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Regulation by Adaptive Management—Is It Possible?

J.B. Ruhl*

INTRODUCTION

The history of environmental law provides as good of an example as any other field in regulatory law of how successful prescriptive regulation has been at meeting public policy objectives and how difficult it will be to extend that experience much further into the future. For decades so-called “command-and-control” regulation has picked the low-hanging fruit—in environmental law, for example, it has targeted emissions from smokestacks and discharge pipes, disposal of wastes in landfills, transportation of hazardous chemicals, and similar discrete, easily-identified sources of environmental harm. Even the most conservative cost-benefit analyses confirm that many of these initiatives were smashing successes.¹ Our nation’s air

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* Matthews & Hawkins Professor of Property, The Florida State University College of Law, Tallahassee, Florida. I am thankful for the comments I received on early versions of this work from Dave Markell and Bradley Karkkainen and from participants at the University of Minnesota’s May 2005 symposium on “Where are Law, Ethics & the Life Sciences Headed? Frontier Issues.” Bridget Kellogg Smitha and Adam Schwartz provided valuable research assistance, and the Florida State University College of Law sustained my research through financial and other support. Please direct comments to jruhl@law.fsu.edu.

1. For example, in March 2005, the White House’s Office of Management and Budget, Office of Information and Regulatory Affairs (OIRA) released the results of a cost-benefit analysis conducted of federal rules imposed from 1994–2004 by nine federal departments and agencies. OIRA estimates that the annual compliance costs of the rules are between \$34.8 billion and \$39.4 billion, that the annual social benefits of the rules are between \$68.1 billion and \$259.6 billion, and that most of the costs and benefits are attributable to several rules the Environmental Protection Agency promulgated to regulate public exposure to fine particulate matter. See OFFICE OF MGMT. & BUDGET, OFFICE OF INFO. & REGULATORY AFFAIRS, DRAFT REPORT TO CONGRESS ON THE COSTS AND BENEFITS OF FEDERAL REGULATIONS 3, 8 (2005), *available at* http://www.whitehouse.gov/omb/infoereg/2005_cb/draft_2005_cd_report.pdf. Of course, it is not necessarily the case that this is the most efficient outcome.

and water resources are cleaner, and our lands and roads are safer.

The future that lies ahead for most fields of regulation, however, is filled with problems of unwieldy dimensions and intractable causes. In environmental law, for example, the problems that are foremost to many observers include the invasion of non-native species into ecosystems, the depletion of estuarine resources by fertilizer runoff from countless agricultural operations hundreds to thousands of miles inland, the degradation of habitat from suburban “sprawl,” and the evidence of climate change, which itself is irrefutable even if its causes are not.² In this brand of environmental policy challenge, there are no discrete sources or clearly traced lines of causation. Rather, problems such as these exhibit the hallmark characteristics of complex adaptive systems.³ Their behavior emanates from a multitude of diverse, dispersed sources responding to coevolving interactions, feedback loops,

Cass Sunstein has observed that “the United States spent no less than \$632 billion for pollution control between 1972 and 1985, and some studies suggest that alternative strategies could have achieved the same gains at less than one-fifth the cost.” Cass R. Sunstein, *Paradoxes of the Regulatory State*, 57 U. CHI. L. REV. 407, 411 (1990). Indeed, it is fair to say that by the mid-1990s “virtually everyone . . . agree[d] that our historical command-and-control approach [was] inefficient and inadequate by itself to carry us where we still need to go.” Barton H. Thompson, Jr., *The Search for Regulatory Alternatives*, 15 STAN. ENVTL. L.J., at viii, viii (1996). On the other hand, for the view that “rigid insistence on making regulations pass cost-benefit tests would, in retrospect, have gotten the wrong answer time after time,” see Frank Ackerman, Lisa Heinzerling & Rachel Massey, *Applying Cost-Benefit to Past Decisions: Was Environmental Protection Ever a Good Idea?*, 57 ADMIN. L. REV. 155, 192 (2005).

2. For a survey of these and similar environmental concerns, see JOHN COPELAND NAGLE & J.B. RUHL, *THE LAW OF BIODIVERSITY AND ECOSYSTEM MANAGEMENT* 299-804 (2002). To be sure, it is not as if human societies have never before confronted such challenges. As Jared Diamond observes in his sweeping survey of the collapse of human societies, environmental phenomena such as climate change and invasive species, and social phenomena, such as urban sprawl and trade, have combined many times in the past to cause dramatic dislocations of previously successful societies. See JARED DIAMOND, *COLLAPSE: HOW SOCIETIES CHOOSE TO FAIL OR SUCCEED* 6-10 (2005). The difference today has to do with scale: we have more people, more potent technology, and fewer resources per capita than did societies of the past, and global interconnections are tighter and far more expansive, meaning problems in one region affect potentially many others. See *id.* at 8.

3. Complex adaptive systems are “macroscopic collections of [interacting] units that are endowed with the potential to evolve in time.” PETER COVENEY & ROGER HIGHFIELD, *FRONTIERS OF COMPLEXITY: THE SEARCH FOR ORDER IN A CHAOTIC WORLD* 7 (1995).

and nonlinear cause-and-effect properties.⁴ They are, to put it simply, excruciatingly hard for researchers to understand,⁵ and

4. Although the study of such systems can be quite technical in substance, many of the recent and most influential works in the field focus on applications of the technical theory to real world phenomena, such as biological evolution. *See, e.g.*, JOHN L. CASTI, COMPLEXIFICATION: EXPLAINING A PARADOXICAL WORLD THROUGH THE SCIENCE OF SURPRISE (1994); JACK COHEN & IAN STEWART, THE COLLAPSE OF CHAOS: DISCOVERING SIMPLICITY IN A COMPLEX WORLD (1994); MURRAY GELL-MANN, THE QUARK AND THE JAGUAR: ADVENTURES IN THE SIMPLE AND THE COMPLEX (1996); BRIAN GOODWIN, HOW THE LEOPARD CHANGED ITS SPOTS: THE EVOLUTION OF COMPLEXITY (1996); JOHN H. HOLLAND, HIDDEN ORDER: HOW ADAPTATION BUILDS COMPLEXITY (1995); STEVEN JOHNSON, EMERGENCE: THE CONNECTED LIVES OF ANTS, BRAINS, CITIES, AND SOFTWARE (2001); STUART KAUFFMAN, AT HOME IN THE UNIVERSE: THE SEARCH FOR LAWS OF SELF-ORGANIZATION AND COMPLEXITY (1995); RICHARD SOLÉ & BRIAN GOODWIN, SIGNS OF LIFE: HOW COMPLEXITY PERVADES BIOLOGY (2000). Complexity theory and the science of complex adaptive systems have radically altered the way in which scientists study natural systems as mundane as a dripping faucet and as grand as the weather. *See* COVENEY & HIGHFIELD, *supra* note 3, at 5-8. For centuries, the classical scientific method has approached such behavior in a reductionist manner, intent on studying components of whole complex systems at their most irreducible levels. *See id.* at 11-14. Reductionism is based on the premise that by understanding how each part works in its simplest form, we can understand how the whole system works. *See id.* at 432; *see also* CASTI, *supra*, at 273; COHEN & STEWART, *supra*, at 33-34. The advent of high-speed computers that allow system modeling at levels of detail never before imagined opened the door to the alternative view of systems that complexity theory posits. *See generally* JOHN L. CASTI, WOULD-BE WORLDS: HOW SIMULATION IS CHANGING THE FRONTIERS OF SCIENCE (1997). Although it is relatively young as a scientific discipline, complexity theory has already emerged as an important force in virtually every field of the physical sciences as well as in a wide array of the social sciences. *See* COVENEY & HIGHFIELD, *supra* note 3, at 5-14. For histories of the development of complexity theory, which has been brought about largely through the efforts of the Santa Fe Institute, *see* JAMES GLEICK, CHAOS: MAKING A NEW SCIENCE (1987); ROGER LEWIN, COMPLEXITY: LIFE AT THE EDGE OF CHAOS (1992); and M. MITCHELL WALDROP, COMPLEXITY: THE EMERGING SCIENCE AT THE EDGE OF ORDER AND CHAOS (1992). Current information about the field is best obtained from the journal *Complexity*.

5. *See* Brian Walker et al., *Resilience Management in Social-Ecological Systems: A Working Hypothesis for a Participatory Approach*, 6 CONSERVATION ECOLOGY 14 (2002), available at <http://www.ecologyandsociety.org/vol6/iss1/art14/print.pdf>. Describing the complex system attributes of natural resources, the authors conclude that [t]hese aspects of uncertainty limit the usefulness of forecasting methods for the scientific study and management of regions in transition. Given these limits to understanding, we must focus on learning to live within systems, rather than “control” them. One might argue that it is impossible to deal with such fundamental limits of understanding, and our only reasonable choice is to struggle blindly onward.

Id.

thus even harder for law to wrestle under control.⁶

6. Jim Salzman and I recently explored the challenge complex adaptive systems, including law itself, pose to the development of regulatory policy. See J.B. Ruhl & James Salzman, *Mozart and the Red Queen: The Problem of Regulatory Accretion in the Administrative State*, 91 GEO. L.J. 757 (2003). A growing body of legal scholarship uses complex adaptive systems theory and the related discipline of chaos theory to inform the design of a broad array of legal institutions and policies. See, e.g., Hope M. Babcock et al., *Democracy's Discontent in a Complex World: Can Avalanches, Sandpiles, and Finches Optimize Michael Sandel's Civic Republican Community?*, 85 GEO. L.J. 2085 (1997) (critiquing civic republican political theory using complex systems principles); Vincent Di Lorenzo, *Complexity and Legislative Signatures: Lending Discrimination Laws as a Test Case*, 12 J.L. & POL. 637 (1996) (using chaos theory to evaluate the legislative response to alleged lending discrimination); Vincent Di Lorenzo, *Legislative Chaos: An Exploratory Study*, 12 YALE L. & POL'Y REV. 425, 432-35 (1994) (developing a model for legislative decisionmaking based on chaos theory); Gerald Andrews Emison, *The Potential for Unconventional Progress: Complex Adaptive Systems and Environmental Quality Policy*, 7 DUKE ENVTL. L. & POL'Y F. 167, 192 (1996) (applying to ecological protection issues); Thomas Earl Geu, *Chaos, Complexity, and Coevolution: The Web of Law, Management Theory, and Law Related Services at the Millennium*, 65 TENN. L. REV. 925 (1998) (discussing complexity theory in the context of corporate structure, management, and law); Thomas Earl Geu, *The Tao of Jurisprudence: Chaos, Brain Science, Synchronicity, and the Law*, 61 TENN. L. REV. 933, 934-35 (1994) (discussing the potential significance of chaos and emergence to legal theory); Andrew W. Hayes, *An Introduction to Chaos and Law*, 60 UMKC L. REV. 751, 764-73 (1992) (containing a general discussion of chaos theory and its application to judicial decisionmaking); Jeff L. Lewin, *The Genesis and Evolution of Legal Uncertainty About "Reasonable Medical Certainty,"* 57 U. MD. L. REV. 380, 389-93 (1998) (describing the evolution of the tort doctrine of "reasonable medical certainty" using complex systems principles); Mark J. Roe, *Chaos and Evolution in Law and Economics*, 109 HARV. L. REV. 641, 643-65 (1996) (describing legal evolution according to path dependence theory and chaotic systems theory); J.B. Ruhl, *Complexity Theory as a Paradigm for the Dynamical Law-and-Society System: A Wake-Up Call for Legal Reductionism and the Modern Administrative State*, 45 DUKE L.J. 849 (1996) (using complexity theory to develop a general behavioral model of the legal system); J.B. Ruhl, *The Fitness of Law: Using Complexity Theory to Describe the Evolution of Law and Society and Its Practical Meaning for Democracy*, 49 VAND. L. REV. 1407 (1996) (using complexity theory to develop a general evolutionary model of the legal system); J.B. Ruhl & Harold J. Ruhl, Jr., *The Arrow of the Law in Complex Administrative States: Using Complexity Theory to Reveal the Diminishing Returns and Increased Risk the Burgeoning of Law Poses to Modern Society*, 30 U.C. DAVIS L. REV. 405 (1997) (using complexity theory to describe the direction in which the behavioral and evolutionary mechanics are leading the sociolegal system given its current transient state); Robert E. Scott, *Chaos Theory and the Justice Paradox*, 35 WM. & MARY L. REV. 329, 329-31 (1993) (applying chaos theory to the legal dilemma between "present justice" and "future justice"); Kenton K. Yee, *Coevolution of Law and Culture: A Coevolutionary Games Approach*, COMPLEXITY, Jan./Feb. 1997, at 4 (describing attempts to mathematically model evolution of common law according to complex adaptive systems dynamics). Several other works

