Rigorous experimentation is not always possible, however, and even if possible may be impracticable given time and resource constraints. Adaptive management can still be useful under such constraints. Any process that facilitates learning from management decisions and application of that newly-acquired knowledge in the next round of decisionmaking can properly be referred to as adaptive.¹³ Even trial and error, performed self-consciously by taking a best guess at management decisions, monitoring the outcome of those decisions, and revising them as new information is obtained, is a form of adaptive management that can improve management outcomes.

There is nothing inherently wrong with the imprecision of the term adaptive management. Just as the feasibility of rigorous experimental adaptive management varies from one situation to another, so does the value of learning and hence the extent of investment we should be prepared to make in it. It makes perfect sense to apply the concept of adaptive management flexibly, adjusting the degree of rigor according to the circumstances.

But the fuzziness of the concept should give us pause in at least one respect. It invites the use of the term, without further definition, as an empty symbol. Agencies can use claims of adaptive management as a ploy to placate demands for environmental protection without actually imposing any enforceable constraints on themselves.

It is also important to keep in mind that no form of adaptive management, no matter how rigorous, can guarantee successful resource protection. The basic premise of adaptive management is that we do not know enough to be confident that our management decisions will achieve the desired results. Adaptive management can help us recognize management mistakes and limit the damage they cause by modifying or correcting them expeditiously. But it does not prevent mistakes, nor does it guarantee that the mistakes we make will be reversible. We should resist the temptation to believe that instituting a program of adaptive management will, by itself, immunize the resource from harm.

12. See, e.g., CARL J. WALTERS, *ADAPTIVE MANAGEMENT OF RENEWABLE RESOURCES* (1986); Murdoch K. McAllister & Randall M. Peterman, *Experimental Design in the Management of Fisheries: A Review*, 12 N. AM. J. FISHERIES MGMT. 1 (1992); Walters & Holling, *supra* note 10; B. Williams et al., *Uncertainty and the Adaptive Management of Waterfowl Harvests*, 60 J. WILDLIFE MGMT. 223 (1996).

13. Carl Walters, *Challenges in Adaptive Management of Riparian and Coastal Ecosystems*, 1(2) CONSERVATION ECOLOGY 1 (1997) at <http://www.consecol.org/Journal/vol1/iss2/art1>.

Within the natural resource management community, there is both great enthusiasm about the potential of adaptive management to help us manage our biological resources, and great skepticism about our practical ability to implement it effectively. The promise of adaptive management springs from its recognition of the very real limits of our knowledge. There is much we do not know about the natural world we are trying to manage. We will inevitably be surprised by its responses to our prodding. Adaptive management holds the hope of improving decisions we must make under conditions of substantial uncertainty by providing a resilient framework that will allow us to recognize and respond to surprises as they occur.¹⁴ Adaptive management offers a way out of the paralysis we might otherwise face where a resource is at grave risk and we understand so little about it that we find ourselves unable to identify a truly safe course of action. Adaptive management can help us act gingerly, probing the system to see how it is responding, providing at least the hope that we can change our tactics before they cause disastrous results.

The skepticism about adaptive management comes from the lack of success stories to date. So far, despite many claims to have implemented or be applying adaptive management, there are few situations in which it has demonstrably improved resource conditions in the face of intense and conflicting demands.¹⁵ Perhaps the longest-running experiment with adaptive management of a hotly contested resource is in the Columbia River Basin, where conscious efforts to implement adaptive management began in 1986.¹⁶ Today we seem no closer to securing the future of the Columbia River salmon runs than we were fifteen years ago, despite the time and money we have poured into management efforts.¹⁷ The shortage of success stories has led many scientists and resource managers to question our willingness or ability to implement effective adaptive management. Institutional structures and arrangements, in particular, have repeatedly been fingered as key impediments to realizing the promise of adaptive management.¹⁸

14. See, e.g., *id.*; Kai N. Lee, *Deliberately Seeking Sustainability in the Columbia River Basin*, in *BARRIERS AND BRIDGES TO THE RENEWAL OF ECOSYSTEMS AND INSTITUTIONS* 225, 229 (Lance H. Gunderson et al., eds., 1995).

15. See, e.g., James P. Gibbs et al., *Effective Monitoring for Adaptive Wildlife Management: Lessons from the Galápagos Islands*, 63 *J. WILDLIFE MGMT.* 1055 (1999) (“Despite the intuitive appeal of the adaptive management concept, there are startlingly few examples in wildlife management in which the adaptive management ‘loop’ has been completed.”). Perhaps the strongest success stories come from waterfowl harvest management, a very different situation because the interests of sportsmen, birdwatchers, and the agency are all aligned on the goal of achieving sustainable populations.

16. John M. Volkman & Willis E. McConnaha, *Through a Glass, Darkly: Columbia River Salmon, The Endangered Species Act, and Adaptive Management*, 23 *ENVTL. L.* 1249, 1258 (1993).

17. See *infra* text accompanying notes 71-78.

18. See, e.g., C.L. Halbert, *How Adaptive Is Adaptive Management? Implementing Adaptive Management in Washington State and British Columbia*, 1 *REVIEWS IN FISH BIOLOGY AND*

One key institutional challenge is to combine the flexibility required by adaptive management with the long-term certainty we often seek through our legal and political institutions. An essential aspect of adaptive management is that management decisions are always tentative or contingent. A management program cannot be adaptive unless decisions are always subject to re-evaluation in light of new information. In some circumstances, for example with respect to many aspects of the management of our public lands, that kind of flexibility is already built into the system. We have had in place for a generation now requirements for periodic long-term planning, providing opportunities for reconsideration of management direction at regular intervals.¹⁹ Of course, as a practical matter, many site-specific decisions have environmental impacts that cannot be reversed, but at least on a broad scale we expect to review our management philosophy from time to time.

But that is not the case with respect to oversight of most activities on private lands. Our dominant paradigm for regulation of private land development is one-time review prior to a proposed action. Proposals for timber harvests, subdivision development, or wetlands filling are either approved or disapproved. If they are approved, we are accustomed to that being the end of the story. We have very little history of continuing oversight of private land management, requiring changes over time if our preliminary assessment of the likely environmental impacts proves inaccurate.

Another challenge is to ensure that our institutions, given sufficient flexibility to reexamine management actions, will use that flexibility to respond appropriately to new information. It is simply human nature to become committed to decisions one has invested considerable time and effort making. Just as scientists tend to interpret equivocal evidence in the light most consistent with their preferred theories,²⁰ decisionmakers are likely to see equivocal evidence

FISHERIES 261 (1993); Rebecca J. McLain & Robert G. Lee, *Adaptive Management: Promises and Pitfalls*, 20 ENVIRONMENTAL MANAGEMENT 437, 443-46 (1996); Volkman & McConnaha, *supra* note 16, at 1261-62; Lance Gunderson, *Resilience, Flexibility and Adaptive Management – Antidotes for Spurious Certitude?*, 3(1) CONSERVATION ECOLOGY 7 (1999), at <http://www.consecol.org/Journal/vol3/iss1/art7>; Barry L. Johnson, *Introduction to the Special Feature: Adaptive Management – Scientifically Sound, Socially Challenged?*, 3(1) CONSERVATION ECOLOGY 10 (1999), at <http://www.consecol.org/Journal/vol3/iss1/art10>; Barry L. Johnson, *The Role of Adaptive Management as an Operational Approach for Resource Management*, 3(2) CONSERVATION ECOLOGY 8 (1999) <http://www.consecol.org/Journal/vol3/iss2/art8>; K. Rogers, *Managing Science/Management Partnerships: A Challenge of Adaptive Management*, 2(2) CONSERVATION ECOLOGY R1 (1998), at <http://www.consecol.org/Journal/vol2/iss2/resp1>.

19. *See, e.g.*, 16 U.S.C. § 1604(a) (1999) (requiring Secretary of Agriculture to “develop, maintain, and, as appropriate, revise land and resource management plans for units of the National Forest System”); 43 U.S.C. § 1712(a) (1995) (imposing identical requirement on Secretary of Interior with respect to the public lands managed by the Bureau of Land Management).

20. *See, e.g.*, THOMAS KUHN, *THE STRUCTURE OF SCIENTIFIC REVOLUTIONS* 80 (1962); Hilary Putnam, *The ‘Corroboration’ of Theories*, in *THE PHILOSOPHY OF SCIENCE* 124-27 (Richard Boyd et al., eds. 1991).

as confirming their preexisting management biases. They may even avoid collecting information that might shake those beliefs. In the absence of countervailing pressures, therefore, we might expect agencies to reveal only information consistent with their management biases,²¹ to interpret ambiguous evidence as supporting existing management practices, and to resist the kinds of mid-course corrections on which adaptive management depends.

Agencies, of course, are also subject to political pressures that may affect the way they collect, interpret, and respond to information. Leaving management decisions open in order to allow adaptive responses to new information necessarily leaves those decisions subject to political pressures that may inhibit biologically rational response.

II. ADAPTIVE MANAGEMENT AND THE ESA

Our experience to date at the intersection of adaptive management and the ESA highlights the difficulty of surmounting these institutional barriers. Relevant information comes from three directions. The first is the history of ESA implementation, which provides a cautionary tale about flexibility and political pressure. As soon after its enactment as the ESA encountered controversy, it became a kind of experiment in political adaptive management. The agencies responsible for implementing the ESA, the Department of Interior's Fish and Wildlife Service and the Department of Commerce's National Marine Fisheries Service (together referred to here as "the Services"), have used their considerable discretion under the ESA to respond to the political signals they receive, most notably by seeking to calm or defuse controversy. Frequently, that has meant limiting species protection.

The other two relevant sources of experience are directly related to scientific adaptive management. First, over the last few years we have gained some experience with attempts to directly integrate adaptive management into the implementation of the ESA. These efforts provide new avenues for flexibility, and consequently for conflict avoidance strategies. Second, the ESA has been, or at least has been perceived to be, an impediment to some of our experiments in adaptive resource management. This experience reminds us that, notwithstanding its perils, flexibility is essential to adaptive management.

Together, these experiences highlight the fundamental challenge of adaptive management. If we are to succeed at adaptively managing our resources in ways that protect them over the long term, we must develop institutions that combine the flexibility needed to allow ap-

21. Cf. Robert L. Fischman & Vicky J. Meretsky, *Endangered Species Information: Access and Control*, 41 WASHBURN L.J. 90 (2001).

propriate responses to new information with sufficient constraints and oversight mechanisms to ensure that protective responses are in fact taken.

A. *A Tradition of Adaptive Implementation*

As has often been pointed out, the ESA was enacted in 1973 virtually without opposition.²² In part, the lack of opposition was a sign of the times in an era when environmental protection carried great political power. But it also highlights the assumption that the legislation would prove relatively limited and benign. The ESA seems to have been seen as a modest expansion of early endangered species legislation, which had relied largely on voluntary efforts to manage public land for the benefit of dwindling wildlife species. Although many witnesses in the Congressional hearings at which the ESA was considered mentioned the importance of habitat protection,²³ there seems to have been little understanding, in Congress or among the general public, of the potential for habitat protection efforts to conflict with economic activities. Prior to its enactment, the ESA could easily have been seen primarily as a limitation on hunting and commercial exploitation of charismatic wildlife species such as whales and polar bears, whose protection posed little threat to mainstream economic activity.²⁴

Illusions about the scope of the law, however, were quickly shattered. In 1978, the U.S. Supreme Court held that the ESA forbade completion of the Tellico Dam, a project into which more than seventy-eight million dollars had been poured, because the lowly snail darter relied on a free-flowing stretch of the Little Tennessee River, which the dam would drown.²⁵ Congress responded almost immediately, creating an exemption procedure so tightly constrained that no

22. See, e.g., Shannon Petersen, *Congress and Charismatic Megafauna: A Legislative History of the Endangered Species Act*, 29 ENVTL. L. 463, 475-76 (1999).