This kind of policy problem thus confounds the prescriptive regulation model, because there are no readily available targets for the prescriptions and, even worse, we have no idea what response the system would exhibit to any particular command. Even if legislatures armed them with unlimited powers, administrative agencies could not simply command away invasive species, or farm runoff, or new rooftops, or global climate change. There is almost universal agreement that problems of this sort demand new approaches to regulation.⁷ Agencies thus have experimented with many alternatives to prescriptive regulation, including market-based programs,

discuss complexity theory or its branches, such as chaos theory, in specific legal settings, albeit sometimes very briefly. See Lawrence A. Cunningham, *Capital Market Theory, Mandatory Disclosure, and Price Discovery*, 51 WASH. & LEE L. REV. 843, 854-59 (1994) (applying chaos theory to capital market regulation); Lawrence A. Cunningham, *From Random Walks to Chaotic Crashes: The Linear Genealogy of the Efficient Capital Market Hypothesis*, 62 GEO. WASH. L. REV. 546, 581-92 (1994) (discussing the application of chaos theory to capital market regulation); Michael J. Gerhardt, *The Role of Precedent in Constitutional Decisionmaking and Theory*, 60 GEO. WASH. L. REV. 68, 114-15 (1991) (explaining Supreme Court constitutional jurisprudence using, among other methods, a discussion of chaos theory); Alistair M. Hanna, *The Land Use System*, 13 PACE ENVTL. L. REV. 531, 538 (1996) (discussing application of chaos theory and self-organization theory to land use regulation system); Glenn Harlan Reynolds, *Chaos and the Court*, 91 COLUM. L. REV. 110, 112-15 (1991) (explaining Supreme Court constitutional jurisprudence using chaos theory); Glenn Harlan Reynolds, *Is Democracy Like Sex?*, 48 VAND. L. REV. 1635, 1639-40 (1995) (discussing the anti-parasitic effect of evolutionary processes as an analogy to democratic processes); William H. Rodgers, Jr., *Where Environmental Law and Biology Meet: Of Pandas' Thumbs, Statutory Sleepers, and Effective Law*, 65 U. COLO. L. REV. 25, 46-48 (1993) (discussing chaos theory surfacing in evolutionary biology commentary as a metaphor for evolution of environmental law); see also Eric Kades, *The Laws of Complexity and the Complexity of Laws: The Implications of Computational Complexity Theory for the Law*, 49 RUTGERS L. REV. 403, 452-54, 476 (1997) (focusing on mathematically complex issues as they arise in law, such as cyclical priority issues in liens and property titles); Lynn M. LoPucki, *The Systems Approach to Law*, 82 CORNELL L. REV. 479, 480-82 (1997) (advocating an empiricist "systems approach" to legal analysis); Randal C. Picker, *Simple Games in a Complex World: A Generative Approach to the Adoption of Norms*, 64 U. CHI. L. REV. 1225 (1997) (using computational theories to examine norm competition).

7. This is the principal thrust of some of my prior work in environmental law—that problems of environmental degradation often behave as complex adaptive systems, and thus the law must respond in ways that are adaptive as well. See J.B. Ruhl, *Thinking of Environmental Law as a Complex Adaptive System: How to Clean Up the Environment by Making a Mess of Environmental Law*, 34 HOU. L. REV. 933 (1997); see also Alastair Iles, *Adaptive Management: Making Environmental Law and Policy More Dynamic, Experimentalist, and Learning*, 10 ENVTL. & PLAN. L.J., 288, 289-90 (1996).

information-based programs, negotiated project-specific licensing, ecosystem-scaled land management programs, multi-party collaborative planning efforts, and government-private quasi-partnerships.⁸ While there remains much debate over the effectiveness of this so-called “second generation” of regulatory instruments,⁹ many bright spots exist in their relatively short period of implementation,¹⁰ and the momentum

8. For excellent summaries of these alternative regulatory instruments, see CLIFFORD RECHTSCHAFFEN & DAVID L. MARKELL, *REINVENTING ENVIRONMENTAL ENFORCEMENT AND THE STATE/FEDERAL RELATIONSHIP* (2003) (surveying alternative enforcement and compliance methods); Dennis D. Hirsch, *Lean and Green? Environmental Law and Policy for the Flexible Production Economy*, 79 IND. L.J. 611 (2004); Dennis D. Hirsch, *Second Generation Policy and the New Economy*, 29 CAP. U. L. REV. 1 (2001); Richard B. Stewart, *Administrative Law in the Twenty-First Century*, 78 N.Y.U. L. REV. 437 (2003); and Richard B. Stewart, *A New Generation of Environmental Regulation?*, 29 CAP. U. L. REV. 21 (2001).

9. See, e.g., Daniel H. Cole & Peter Z. Grossman, *When Is Command-and-Control Efficient? Institutions, Technology, and the Comparative Efficiency of Alternative Regulatory Regimes for Environmental Protection*, 1999 WIS. L. REV. 887; Rena I. Steinzor, *Regulatory Reinvention and Project XL: Does the Emperor Have Any Clothes?*, 26 Env'tl. L. Rep. (Env'tl. Law Inst.) 10,527, 10,527-28 (1996).

10. The Clean Air Act sulfur dioxide emissions trading program for electric utilities, Pub. L. No. 101-549, § 401, 104 Stat. 2399, 2584 (1990), is widely regarded as the most successful example of integration of market efficiencies into the command-and-control regulatory structure. See, e.g., Dallas Burtraw & Byron Swift, *A New Standard of Performance: An Analysis of the Clean Air Act's Acid Rain Program*, 26 Env'tl. L. Rep. (Env'tl. Law Inst.) 10,411 (1996); *Utilities Achieve 100 Percent Compliance with EPA Acid Rain Program, Report Says*, 27 Env't Rep. (BNA) 885 (Aug. 16, 1996); Timothy A. Wilkins & Terrell E. Hunt, *Agency Discretion and Advances in Regulatory Theory: Flexible Agency Approaches Toward the Regulated Community as a Model for the Congress-Agency Relationship*, 63 GEO. WASH. L. REV. 479, 491 (1995). For an example of the success of information-based approaches to environmental regulation, companies subject to the toxic release inventory (TRI) reporting provisions of the Emergency Planning and Community Right-to Know Act, 42 U.S.C. § 11023, reported the total release of 10.4 billion pounds of specified toxic chemicals into the environment in 1987, including 3.9 billion to landfills, 3.3 billion to other treatment and disposal facilities, 2.7 billion into the ambient air, and 550 million to surface waters. By 1995 the total reported had fallen to 2.6 billion pounds, and by 1997 it had fallen to 2.57 billion. See ROBERT V. PERCIVAL ET AL., *ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY* 377-78 (3d ed. 2000). Industry sources have attributed the reporting requirement as having galvanized industry into voluntary pollution reduction goals that in many cases exceed anything required by law. See *CMA Initiative Cuts Toxic Emissions 49 Percent Over Six Years, Official Says*, 27 Env't Rep. (BNA) 11 (May 3, 1996). Reductions have continued. See EPA, *EPA TOXICS RELEASE INVENTORY DATA FOR REPORTING YEAR 2000* (May 23, 2002), reprinted in 33 Env't Rep. (BNA) 1229 (May 31, 2002). For analyses of the TRI from the perspective of its information effects, see David W. Case,

for more use of these and similar innovations has not abated.

One attribute that runs commonly through these new tools of regulation is their ability to tap into decentralized behavior-coordinating mechanisms. Market-based programs, for example, replace bureaucratic decisionmaking with basic economic incentives to coordinate more efficient decisions by private actors about, among other things, how and when to emit pollutants. Information-based programs put information about regulated activities into the hands of the public, which may use it in ways centralized agencies might not conceive as means of pushing individuals, companies, governments, and other actors to alter environmentally damaging behavior. Ecosystem-scaled land management promotes decisions that recognize the holistic, dynamic nature of integrated landscapes, rather than having one agency make decisions about trees, another about water, and yet another about butterflies. Multiparty collaboration puts a more diverse set of interests at the negotiating table, thus increasing the chances of creative, multifaceted regulatory responses. And negotiated project-specific permits allow an agency and an applicant, much like parties to a contract, to tailor the conditions attached to regulator approval of a particular activity more efficiently than could a one-size-fits-all approach to permitting. In short, the decentralized nature of the second generation instruments of regulation allows agency policies and decisions to be implemented more adaptively, which, it is reasonable to believe, will facilitate a more responsive, flexible continuum of reactions to the future's amorphous regulatory challenges.

To take advantage of their inherently adaptive qualities, however, these regulatory instruments must themselves be managed adaptively. It will do no good, in other words, to hand an agency a market-based program only to have the agency administer the program through centralized decisionmaking. Nor is it likely that the now-dominant public land use theme of ecosystem management, which focuses on landscapes and ecosystem dynamics rather than discrete media or species,¹¹

Corporate Environmental Reporting as Informational Regulation: A Law and Economics Perspective, 76 U. COLO. L. REV. 379 (2005); and Bradley C. Karkkainen, *Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New Paradigm?*, 89 GEO. L.J. 257 (2001).

11. Ecosystem management is a relatively new natural resources policy model that focuses decisionmaking on the consequences of policy choices to the integrity of functioning ecosystems. See NAGLE & RUHL, *supra* note 2, at 299-

can successfully be implemented through decisionmaking that relies on reductionist, linear models of how “parts” of ecosystems function. Not only must the instruments of regulation be transformed, therefore, but so too must the methods of regulation. Hence it is almost universally the case that advocates of regulatory innovations also advance the method of implementation known generally as *adaptive management*.¹²

Today’s voluminous literature on adaptive management traces its roots to Professor C.S. Holling’s seminal work, *Adaptive Environmental Assessment and Management*.¹³ Although almost thirty years have passed since he and his colleagues first described the adaptive management methodology, no work on the topic has improved on their core theory. Its essence is an iterative, incremental decisionmaking process built around a continuous process of monitoring the effects of decisions and adjusting decisions accordingly.¹⁴ It is,

393 (reviewing the history and content of ecosystem management). In what remains the most authoritative description of the early roots of ecosystem management, Grumbine describes ecosystem management as “integrat[ing] scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term.” R. Edward Grumbine, *What Is Ecosystem Management?*, 8 CONSERVATION BIOLOGY 27, 31 (1994).

12. For example, there is broad consensus today among resource managers and academics that adaptive management is the only practical way to implement ecosystem management policy. See Ronald D. Brunner & Tim W. Clark, *A Practice-Based Approach to Ecosystem Management*, 11 CONSERVATION BIOLOGY 48 (1997); Anne E. Heissenbuttel, *Ecosystem Management—Principles for Practical Application*, 6 ECOLOGICAL APPLICATIONS 730 (1996); Paul L. Ringold et al., *Adaptive Management Design for Ecosystem Monitoring*, 6 ECOLOGICAL APPLICATIONS 745 (1996). Indeed, the Ecological Society of America’s comprehensive study of ecosystem management treats the use of adaptive management methods as a given. See Norman L. Christensen et al., *The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management*, 6 ECOLOGICAL APPLICATIONS 665 (1996).

13. See ADAPTIVE ENVIRONMENTAL ASSESSMENT AND MANAGEMENT (C.S. Holling ed., 1978). It is universally agreed that adaptive management theory traces its origins to Holling’s influential work. See, e.g., Kai N. Lee & Jody Lawrence, *Adaptive Management: Learning from the Columbia River Basin Fish and Wildlife Program*, 16 ENVTL. L. 431, 442 n.45 (1986) (tracing the term “adaptive management” to Holling’s book). For more background on Holling’s contribution to the discipline of adaptive management, see NAGLE & RUHL, *supra* note 2, at 334–38.

14. The biologist Simon Levin recently defined adaptive management concisely as “maintaining flexibility in management structures and adjusting rules and regimes on the basis of monitoring and other sources of new data.”

in other words, far more suited to the needs of future regulatory challenges than is prescriptive regulation.

My focus, however, is not on what adaptive management should be, but on whether it *can* be. Recently, for example, the National Research Council branch of the National Academy of Sciences, at the request of several federal agencies, convened a committee of scientists to explore how adaptive management might be used to improve resource agency decisionmaking in the Klamath River Basin, which straddles southern Oregon and northern California (Klamath Committee).¹⁵ The Committee outlined eight steps of adaptive management: (1) definition of the problem, (2) determination of goals and objectives for management of ecosystems, (3) determination of the ecosystem baseline, (4) development of conceptual models, (5) selection of future restoration actions, (6) implementation of management actions, (7) monitoring and ecosystem response, and (8) evaluation of restoration efforts and proposals for remedial actions.¹⁶ The Committee's description of the last stage provides some flavor of how adaptive management differs from prescriptive regulation:

SIMON LEVIN, *FRAGILE DOMINION* 200 (1999); *see also* Simon A. Levin, *Towards a Science of Ecological Management*, 3 *CONSERVATION ECOLOGY* 6 (1999) (discussing Holling's arguments), *available at* <http://www.consecol.org/vol3/iss2/art6>. A more detailed description is found in a recent report by the National Academy of Science's research arm, the National Research Council, in its investigation of the Missouri River ecosystem:

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

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

15. *See* COMMITTEE ON ENDANGERED AND THREATENED FISHES IN THE KLAMATH RIVER BASIN, BD. ON ENVTL. STUDIES & TOXICOLOGY, DIV. ON EARTH & LIFE STUDIES, NAT'L RESEARCH COUNCIL, *ENDANGERED AND THREATENED FISHES IN THE KLAMATH RIVER BASIN: CAUSES OF DECLINE AND STRATEGIES FOR RECOVERY* (2004), *available at* <http://www.nap.edu/books/0309090970/html>. In the interests of full disclosure: I was a member of the so-called "Klamath Committee."

16. *See id.* at 332-35.

After implementation of specific restoration activities and procedures, the status of the ecosystem is regularly and systematically reassessed and described. Comparison of the new state with the baseline state is a measure of progress toward objectives. The evaluation process feeds directly into adaptive management by informing the implementation team and leading to testing of management hypotheses, new simulations, and proposals for adjustments in management experiments or development of wholly new experiments or management strategies.¹⁷

As Sidney Shapiro and Robert Glicksman suggest in their review of regulatory innovations,¹⁸ this form of decisionmaking allows agencies to learn about and respond to changing conditions at the “back end” rather than loading all decisionmaking at the “front end,” when the effects of decisions and of other changing conditions are not yet known.¹⁹ This “front-end/back-end” distinction captures the essence of adaptive management, and thus, can be used to identify the features of any regulatory program that hold potential for adaptive management implementation. The more a program directs administrative action toward fixing long-term policies and decisions based on pre-regulatory analysis, the more “front-end” it is. Adaptive management requires institutionalization of monitoring-adjustment frameworks that allow incremental policy and decision adjustments at the “back end,” where performance results can be evaluated and the new information can be fed back into the ongoing regulatory process. Deliberate monitoring and a framework for altering course, rapidly and frequently if conditions warrant, thus are essential ingredients of adaptive management.

On the one hand, nothing about this is startlingly new or unusual as a general means of decisionmaking—businesses implement adaptive management all the time, or they perish. Ironically, however, the puzzle is whether administrative agencies can behave adaptively *and survive*. As a leading

17. *Id.* at 335.

18. See SIDNEY A. SHAPIRO & ROBERT L. GLICKSMAN, RISK REGULATION AT RISK: RESTORING A PRAGMATIC APPROACH (2003); Sidney A. Shapiro & Robert L. Glicksman, *The Missing Perspective*, ENVTL. F., Mar./Apr. 2003, at 42 [hereinafter Shapiro & Glicksman, *The Missing Perspective*].

19. Their work demonstrates the folly of attempts “to perfect regulation on the ‘front end’ by subjecting proposed policies to careful scrutiny using cost-benefit analysis and other similar techniques,” arguing instead for methods that “improve policy on the ‘back end’ by engaging in incremental adjustments of policy as new information is obtained about how the policy affects the real world.” Shapiro & Glicksman, *The Missing Perspective*, *supra* note 18, at 43.

proponent of adaptive management once observed, agencies “have not often been rewarded for flexibility, openness, and their willingness to experiment, monitor, and adapt.”²⁰ The deterrents to these core attributes of adaptive management come from three fronts: legislatures, the public, and the courts. In short, in order for adaptive management to flourish in administrative agencies, legislatures must empower them to do it, interest groups must let them do it, and the courts must resist the temptation to second-guess when they do in fact do it. The track record of administrative law from the era of prescriptive regulation suggests that none of these three institutional constraints will yield easily. Quite simply, there is good reason to doubt whether regulation by adaptive management is possible without substantial change in administrative law.²¹

In this Article, I explore this concern using the example of the Endangered Species Act’s (ESA)²² Habitat Conservation

20. R. Edward Grumbine, *Reflections on “What is Ecosystem Management?”*, 11 CONSERVATION BIOLOGY 41, 45 (1997).

21. This view is shared by the few other commentators who have done exploratory work in the field. See, e.g., Warren T. Coleman, *Legal Barriers to the Restoration of Aquatic Systems and the Utilization of Adaptive Management*, 23 VT. L. REV. 177, 188 (1998) (“Can adaptive management work within our current legal framework?”); Holly Doremus, *Adaptive Management, the Endangered Species Act, and the Institutional Challenges of “New Age” Environmental Protection*, 41 WASHBURN L.J. 50, 54 (2001) (“Institutional structures and arrangements, in particular, have repeatedly been fingered as key impediments to realizing the promise of adaptive management.”); see also Iles, *supra* note 7, at 301 (“It is difficult to imagine existing Australian law imposing means to continuously monitor environmental changes and actively altering remedies to reflect those changes.”). By and large, however, although support for adaptive management is legion and literature on implementation theory abounds, from what I can tell very few commentators from science or law are asking whether it can succeed in the conventional administrative law system.

22. Endangered Species Act of 1973, 16 U.S.C. §§ 1531-1544 (2000). Elsewhere I have explored whether the Act as a whole reflects adaptive management qualities. See J.B. Ruhl, *Taking Adaptive Management Seriously: A Case Study of the Endangered Species Act*, 52 KAN. L. REV. 1249 (2004). Here, I use the ESA as a case study to examine the constraints conventional administrative law places on adaptive management in general. Like the other work, this Article is not intended to provide a comprehensive overview of the ESA. Rather, it uses the ESA as a case study to focus attention on the potential obstacles conventional administrative law poses to the realization of adaptive management principles and techniques in regulatory contexts. For comprehensive treatments of the ESA, several of which are referred to frequently *infra*, see MICHAEL J. BEAN & MELANIE J. ROWLAND, *THE EVOLUTION OF NATIONAL WILDLIFE LAW* (3d ed. 1997);

Plan (HCP) program.²³ Section 9 of the ESA generally prohibits any act that would injure or kill an animal that is of a species the federal government has designated as in danger of extinction.²⁴ The U.S. Fish and Wildlife Service (FWS), which administers the ESA for terrestrial and freshwater species, has interpreted section 9 to extend to any habitat modification that leads to actual death or injury of an endangered species.²⁵ The effect of that interpretation is that many land development projects around the nation would violate section 9, *except* that section 10 of the ESA provides authority for FWS to issue permits for “incidental take” of protected species—that is, take which is incidental to an otherwise lawful activity.²⁶ To obtain such a permit, an applicant prepares a “conservation plan,” which has come to be known as a habitat conservation plan (and thus HCP), demonstrating compliance with a variety of criteria.²⁷

Through a series of events described in more detail below, FWS implemented the HCP permit program very much in the

ENDANGERED SPECIES ACT: LAW, POLICY, AND PERSPECTIVES (Donald C. Baur & Wm. Robert Irvin eds., 2002) [hereinafter LAW, POLICY, AND PERSPECTIVES]; LAWRENCE R. LIEBESMAN & RAFE PETERSEN, ENVTL. LAW INST., ENDANGERED SPECIES DESKBOOK (2003); STANFORD ENVTL. LAW SOC'Y, THE ENDANGERED SPECIES ACT (2001); and TONY A. SULLINS, THE ENDANGERED SPECIES ACT (2001).