23. See, e.g., *Endangered Species Act of 1973, Hearings Before the Subcomm. on the Environment of the Senate Comm. on Commerce*, 93d Cong. 80 (1973) (statement of Tom Garrett, Friends of the Earth); *id.* at 83 (statement of John S. Gottschalk, International Association of Game, Fish, and Conservation Commissioners); *id.* at 86 (statement of John Grandy, National Parks and Conservation Association); *id.* at 87 (statement of Lawrence R. Jahn, Wildlife Management Institute).

24. Several people who were in the legislature at the time have subsequently claimed that they did not intend the ESA to have the reach it later proved to have. Even Senator John Chafee, well known as a friend of the environment, said in 1979, “[w]e who voted for the Endangered Species Act with the honest intention of protecting such glories of nature as the wolf, the eagle, and other natural treasures have found that others with wholly different motive are using this noble act . . . for merely obstructive ends.” See Petersen, *supra* note 22, at 486. Others have complained that a law intended to protect the most charismatic species had somehow expanded to fairy shrimp and similarly unimportant species. See John Copeland Nagle, *Playing Noah*, 82 MINN. L. REV. 1171, 1202-03 n.122 (1998). Still others have complained about its geographic breadth, and claimed that it is being applied to species not in serious danger. See Mark O. Hatfield, *Can’t See the Forests for the Endangered Species*, WASH. POST, June 12, 1992, at A23.

25. See *Tennessee Valley Auth. v. Hill*, 437 U.S. 153, 166 (1978).

one could view it as anything but an emergency safety valve.²⁶ Although the amendments to the ESA added very little flexibility, several legislators used the occasion of oversight hearings in 1979 to forcefully remind the Fish and Wildlife Service of the political costs of listing non-charismatic species or species that could interfere with significant economic development.²⁷ The Service could hardly fail to get the message that aggressive implementation of the ESA might lead to its repeal. Not surprisingly, the story of ESA implementation since 1978 consists generally of the Services exploiting their discretion to the fullest to avoid political controversy. That tendency has been checked only by the ability of citizen suits to force the agencies to perform politically unpalatable duties.

Listings, especially those of species lacking charisma or standing in the way of development, have typically been initiated by citizen petition rather than agency action, and often finalized only after litigation produced court orders.²⁸ Once species are listed, effective protection does not follow as automatically as the words of the ESA would suggest. Nearly ten years ago, Oliver Houck chronicled the variety of ways in which the Services have subtly but effectively softened its impact.²⁹ They have, for example, defined the provision of section 7 requiring that federal actions must not be likely to destroy or adversely modify critical habitat³⁰ into practical irrelevance.³¹ Even so,

26. See 16 U.S.C. § 1536(e)-(p) (1999).

27. In 1978 oversight hearings, for example, Representative Beard of Tennessee complained that through taxonomic splitting biologists could “find” a new endangered species to halt any public works project. *Endangered Species – Part 1: Hearings Before the Subcomm. on Fisheries and Wildlife Conservation and the Environment of the House Comm. on Merchant Marine and Fisheries*, 95th Cong. 67 (1978). Representative Watkins of Oklahoma argued that an insignificant fish, the leopard darter, was driving people from their homes in his district by blocking a flood control project. *Id.* at 109-10. Representative Bevill of Alabama, ridiculing the halting of the Tellico Dam to protect the snail darter, fumed that “Congress did not anticipate that one of the departments of the government was going to take the position that everything has to stop because of these endangered species.” *Id.* at 180.

28. The strong effect of political pressures on listing decisions was noted in a General Accounting Office report in 1979. U.S. GENERAL ACCOUNTING OFFICE, *ENDANGERED SPECIES: A CONTROVERSIAL ISSUE NEEDING RESOLUTION* (1979). Steven Yaffee’s classic study a few years later confirmed the report’s conclusions. See STEVEN L. YAFFEE, *PROHIBITIVE POLICY: IMPLEMENTING THE FEDERAL ENDANGERED SPECIES ACT* (1982). Politics continues to play a critical role in listing determinations. See, e.g., Amy Whritenour Ando, *Waiting to Be Protected Under the Endangered Species Act: The Political Economy of Regulatory Delay*, 42 J.L. & ECON. 29 (1999); Federico Cheever, *Butterflies, Cave Spiders, Milk-Vetch, Bunchgrass, Sedges, Lilies, Checker-Mallows and Why the Prohibition Against Judicial Balancing of Harm Under the Endangered Species Act Is a Good Idea*, 22 WM. & MARY ENVTL. L. & POL’Y REV. 313, 348-49 (1998); Holly Doremus, *Listing Decisions Under the Endangered Species Act: Why Better Science Isn’t Always Better Policy*, 75 WASH. U. L.Q. 1029 (1997); Oliver A. Houck, *The Endangered Species Act and Its Implementation by the U.S. Departments of Interior and Commerce*, 64 U. COLO. L. REV. 277, 285-92 (chronicling use of the “warranted but precluded designation” as a “black hole” in the listing process); Ivan J. Lieben, *Political Influences on USFWS Listing Decisions Under the ESA: Time to Rethink Priorities*, 27 ENVTL. L. 1323 (1997).

29. Houck, *supra* note 28.

30. See 16 U.S.C. § 1536(a)(2).

31. See Houck, *supra* note 28, at 298-301; Jason M. Patlis, *Paying Tribute to Joseph Heller with the Endangered Species Act: When Critical Habitat Isn’t*, 20 STAN. ENVTL. L. J. 133 (2001).

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they have strongly resisted designation of critical habitat.³² When consultations are conducted under section 7, the agencies nearly always offer a “reasonable and prudent alternative” that allows the project to proceed.³³ The Services were initially slow to generate recovery plans.³⁴ The plans they eventually produced are often extraordinarily vague, and therefore unlikely to force any action,³⁵ and their targets for recovery are generally, according to one scientific study, too modest to assure the survival of the species.³⁶ Furthermore, the Service has been reluctant to enforce the ESA’s prohibition on taking listed animal species against landowners. For nearly the first twenty years of the ESA’s existence, there were no attempts to prosecute landowners who harmed species through habitat modification.³⁷

The choice to limit enforcement efforts against private landowners, like the other agency moves to limit the scope and effect of the ESA, was undoubtedly politically rational. Enforcement efforts against private landowners, when later undertaken, aroused considerable controversy and were not notably successful.³⁸

Taken to the extreme, though, this natural tendency to avoid or minimize conflicts can eventually backfire. Because federal agencies did not address conflicts between the needs of species and development pressures early and decisively, the crisis, when it came, may have been exacerbated. Agency discretion under the ESA is limited by the Act’s irreducible commands to avoid jeopardy and unpermitted take, and to list species that are in danger of extinction. Although all of those provisions leave some room for interpretation, conflict can no longer be avoided when the condition of a species becomes so precarious that it is obviously inconsistent with the statute’s commands. Once that point was reached for the spotted owl, for example, envi-

In 1986, the two Services defined the “destruction or adverse modification” of critical habitat in terms identical to the definition of jeopardy, so that section 7’s prohibition on destruction or adverse modification of critical habitat would provide no greater protection than its prohibition on jeopardy. See 50 C.F.R. § 402.02 (2000). The regulatory definition of destruction or adverse modification was recently overturned by the Fifth Circuit as inconsistent with the ESA. *Sierra Club v. U.S. Fish & Wildlife Serv.*, 245 F.3d 434 (5th Cir. 2001).

32. See Houck, *supra* note 28, at 301-07; Notice of Intent to Clarify the Role of Habitat in Endangered Species Conservation, 64 Fed. Reg. 31871 (June 14, 1999) (suggesting that the marginal additional protection obtained through critical habitat designation does not justify the costs of going through the designation process).

33. Houck, *supra* note 28, at 317-22.

34. See *id.* at 344-48.

35. See *id.* at 348-49; Federico Cheever, *The Road to Recovery: A New Way of Thinking About the Endangered Species Act*, 26 *ECOLOGY L.Q.* 1 (1996).

36. See Timothy Tear et al., *Recovery Plans and the Endangered Species Act: Are Criticisms Supported by Data?*, 9 *CONSERVATION BIOLOGY* 182 (1995).

37. See MICHAEL J. BEAN ET AL., *RECONCILING CONFLICTS UNDER THE ENDANGERED SPECIES ACT: THE HABITAT CONSERVATION PLANNING EXPERIENCE* 42 (1991).

38. See, e.g., Francesca Ortiz, *Candidate Conservation Agreements as a Devolutionary Response to Extinction*, 33 *GA. L. REV.* 413, 511 n.48 (explaining the saga of Taung Ming-Lin, the immigrant farmer against whom the Service brought criminal charges for killing kangaroo rats in the course of agricultural operations).

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ronmental groups were able to use the ESA's citizen suit provision to force some extremely high profile actions the agencies would surely rather have avoided, including broad injunctions against logging on federal lands in the Pacific Northwest.³⁹

The Clinton Administration took office in the face of the perceived "train wreck" that resulted. Time has shown that the economy of the region as a whole, though not necessarily that of rural communities within the region, was far more resilient than it at first seemed.⁴⁰ In the short term, though, the political heat surrounding the ESA was intense, and the new Administration took it very much to heart. Perceiving the Act to be "foundering," and its support in Congress to be "steadily eroding," the Interior Department under Secretary Babbitt turned its considerable creative resources to the task of fixing the ESA.⁴¹

It did so by unearthing considerable flexibility in portions of the statute where the prior administration had seen none. By issuing first a policy and then formal regulations calling for "no surprises" agreements that would assure landowners of the outer limits of their financial obligations to endangered species,⁴² for example, Babbitt's Interior Department jump-started the dormant incidental take permit program. It encouraged landowners and states to create conservation programs that would protect unlisted species and, through memorialization in "candidate conservation agreements," forestall the need for contentious listings.⁴³ It developed the concept of "safe harbors" for landowners who voluntarily undertake activities that may improve their property's suitability for listed species.⁴⁴ It began to use special

39. See Patrick Parenteau, *Rearranging the Deck Chairs: Endangered Species Act Reforms in an Era of Mass Extinction*, 22 WM. & MARY ENVTL. L. & POL'Y REV. 227, 258, n.204 (1998).

40. See, e.g., THOMAS M. POWER, *LOST LANDSCAPES AND FAILED ECONOMIES: THE SEARCH FOR A VALUE OF PLACE* (1996). Even with respect to rural communities, which did lose jobs during the period, it is far from clear that those losses were caused by protection of endangered species. See Kevin T. Duffy-Deno, *Economic Effect of Endangered Species Preservation in the Non-Metropolitan West*, 28 GROWTH & CHANGE 263 (1997); William R. Freudenburg et al., *Forty Years of Spotted Owls? A Longitudinal Analysis of Logging Industry Job Losses*, 41 SOC. PERSP. 1 (1998).

41. See John Leshy, *The Babbitt Legacy at the Department of Interior: A Preliminary View*, 31 ENVTL. L. 199, 213 (2001) (this article provides a fascinating inside look at Interior's approach to the ESA during this time; Professor Leshy was the Department of Interior's Solicitor throughout the Babbitt years).

42. See Habitat Conservation Plan Assurances ("No Surprises") Rule, 63 Fed. Reg. 8859 (Feb. 23, 1998) (codified at scattered sections of 50 C.F.R. Parts 17 and 222).