23. See 16 U.S.C. § 1539(a)(1). This Article also is not intended to provide a comprehensive overview of the ESA's HCP program. For a more complete description of the mechanics of the HCP program, see J.B. Ruhl, *How to Kill Endangered Species, Legally: The Nuts and Bolts of Endangered Species Act “HCP” Permits for Real Estate Development*, 5 ENVTL. LAW. 345 (1999).

24. See 16 U.S.C. § 1538(a)(1)(C). For a description of the cases developing the legal standards for what constitutes “take,” see Gina Guy, *Take Prohibitions and Section 9*, in LAW, POLICY, AND PERSPECTIVES, *supra* note 22, at 191; LIEBESMAN & PETERSEN, *supra* note 22, at 39–46; Steven P. Quarles & Thomas R. Lundquist, *When Do Land Use Activities “Take” Listed Wildlife Under ESA Section 9 and the “Harm” Regulation?*, in LAW, POLICY, AND PERSPECTIVES, *supra* note 22, at 207; STANFORD ENVTL. LAW SOC'Y, *supra* note 22, at 104–12; SULLINS, *supra* note 22, at 44–54; and Alan M. Glen & Craig M. Douglas, *Taking Species: Difficult Questions of Proximity and Degree*, 16 NAT. RESOURCES & ENV'T 65 (2001). For a description of the process for identifying, or “listing,” species as endangered or threatened, see LIEBESMAN & PETERSEN, *supra* note 22, at 15–20; J.B. Ruhl, *Section 4 of the ESA: The Keystone of Species Protection Law*, in LAW, POLICY, AND PERSPECTIVES, *supra* note 22, at 19; STANFORD ENVTL. LAW SOC'Y, *supra* note 22, at 38–58; and SULLINS, *supra* note 22, at 11–25.

25. See 50 C.F.R. § 17.31 (2004).

26. 16 U.S.C. § 1539(a)(1)(B).

27. *Id.* § 1539(a)(2)(A).

model of a negotiated site-specific permitting program combined with a market-based mechanism for compensation of habitat impacts. Moreover, the agency announced its resolve to implement the program using an adaptive management approach. While the effort produced some initial success, ambiguous legislative delegation of authority, aggressive interest group opposition, and skeptical courts have all kept the HCP program mired in the swamp of old school prescriptive regulation. There is probably no regulatory program more in need of adaptive management than the conservation of endangered species, yet the adaptive energy is being sucked dry from the HCP program by the institutions of administrative law.

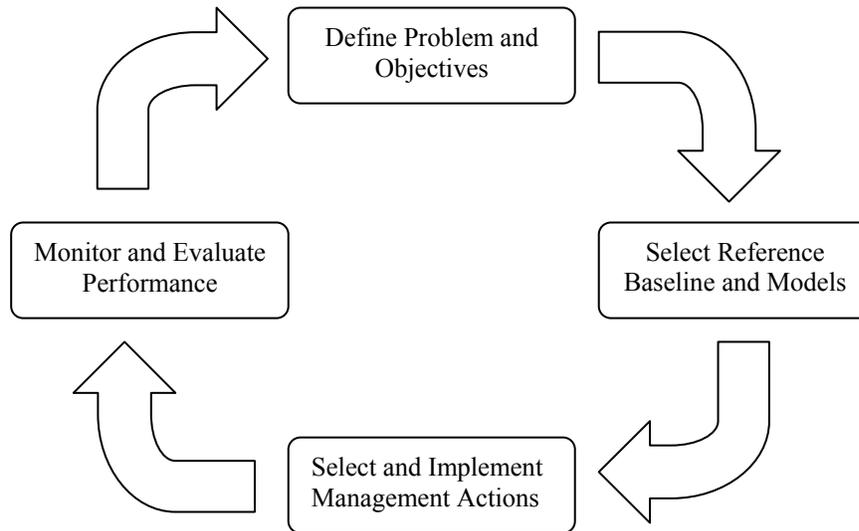
How can this have come to be, and what can be done to improve the overall situation of adaptive management in administrative law? Part I of this Article briefly places those questions in the general background of interest—the potential for collision between adaptive management theory and administrative law institutions—to more firmly illustrate the nature of the problem. Part II then grounds the topic in a real-world context through the story of the HCP program. Although Congress appears to have hoped that the HCP program would promote adaptive management of imperiled species, its delegation of authority to FWS was an imprint of prescriptive regulation. Nevertheless, during the 1990s, while Congress was functionally inert on reform of the ESA despite much rhetorical enthusiasm, FWS essentially reinvented the program through administrative reform in the mold of adaptive management. Soon, however, citizen groups representing environmentalist interests responded with vociferous and litigious opposition to reform, ultimately bearing down on the agency's injection of "flexibility" into the program through repeated lawsuits challenging HCP permits. With few (but notable) exceptions, the courts were all too quick to pounce as well, stifling the agency's willingness to experiment. The result could be one of the tragedies of environmental and administrative law. Today, the HCP program increasingly resembles a plain vanilla regulatory program: functional, but increasingly stripped of its once promising adaptive qualities. One can only hope this is not a harbinger for the future of adaptive management in general. If it is, regulation by adaptive management will *not* be possible.

In the long run, however, the need to use adaptive

approaches will not diminish—if anything, it will only increase. Thus the pressure to reform administrative law will be unyielding. As gloomy as the prospects for adaptive management appear today, regulation by adaptive management is *inevitable*. But knowing this makes it tempting to cast aside the conventions of administrative law too quickly. The process of making regulation more adaptive should itself implement the adaptive management approach. Before we change anything about administrative law, we need first to define the problem, set objectives, assess the baseline, and formulate models. Hence this Article closes by suggesting a basic model to use in thinking about regulation by adaptive management.

I. ADAPTING TO ADAPTIVE MANAGEMENT

The Klamath Committee's list of the eight stages of adaptive management gives the false impression that adaptive management is a linear checklist with a beginning and an end. Rather, adaptive management is a cyclical decisionmaking process. For example, consolidating the eight stages into four core functions, adaptive management looks like this:



While the logical starting point for introduction of this form of adaptive management into any particular policy solution is the definition of problem and objectives, there is no

logical terminus. Particularly for problems such as invasive species—which we are unlikely ever fully to eradicate—adaptive management, once started, anticipates literally endless application. All along the way, cycle after cycle, countless decisions are made about what the problem entails, what the objectives are, which models seem best suited, how and when to implement management actions, which performance metrics to measure, and what to do when things do not go as planned. As new information continuously enters the stream of decisions, sound management may require an agency practicing adaptive management to replace objectives, models, or performance criteria “on the fly.”²⁸

To anyone familiar with conventional administrative law, this sounds nothing like what actually happens.²⁹ With broad latitude to delegate legislative power and processes to administrative agencies, legislatures intending to regulate behavior through administrative institutions exhibit a spectrum of approaches from open-ended mandates to micromanaged authority. But one truly searches in vain for legislation that establishes anything like the decisionmaking cycle of adaptive management. Instead, most administrative agencies increasingly are required to engage in a tremendous amount of foreplay before promulgating a rule or adjudicating a decision. Most of this pre-decisional activity is geared toward serving two goals: public participation and judicial review. Interest groups enter the process primarily through notice and comment opportunities, rights of participation in administrative hearings, and actions for judicial review of administrative actions. Courts engaging in such judicial review defer to agencies in many aspects of substantive outcome, but nonetheless demand thorough explanations of the rationales for agency decisions, take a “hard look” at how the agencies connect the dots, and show little tolerance for any procedural

28. As Holly Doremus aptly sums up, “A management program cannot be adaptive unless decisions are always subject to re-evaluation in light of new information.” Doremus, *supra* note 21, at 55.

29. This paragraph is not intended to provide a complete exposition on the plodding, inefficient nature of conventional administrative law. Jim Salzman and I have done so, and have pointed to the extensive body of literature on the topic in J.B. Ruhl & James Salzman, *Mozart and the Red Queen: The Problem of Regulatory Accretion in the Administrative State*, 91 *Geo. L.J.* 757 (2003). Shapiro and Glicksman review it ably in their work on the “front end/back end” distinction. Shapiro & Glicksman, *The Missing Perspective*, *supra* note 18, at 42-43.

slips.

It is little wonder that, having to operate in an atmosphere in which each decision involves so much “front-end” preparation designed largely in anticipation of the onslaught of the public’s “participation” and judges’ “hard looks,” many agencies display an aversion to adaptation. For example, a recent study of over 392 federal agency rules issued in November and December 2003 found that the mean number of days to completion of the final rule from date of first proposal was 322.³⁰ If public comments were presented, the mean period increased to 414 days.³¹ If the agency made any significant changes from the proposal to the final rule—in other words, adapted to the public comments—the mean time was 472 days.³² As this demonstrates, a single instance of adaptation in the course of a rulemaking can add about 150 days to the agency’s decision timeline.³³

More broadly, a recent General Accounting Office report found that innovative environmental regulation by the states faced significant obstacles at the federal level because of “cultural resistance among many in [the Environmental Protection Agency (EPA)] toward alternative approaches” and the lack of “explicit language authorizing the use of innovative environmental approaches.”³⁴ State officials reported that the resistance from EPA “often manifested itself in a lengthy and costly EPA review of their proposals.”³⁵ Bottom line:

30. See Stuart Shapiro, *Two Months in the Life of the Regulatory State*, 30 ADMIN. & REG. L. NEWS, Spring 2005, at 12, 15 tbl.5.

31. *Id.*

32. *Id.*

33. The empirical study demonstrates that rulemaking is, in general, a skewed process, with relatively few rules. Those rules with general application affecting significant social or economic interests receive most of the public comments and agency time. But public comment adds time even in the median case: the median time for completion for all rules was 175 days; the median for rules with comments was 285 days; and the median for rules that changed significantly in response to comments was 366 days. See *id.* Agency adaptation in the median case added almost 200 days, even longer in the mean case. See *id.*

34. U.S. GEN. ACCOUNTING OFFICE, ENVIRONMENTAL PROTECTION: OVERCOMING OBSTACLES TO INNOVATIVE STATE REGULATORY PROGRAMS 3 (2002), available at <http://www.gao.gov/new.items/d02268.pdf>.

35. *Id.*; see also David L. Markell, *States as Innovators: It's Time for a New Look to Our "Laboratories of Democracy" in the Effort to Improve Our Approach to Environmental Regulation*, 58 ALB. L. REV. 347, 376 & n.124 (1994) (noting the New York environmental agency's view that changes in the “regulatory culture” at the federal level are needed to facilitate effective

adaptation in the current milieu takes time and resources, with little payoff, so why bother?

With this general experience in mind, it would seem unreasonable, even cruel, to command agencies to engage in adaptive management of their rulemaking and other decisionmaking without changing the rules of the game. Given that adaptive management contemplates a continuous cycle of decisions, decisions many of which under conventional administrative law would trigger the full-blown process described above, the adaptive management decision cycle would rotate slowly and painfully.

Today agencies are under pressure to act more efficiently and flexibly with no explicit adaptive management framework for doing so. As a result, agencies must search through their inventories of authority for every possible opportunity to adjust their objectives, models, management actions, and performance criteria without opening the door to the flood of citizen suits and judicial glares. At best, they may cobble together some set of tools that they can, with some sense of credibility, think of as adaptive management and hope nobody notices what they are doing.³⁶

Despite these efforts, over time agencies will find that interest groups and courts relentlessly will peck away at adaptive agency behavior, using all the armament that conventional administrative law puts at their disposal. A stunning example comes from the litigation over the U.S. Army Corps of Engineers' management of the Missouri River navigation and flow regime system. The background is long and complex,³⁷ but a recent crescendo came when a court rejected Missouri's claim, one among many, that the Corps had violated the National Environmental Policy Act (NEPA)³⁸ by

operation of the cooperative federalism system of environmental law).

36. For a discussion of the places agencies might look for such authorities, see Robert L. Glicksman & Sidney A. Shapiro, *Improving Regulation Through Incremental Adjustment*, 52 U. KAN. L. REV. 1179 (2004).

37. For comprehensive backgrounds, see MISSOURI RIVER ECOSYSTEM, *supra* note 14, at 1-106; John H. Davidson & Thomas Earl Geu, *The Missouri River and Adaptive Management: Protecting Ecological Functions and Legal Process*, 80 NEB. L. REV. 816, 817-862 (2001); and also *South Dakota v. Ubbelohde*, 330 F.3d 1014 (8th Cir. 2003).

38. NEPA requires all federal agencies to prepare an EIS for all "major federal actions significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C) (2000).

adopting an adaptive management approach.³⁹ The Corps' "victory" sowed the seeds of a long future of litigation:

Adaptive management is an approach to natural resources management in which policy choices are made incrementally. As each choice is made, data on the effects of these choices are collected and analyzed in order to assess whether to retain, reverse, or otherwise alter the policy choice. Missouri maintains that the adaptive management approach violates NEPA because it permits the Corps to circumvent the NEPA process when policy choices are modified. Missouri takes issue with the potential flow changes that the Corps may undertake in the future. Missouri fails to point to any evidence that indicates that the Corps intends to avoid its NEPA obligations by implementing this adaptive management approach. To the contrary, the Corps acknowledges that in the event a major policy change results, the Corps will be required to comply with NEPA. Absent evidence that the adaptive management process actually results in the Corps' evasion of NEPA obligations, the Court declines to declare this approach invalid.⁴⁰

In other words, the Corps did not err in law by adopting adaptive management as its implementation method; rather, it erred in sensibility by doing so, because it opened the door to litigation over whether each policy adjustment triggers NEPA. One might wonder how pleased the Corps was to have prevailed on those terms.

Indeed, recent NEPA decisions by the Supreme Court highlight the perverse disincentives in conventional administrative law that hinder adaptive decisionmaking of the kind the Corps has flirted with. In *Norton v. Southern Utah Wilderness Alliance*⁴¹ and *Department of Transportation v. Public Citizen*,⁴² the Court established in no uncertain terms that if an agency lacks discretion over some aspect of an action, or has reached a decision within its discretion and divested itself of further discretion to alter the decision, NEPA does not apply. This principle benefits an agency in a "front-end" world of administrative law, allowing it to dodge the NEPA bullet, but it provides a strong disincentive to establishing and retaining long-term adaptive management programs. After all,

39. *See In re Operation of the Mo. River Sys. Litig.*, 363 F. Supp. 2d 1145 (D. Minn. 2004), *aff'd*, 421 F.3d 618 (8th Cir. 2005).

40. *Id.* at 1163-64 (citations omitted); *see also* *Confederated Tribes of the Umatilla Indian Reservation v. Washington*, No. 03-075, 2004 WL 322135 (Wash. Poll. Control Bd. Feb. 13, 2004) (expressing skepticism over whether the agency's use of adaptive management satisfied legal standards and requiring evidentiary hearing).

41. 542 U.S. 55 (2004).

42. 541 U.S. 752 (2004).

continuing discretion to alter a decision is *the essence* of adaptive management. Thus, the clear message to agencies under conventional administrative law is that they adopt adaptive management at their own peril. Adopting adaptive management may be an agency's dream; practicing it is a nightmare. This sobering conclusion is confirmed by the HCP experience.

II. THE RISE AND FALL OF THE HCP ADAPTIVE MANAGEMENT EXPERIMENT

Generally, land use regulation has long been a breeding ground of "front-end" approaches to regulatory decisionmaking, and thus is likely to be resistant to change. As Holly Doremus summarizes the field:

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.⁴³

For example, although the ESA explicitly recognizes the importance of ecosystem integrity to imperiled species,⁴⁴ its species-focused statutory structure does little to address that connection in any positive law sense.⁴⁵ As our understanding of the complexities of species decline and its relation to ecosystem change has advanced tremendously since the early 1970s, increasingly we are finding the ESA ill-equipped to handle the task for which it was intended. One of the first such struggles for the ESA was what to do about private land uses that disturb or destroy habitat occupied by endangered species. Other than the section 9 prohibition of take, there was no provision in the original enactment addressing such situations. Yet as urban growth increasingly encroached upon species habitat, the need for a permit-based option became more pressing. A development project at San Bruno Mountain on California's San Francisco Peninsula brought this issue to a

43. Doremus, *supra* note 21, at 55.

44. One purpose of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." 16 U.S.C. § 1531(b) (2000).

45. See J.B. Ruhl, *Ecosystem Management, the ESA, and the Seven Degrees of Relevance*, 14 NAT. RESOURCES & ENV'T 156 (2000).

head when a habitat for an endangered butterfly was ground zero for the prime development property.⁴⁶ Thus began the rise and fall of the HCP adaptive management experiment.

A. LEGISLATIVE DELEGATION AND ADMINISTRATIVE RESPONSE

With this San Bruno Mountain development directly in mind, Congress in 1982 amended the ESA to create the HCP program in section 10(a)(1).⁴⁷ The legislative history makes it clear that Congress had intended a flexible program that would “encourage creative partnerships between the public and private sectors.”⁴⁸

As a delegation of regulatory authority, however, section 10(a)(1) does little to implement “creativity” and less to encourage adaptive management. The program is structured around a “front-end” process designed to reach long-term predictions about project impacts on species. To approve a permit, for example, the agency must find that the HCP ensures that “the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking,” and that “the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.”⁴⁹ Although FWS may impose “terms and conditions” in the permit, “including, but not limited to, such reporting requirements as the [agency] deems necessary for determining whether such terms and conditions are being complied with,”⁵⁰ it is not always practical for FWS to embed adaptive management monitoring and reporting into permits through this authority. In many cases, the harm to the species that prompts the need for an HCP permit occurs only in the construction phase of a project. It is not clear from the statutory structure how FWS could exercise adaptive management adjustments based on new information that becomes available during the operational phase of such a project. Thus, the overall statutory version of the HCP program leaves much to be desired when it comes to

46. The project background is described in *Friends of Endangered Species, Inc. v. Jantzen*, 760 F.2d 976 (9th Cir. 1985).

47. Endangered Species Act Amendments of 1982, Pub. L. No. 97-304, § 6, 96 Stat. 1411, 1422-25 (1982).

48. H.R. REP. NO. 97-835, at 30 (1982) (Conf. Rep.), *reprinted in* 1982 U.S.C.C.A.N. 2860, 2871.

49. 16 U.S.C. § 1539(a)(2)(B)(ii), (iv) (2000).

50. *Id.* § 1539(a)(2)(B).

establishing a cohesive adaptive management framework.

Although the San Bruno Mountain HCP was successfully concluded, perhaps not surprisingly, very little else happened under section 10(a)(1) over the next decade.⁵¹ The politics of the ESA changed all of that in the early 1990s, as the regulatory reinvention movement⁵² spread to the ESA. The result was an injection of adaptive management into the HCP program through administrative reform rather than legislative initiative.⁵³

As the new Secretary of the Interior under the incoming Clinton Administration, Bruce Babbitt was caught between a rock and a hard place when he inherited the ESA. The statute's reputation had reached a low point in the Republican-controlled Congress, while at the same time, many environmental protection interest groups were poised to condemn any effort that would, in their view, weaken the statute.⁵⁴ To fend off both fronts, Babbitt embarked on a two-part agenda focused on enhancing species conservation through greater emphasis on ecosystems, and on providing greater balance to landowners on whose property the imperiled species are found.⁵⁵

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

52. See PRESIDENT WILLIAM J. CLINTON & VICE PRESIDENT AL GORE, REINVENTING ENVIRONMENTAL REGULATION (1995), reprinted in *Daily Env't Rep. (BNA)*, at E-1 (Mar. 17, 1995), available at <http://govinfo.library.unt.edu/npr/library/rsreport/251a.html>.

53. I have previously reviewed some of the events discussed *infra* from the perspective of adaptive management. See Ruhl, *supra* note 22, at 1273-80.

54. For a more thorough account of the political factors that set the stage, see John D. Leshy, *The Babbitt Legacy at the Department of the Interior: A Preliminary View*, 31 *ENVTL. L.* 199, 208-12 (2000).

55. See J.B. Ruhl, *Who Needs Congress? An Agenda for Administrative*

The most prominent example of the impact this approach had on the ESA is the life it breathed into the HCP program, causing it to be lauded as “a sweeping new approach to protecting endangered species.”⁵⁶ By treating HCPs as a “thrash it out” form of contract negotiation,⁵⁷ Babbitt turned the administrative version of the HCP program into a “back-end” approach for resolving the ever-increasing instances of collision between the ESA take prohibition and urban growth. Landowners increasingly participated in site-specific HCP negotiations as a practical means of resolving ESA issues with lasting certainty,⁵⁸ while the agency increasingly promoted the ecosystem scale of the program.⁵⁹ The number of HCP permits began to grow in the early 1990s,⁶⁰ and with experience, the agency added structure and standards to the program while retaining the flexibility to accommodate the changing needs of species and landowners.⁶¹ HCP permits began to proliferate under Babbitt’s tenure, with several hundred having been approved by the end of his term.⁶²

Reform of the Endangered Species Act, 6 N.Y.U. ENVTL. L.J. 367, 388–400 (1998) (providing a survey of policies serving this purpose). For an insider’s account providing a thoughtful perspective on the strategic approach the Babbitt administration took, see Leshy, *supra* note 54, at 212–14.

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

57. See Bruce Babbitt, Address to the National Press Club Luncheon (July 17, 1996), *quoted in* Thornton, *supra* note 51, at 95.

58. Several commentators have stressed the negotiation-based character of the HCP program. See Farber, *supra* note 56, at 43; Hsu, *supra* note 51, at 10,594–600; Ruhl, *supra* note 23, at 391–96.

59. See Thornton, *supra* note 51, at 94–95.

60. See NATIONAL CTR. FOR ECOLOGICAL ANALYSIS & SYNTHESIS & AMERICAN INST. OF BIOLOGICAL SCIENCES, USING SCIENCE IN HABITAT CONSERVATION PLANS 6 (1999) [hereinafter USING SCIENCE IN HABITAT CONSERVATION PLANS], *available at* <http://www.nceas.ucsb.edu/nceas-web/projects/97KAREI2/hcp-1999-01-14.pdf>. In the interests of full disclosure: during this timeframe I was engaged in private practice and frequently represented applicants for HCP permits.