43. See Safe Harbor Agreements and Candidate Conservation Agreements with Assurances, 64 Fed. Reg. 32706 (June 17, 1999), corrected by 64 Fed. Reg. 52676 (Sep. 30, 1999) (codified at 50 C.F.R. §§ 17.22, 17.23 (2000)); Announcement of Final Policy for Candidate Conservation Agreements with Assurances, 64 Fed. Reg. 32726 (June 17, 1999); Ortiz, *supra* note 38.

44. See Safe Harbor Agreements and Candidate Conservation Agreements with Assurances, 64 Fed. Reg. 32706, corrected by 64 Fed. Reg. 52676 (codified at scattered sections of 50 C.F.R. Parts 13 and 17); Michael J. Bean, *Four Sure Ways to Undermine a Good Idea . . . and Hurt Endangered Species*, 15 ENDANGERED SPECIES UPDATE 94 (1998).

rules issued under ESA section 4(d) to relax the protection of threatened species in order to reduce conflicts.⁴⁵

It is not my intention here to criticize the Clinton-era Interior Department. I believe the Department undertook its flexibility initiatives with the sincere intention of maximizing conservation gains while lowering controversy to a level that would keep the ESA off the political table. It is difficult to know what the political outcome would have been in the absence of those reforms. The reformers are astute political observers; they may well be right to congratulate themselves on saving the ESA from repeal or severe weakening during their tenure.⁴⁶ Certainly the ESA was a target of the Contract with America Republicans who controlled Congress in the mid-1990s, and the 1995 listing moratorium⁴⁷ showed that the ESA was politically vulnerable in at least some respects. On the other hand, it is easy to see how agency personnel, caught up in the overheated atmosphere inside the Beltway, could overestimate the strength of political opposition.⁴⁸

The point I mean to emphasize through this extended inquiry into the brief history of ESA implementation is that agencies are institutionally vulnerable to focused political pressures, and institutionally disposed to underplay their hand in controversial situations. Perhaps the Clinton-era ESA reforms have even increased the ESA's conservation effectiveness, although I believe that has yet to be demonstrated. If they did so, however, it was in a curious, Alice-in-Wonderland sort of fashion. The reforms rest on the assumption that the levels of protection facially mandated by the ESA are not practically and politically achievable. By stepping back from that pretense, they are supposed to achieve, in the real world, greater protection than we could expect through vigorous implementation of the ESA. They give up the possibility of strong protection for a higher probability of maintaining a reduced level of protection.

45. See 16 U.S.C. § 1533(d) (1999) (providing that for threatened species the Services shall issue such regulations as they deem "necessary and advisable to provide for the conservation of such species"); Robert L. Fischman & Jaelith Hall-Rivera, *A Lesson for Conservation from Pollution Control Law: Cooperative Federalism for Recovery Under the Endangered Species Act*, 27 COLUMBIA J. ENVTL. L. (forthcoming 2001). One of the first experiments with a special rule under section 4(d) was undertaken in support of California's innovative Natural Communities Conservation Planning effort to protect coastal sage scrub. See Special Rule Concerning Take of the Threatened Coastal California Gnatcatcher, 58 Fed. Reg. 65088 (Dec. 10, 1993).

46. See Leshy, *supra* note 41, at 214.

47. See Emergency Supplemental Appropriations and Rescissions for the Department of Defense to Preserve and Enhance Military Readiness Act of 1995, Pub. L. No. 104-6, 109 Stat. 73 (1995); Restarting the Listing Program and Final Listing Priority Guidance, 61 Fed. Reg. 24772 (May 16, 1996).

48. See Zygmunt J.B. Plater, *The Embattled Social Utilities of the Endangered Species Act—A Noah Presumption and Caution Against Putting Gasmasks on the Canaries in the Coalmine*, 27 ENVTL. L. 845, 872 (1997) (arguing that intense political pressures in Washington can lead to unnecessary erosions of environmental protection). The heated rhetoric of some legislators in oversight hearings, for example, may well cause agency personnel to overestimate the political strength of the positions articulated.

Whether that is a good trade depends upon the differences in protection levels and the relative probabilities of persistence. There is reason to suppose that agencies might systematically miscalculate both of these differences. They are apt, like all of us, to optimistically overestimate the effectiveness of their flexible protection strategies, meaning that they are likely to believe they are sacrificing less in the way of protection than they in fact are. At the same time, they may well overestimate the vulnerability of a robustly protective stance to political challenge, meaning they are likely to see greater durability gains than are actually realized.

Agencies, even if they are managed and staffed by people with genuine enthusiasm for their conservation mission, are by their nature prone to that kind of response. They are vulnerable to focused political pressures, which are more likely to come from the regulated than from the beneficiaries of regulation. Under the intense pressure that has been the norm for the ESA, they will seek out any flexibility the statute allows, and exploit it to deflect controversy. They will seize any opportunity to defer controversial decisions into the future, delegate those decisions to others, optimistically interpret data, and assume that uncertain or as yet unproven initiatives will rescue disappearing species.

The tendency to use discretion to reduce the protection of biological resources under political pressure has important implications for adaptive management. Political pressures to lessen protection are likely to become even more intense as more species are listed and more listed species are pressed to the point where they can bear no additional losses. If adaptive management is to prove biologically effective, we must develop institutions capable of permitting flexibility while cabining discretion and strengthening the agencies' resolve in the face of concentrated opposition.

Of course every rule has its exception, and there is at least one conspicuous instance of the Fish and Wildlife Service standing by fairly bold protective action in the face of vocal opposition. The ESA prohibits the taking of endangered animal species,⁴⁹ and defines the term "take" to include, among other things, harm.⁵⁰ The Service, in turn, has defined "harm" to include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering."⁵¹ That definition arguably does no more than make explicit what is implicit in the ESA's use of the term "harm" in the defi-

49. 16 U.S.C. § 1538(a)(1)(B).

50. *Id.* at § 1532(19).

51. 50 C.F.R. § 17.3 (2000).

inition of prohibited take. Nonetheless, it surely sharpens, and makes more politically salient, the potential for conflict between endangered species protection and economic activities on non-federal lands. Those are the conflicts that arouse the strongest political opposition to the ESA. Yet the regulation has survived through administrations with radically different views of the importance of protecting endangered species, even in the face of opposition sufficiently dedicated to litigate to the Supreme Court the claim that the regulation exceeded the Service's authority.⁵²

This exception may itself provide an important institutional lesson. It may well be that the Service has been able to stand by its strong definition of harm because it has been able to deflect, at least to some degree, the political consequences of that definition. The Service itself has largely avoided bringing enforcement actions under section 9. Instead, it has left that task to environmental groups, which then become the direct targets of any political fallout, while the agency remains politically insulated from the controversy. Absent such institutional insulation, though, the history of the ESA teaches us not to expect great political courage from the agencies.

Furthermore, we should not expect Congress to stiffen the agencies' backbones, at least not directly in the face of controversy. Legislators interested in re-election often find it advantageous to enact statutes that declare appealing aspirational goals in ringing terms, but leave implementing agencies plenty of discretion to temper their effect.⁵³ The history of the ESA reflects the legislative disinterest we might expect in forcing agencies to push controversial statutes to their limits. As early as 1979, legislators began criticizing the Service for overzealous listing decisions, despite evidence that the agency had been, if anything, proceeding too cautiously on listing.⁵⁴ The Service could hardly have failed to get the message that it should not rush to list controversial species if it could avoid doing so. In 1982, Congress amended the ESA, at the request of the Fish and Wildlife Service, to afford the agency discretion to limit the protections provided to reintroduced species, in order to reduce landowner and state opposition to reintroduction.⁵⁵ More recently, many legislators have endorsed Interior's administrative efforts to soften the ESA, including the "no surprises" policy, candidate conservation agreements, and safe harbor

52. See *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*, 515 U.S. 687 (1995).

53. See, e.g., Wendy E. Wagner, *Congress, Science, and Environmental Policy*, 1999 U. ILL. L. REV. 181; William H. Rodgers, Jr., *The Lesson of the Owl and the Crows: The Role of Deception in the Evolution of the Environmental Statutes*, 4 J. LAND USE & ENVTL. L. 377 (1989).

54. See Doremus, *supra* note 9, at 1052.

55. See 16 U.S.C. § 1539(j); Holly Doremus, *Restoring Endangered Species: The Importance of Being Wild*, 23 HARV. ENVTL. L. REV. 1, 19 (1999).

agreements. The major ESA bills considered in the last few years, supported by legislators of very different political persuasions, have all endorsed these programs, albeit with modifications.⁵⁶ Moreover, Congress has spoken frequently, and quite clearly, through the appropriations process. It has regularly acquiesced in budget requests that all concerned know are far too small to cover the backlog of species awaiting listing.⁵⁷ In 1995, at the height of the Republican anti-ESA rhetoric, it went so far as to place a moratorium on any expenditures for purposes of adding species to the list.⁵⁸

Again, there are some notable exceptions. Congress is sometimes so intent on exhibiting its concern about a problem, or so unaware of the potential for controversy, that it leaves implementing agencies with no discretion at all. When controversies develop, however, Congress often does provide a safety-valve, although it may take some time for sufficient pressure to build up to stir the legislature to action. Perhaps the best-known example is the Delaney Clause, enacted in 1958, which flatly prohibited approval of any food additive known to be a carcinogenic substance, no matter how small the risk posed by its consumption in food. When advances in detection technology revealed the presence at trace levels of many chemical substances in foods, and increased toxicological testing showed that many of those substances, as well as many naturally-occurring food constituents, could induce cancer in laboratory animals, the Food and Drug Administration interpreted the seemingly clear clause to permit an exception for de minimis risks.⁵⁹ After the federal courts rejected that attempt to defuse the conflicts caused by rigorous application,⁶⁰ Congress softened the Delaney Clause.⁶¹ The ESA was originally similarly inflexible, allowing no exceptions to either the prohibition on jeopardizing the continued existence of a species through federal action or the prohibition on take of a listed species by a non-federal actor. The former was softened in 1979 by addition of the "God Squad" exemption pro-

56. In the 106th Congress, those bills were H.R. 3160, introduced by Representative Don Young of Alaska, and H.R. 960, introduced by Representative George Miller of California. In the 105th Congress, the key bill was S. 1180, a bipartisan effort sponsored by Senators Dirk Kempthorne of Idaho and John Chafee of Rhode Island.

57. For fiscal year 2002, Interior has requested \$7.6 million for listing activities, a slight increase over 2001 funding levels, but far less than the \$120 million the agency itself says is needed to cover the backlog. See Katherine O. Seelye, *Ending Logjam, U.S. Reaches Accord on Endangered Species*, N.Y. TIMES, Aug. 30, 2001, at A1.

58. See *supra* note 47.

59. See Richard A. Merrill, *FDA's Implementation of the Delaney Clause: Repudiation of Congressional Choice or Reasoned Adaptation to Scientific Progress?*, 5 YALE J. REG. 1 (1988).

60. See *Les v. Reilly*, 968 F.2d 985 (9th Cir. 1992).

61. See Food Quality Protection Act of 1996, Pub. L. No. 104-170, 110 Stat. 1489 (codified in scattered sections of 7 and 21 U.S.C.); Thomas O. McGarity, *Politics by Other Means: Law, Science, and Policy in EPA's Implementation of the Food Quality Protection Act*, 53 ADMIN. L. REV. 103 (2001).

cedure;⁶² the latter in 1982 by creation of the incidental take permit provision.⁶³

Sometimes Congress does act to limit agency discretion even in the face of some political pressure. In 1982, for example, at the same time that it relaxed the protection of reintroduced species, Congress revamped the ESA's listing provisions to force foot-dragging agencies to add deserving species to the protected list.⁶⁴ Those changes were a reaction to an extreme situation. The Reagan Administration had essentially blocked any listings.⁶⁵ Congress responded by imposing time limits on listing decisions and forbidding consideration of costs in the listing process.⁶⁶ Nonetheless, it left the agencies considerable discretion in the listing process, and has continued to fund listing at unrealistically low levels,⁶⁷ signaling clearly that it does not expect listing of every species that meets the ESA's definitional standards.

The most enduring and effective statutory constraint on the agencies' ability to exploit their discretion to reduce species protections is the citizen suit device, of which Professor Sax was an early champion.⁶⁸ Citizen suits can force agencies and the regulated community to comply with the terms of a statute in situations where political forces would permit the government to turn a blind eye. Furthermore, they can provide political cover, allowing agencies to deflect responsibility for controversial decisions or strong statutory interpretations, as the persistence of the harm regulation shows.⁶⁹ Citizen suits have played an important role in almost every phase of ESA implementation, including obtaining the protections of the ESA for noncharismatic species, overseeing the section 7 consultation process, and enforcing the section 9 take prohibition on private lands.

The ESA's citizen suit provision has often courted controversy, yet Congress has never seriously considered repealing it. Like that of the harm regulation, the durability of the citizen suit provision may be institutionally informative. Perhaps citizen suits can deflect political heat from the legislature as well as from agencies. In addition, the citizen suit device seems to enjoy a high political profile; it might be difficult for legislators to explain a vote against citizen suits as consistent with strong support for the goals of the ESA, which remain politically popular. Instead, legislators (and agencies) maneuver to limit

62. See 16 U.S.C. § 1536(e)-(p) (1999).

63. *Id.* at § 1539(a)(1)(B).

64. See Endangered Species Act Amendments of 1982, Pub. L. No. 97-304, 96 Stat. 1411 (1982).

65. See H.R. REP. NO. 97-567, at 11 (1982).

66. See 16 U.S.C. § 1533(b).

67. See *supra* note 57 and accompanying text.

68. See JOSEPH L. SAX, *DEFENDING THE ENVIRONMENT* (1970).

69. See *supra* text accompanying notes 49-52.

the power of citizen suits in subtle, indirect ways. This past spring, for example, the Bush Administration requested that Congress use the Interior appropriations bill to limit expenditures for compliance with court orders directing ESA listings. This back-door attack on citizen suits aroused strong opposition, however, and even the conservative-dominated House Appropriations Subcommittee on the Interior refused to endorse it.⁷⁰ In sum, the citizen suit device is a robust, durable institutional mechanism for constraining the inevitable tendency of agencies to avoid political controversy by softening protective mechanisms. If we can appropriately employ citizen suits, or develop similar mechanisms, our chances of effectively implementing adaptive management should be substantially improved.

B. *Integrating Adaptive Management in ESA Implementation*

By now we do have some, albeit limited, experience with attempts to use adaptive management to manage ecosystems and species in peril. Like the politics of ESA implementation, that experience teaches us that adaptive management is not likely to succeed without institutional changes. The dangers of heavy reliance on adaptive management without those institutional corrections are apparent in recent initiatives to increase the emphasis on adaptive management in habitat conservation plans, candidate conservation agreements intended to forestall listing, and critical habitat determinations.

1. *Managing the Columbia River System for Fish and Energy*

Our longest systematic experience with adaptive management of imperiled biotic resources comes from the Columbia River Basin. The Columbia tale is a cautionary one that might give us pause in our enthusiasm for adaptive management.

Wild salmon in the Pacific Northwest have been declining for nearly a hundred years under the combined pressure of overfishing, hatchery operations, construction of a network of hydroelectric dams, and careless logging.⁷¹ In 1980, recognizing the conflicts between power generation and fish, Congress enacted the Northwest Power Act,⁷² which mandated management of the Columbia hydropower sys-

70. See, e.g., Lynda Gorov, *Bush Plan Could Narrow Species' Path to Protection*, BOSTON GLOBE, May 16, 2001, at A1; Wendy Williams, *Identifying Critical Habitat in the Halls of Congress*, 51 *BIOSCIENCE* 432 (2001).

71. See Michael C. Blumm & Greg D. Corbin, *Salmon and the Endangered Species Act: Lessons from the Columbia Basin*, 74 *WASH. L. REV.* 519, 525 (1999); John M. Volkman, *How Do You Learn From a River? Managing Uncertainty in Species Conservation Policy*, 74 *WASH. L. REV.* 719, 727-28 and n.22 (1999).

72. Pacific Northwest Electric Power Planning and Conservation Act, Pub. L. No. 96-501, 94 Stat. 2697 (1980) (codified at 16 U.S.C. § 839-839h (1999)).

tem for fish and wildlife protection as well as energy production.⁷³ Under the leadership of Kai Lee, the Northwest Power Planning Council adopted an adaptive management strategy in the mid-1980s. The Council was determined to structure its salmon recovery efforts as scientific experiments.

It quickly became apparent, however, that unfettered experimentation with flows, barging, and hatcheries would be politically impossible. John Volkman and Willis McConnaha, two insiders at the Northwest Power Planning Council, have detailed some of the impediments to robust experimentation. They note that the risk of harm to species teetering on the edge of extinction arouses opposition to experiments; that it may be difficult to demonstrate the value of spending public money on experiments that are quite likely to fail; that ignorance has political value to parties with a stake in the outcome; and that the political system operates on a much shorter time scale than that needed to generate firm data.⁷⁴

Although Volkman and McConnaha remained optimistic in 1993 about the prospects for adaptive management,⁷⁵ it has not yet secured the future of the salmon, nor has it noticeably cooled the salmon controversy. Since implementation of adaptive management, at least twelve salmon runs in the Columbia Basin have been listed as threatened or endangered.⁷⁶ Considerable scientific disagreement, as well as public confusion, remains over the primary causes of salmon decline and the appropriate remedies.⁷⁷ Litigation over every major agency decision remains the rule.⁷⁸ Clearly, adaptive management is neither easy to implement nor an automatic cure for our environmental woes.

73. It has been pointed out that Congress struck an ambiguous balance, directing management changes to benefit fish but at the same time suggesting that those changes should not unreasonably curtail power production or increase power costs. See Volkman & McConnaha, *supra* note 16, at 1253-54.

74. See *id.* at 1261-62.

75. See *id.* at 1262.

76. See Peter Kareiva et al., *Recovery and Management Options for Spring/Summer Chinook Salmon in the Columbia River Basin*, 290 *SCIENCE* 977 (2000).

77. In the last few years, two expert groups have come to different conclusions. The first, the Plan for Analyzing and Testing Hypotheses (PATH), resulted in a split decision. Their report concluded that under most of the scenarios they examined, breaching dams was the best route to recovery. Several members signed a letter to the President urging that step, but several refused to sign on the grounds that much uncertainty remained. Subsequently, a group of NMFS scientists known as the Cumulative Risk Initiative, concluded that protecting spawning habitat in other ways and reducing fishing pressure would be as effective as breaching dams. See Charles C. Mann & Mark L. Plummer, *Can Science Rescue Salmon?*, 289 *SCIENCE* 716 (2000).

78. See, e.g., *Aluminum Co. of America v. Admin.*, 175 F.3d 1156 (9th Cir. 1999); *Northwest Env'tl. Def. Ctr. v. Bonneville Power Admin.*, 117 F.3d 1520 (9th Cir. 1997); *Ramsey v. Kantor*, 96 F.3d 434 (9th Cir. 1996); *Nat'l Audubon Soc. v. Butler*, No. C00-615R, 2001 WL 1002083 (W.D. Wash. Aug. 7, 2001).

2. Adaptive Management in Habitat Conservation Plans

One of the statutory reforms that added flexibility to the ESA was addition of the incidental take permit provision in 1982. That provision allows the Fish and Wildlife Service to authorize acts that would otherwise violate the prohibition on taking listed species, provided the taking is “incidental to, and not the purpose of,” the activity permitted.⁷⁹ Incidental take permits are the ESA’s nod to sustainable development; they are intended to allow economic activity to the extent compatible with conservation.

The permit process languished in obscurity until Babbitt’s administrative reform program. Between 1982 and 1992, only fourteen permits were issued.⁸⁰ The program was slow to take off even at the start of the Clinton years; by the end of 1994, only thirty-nine habitat conservation plans (“HCPs”) had been approved.⁸¹ Shortly thereafter, though, the program began to grow exponentially. By the middle of 1997, more than 200 plans had been approved, and some 200 more were under development.⁸² Today, incidental take permits are a key element of ESA implementation, covering not only construction in all its forms, but such diverse activities as timber harvest, irrigation projects, and the operation of large river systems.⁸³

In order to obtain an incidental take permit, the applicant must submit an HCP specifying: the impact from the expected taking; steps that will be taken to minimize and mitigate that taking, and the funding available for those steps; alternatives considered and why they were rejected; and any other information the Service deems necessary or appropriate.⁸⁴ The Service issues the permit if it finds, after reviewing the HCP and considering public comment, that: the taking will be incidental; its impacts will be minimized and mitigated to the maximum extent practicable; adequate funding will be provided; and the taking “will not appreciably reduce the likelihood of survival and recovery of the species in the wild,” that is, it will not jeopardize the species’ continued existence.⁸⁵

79. 16 U.S.C. § 1539(a)(1)(B) (1999).

80. Notice of Availability of a Final Addendum to the Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, 65 Fed. Reg. 35242, 35342 (June 1, 2000) [hereinafter HCP Handbook Addendum].

81. See Karin P. Sheldon, *Habitat Conservation Planning: Addressing the Achilles Heel of the Endangered Species Act*, 6 N.Y.U. ENVTL. L.J. 279, 300 (1998).

82. See *id.* at 301.

83. The Fish and Wildlife Service makes a database of HCPs available through <http://ecos.fws.gov>. As of September 6, 2001, 361 HCPs had been approved and 508 incidental take permits issued.

84. 16 U.S.C. § 1539(a)(2)(A).

85. *Id.* at § 1539(a)(2)(B). Compare 50 C.F.R. § 402.02 (2000) (“‘Jeopardize the continued existence of’ means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.”).

Incidental take permits can run for as long as the Services deem appropriate under the circumstances.⁸⁶ They have been issued for terms as long as 100 years.⁸⁷ Because it is virtually impossible to predict conditions that far in the future, it is easy to see adaptive management as an essential component of long-duration HCPs. Surprisingly, though, the primary use to which adaptive management has been put so far in the HCP context is allowing the Services to issue permits in the face of substantial uncertainty as to the condition of the species at the outset and the ability of the plan to ensure its survival.

The Services have issued a Handbook to guide the development of HCPs and the processing of incidental take permit applications,⁸⁸ and a recent Addendum.⁸⁹ Both present adaptive management as an answer to uncertainty at the time of plan approval. To quote the Handbook:

The Services often incorporate adaptive management concepts into the HCP process to minimize the uncertainty associated with listed or unlisted species where there are gaps in the scientific information or their biological requirements

For some species, not all of the scientific information needed to develop comprehensive long-term conservation strategies to conserve species may be available at the time of HCP development. Where these data gaps occur, not all of the questions regarding the long-term effects of implementing these HCPs can be answered. When significant uncertainty exists, it can be addressed through the incorporation and implementation of adaptive management measures into HCPs⁹⁰

The HCP Handbook Addendum confirms the role of adaptive management as a mechanism to permit the approval of plans that would otherwise pose too great a risk to the species:

Not all HCPs or all species covered in an incidental take permit need an adaptive management strategy. However, an adaptive management strategy is essential for HCPs that would otherwise

86. See 50 C.F.R. § 17.22(b)(4) (“The duration of permits issued under this paragraph shall be sufficient to provide adequate assurances to the permittee to commit funding necessary for the activities authorized by the permit In determining the duration of the permit, the Director shall consider the duration of the planned activities, as well as the possible positive and negative effects associated with permits of the proposed duration on listed species”); H.R. REP. NO. 97-835, at 30-31 (1982) *reprinted in* 1982 U.S.C.C.A.N. 2807, 2830-31; Robert D. Thornton, *Searching for Consensus and Predictability: Habitat Conservation Planning Under the Endangered Species Act of 1973*, 21 ENVTL. L. 605 (1991).