61. For example, the FWS has published a lengthy handbook describing the steps required to obtain an HCP permit. U.S. FISH & WILDLIFE SERV. & NAT’L MARINE FISHERIES SERV., ENDANGERED SPECIES HABITAT CONSERVATION PLANNING HANDBOOK (1996) [hereinafter HCP HANDBOOK], *available at* <http://www.fws.gov/endangered/hcp/hcpbook.html>.

62. U.S. FISH & WILDLIFE SERV., HABITAT CONSERVATION PLANS: SECTION 10 OF THE ENDANGERED SPECIES ACT (2002), *available at* http://endangered.fws.gov/hcp/HCP_Incidental_Take.pdf. For a running count, see U.S. FISH & WILDLIFE SERV., GENERAL STATISTICS FOR ENDANGERED SPECIES, http://ecos.fws.gov/tess_public/TessStatReport (last updated Oct. 24, 2005). For an excellent statistical summary of the 208 HCP

In addition to adopting a contract negotiation model for HCPs, FWS promoted a market-based approach for habitat mitigation requirements that are made conditions of particular HCP permits.⁶³ The central topic of the negotiations for HCPs is what habitat the applicant will “trade” in return for the habitat that will be impaired as a result of the development project. Turning from this barter approach to a program even closer to market-based mechanisms, FWS recently developed a policy for the “banking” of endangered species habitat⁶⁴ modeled on the more mature version of habitat banking found in the wetlands protection program under section 404 of the Clean Water Act.⁶⁵ As a logical extension of the HCP program, habitat banking allows some landowners to assemble and restore significant holdings of prime habitat for listed species and to market “credits” in the habitat to other landowners in need of mitigation habitat to satisfy their HCP permit

permits that the FWS had issued nationally by August 1997, including acreage statistics, see USING SCIENCE IN HABITAT CONSERVATION PLANS, *supra* note 60.

63. Mitigation for impacts to endangered species or their habitat can be achieved through “compensating for the impact,” such as through restoring or protecting habitat at an onsite or offsite location. See HCP HANDBOOK, *supra* note 61, at 3-19 to 3-20.

64. See Guidance for the Establishment, Use, and Operation of Conservation Banks, 68 Fed. Reg. 24,753 (May 8, 2003).

65. See Federal Guidance for the Establishment, Use and Operation of Mitigation Banks, 60 Fed. Reg. 58,605 (Nov. 28, 1995) (clarifying the manner in which mitigation banks may be used to satisfy mitigation requirements of the Clean Water Act). Although the Corps has long applied a mitigation policy to regulated fill of jurisdictional wetlands, initially that policy focused on, even preferred, mitigation on the site of the project seeking a section 404 permit. Over time, however, the Corps found that the onsite mitigation preference led to a proliferation of “postage stamp” mitigation sites that presented serious administrative monitoring and enforcement concerns. Indeed, many studies have shown that onsite mitigation generally failed to produce compensatory wetland resource values. See, e.g., U.S. ARMY CORPS OF ENG’RS, NEW ENGLAND DIST., SUCCESS OF CORPS-REQUIRED WETLAND MITIGATION IN NEW ENGLAND (2003); WASHINGTON DEP’T OF ECOLOGY, WASHINGTON STATE WETLAND MITIGATION EVALUATION STUDY (2002); NEW JERSEY DEP’T OF ENVTL. PROT., CREATING INDICATORS OF WETLAND STATUS (QUANTITY AND QUALITY): FRESHWATER WETLAND MITIGATION IN NEW JERSEY (2002). Consequently, during the 1990s the Corps gradually moved first to an offsite compensatory mitigation policy, and eventually toward the mitigation banking concept, officially blessing it in the 1995 multi-agency policy laying out the basic design and implementation standards. For a comprehensive overview of the wetlands mitigation banking program and comparison of it to endangered species habitat banking approaches, see Michael J. Bean & Lynn E. Dwyer, *Mitigation Banking as an Endangered Species Conservation Tool*, 30 *Envtl. L. Rep. (Envtl. L. Inst.)* 10,537 (2000).

conditions. The conservation values accruing to the species within the banked habitat area are translated by the regulatory authority into quantified “credits,” and each development project’s negative impacts to the species are quantified through the permitting process into mitigation needs or “debits.” The debit holders can retire their regulatory “debt” by purchasing an offsetting number of credits from an owner of a bank located within a specified geographic area, with the market, rather than the regulators, determining the price of the credits. Presumably, bank owners enter the banking enterprise because they believe their cost of generating credits through land acquisition and resource management will be more than amply recovered in the credit market. Meanwhile, projects in need of regulatory approvals can purchase bank credits as a means of satisfying mitigation requirements in a manner that is less expensive than other measures such as dedicating project lands or purchasing and managing conservation lands directly. Thus, a supply of and demand for credits should emerge. To make this a three-way win, regulatory agencies believe that conservation banking is good for the species as well, as it promotes a more orderly system for securing permanently dedicated conservation lands and attracts persons with true expertise to the “industry” of creating and managing those lands. It is common, therefore, to hear conservation banking described as “a free-market enterprise that offers landowners economic incentives to protect natural resources, saves developers time and money by providing them with certainty of pre-approved compensation lands, and provides long-term protection of habitat.”⁶⁶ Although there has yet to be any substantial experience under the new program, it appears the FWS has developed a flexible framework for habitat banking that meets the expectations of many environmentalists and landowners.⁶⁷

66. Guidance for the Establishment, Use, and Operation of Conservation Banks, 68 Fed. Reg. at 24,753.

67. In 2000, Bean and Dwyer, both of Environmental Defense, offered many thoughtful principles for construction of an endangered species habitat banking program, even drafting a proposed policy, and the program the FWS has developed incorporates many of their guidelines. *Compare* Bean & Dwyer, *supra* note 65, at 10,546–56, *with* Guidance for the Establishment, Use, and Operation of Conservation Banks, 68 Fed. Reg. at 24,753. To be sure, implementing banking programs, particularly habitat-based banking programs, poses significant challenges to ensure appropriate environmental results. But, if carefully constructed and monitored, they are promising in

The design of HCPs as negotiated regulatory instruments that take advantage of market-based mitigation led naturally to an adaptive management theme. Indeed, not long after the HCP permit program was fully on its feet, FWS announced it would henceforth administer permits under the ESA by using adaptive management as a means to “examine alternative strategies for meeting measurable biological goals and objectives through research and/or monitoring, and then, if necessary, to adjust future conservation management actions according to what is learned.”⁶⁸ FWS thus portrayed adaptive management as an important practical tool that “can assist the Services and the applicant in developing an adequate operating conservation program and improving its effectiveness.”⁶⁹ FWS also intended adaptive management to foster continuing relations between the parties after issuance of the incidental take permit, serving the agencies’ goal of promoting long-term, collaborative “conservation partnerships” with landowners.⁷⁰

that regard. For a thorough review of the promise and pitfalls of habitat banking programs generally, see James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607 (2000).

68. Notice of Availability of a Draft Addendum to the Final Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, 64 Fed. Reg. 11,485, 11,486 (Mar. 9, 1999). Accordingly, HCPs are acknowledged to be working hypotheses of how species will respond to changes in habitat size, location, configuration, and quality. To truly integrate adaptive management into an HCP, the plan must include a monitoring program to evaluate the performance of mitigation measures and a system that automatically triggers alternative conservation actions in the event that performance fails to meet conservation goals. See Gregory A. Thomas, *Where Property Rights and Biodiversity Converge Part III: Incorporating Adaptive Management and the Precautionary Principle into HCP Design*, 18 ENDANGERED SPECIES UPDATE 32, 34–35 (2001); George F. Wilhere, *Adaptive Management in Habitat Conservation Plans*, 16 CONSERVATION BIOLOGY 20 (2002).

69. Notice of Availability of a Final Addendum to the Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, 65 Fed. Reg. 35,242, 35,252 (June 1, 2000). For an in-depth discussion of the integration of adaptive management into the HCP program during Babbitt’s tenure, see Doremus, *supra* note 21, at 68–74.

70. As one FWS official has explained:

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

And for environmentalists, adaptive management, if faithfully implemented, can be used to offset information gaps by building more robust monitoring, evaluation, and revision processes into the permit.⁷¹

As a result, although Congress clearly did not install adaptive management as the method of implementation for HCPs, the ambiguity it left in the statute gave Babbitt the room the agency needed to do so through administrative reform. While the initiative surely would have been on firmer ground had the statute even so much as mentioned adaptive management, the enthusiastic response of landowners to the reformed HCP program suggested that Congress would have little complaint about what the agency had accomplished. In short, had it come to its full fruition, the integration of adaptive management in the HCP process, which is by no means required or even signaled in the statute, would have truly marked HCPs as “a system of negotiation rather than one of unilateral federal imposition on landowners.”⁷² Alas, that is far from the end of the story.

B. CITIZEN PARTICIPATION

While FWS was patting itself on the back for its foray into adaptive management, widespread concern surfaced among environmental protection interests about how the agency implemented the adaptive management theme.⁷³ The major sore spot was the perceived lack of meaningful public

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

71. See Thomas, *supra* note 68, at 36 (suggesting that where information critical to the HCP design is scarce or uncertain, the HCP should be shorter in duration, cover a smaller area, avoid irreversible impacts, require that mitigation measures be accomplished before take is allowed, include contingencies, and have more rigorous monitoring).

72. Farber, *supra* note 56, at 43.

73. See, e.g., HOOD, *supra* note 51, at vi–xiii (presenting a pessimistic assessment of the HCP program); John Kostyack, *Surprise!*, 15 ENVTL. F., Mar.–Apr. 1998, at 19, 19–24 (presenting extensive criticism of the Babbitt Administration’s HCP reforms from an attorney for National Wildlife Federation); see *generally* Thornton, *supra* note 51, at 95–96 (describing other organizations’ criticisms).

participation in the HCP negotiation process. By the late 1990s, environmental groups had begun to complain that mitigation decisions in the HCP program were taking place without following “biological standards”—in other words, not according to the traditional permitting system—and to demand more public participation as a result.⁷⁴ For example, in 1999 the Defenders of Wildlife offered the following description of the HCP permitting process:

Citizens from various stakeholder groups have no formal role in the HCP process except through the public comment period and, for some plans, through the National Environmental Policy Act (NEPA) or requirements of state or local law. Often, by the time public meetings occur or official drafts are released for comment, however, both the regulated interests and the services have invested so much money and time in plan development that they are unlikely to change course.

. . . [C]itizens (including those representing the environmental community) generally have not had a seat at the negotiating table in many major recent negotiations despite the fact that conservationists (in addition to FWS) represent the public’s interest in protecting endangered species.

...