87. A Fish and Wildlife Service database of all HCPs approved or in the approval process currently lists three with terms of 100 years, four with terms of ninety-nine years, and several more with terms of fifty or seventy-five years. One is described as “indefinite,” and another as “in perpetuity.” See U.S. FISH & WILDLIFE SERV., HCP DATABASE, http://ecos.fws.gov/hcp_report/ (last visited Sept. 20, 2001).

88. U.S. FISH & WILDLIFE SERV. AND NAT’L MARINE FISHERIES SERV., HABITAT CONSERVATION PLANNING AND INCIDENTAL TAKE PERMIT PROCESSING HANDBOOK (1996), available at <http://endangered.fws.gov/hcp/hcpbktoc.pdf> (last visited Sept. 9, 2001) [hereinafter HCP HANDBOOK].

89. HCP Handbook Addendum, *supra* note 80.

90. HCP HANDBOOK, *supra* note 88, at 3-24.

pose a significant risk to the species at the time the permit is issued due to significant data or information gaps.⁹¹

The Services reiterated in response to comments on the draft Addendum that adaptive management is a tool that can be used to meet the statutory and regulatory requirements of incidental take permit issuance.⁹²

Using adaptive management strategies as a foundation for permits in the face of uncertainty sounds on the surface like an excellent strategy for advancing the goal of section 10 to accommodate development to the extent compatible with protecting species. Adaptive management should allow development to proceed while retaining the flexibility to mandate additional protective steps as we learn more about what the species requires. That is certainly how it is presented in the HCP Handbook:

The primary reason for using adaptive management in HCPs is to allow for changes in the mitigation strategies that may be necessary to reach the long-term goals (or biological objectives) of the HCP, and to ensure the likelihood of survival and recovery of the species in the wild. Under adaptive management, the mitigation activities of the HCP could be monitored and analyzed to determine if they are producing the required results (e.g., properly functioning riparian habitats). If the desired results were not being achieved, then adjustments in the mitigation strategy could be considered through an adaptive management clause of the HCP.⁹³

The Addendum echoes this view. Adaptive management is:

a means for increasing the flexibility of an HCP Results are periodically assessed, and if shortcomings are evident, previously agreed-upon alternative strategies are implemented Setting the sideboards and structure during development of the HCP provides applicants certainty in the extent of requirements for implementing an adaptive management strategy.⁹⁴

Enticing as it is, however, the use of adaptive management to substitute for information as a basis to grant incidental take permits is inappropriate. There are two problems with the current policy. The first is conceptual. Sometimes we are better off not acting, instead of acting under conditions of uncertainty, even with incorporation of adaptive management. Approval of incidental take permits generally falls in that category, because the risks posed to the species by the status quo are usually low. The second problem is one of implementation. The Services have not defined the parameters of adaptive management sufficiently to restrain its misuse in HCPs. In many cases, the adaptive management provisions of HCPs fail to provide sufficient

91. HCP Handbook Addendum, *supra* note 80, at 35252.

92. *Id.* at 35245.

93. HCP HANDBOOK, *supra* note 88, at 3-24.

94. HCP Handbook Addendum, *supra* note 80, at 35245-46.

flexibility to increase protection for the species if initial guesses about mitigation requirements prove too optimistic.

Consider first the conceptual error. Reliance on adaptive management to reduce the information base required to support permit issuance is a category mistake. Adaptive management is most sorely needed when the resource is suffering under the status quo, we do not fully understand why or what changes will most effectively remedy the situation, and we are under heavy economic or political pressure to minimize changes to the status quo. The management of resources that are already severely impacted and upon which many people have developed substantial economic reliance, such as the Columbia River or the Florida Everglades, is an example. Under those circumstances, our best choice is to act adaptively, collecting information as we go and trying to avoid irreversible commitments until we have enough information to make them with some confidence.

But the decision to grant an incidental take permit is usually not like that. Permits typically cover new development activities, altering a relatively intact, albeit not necessarily perfect, ecological status quo. An important underlying premise of adaptive management is that, given our limited information about the resources we are managing, we will sometimes, inevitably, make serious mistakes. Where nothing we do can assure the safety of the resource, adaptive management may be the least risky alternative. But if the status quo poses little risk to the species or ecosystem, inaction will be safer. In the context of the ESA, which seeks to prevent extinction because of the high societal value of species,⁹⁵ the safer choice should be preferred.

Moreover, the fact that incidental take permits can be denied if the applicant offers insufficient information to assure success means that development pressures can be used to generate badly needed information about the status and needs of the species. Faced with the choice of producing needed information or delaying development, landowners will decide whether the value of immediate development outweighs the costs of identifying, as well as implementing, appropriate mitigation measures. If it does, development can proceed and society can be reasonably confident the species will be adequately protected. If it does not, development should wait.

Providing appropriate incentives for the generation and disclosure of information through this sort of mechanism is critical to the

95. See 16 U.S.C. § 1531(3) (1999); *Tennessee Valley Auth. v. Hill*, 437 U.S. 153, 187 (1978) (“[T]he plain language of the Act, buttressed by its legislative history, shows clearly that Congress viewed the value of endangered species as ‘incalculable.’”).

effective protection of endangered species on private land.⁹⁶ Information is nearly always a limiting factor, and it is nearly always more available to landowners than to regulators. Using the promise of adaptive management to reduce the information needed to obtain an incidental take permit undermines a potentially powerful information-generating tool. By not using their ESA authority to demand more information, the Services are significantly weakening confidence in the ability of approved HCPs to protect listed species. One recent study concluded that HCPs are being approved on the basis of extraordinarily limited information,⁹⁷ making it virtually impossible to predict the likelihood of success.

The second problem with the current reliance on adaptive management in HCPs is that the actual provisions for adaptive management do not provide the flexibility needed to ensure protection. Even with severely limited information at the outset, we might be able to justify approval of cautious incremental action within a framework providing for rigorous monitoring and, if necessary, revision of the extent of allowable take and required mitigation. But that is not, at least for the most part, what we are getting. Many HCPs approve development with irreversible impacts, such as subdivision construction, or impacts that can only be reversed over a very long time period, such as extensive timber harvests. Yet under the “no surprises” regulation, they often do not provide for reductions in allowable take or increases in required mitigation if monitoring shows that the initial scheme is not working well for the species.

“No surprises” does leave the Services with legal authority to build increased mitigation requirements into HCPs under the rubric of foreseeably changed circumstances.⁹⁸ But the genesis of the rule, the perceived need to accommodate landowners, informs the manner in which it is implemented. The Services appear strongly inclined to provide as much certainty to applicants as possible. They also appear to view the provision of assurances as an on-off, yes or no proposition. Rather than adjust the level of assurances to match the level of information available, they commit to complete assurances if they believe the available information meets minimal threshold requirements.

An unscientific survey of a small number of HCPs suggests that the Services are prone to provide levels of certainty that are inconsistent with truly adaptive management, but entirely explainable by the

96. See generally Stephen Polasky & Holly Doremus, *When the Truth Hurts: Endangered Species Policy on Private Land with Incomplete Information*, 35 J. ENVTL. ECON. & MGMT. 22 (1998).

97. See PETER KAREIVA ET. AL., USING SCIENCE IN HABITAT CONSERVATION PLANS 18 (1999), available at <https://www2.nceas.ucsb.edu/projects/2049/hcp-1999-01-14.pdf> (last visited Sept. 20, 2001).

98. See 50 C.F.R. § 17.22(b)(5) (2000).

political pressures on the agencies. Under the “no surprises” rule, the Services may demand additional mitigation from the applicant for the effects of “changed circumstances,” but not for “unforeseen circumstances.”⁹⁹ Many HCPs define “changed circumstances” to include only such events as fire, flood, drought, and the addition of new species to the ESA’s list.¹⁰⁰ By thus circumscribing the universe of changed circumstances, these HCPs place any other inadequacy in the ability of the plan to protect the species into the category of unforeseen circumstances, for which no additional mitigation may be required. In particular, should the initial mitigation scheme provided in the plan prove inadequate to protect the species, the permittee may not be required to do more. In other words, at the same time that they are relying on adaptive management to make up for shortcomings in the knowledge base at the time of permit issuance, the Services are entering into HCPs that preclude the use of truly adaptive management to correct for those shortcomings. While the Services assert that they can and will bear the burden of any additional measures that prove to be necessary, that assurance is legally empty.¹⁰¹

Just as we might expect from the history of ESA implementation, the Services are using the promise of adaptive management to avoid politically tough decisions. They invoke adaptive management to justify approving development before they know whether that development is truly compatible with the long-term viability of the species. They are relying, and through the use of the reassuring term adaptive management inducing the public to rely, on the optimistic hope that any harm can be corrected through later changes. But at the same time, in order to placate landowners, they are precluding the most reliable means of guaranteeing such future corrections. There are few institutional incentives for the Services to robustly concern themselves

99. *Id.*

100. *See, e.g.,* HABITAT CONSERVATION PLAN, EVERGREEN NURSERY, OCEANSIDE, CALIFORNIA 40-42 (1999) (stating that changed circumstances include wildfire, fire ant invasion, and flooding); HABITAT CONSERVATION PLAN IN SUPPORT OF THE ISSUANCE OF SECTION 10(A) PERMITS FOR INCIDENTAL TAKE OF THE ENDANGERED DELHI SANDS FLOWER-LOVING FLY IN CONNECTION WITH THE DEVELOPMENT OF APPROXIMATELY 32.8 ACRES CONTAINING APPROXIMATELY 29.9 ACRES OF POTENTIAL DSF HABITAT IN THE CITY OF RIALTO, CALIFORNIA AND IN THE CITY OF COLTON, CALIFORNIA 4 -14 to 4-17 (2000) (stating that changed circumstances include fire, drought, unauthorized dumping of trash, and future listings); WISCONSIN STATEWIDE KARNER BLUE BUTTERFLY HABITAT CONSERVATION PLAN AND ENVIRONMENTAL IMPACT REPORT (1999), *available at* <http://www.dnr.state.wi.us/org/land/er/publications/karner/karner.htm> (last visited Sept. 23, 2001) (stating that changed circumstances include wildfires, natural weather events, and gypsy moth infestation); FINAL CLARK COUNTY MULTIPLE SPECIES HABITAT CONSERVATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT FOR ISSUANCE OF A PERMIT TO ALLOW INCIDENTAL TAKE OF 79 SPECIES IN CLARK COUNTY, NEVADA 2-291 (2000) (stating that changed circumstances include new listings, vandalism, natural catastrophes of a magnitude expected to occur during the permit term, invasion by exotic species or diseases, and redesignation of wilderness study areas within the permit area to more intensive uses).

101. *See* Habitat Conservation Plan Assurance (“No Surprises”) Rule, 63 Fed. Reg. 8859, 8862 (Feb. 23, 1998).

with the species' long-term future. The HCP sounds good when approved, and failure, if it occurs, is likely to be many years removed from the decision. No one involved in permit approval is likely to face the blame for failure.

There is at least one conspicuous exception to this tendency. The Plum Creek Timber Company Native Fish Habitat Conservation Plan ("Plum Creek Plan") provides for more robust adaptive management. Under the Plum Creek Plan, if monitoring shows a statistically significant shortfall between performance expectations and actual results, that shortfall is negatively affecting the conservation of species covered by the Plum Creek Plan, and it is caused by the inadequacy of management measures prescribed in the Plum Creek Plan, management changes are triggered. Some of those management changes are pre-defined in the Plum Creek Plan, while others would have to be mutually developed by the Services and Plum Creek based upon the data obtained.¹⁰²

Two possible explanations for Plum Creek's agreement to these more rigorous adaptive management provisions come to mind. First, the company touts itself as "the leader in environmentally responsible forest resources management."¹⁰³ It may believe the benefits it gets from that reputation outweigh the additional costs of the adaptive provisions in the native fish HCP (which it has posted on its web site as an example of its environmental stewardship). Second, the adaptive provisions of the HCP offer the potential for decreased, as well as increased, conservation measures. If monitoring shows that in some respects Plum Creek is doing more for the native fish than expected, it will be allowed to reduce its efforts.

3. *Adaptive Management as a Means to Forestall Listing or Critical Habitat Designation*

Adaptive management is also currently being considered as a factor in listing and critical habitat determination decisions. As in HCPs, vaguely framed assurances of adaptive management in these contexts may pose a barrier to effective species protection.

Section 4 of the ESA requires the Services to consider in listing decisions whether a species is threatened or endangered by: habitat destruction; overutilization; disease or predation; the inadequacy of

102. See FINAL PLUM CREEK TIMBER COMPANY NATIVE FISH HABITAT CONSERVATION PLAN 8-1 to 8-25 (2000), available at <http://www.plumcreek.com/environment/HCP-fish.cfm> (last visited Sept. 23, 2001). Two other plans incorporating at least limited opportunities for truly adaptive management are cited in DEFENDERS OF WILDLIFE, FRAYED SAFETY NETS: CONSERVATION PLANNING UNDER THE ENDANGERED SPECIES ACT 73-74 (1998).

103. PLUM CREEK TIMBER CO., ENVIRONMENTAL PRINCIPLES, <http://www.plumcreek.com/environment/principles.cfm> (last visited Sept. 23, 2001).

existing regulatory mechanisms; or any other natural or manmade factor.¹⁰⁴ Listing decisions must be based solely on the best available scientific information, taking into account efforts being made by states and localities to protect the species.¹⁰⁵ As the Services interpret section 4, they must consider “the pertinent laws, regulations, programs, and other specific actions of any entity that either positively or negatively affect the species,” including conservation efforts by governments, tribes, businesses, organizations, and individuals.¹⁰⁶

To implement that obligation, the Services have issued a draft policy explaining how they evaluate formal and informal conservation efforts when making listing decisions.¹⁰⁷ The draft policy calls for attention to two key questions: will conservation efforts be implemented, and if so will they be effective?¹⁰⁸ It identifies several factors that influence the likelihood of effectiveness, without specifying how those factors should be weighted. One is whether “[p]rinciples of adaptive management are incorporated.”¹⁰⁹ If so, the policy assumes, effectiveness is more strongly assured. The draft policy defines adaptive management in extremely general terms as “the process of monitoring the results of implemented conservation efforts, then adjusting those efforts according to what was learned.”¹¹⁰

Although it does not say so, the draft policy seems to be a response to a series of adverse court rulings. Several district courts have overturned determinations by the Services that newly implemented or planned conservation measures made listing unnecessary. In the most recent of these cases, *Federation of Fly Fishers v. Daley*, the court flatly held that the Services “may not rely on future conservation actions” because the “ESA cannot be administered on the basis of speculation or surmise.”¹¹¹ Other decisions have similarly rejected reliance on measures that have not yet been implemented or that are too new to have a clear track record of effectiveness.¹¹² Presumably the Services hope that articulation of a framework for evaluating new or proposed conservation efforts will win them greater deference from the courts.

104. 16 U.S.C. § 1533(a)(1) (1999).

105. *Id.* § 1533(b)(1)(A).

106. See Announcement of Draft Policy for Evaluation of Conservation Efforts When Making Listing Decisions, 65 Fed. Reg. 37102 (June 13, 2000) [hereinafter Draft Policy for Evaluation of Conservation Efforts].

107. *Id.*

108. *Id.* at 37104.

109. *Id.* at 37105.

110. *Id.*

111. 131 F. Supp. 2d 1158, 1165 (N.D. Cal. 2000).

112. See *Oregon Natural Res. Council v. Daley*, 6 F. Supp. 2d 1139 (D. Or. 1998); *Save Our Springs v. Babbitt*, 27 F. Supp. 2d 739 (W.D. Tex. 1997); *Biodiversity Legal Found. v. Babbitt*, 943 F. Supp. 23 (D.D.C. 1996); *Southwest Ctr. for Biological Diversity v. Babbitt*, 939 F. Supp. 49 (D.D.C. 1996).

The decisions that appear to have sparked the draft policy statement demonstrate the pressures the Services are under to avoid listing. Adaptive management provides a plausible-sounding avoidance mechanism. As in HCPs, the Services are prone to invoke adaptive management almost as a talisman, without disclosing to the public the precise parameters of the particular adaptive management proposal and, for all a reader of their public statements can tell, perhaps even without considering those parameters themselves. The recent decision not to propose listing of a northeastern population of the harbor porpoise¹¹³ provides an example. The decision rested primarily on the conclusion that the porpoise would be adequately protected by measures taken under the the Marine Mammal Protection Act and Magnuson-Stevens Fishery Conservation and Management Act.¹¹⁴ The agency noted, among other things, that these measures “include[d] adaptive management principles.”¹¹⁵

The porpoise decision may well be entirely appropriate, with or without adaptive management. My point, though, is that it invokes adaptive management in an utterly vacuous fashion. It provides no information about how adaptive management is to be carried out, making it impossible to evaluate the extent to which it will protect the species. Does the management program include a well-designed monitoring program that will reveal declines in the porpoise population? Does it include enforceable provisions that will ensure changes if such declines ensue? We cannot know from the Service’s explanation, which invokes the term with no further explanation. As in the HCP context, reliance on adaptive management can provide an easy, but perhaps unjustified, rationalization for avoiding political confrontations.¹¹⁶

In a similar fashion, without articulating a formal policy, the Services also have begun to rely on vague assurances of adaptive management to exclude areas from critical habitat. To the maximum extent prudent and determinable, the Services are supposed to designate critical habitat concurrently with listing,¹¹⁷ a requirement honored prima-

113. Status Review of the Gulf of Maine/Bay of Fundy Population of Harbor Porpoise Under the Endangered Species Act (ESA), 66 Fed. Reg. 40176 (Aug. 2, 2001).

114. *See id.* at 40185.

115. *Id.*

116. I must concede that, despite these pressures, the Services do not always genuflect at the mere mention of adaptive management in conservation measures. For an example of a listing made in the face of a claim that a conservation strategy including an adaptive component made listing unnecessary, see Threatened Status for Southwestern Washington/Columbia River Coastal Cutthroat Trout in Washington and Oregon, and Delisting of Umpqua River Cutthroat Trout in Oregon, 64 Fed. Reg. 16397, 16404 (Apr. 5, 1999).

117. *See* 16 U.S.C. § 1533(a)(3) (1999).

rily in the breach.¹¹⁸ Critical habitat is to include areas that are essential to the conservation of the species and may require special management considerations.¹¹⁹ Areas can be excluded from critical habitat if the benefits of exclusion, including socio-economic benefits, outweigh the benefits of designation, unless exclusion would cause the species' extinction.¹²⁰ Federal agencies must insure that their actions are not likely to destroy or adversely modify critical habitat.¹²¹

The current regulatory definition of adverse modification or destruction of critical habitat is virtually identical to the definition of jeopardizing the continued existence of the species.¹²² As a result, the Services regard the designation of critical habitat as essentially irrelevant to implementation of the law.¹²³ Despite its limited significance as currently defined, though, critical habitat designation has often been extraordinarily controversial. The Services have frequently ducked designation, and have been particularly anxious to exclude non-federal lands from their designations. The invocation of adaptive management now serves as an additional tool for that purpose. In a series of recent rules, the Services have excluded (or proposed to exclude) areas from critical habitat on the grounds that, because they already are adaptively managed, they do not require any other special management considerations. Yet, as in listing decisions, the Services have provided no explanation of the details of the adaptive management programs that allegedly secure the habitat in question.¹²⁴

Like the use of adaptive management in decisions not to list, the critical habitat experience is a cautionary tale. Perhaps in every instance the exclusion of areas from critical habitat has been justified. As with the listing decisions, though, the lack of information leaves room for questions. The Services may not be paying sufficient attention to the details of adaptive management, and they appear reluctant to facilitate public inquiry into those details. The public record is entirely consistent with adaptive management being used as a convenient, and difficult to penetrate, cover for conflict avoidance.

118. See Notice of Intent to Clarify the Role of Habitat in Endangered Species Conservation, 64 Fed. Reg. 31871, 31872 (June 14, 1999) (noting that critical habitat has been designated for only nine percent of listed species).

119. See 16 U.S.C. § 1532(5).

120. See *id.* at § 1533(b)(2).

121. See *id.* at § 1536(a)(2).

122. See *supra* note 31 and accompanying text.

123. See *generally* Notice of Intent, *supra* note 118.

124. See, e.g., Proposed Designation of Critical Habitat for the Northern Great Plains Breeding Population of the Piping Plover, 66 Fed. Reg. 31760, 31767 (June 12, 2001); Final Designation of Critical Habitat for the Riverside Fairy Shrimp, 66 Fed. Reg. 29384, 29391 (May 30, 2001); Final Determination of Critical Habitat for the California Red-legged Frog, 66 Fed. Reg. 14626, 14639 (Mar. 13, 2001).

C. *The ESA as a Barrier to Adaptive Management*

The history of political adaptation and current use of adaptive management under the ESA highlight the hazards of granting discretion to agencies vulnerable to political pressure. The third relevant experience reminds us of the countervailing point. Flexibility of two kinds is an essential element of adaptive management. First, we must have the ability to experiment with management decisions. Those experiments cannot be timid; they must be dramatic enough to produce an observable response from the ecosystem or they will not help us learn.¹²⁵ Second, we must have the flexibility to adjust management actions in response to measured outcomes. Excessively rigid statutory or regulatory demands can severely constrain our ability to learn about the systems we are managing, or to implement our newly-acquired knowledge.

One example of constraints on learning comes from the experimental controlled flood of the Grand Canyon in 1996. Historically, the Colorado River experienced extreme seasonal fluctuations, with the flow ranging from a torrential flood at times in the spring to a mere trickle in the late summer. Construction of a series of large dams along the river converted it to a predictable, relatively constant flow. Even flows are useful for hydropower, flood control, and irrigation, but they have drastically altered the Colorado River ecosystem. Among other effects, the extreme reductions in peak flows have greatly reduced the river's ability to carry sediment from the main channel to beaches and sandbars along the shoreline. Without that renewing sediment, the beaches and sandbars have disappeared, together with the still backwaters they created. Warmed by the sun, those backwaters provided essential nurseries for the river's native fish.¹²⁶

The Bureau of Reclamation in 1995 undertook an adaptive management program for operation of Glen Canyon Dam. The first large-scale experiment planned was a controlled release from the dam designed to mimic annual pre-dam flood conditions.¹²⁷ Interior Department scientists hoped that the flood would redistribute sediment from the main channel to the beaches and sandbars, improving conditions for imperiled native fish. At the same time they expected the flood,

125. See John M. Volkman, *How Do You Learn From a River? Managing Uncertainty in Species Conservation Policy*, 74 WASH. L. REV. 719, 739 (1999) (noting that adaptive management calls for "experimentation that generates a measurable response," which in many cases will require "dramatic action").