. . . For the vast majority of plans . . . public participation was not adequate, given the plans’ large effects on public resources. The most glaring examples are large-scale, single-landowner plans that significantly affect public resources While those plans did have public meetings and/or formal comment periods, the conservation strategies resulted from private negotiations with largely token attempts at listening to the public’s concerns. In addition, numerous small-scale HCPs reviewed here involved exclusive negotiations between the landowner and FWS

...

. . . This lack of public participation has resulted from an absence of formal requirements to involve the public and the limited leverage of citizens who do not have a direct financial stake in negotiations.⁷⁵

A similar theme emerged with respect to the interplay between HCP adaptive management and the parallel objective of providing fairness to landowners. Another policy the Babbitt administration introduced to the HCP process, the so-called “No Surprises” provision, was designed to relieve the HCP

74. See, e.g., HOOD, *supra* note 51, at 59-61, 80-81 (1998) (summarizing Defenders of Wildlife’s critique of HCP program).

75. HOOD, *supra* note 51, at 41, 43-44; see also Holly Doremus, *Preserving Citizen Participation in the Era of Reinvention: The Endangered Species Act Example*, 25 *ECOLOGY L.Q.* 707 (1999) (examining the growing tension between the HCP and other ESA reform programs and public participation values).

permit holder of any additional conservation obligations beyond those specified in the HCP regarding unforeseen circumstances that arise after the HCP is issued.⁷⁶ The policy was not popular with environmental protection interest groups, which argued that the No Surprises policy may constrain the use of adaptive management, as it cuts off revision of prior agreements about the HCP's conservation measures.⁷⁷

On the other hand, one might just as reasonably observe that adaptive management undermines the No Surprises policy, as the very purpose of adaptive management is to ensure the ability to adjust decisions after the HCP is issued. But a third view is that the two policies can be implemented as complementary, not conflicting.⁷⁸ The No Surprises policy simply defines who is responsible for measures necessary to address unforeseen circumstances. Additionally, a comprehensive, criteria-specific adaptive management provision in an HCP negates the argument that matters contemplated as adaptive management were unforeseen for purposes of the No Surprises policy. It should be in the interests of the agency and the applicant, therefore, to negotiate an adaptive management provision that spells out its

76. Habitat Conservation Plan Assurances ("No Surprises") Rule, 63 Fed. Reg. 8859, 8860 (Feb. 23, 1998). The policy has been described as an essential component of the HCP program, necessary to make HCPs attractive to landowners. See Fred P. Bosselman, *The Statutory and Constitutional Mandate for a No Surprises Policy*, 24 *ECOLOGICAL L.Q.* 707, 717-19 (1997).

77. See Doremus, *supra* note 21, at 72-73. Indeed, in recent litigation brought to challenge the No Surprises Rule, a federal district court identified procedural errors in the agency's rule promulgation. See *Spirit of the Sage Council v. Norton*, 294 F. Supp. 2d 67 (D.D.C. 2003). The court found that the FWS did not follow proper notice and comment procedures in promulgating the so-called Permit Revocation Rule, which explains how and when the FWS can revoke a permit when it is evident continued use of the permit would violate the ESA. *Id.* at 92. Because the agency made the Permit Revocation Rule an integral component in its substantive defense of the previously-adopted No Surprises Rule, the court also remanded the No Surprises Rule even though it was adopted through proper notice and comment procedures. *Id.* Yet, the court declined to vacate or enjoin implementation of the No Surprises Rule itself and made no substantive findings on either rule. In response, FWS reissued final rules governing incidental take permit revocations. See *Endangered Species Act Incidental Take Permit Revocation Regulations*, 69 Fed. Reg. 71,723 (Dec. 10, 2004). The court has yet to rule on any of the substantive claims in the case, but presumably with the procedural defects resolved that phase of the litigation will resume.

78. For an additional discussion of this point, see J.B. Ruhl, *Is the Endangered Species Act Eco-Pragmatic?*, 87 *MINN. L. REV.* 885, 935 n.221 (2003).

scope and subject matter with clarity and precision. Hence, with deliberate attention by the permitting agency to the contours and interplay of the adaptive management and No Surprises provisions of an HCP, the two policies seem perfectly capable of meeting their respective objectives.⁷⁹

Indeed, many HCPs issued after the No Surprises rule was enacted contain substantial adaptive management provisions that detail a comprehensive monitoring and adjustment protocol and specify the kinds of events and responses for which adjustments will be made.⁸⁰ Nevertheless, the pressure for more public input on this and other aspects of HCP permits continued to build, culminating in a wave of litigation against specific HCP permits testing both the general validity of the agency's HCP program policies and the agency's particular application thereof.

C. JUDICIAL REVIEW

Interest groups did not waste time launching an assault on the HCP program, challenging the San Bruno Mountain HCP⁸¹ on three claims that would appear time and again in later HCP

79. See Jan S. Pauw & James R. Johnston, *Habitat Planning Under the ESA on Commercial Forestlands*, 16 NAT. RESOURCES & ENV'T 102, 104-05 (2001) (suggesting the two policies are compatible).

80. See, e.g., *Center for Biological Diversity v. U.S. Fish & Wildlife Serv.*, 202 F. Supp. 2d 594 (W.D. Tex. 2002). This case involved an HCP issued in 2001 to the LaCantera commercial development in San Antonio, Texas. As discussed *infra*, the plaintiff environmental group challenged virtually every aspect of the permit, including the adequacy of the adaptive management provisions, but lost on every claim. The court's discussion of the adaptive management provisions emphasized the comprehensive and detailed nature of the monitoring and response protocols. See *id.* at 616. In the interest of full disclosure: I served as a consultant to the HCP applicant in the case. Another example is the elaborate thirty-five page adaptive management provision found in the HCP issued to Plum Creek Timber Company for 1.6 million acres of its timberland holdings in the Pacific Northwest, which include habitat of endangered fish. See PLUM CREEK TIMBER CO., FINAL PLUM CREEK TIMBER COMPANY NATIVE FISH HABITAT CONSERVATION PLAN 8-1 to 8-32 (Sept. 2000). More recently, FWS joined with other state and federal agencies to develop a detailed technical guidance for monitoring protocols to assist adaptive management in large-scale HCPs. See U.S. DEP'T OF THE INTERIOR ET AL., DESIGNING MONITORING PROGRAMS IN AN ADAPTIVE MANAGEMENT CONTEXT FOR REGIONAL MULTIPLE SPECIES CONSERVATION PLANS (2004), available at <http://www.dfg.ca.gov/nccp/pubs/monframewk10-04.pdf>. The No Surprises Rule, in other words, cannot be blamed for the withering of adaptive management in the HCP program.

81. See *Friends of Endangered Species, Inc. v. Jantzen*, 760 F.2d 976 (9th Cir. 1985).

challenges: First, FWS did not provide adequate support for its required finding that the HCP “will not appreciably reduce the likelihood of the survival of the species,”⁸² second, the HCP did not “to the maximum extent practicable, minimize and mitigate the impacts” to the species,⁸³ and third, the agency’s decision not to prepare an Environmental Impact Statement (EIS) under NEPA⁸⁴ was not supported. The court decided that HCPs should be reviewed similar to other environmental permits, under the Administrative Procedure Act’s “arbitrary and capricious” standard of review,⁸⁵ and found the agency’s permit acceptable on all claims under that standard.

HCP litigation went into remission after this decision and did not resurface until after Babbitt’s reforms had taken hold. In 1998, a court found two FWS-issued HCP permits that allowed construction in the habitat of the Alabama beach mouse to be defective because of a lack of record evidence that the offsite habitat acquisition offered as mitigation was (1) adequately funded, (2) the maximum extent of mitigation practicable, or (3) consistent with mitigation required for other projects affecting the beach mouse.⁸⁶ The court also found that FWS’s decision not to prepare a full-blown EIS under NEPA was unsupported because the finding of no significant impact was made “without any inventory or population data regarding how many of this declining endangered species exist elsewhere in the range, and without knowing how many of the species are being destroyed in the project site.”⁸⁷

Later, and on a much larger scale, a California district court held that FWS improperly issued an HCP permit authorizing development over 53,000 acres in the Natomas Basin area of northern California.⁸⁸ The plaintiffs alleged FWS had inadequately considered factors relevant to the required determinations regarding the impact of the HCP on the species, the adequacy of mitigation, and the adequacy of funding.⁸⁹ The court found many positive aspects of the plan as a whole, but

82. 16 U.S.C. § 1539(a)(2)(B)(iv) (2000); *see also* Jantzen, 760 F.2d at 976.

83. 16 U.S.C. § 1539(a)(2)(B)(ii); *see also* Jantzen, 760 F.2d at 976.

84. *See supra* note 38; *see also* Jantzen, 760 F.2d at 981-82.

85. *See* 5 U.S.C. § 706(2)(A) (2000); Jantzen, 706 F.2d at 981.

86. *Sierra Club v. Babbitt*, 15 F. Supp. 2d 1274, 1284-85 (S.D. Ala. 1998).

87. *See id.* at 1280-83.

88. *National Wildlife Fed’n v. Babbitt*, 128 F. Supp. 2d 1274, 1302 (E.D. Cal. 2000).

89. *See id.* at 1284-85.

found flaws in the mechanics and implementation.⁹⁰ On the other hand, the court rejected the plaintiffs' arguments that the plan did not include sufficient data regarding the species and was not scientifically sound.⁹¹ Thus, most of the biological aspects of the permit were upheld, including the amount of development allowed and mitigation required, but the implementation mechanics were deemed inadequate to attain those biological goals. The lead attorney for the National Wildlife Federation later proclaimed that "the effect of the ruling will likely be to produce more rigorous HCPs."⁹²

Several other cases have found HCPs lacking on procedural grounds.⁹³ For example, one court held that FWS erred in issuing an HCP permit to a housing subdivision development in the habitat of an endangered squirrel species.⁹⁴ The agency failed to make certain critical information about the permit applicant's mitigation plan adequately available for public comment.⁹⁵ The agency also failed to make an independent finding that the applicant's plan would minimize and mitigate harm to the species to the maximum extent practicable, as required by section 10(a)(1).⁹⁶ It was not sufficient for the agency to rely on the applicant's statements about the effects of mitigation without making an independent finding.⁹⁷

Similarly, another court preliminarily enjoined use of an HCP permit for a beach condominium development in

90. A critical problem with the permit was that it covered an area encompassing many local jurisdictions, but the permit as approved included Sacramento as the only permittee. *See id.* at 1298-99. FWS improperly assumed other jurisdictions voluntarily would become permittees. *See id.* at 1291. Also, the plan did not guarantee funding adequately because the development fee associated with the permit was inadequate and other jurisdictions that would need to impose the fee outside of Sacramento were not included. *See id.* at 1293-95.

91. *See id.* at 1291.

92. John Kostyack, NWF v. Babbitt: *Victory for Smart Growth and Imperiled Wildlife*, 31 *Envtl. L. Rep.* (Envtl. L. Inst.) 10,712, 10,718 (2001).

93. *See, e.g.*, Gerber v. Norton, 294 F.3d 173 (D.C. Cir. 2002); Sierra Club v. Norton, 207 F. Supp. 2d 1310 (S.D. Ala. 2002).