126. See D.T. Patten et al., *A Managed Flood on the Colorado River: Background, Objectives, Design and Implementation*, 11 ECOLOGICAL APPLICATIONS 635 (2001); Bernice Wuethrich, *Deliberate Flood Renews Habitat*, 272 SCIENCE 344 (1996).

127. See Vicky J. Meretsky et al., *Balancing Endangered Species and Ecosystems: A Case Study of Adaptive Management in Grand Canyon*, 25 ENVTL. MGMT. 579, 580 (2000).

which would be closely monitored, to improve their understanding of sediment and nutrient transport, as well as other ecological processes. Better understanding, they hoped, would improve future dam operations.

Flood planners soon ran into an ESA problem. One of three known populations of the endangered Kanab ambersnail inhabited the vegetation at the edge of the river.¹²⁸ The Bureau of Reclamation, which would carry out the experimental flood, could not precisely forecast the height of the floodwaters; under the worst case estimate, up to seventeen percent of the snail's habitat would be destroyed. To protect the snail population, the Service initially required that the Bureau move virtually all snails located below the worst-case line to higher ground before the flood. That proved difficult because to mimic natural flows the flood had to be carried out in early spring; many snails were still dormant and therefore difficult to locate. Moving them at that stage required wholesale removal of riparian vegetation. Service and Bureau personnel reached a compromise in which a smaller number of snails was relocated, allowing much of the vegetation above the predicted flood height to remain undisturbed. The flood went as planned, and the snail population returned quickly to pre-flood levels.¹²⁹

The Glen Canyon flood is a successful example of adaptive management in the presence of a listed species. The flood significantly advanced understanding of the sediment and nutrient dynamics of the system, and improved river conditions for critically endangered native fish, at least in the short run.¹³⁰ All this was accomplished with only minor, temporary effects on the snails.

That success may not be easy to repeat in other locations, however. It required a combination of several factors that may not recur. The species was a good candidate for experimentation. The Kanab ambersnail carries a far lower public profile than the Colorado River; therefore excitement over the possibilities of improving the river overwhelmed any protests about the risk to the snail. The low level of public concern for the snail may have increased the willingness of the Fish and Wildlife Service to negotiate down from its initial demand that nearly all snails be moved away from the flood risk zone. Furthermore, the population was large enough, at some 10,000 individuals, that a substantial portion of it could be risked without threatening its viability. Finally, unlike many listed species, the snails were rela-

128. The other populations were on private land in Utah and, the Fish and Wildlife Service believed, less securely protected. *See id.* at 581.

129. *See id.* at 583.

130. *See* J.C. Schmidt et al., *The 1996 Controlled Flood in Grand Canyon: Flow, Sediment Transport, and Geomorphic Change*, 11 *ECOLOGICAL APPLICATIONS* 657 (2001).

tively easy to locate and move out of harm's way. The system, too, was well situated for adaptive management. The political power of the Grand Canyon ensured the availability of funding. Generous funding and public support also made it possible to involve a large number of interest groups in the decision, increasing public confidence in the outcome. Even with all these elements in alignment, though, concern about impacts on the Kanab ambersnail did limit the size of the experimental flood and consequently the extent and type of data produced by this management experiment.¹³¹

In other situations, the precariousness of a species' or ecosystem's condition, juxtaposed with economic pressures on the system, may inhibit experimentation. In the Columbia River system, at the time the Council endorsed adaptive management only limited, ambiguous data supported either augmentation of river flows or transporting fish by truck and barge around dams as a strategy to boost salmon survival.¹³² It took a decade to develop a research strategy to address these issues. That strategy has focused on monitoring fish that follow different routes down the river, rather than on manipulating river flows or modifying barging strategies.¹³³ It is difficult to gather the courage to experiment aggressively with barging when it is assumed to provide a critical backstop for the population in low flow years.¹³⁴ From the opposite perspective, it is just as difficult to justify adjusting flows, at substantial economic cost, without considerable evidence that the experiment will improve the status of imperiled salmon. Moreover, interest groups who would be hurt by reduced flows resist efforts to gather information that might lead to flow reductions.

III. LESSONS FROM THE ESA EXPERIENCE: THE INSTITUTIONAL CHALLENGES OF SCIENTIFICALLY RATIONAL MANAGEMENT

Our experience with adaptive management highlights the institutional challenges to making effective use of evolving scientific knowledge. To support management of our natural resources in this new age of scientifically-intensive resource management, our institutions must improve in four ways. First, they must more effectively counteract the political imbalance created by the opposition of focused economic costs and diffuse noneconomic benefits. Second, and related to the first, they must reduce the immediate political pressures associ-

131. The 1996 flood attained flows of only 1274 cubic meters per second, far below pre-dam peak flows, which ranged as high as 8500 cubic meters per second. See Patten et al., *supra* note 126, at 635.

132. See Volkman and McConnaha, *supra* note 16, at 1259-60; Volkman, *supra* note 125, at 741-42.

133. See Volkman, *supra* note 125, at 742.

134. See Volkman & McConnaha, *supra* note 16, at 1260-61.

ated with key management decisions. Third, they must keep management decisions open to correction without forever leaving them at the mercy of changing political winds. Finally, and perhaps most difficult, our institutions must successfully combine flexibility with accountability.

A. *Reducing Political Asymmetry*

The political pressures the Services encounter in the course of ESA implementation tend to be highly asymmetric. Regulated landowners face substantial economic costs if the law is stringently applied. Consequently, they have strong incentives to convey their views to the agencies as forcefully as possible. The advocates of endangered species protection, on the other hand, are a far more diffuse group, with no economic stake in the outcome. Although they can organize through environmental groups, transaction costs can make that difficult. The increasing decentralization of ESA decisionmaking, particularly through the HCP process, makes it even more difficult for these diffuse interests to play an effective role.

Information, gathered in a manner that maximizes its reliability and widely disseminated, can help correct the political imbalance. As Professors Fischman and Meretsky note in their contribution to this volume, information relevant to the management of endangered species and ecosystems is often not collected at all, not collected systematically, or not made widely available.¹³⁵ The agencies have substantial authority to collect, require collection of, and distribute information in connection with the issuance of incidental take permits¹³⁶ and research permits.¹³⁷ They have not exercised that authority because they are reluctant to confront, and even more reluctant to share, information that may shake the foundations of their management programs or force them into political confrontations.

We need institutional counterweights to that reluctance. Clear, enforceable information collection and disclosure mandates must be part of any adaptive management requirement or authority. We must, in so far as possible, specify the type and extent of monitoring required in advance. We should consider delegating responsibility for research design and data collection to a group of scientists independent of, and more politically insulated than, the management agency. Prohibitions on uninformed action can also serve as powerful incen-

135. Fischman & Meretsky, *supra* note 21, at 96.

136. *See supra* text following note 95.

137. *See* Fischman & Meretsky, *supra* note 21, at 108-09.

tives for information disclosure, as the discussion of incidental take permits above illustrates.¹³⁸

Once we have information, however, we cannot simply trust the agencies to do the right thing with it. Monitoring data are likely to be ambiguous, difficult to interpret, and at the frontiers of scientific knowledge. Despite our ready assumption to the contrary, the agencies may not have the technical expertise to properly evaluate it. Agency personnel may be working well beyond the boundaries of their formal training. Furthermore, if they are many years beyond their formal education, they may not be familiar with the latest developments in conservation biology, ecology, or the biology of the individual species at issue.¹³⁹ That is not a criticism of agency personnel; the demands of their jobs often limit the time and energy they can devote to keeping up with the latest advances in their fields.

Even with the right expertise, it is optimistic to expect that the Services will interpret the data impartially and act quickly to correct any problems it reveals. It is human nature to resist recognizing that one has been wrong. Any ambiguities in the data are likely to be interpreted according to the agency's self-interest, which will lie both in affirming the correctness of its earlier decision and in avoiding controversy. Shortage of expertise, or disagreement among the experts within the agency, is likely to exacerbate the tendency to interpret data according to political, rather than scientific, signals.

Requiring wide dissemination of the data should help to correct this tendency by allowing interested experts outside the agency to articulate their views. Many people and groups with an interest in the outcome of agency decisions, however, will lack both the technical ability to evaluate the data and the financial resources to hire experts for that purpose. Citizens concerned about the environment are far more likely to fall in this category than regulated entities with a focused financial interest in the outcome. Simply disclosing information, therefore, can in some ways exacerbate the political imbalance.

Our management institutions must attempt to give the public, not just the regulated community, effective access to all relevant information. Capacity-building grants to help citizen groups hire experts or educate their members are one possible strategy.¹⁴⁰ Independent sci-

138. See *supra* text accompanying notes 95-97.

139. One recent study found that "recovery plans written exclusively by federal government employees are less well grounded in biological information than those that include nonfederal participation," suggesting that expertise about endangered species lies more outside than within the Services, or at least that outside participation is required to get the most out of the Services' expertise. Leah R. Gerber & Cheryl B. Schultz, *Authorship and the Use of Biological Information in Endangered Species Recovery Plans*, 15 CONSERVATION BIOLOGY 1308, 1309 (2001).

140. For a description and analysis of the many ways in which government already is both trying to increase the capacity of non-profit organizations to contribute to societal conservation goals, and relying on that capacity as it currently exists, see generally Lee P. Breckenridge, *Non-*

entific review of data by a balanced blue-ribbon panel will also be useful in some circumstances. That type of independent scientific oversight, however, cannot be regarded as a panacea. Because blue-ribbon panels are difficult to organize and resource-intensive, they are most useful for extremely high-profile, large-scale decisions, such as management of the Columbia River system or restoration of the Everglades. They are unlikely to be a practical accompaniment to the large number of decentralized management decisions that are the hallmark of our new age. Furthermore, while independent science boards can highlight areas where there is true scientific consensus, they will not eliminate political battles over the interpretation of ambiguous scientific information. Nor, since entire fields of science can be subject to unconscious biases and there will always be subtle opportunities to skew panel line-ups, will blue-ribbon panels necessarily bring all possible views of the data to the table. Capacity-building seems more likely to offer a long-term mechanism for allowing all interested persons effective access to the data supporting management decisions.

Access to the decisionmaking table is also an important aspect of the current political asymmetry. The HCP negotiation process, for example, does not guarantee anyone but the applicant the right to participate in the early stages of creating a plan.¹⁴¹ Similarly, consultations under section 7 involve only the Service and the federal agency proposing an action.¹⁴² Facing only the applicant or an agency advocating a project, Service personnel will be under intense pressure to relax protective requirements. Not surprisingly, the Services do not always negotiate effectively in those circumstances.¹⁴³ Guaranteeing other interests a seat at the table at the earliest possible time could help insulate the agency from that sort of asymmetric political pressure.

profit Environmental Organizations and the Restructuring of Institutions for Ecosystem Management, 25 *ECOLOGY L.Q.* 692 (1999).

141. The Services encourage applicants for large-scale plans to involve the public prior to submitting their application, but there is no formal requirement that they do so. The ESA requires a minimum thirty day period for public comment before permits are issued. 16 U.S.C. § 1539(c) (1999). The Services have extended the length of the public comment period to sixty days for most HCPs, and ninety days for large scale or exceptionally complex HCPs. See HCP Handbook Addendum, *supra* note 80, at 35256. While the extension of the comment period is welcome, it does not alter the fact that most HCPs are negotiated solely between the applicant and the relevant Service. In most cases, the comment period comes after the Service has substantially (though not formally) agreed to the terms of the HCP.

142. See 16 U.S.C. § 1536(a)(2).

143. See Shi-Ling Hsu, *The Potential and Pitfalls of Habitat Conservation Planning Under the Endangered Species Act*, 29 *ENVTL. L. REP.* 10592, 10597-98 (1999) (describing some deals struck by the Services in HCPs, and wondering whether weak HCPs spring from the Services underestimating the strength of their bargaining position). Weak negotiation by government agencies may be a more general phenomenon. See Jerold S. Kayden, *Market-Based Regulatory Approaches: A Comparative Discussion of Environmental and Land Use Techniques in the United States*, 19 *B.C. ENVTL. AFF. L. REV.* 565 (1992) (noting that cities consistently underprice zoning incentives, based on their lack of expertise and the absence of market-driven incentives to drive a hard bargain).

Finally, the availability of citizen suits can effectively counterbalance political asymmetries. Agencies are less likely to give in to political pressures if doing so would risk citizen litigation. They can deflect the blame for protective decisions by pointing out the likelihood of such a suit. Furthermore, the shadow of citizen suits can weaken the negotiating power of landowners and extractive industries. A landowner facing the threat of citizen action, for example, will be more anxious to obtain an incidental take permit. That landowner is likely to accept more onerous conditions in the permit than one who thinks section 9 cannot or will not be enforced.

Increasing, or at least maintaining, the availability of citizen suits, therefore, is an important aspect of realizing the promise of the new age of environmental restoration. Citizen suits are most effective when statutes impose clear obligations or limits. Adaptive management seems at first blush ill suited to such clarity. As I explain below, though, through pre-negotiated management commitments, we may be able to incorporate clear boundaries and obligations into adaptive management. We also surely could impose clear procedural requirements, enforceable by citizen suits, for information collection, disclosure, and periodic re-examination of management decisions.

B. *Distancing Decisions from Political Pressures*

Another way to help decisionmakers make the most effective use of scientific information is to reduce the immediate political pressures associated with management decisions. One way to do that is to make key decisions outside the context of any individual dispute. Another is to leave them to case-by-case determination, but ensure that they are made *before* the controversy becomes intense.

Decisions can be taken out of the context of individual disputes by making them generally, in a single rule or policy statement, rather than leaving them up for negotiation in every individual decision. The Services, for example, could formulate rules or announce a policy clearly defining the minimum requirements for adaptive management in HCPs or in conservation efforts intended to make listing unnecessary. That would help balance the political pressures: environmental groups whose members care generally about endangered species would have a strong incentive to participate in formulating those general policies, while individual landowners whose interests might be affected only by one or a few species would have less reason for involvement. Unfortunately, an agency which seeks to preserve as much flexibility as possible to respond to the politics of particular decisions is unlikely to constrain itself in advance with this sort of general rule. Congress could directly impose such constraints or require

that the agency articulate regulations, but it too may see little political advantage in doing so.

Perhaps the most likely catalyst for this sort of institutional change is the federal courts. A few judicial decisions rejecting individual agency actions as arbitrary and capricious or insufficiently explained can spark a rulemaking or policy statement designed to more fully explain the agency's reasoning.¹⁴⁴

Pre-negotiated commitments, in which the management agencies and regulated parties agree in advance on specific steps that will be taken if monitoring shows that the species or system is in decline,¹⁴⁵ are another strategy that can allow management decisions to precede heated controversies. Such pre-commitments have the advantage of leaving the exact parameters of management free to respond to future information, while providing closure to the decisionmaking process and a degree of certainty to the regulated community.

The "no surprises" provisions of habitat conservation plans could offer a perfect opportunity to use such pre-commitments. Assurances to permittees could be carefully tailored to match the information available at the time the permit is sought. They could easily provide, for example, that mitigation ratios will increase in pre-established steps if the species does not respond as expected to the initial level of protection. Or, like the Plum Creek Native Fish HCP, they could prescribe other management changes to follow declines detected by monitoring.¹⁴⁶ Although landowners could not be assured at the outset of the precise extent of their obligations, they could be assured that they will not have to do more than the species requires. And they would always have the option of postponing their application until they are able to provide information justifying stronger assurances. That choice could force applicants to determine and reveal the value they place on different levels of assurances.

The Services have little incentive to treat the HCP process this way, as our experience to date reveals. Greater participation early in the process by skeptical outside observers might prod them in the right direction. But again the courts could provide the strongest stimulus. Incidental take permits cannot be issued unless the Services find that "the taking *will not* appreciably reduce the likelihood of the sur-

144. See *supra* text accompanying notes 109-10 (speculating that draft policy on evaluation of conservation efforts is a response to a series of rulings overturning decisions not to add species to the protected lists).

145. This possibility was suggested to me by Professor Buzz Thompson. Prenegotiation may lessen some of the many psychological barriers to effectively addressing environmental problems. For an insightful discussion of how human nature makes common problems particularly challenging, see Barton H. Thompson, Jr., Essay, *Tragically Difficult: The Obstacles to Governing the Commons*, 30 ENVTL. L. 241 (2000).

146. See *supra* text accompanying note 102.

vival and recovery of the species in the wild.”¹⁴⁷ That is a stronger standard than imposed by section 7 on other federally-approved actions which must only not be *likely* to reduce the chance of survival and recovery.¹⁴⁸ The difference justifies more searching review. Courts should hold the issuance of an incidental take permit arbitrary and capricious unless it is supported by sufficient information to accurately forecast the impact on the species.

To reduce the informational prerequisites for a permit, an adaptive management program must establish clear provisions for either decreased take or increased mitigation if the plan proves not to be protecting the species. Given the Services’ historic reluctance to exercise their authority, such adaptive provisions must be enforceable by citizens as well as by the Services. Citizen suit oversight will be possible only if the precise conditions that will lead to a change in permitted take or required mitigation are clearly set out, and the change will be automatic, not dependent on formal action by the permitting agency. Under those circumstances, a permittee who did not reduce take or increase mitigation would no longer be in compliance with the terms of the permit, and would be subject to a citizen suit for violation of section 9.

Of course, pre-commitments in HCPs and other adaptive management schemes will only be effective to the extent that monitoring can provide sufficient, and sufficiently clear, information to adjust management. Unless much greater resources are invested in monitoring than is typically required under today’s HCPs, the available data will rarely rise to that level of certainty. Again, a partial answer is that the permit applicant can be forced to choose between waiting for a permit and providing sufficient resources to ensure that the plan functions as anticipated. Even with substantial monitoring efforts, however, natural variations in population sizes may make it exceedingly difficult to determine how well an HCP is performing. Against background variations, it is an open question whether problems with an HCP would be detected, and the terms of the permit adjusted, in time to assure the species’ survival. But the odds would surely be better than they are today.

C. *Balancing Openness to Change with Political Closure*

We cannot make effective use of evolving scientific information unless our management decisions are always subject to modification. But leaving decisions constantly open exacerbates political asymmetries. Those facing focused economic costs will continually express

147. 16 U.S.C. § 1539(a)(2)(B)(iv) (emphasis added).

148. See *id.* at § 1536(a)(2).

their views to the agency; others may not be able to persevere. At the same time, decisions that are never final create a different kind of risk for the regulated community. They can never be sure that the terms of their deal will not be arbitrarily changed by a new administration with very different political views.

There must, therefore, be some finality to decisions. Finality and flexibility can be combined through a couple of strategies. One is to make only incremental decisions. We might decide to operate a dam under a certain regime for a year (or even less), for example, or to approve a small timber harvest or subdivision. Data derived from monitoring the consequences of that small decision could then be used to decide whether to renew or extend it. Another possibility is the sort of pre-negotiated management discussed earlier. We might make a decision only once, but build into that decision our responses to monitoring data. The second strategy offers greater political closure, but less flexibility, than the first. It might be more appropriate where substantial, and irreversible, investment decisions must be made on the basis of the initial decision.

D. *Combining Flexibility with Accountability*

Our institutions must also successfully marry flexibility and accountability. If flexibility comes without accountability, the agencies, subjected to intense political pressure, will use it to duck controversy rather than to incorporate the best new science into their decisions.

Mandates to collect and distribute information, citizen suits, and precommitments can all help keep agencies accountable for the ways in which they exercise their flexibility. So can statutory or regulatory boundaries on agency action.

Consider, for example, the quest for knowledge in the Columbia River system. How should we decide to what extent to experiment with alternatives to barging young salmon around the dams? We could impose a mandate for experimentation, and require that the management agencies seek the advice of a group of salmon biologists and other experts on experimental design. That should get all possible management experiments that could help us learn whether barging helps or hurts the fish into the public debate, with their risks and their potential information value straightforwardly revealed.

But how should we decide what degree of risk to the salmon we can accept in order to gain more information? We can look to the ESA for help with that decision. It sets as an outer boundary the jeopardy standard. We cannot conduct an experiment that is likely to jeopardize the continued existence of the species without a special exemption from the "God Squad." Even short of that, the ESA sets a

helpful standard. Decisions to experiment should be undertaken only if they can be defended by the standards required to obtain permits for scientific purposes or to enhance the survival of the species.¹⁴⁹ Decisions to experiment should be explained by showing that the information gained will be sufficiently beneficial *to the imperiled species* to justify the experimental risk. We should seek to ensure that such risks are not imposed with the primary aim of benefitting economic interests opposed to conservation.

We do not need to provide unlimited flexibility. Constraints may indicate societal goals and societal limits that are simply not subject to reconsideration by a management agency. We should not quickly assume that such constraints are interfering with rational management; rather, we should make every effort to find management alternatives consistent with those constraints and our other goals. If, on sober reflection, we find that we cannot achieve such consistency, we may need to reconsider our full set of goals.

The conflict between the Kanab ambersnail and the Glen Canyon controlled flood is an example. It seemed that the needs of the snail and the larger ecosystem, or perhaps the endangered native fish, conflicted. Flood managers felt frustrated by requirements imposed to protect the snail. But the ESA precludes the sacrifice of one species for the benefit of another, or of an ecosystem. That boundary has been imposed for strong societal reasons. We do not want species carelessly tossed aside, even if the reason is to save another species. The ESA forces us to look closely for a solution that will accommodate both sets of needs, and in fact such a solution was found for the Glen Canyon flood. If, at some point in the future, such a conflict cannot be resolved in a way that protects all listed species, the choice must be elevated to the "God Squad" or the Congress.

CONCLUSION

The new age of environmental restoration offers the enticing hope that we may finally find a way to balance our desires for material goods with the needs of the natural world. Adaptive management is a necessary foundation for that balance. The evolution of institutions that comfortably cross political boundaries brings us closer to realizing the promise of adaptive management.

But the peril of adaptive management remains real, and is not reduced by those institutional changes. Adaptive management can be used as a smokescreen to conceal political accommodations that sacrifice the protection of species or natural systems. In order to reduce

149. *See id.* at § 1539(a)(1)(A).

2001]

Adaptive Management and the ESA

89

that peril, we must develop institutions that will help us manage in a more scientifically rational manner. We must implement true adaptive management, collecting, recognizing, and responding to the best information science can give us, even when the response is painful. At the moment, our institutions seem ill suited to that task, but there are corrective steps we can take. Only if we can erect institutions that counter our human tendencies to avoid conflict, assume the best, and cling to outmoded assumptions about the world will the patience and perseverance that Professor Sax counsels bear fruit.