94. *See* Gerber, 294 F.3d at 186.

95. *See id.* at 180-84.

96. *See id.* at 184-86.

97. FWS later corrected these procedural errors and reissued the permit. *See* Notice of Availability of Documents Associated with Winchester Creek Habitat Conservation Plan, 64 *Fed. Reg.* 52,609, 52,609-10 (Sept. 4, 2003).

endangered beach mouse habitat.⁹⁸ The court found the permit deficient because FWS did not have sufficient information, or had not provided a sufficient explanation of the information it did have, to justify a finding that there would be no significant impact to the species and thus no EIS would be necessary under NEPA.⁹⁹

To be sure, some cases have upheld HCPs in the face of such challenges. For example, against a barrage of claims that an HCP permit violated the ESA and NEPA, a court upheld the permit for commercial development in the range of several endangered karst-dwelling invertebrate species.¹⁰⁰ The judge observed that “despite my personal lamentation about failing to nurture nature, my oath and the judicial process require decisions to be made within the parameters of the law.”¹⁰¹ On that basis he found, with meticulous documentation from the record responding to each claim by the plaintiffs, that FWS had acted within those parameters under both statutes.¹⁰²

In a more recent decision upholding an HCP for a development near the Sacramento airport, a court ruled that the permit issuance requirement that FWS must find the applicant has mitigated to the “maximum extent practicable” does not require the permittee to invest as much as it possibly can afford in mitigation measures such as habitat purchases.¹⁰³ Rather, endorsing the FWS policy on the question, the applicant need only mitigate the effects of its incidental take and “may do something less than fully minimize and mitigate the impacts of the take where to do more would not be practicable.”¹⁰⁴ The court upheld the permit on all other grounds, including the adequacy of funding and the determination that the take would not jeopardize any of the covered species.¹⁰⁵

The won-loss record of the HCP litigation history is not nearly as important for my purposes as is the fact that there is

98. See *Sierra Club*, 207 F. Supp. 2d at 1317.

99. See *id.* at 1331-36.

100. See *Center for Biological Diversity v. U.S. Fish & Wildlife Serv.*, 202 F. Supp. 2d 594, 663 (W.D. Tex. 2002).

101. *Id.* at 597.

102. See *id.*

103. See *National Wildlife Fed'n v. Norton*, 306 F. Supp. 2d 920, 927-28 (E.D. Cal. 2004).

104. See *id.* at 928.

105. See *id.* at 926-27.

a history of aggressive challenges to the program both at the policy level, such as in the litigation over the No Surprises Rule,¹⁰⁶ and in the applied context, such as with individual permits. Interest groups fearful of the flexible model of regulation the HCP program represents can fight it by nitpicking HCPs to death in the courts, where, notwithstanding the deferential standard of review required under the Administrative Procedure Act, judges appear all too willing to police the program closely. As a consequence, the reward for agency willingness to experiment with adaptive implementation of the HCP program has been lawsuits and judicial admonitions, which do nothing to encourage agency personnel to exhibit “flexibility, openness, and their willingness to experiment, monitor, and adapt.”¹⁰⁷

Not surprisingly, practitioners also have become gloomy about the HCP program, suggesting its gradual ossification as litigation claims mount.¹⁰⁸ One lawyer active in HCP permit application processing suggests that the agency’s “response to the handful of successful HCP challenges has been to fret endlessly over the documents and records, thus making the process much more burdensome. . . . The administrative burdens in doing HCPs are out of hand.”¹⁰⁹ The agency, in other words, has sought refuge in the “front end” of administrative process, which can only spell doom for any hope that the adaptive “back end” will flourish. Alas, regulation by adaptive management, while possible, seems impractical for agencies to manage in the long run under conventional rules of administrative law

CONCLUSION—BUILDING A MODEL FOR REGULATION BY ADAPTIVE MANAGEMENT

As any policy response directed at the complex regulatory problems of the future will require, ecosystem management requires adaptive management as its method of implementation. But truly adaptive management cannot flourish among regulatory agencies in the conventional administrative law context. Legislatures, interest groups, and

106. *See supra* note 77.

107. Grumbine, *supra* note 20, at 45.

108. *See, e.g.,* Thornton, *supra* note 51, at 98-101.

109. Email from Alan M. Glen, Partner, Smith, Robertson, Elliott, Glen, Klein & Bell L.L.P. to author (Mar. 9, 2005) (on file with the author).

courts have become acculturated to a “front-end” style of command-and-control regulation that has dominated for decades and is, to be candid, particularly suited to taking on discrete, readily-identified vectors of public harm. Few observers believe that this model will have lasting success as problems such as invasive species, sprawl, and terrorism take hold as the primary transmitters of policy challenges. Why then should anyone expect the implementation apparatus associated with command-and-control to be of much use either? As the National Research Council Committee studying the Missouri River concluded, adaptive management will “entail new governance structures.”¹¹⁰

This is not to say that regulation by adaptive management demands a hands-off, free-wheeling culture of anything goes in so far as agency decision process is concerned. But public participation and judicial review can come in many forms, so adaptive management need not be squeezed into the current conventions. Some observers suggest, for example, that adaptive management demands collaborative rather than confrontational forms of public participation, so as to foster the continuous relationships necessary for continuous adaptation.¹¹¹ Some are skeptical.¹¹² The fact is we do not yet know which, if any, constructs of collaboration work to promote regulation by adaptive management, or whether other means of public participation we have not thought of are even better suited. Hence, the challenge for administrative law and policy is to devise and test new institutions and instruments of policy implementation that allow agencies to use adaptive management while ensuring adequate agency accountability.

This effort is a work in process in its early stages. We are far from ready to draft the National Adaptive Management Act!

110. See MISSOURI RIVER ECOSYSTEM, *supra* note 14, at 112.

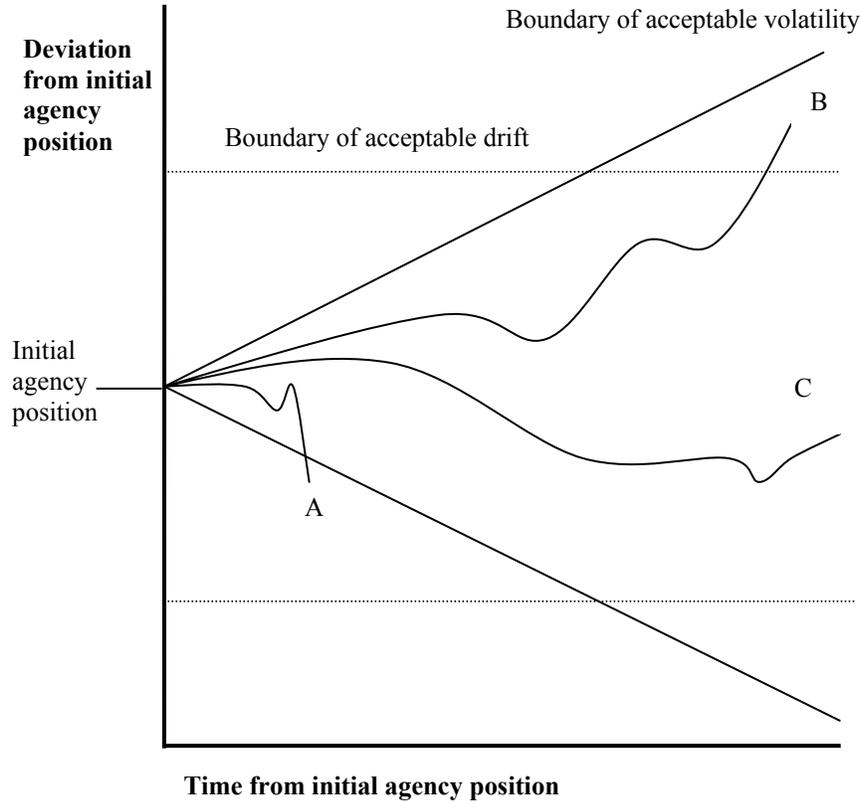
111. See, e.g., Bradley C. Karkkainen, *Environmental Lawyering in the Age of Collaboration*, 2002 WIS. L. REV. 555; see also Bradley C. Karkkainen, *Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism*, 21 VA. ENVTL. L.J. 189 (2002); cf. David L. Markell, “Slack” in the Administrative State and Its Implications for Governance: *The Issue of Accountability*, 84 OREGON L. REV. 1 (forthcoming 2005). See generally Jody Freeman, *Collaborative Governance in the Administrative State*, 45 UCLA L. REV. 1 (1997).

112. See, e.g., Jim Rossi, *Participation Run Amok: The Costs of Mass Participation for Deliberative Decisionmaking*, 92 NW. U. L. REV. 173 (1997); Mark Seidenfeld, *Empowering Stakeholders: Limits on Collaboration as the Basis for Flexible Regulation*, 41 WM. & MARY L. REV. 411 (2000).

Yet the central objective for institutional design is quite apparent: decisionmakers need to be in a position to adjust decisions based on reliable monitoring feedback. But they must do so in a manner that is transparent and accountable to the public, legislatures, and courts and which—here is the kicker—is subject to some objective boundaries.

The boundaries question poses the more difficult institutional design problems. By relying more on adaptive “back-end” decision adjustment processes, adaptive management presents two potential sources of concern. One, which I call “volatility,” is that an agency might alter its initial decision too substantially too soon after making the initial decision. A small adjustment made soon after the initial position is implemented is understandable, but a radical departure made quickly after the initial position suggests that the agency’s operational model is faulty, its monitoring is defective, or something else about the agency’s approach is fundamentally flawed, and that the agency needs to go back to the drawing board. The other problem, which I call “drift,” is the concern that an accumulation of small adjustments over time may put the agency so far from its initial position that it is appropriate to demand that the agency pause and conduct a top-to-bottom review of its objectives, models, monitoring, and so on.

Volatility and drift present the concerns that require the construction of objective boundaries the legislature must express, the public may monitor, and the courts must police. The boundaries must be defined sharply enough so an agency will know when it is acting within its adaptive management mandate and when it has transgressed the mandate and thus made itself subject to a “front-end” reassessment of its adaptive management regime. Conceptually, therefore, the following model of regulation by adaptive management illustrates the challenge for administrative law reform:



Defining Boundaries for Volatility and Drift: The institutional structure of adaptive management must clearly define instances of volatility, in which the agency has deviated from its initial position too dramatically over the short-term (decision path line A), and instances of drift, in which the agency has slowly over time moved substantially away from its initial position (decision path line B), while still protecting the agency from obtrusive public participation and judicial review when it has neither acted with too much volatility nor drifted too far off course (decision path line C).

As this Article has demonstrated, administrative law does not have much experience with this sort of institutional structure, one which focuses on what the agency does *after* rather than before establishing its initial position. Indeed, the

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conventions of administrative law resist even exploring the possibilities. It will be essential, therefore, for advocates of adaptive management to move beyond defining the need for and basic approach of adaptive management and begin working directly and aggressively with the institutional design questions. Regulation by adaptive management *is* possible, even inevitable, but hard work lies ahead to make it so.