Adaptive Management in the Courts

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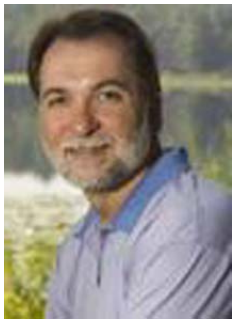

Abstract:

Adaptive management is a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood.

These days, adaptive management is natural resources policy and with its core idea of "learning while doing", adaptive management squares up much better with the needs of many contemporary resource management problems.

Adaptive management theory regards decision-making more as a series of fine-tuning steps that are continually reevaluated. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process

Rezumat:

Managementul adaptiv este un proces decizional care promovează luarea deciziilor flexibile ce pot fi ajustate în fața incertitudinilor rezultate din acțiuni de management și alte evenimente să devină mai bine înțelese.

În zilele noastre, managementul adaptiv este o politică a resurselor naturale și cu ideea sa de bază "Învață în timp ce faci" se îmbină mai bine cu nevoile mai multor probleme contemporane de gestionare a resurselor.

Teoria managementului adaptiv privește luarea deciziilor mai mult ca o serie de reglaje fine ale etapelor care sunt continuu reevaluate. Monitorizarea atentă a acestor rezultate favorizează atât înțelegerea progreselor științifice și ajută adaptarea politicilor sau operațiunile ca parte a unui proces iterativ de învățare.

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Introduction

Adaptive management has become the tonic of natural resources policy. With its core idea of "learning while doing,"[10] adaptive management has breathed life and hope into a policy realm beset by controversy, uncertainty, and complexity. Adaptive management offers what many believe is needed most in a world bombarded by ecological deterioration of massive scales—expert agencies exercising professional judgment through an iterative decision-making process emphasizing definition of goals, description of policy decision models, active experimentation with monitoring of conditions, and adjustment of implementation decisions as suggested by performance results. This ideal has infused the natural resources policy world to the point of ubiquity, surfacing in everything from mundane agency permits[11] to grand presidential proclamations.[12] Indeed, it is no exaggeration to suggest that these days adaptive management *is* natural resources policy.

But is it working? Does appending "adaptive" in front of "management" somehow make natural resources policy, which has always been about balancing competing claims to nature's bounty, something more and better? Many legal and policy scholars have asked that question, with mixed reviews.[13] Their

[10] As Professor Holly Doremus explains, "active learning is rarely incorporated into the resource management process. For iterative or related decisions, where there is no 'safe' choice, precaution and science are not in tension. Both point us toward an incremental framework for decisionmaking that emphasizes learning. We might call that framework adaptive management, but … I prefer the more descriptive phrase 'learning while doing.'" Holly Doremus, *Precaution, Science, and Learning While Doing in Natural Resource Management*, 82 Wash. L. Rev. 547, 550 (2007). For more detail on what "learning while doing" entails, see *infra* Part I.

[11] For example, the U.S. Fish and Wildlife Service has proclaimed it will use adaptive management in administering habitat conservation plan (HCP) permits it issues pursuant to the Endangered Species Act, 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." 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). As one FWS official explained: We will continue to incorporate contingency planning within all types of HCPs. In the future, HCPs will have improved structure in their adaptive management strategies. Increased structure in adaptive management strategies will require increased vigilance on the part of permittees and the Service during implementation of long-term plans; this reflects the nature of the conservation partnership created by HCPs. Marj Nelson, *The Changing Face of HCPs*, Endangered Species Bull., July/Aug 2000, at 4, 7.

[12] *See*, *e.g.*, Executive Order No. 13,508, Chesapeake Bay Protection and Restoration (May 12, 2009) (section 301(b) directs the EPA to draft pollution control strategies for the Chesapeake Bay watershed that are "based on sound science and reflect adaptive management principles;" section 801 directs the Departments of the Interior and Commerce to use "adaptive management to plan, monitor, evaluate, and adjust environmental management actions" in the Chesapeake Bay watershed).

[13] For recent examples see Mary Jane Angelo, *Stumbling Toward Success: A Story of Adaptive Lawand Ecological Resilience, 87 Neb. L. Rev. 950 (2009) (detailing the theory of adaptive management through a case study based in Florida); Alejandro E. Camacho, Can Regulation Evolve? Lessons from a Study in Maladaptive Management, 55 UCLA L. Rev. 293 (2007) (critiquing the use of adaptive management in Endangered Species Act permitting); Holly Doremus, Adaptive Management, the Endangered Species Act, and the Institutional Challenges of "New Age" Environmental Protection, 41 Washburn L.J. 50 (2001) (identifying challenges for adaptive management in administration of the Endangered Species Act); Robert L. Glicksman, Ecosystem Resilience to Disruptions Linked to Glo-*

evaluations, however, have rested on theory,[14] program-specific surveys,[15] and isolated case studies.[16] No review of adaptive management has comprehensively explored and extracted lessons from what likely matters most to the natural resource agencies practicing adaptive management - how is it faring in the courts? We do so in this Article.

Part I of the Article examines the theory, policy, and practice of adaptive management, focusing on the experience of the federal resource management agencies. From theory to policy to practice, at each step forward in the emergence of adaptive management something has been lost in the translation. The end product is something we call "a/m-lite," a watered down version of the theory that resembles ad hoc contingency planning more than it does planned "learning while doing." This gap between theory and practice leads to profound disparities between how agencies justify decisions and how adaptive management in practice arrives at the courthouse doorsteps.

In Part II we review how these disparities have played out in courts considering claims that agency practice of adaptive management has not lived up to its theoretical promise or to the legal demands of substantive and procedural law. Our overall assessment is that, although courts genuinely and often enthusiastically endorse adaptive management, they frequently are underwhelmed by how agencies implement adaptive management in the field. We extract three key themes from the body of case law in this respect.

The pool of judicial opinions on adaptive management is still limited in scope, leaving many questions unanswered and providing only a partial playbook for moving forward. In Part III, therefore, we extend from the existing case law to draw lessons for agencies and Congress about the future practice of adaptive management. The message for Congress is straightforward - provide more funding and clearer standards. With neither in the cards for the foreseeable future, as a practical matter agencies cannot hope to practice a fully realized version of adaptive management theory. Our message to agencies, however, is that even compromised adaptive management, in the form of a/m-lite, can be an effective decision method - and one that survives

bal Climate Change: An Adaptive Approach to Federal Land Management, 87 Neb. L. Rev. 833, 871 (2009) (proposing the broad use of adaptive management in public land management); Bradley C. Karkkainen, Panarchy and Adaptive Change: Around the Loop and Back Again, 7 Minn. J.L. Sci. & Tech. 59, 70-71 (2005) (examining the theory of active adaptive management); J.B. Ruhl, Regulation by Adaptive Management—Is It Possible?, 7 Minn. J. of L. Sci & Tech 21 (2005) (identifying disconnects between adaptive management and conventional administrative procedure); Annecoos Wiersema, A Train Without Tracks: Rethinking the Place of Law and Goals in Environmental and Natural Resources Law, 38 Envtl. L. 1239 (2008) (arguing that adaptive management by agencies pays insufficient attention to substantive goals).

[14] *See, e.g.,* Karkkainen, *supra* note 4 (examining the theories of passive and active adaptive management).

[15] The use of adaptive management to implement programs of the Endangered Species Act has received considerable attention. *See*, *e.g.*, Camacho, *supra* note 4; Doremus, *supra* note 4; J.B. Ruhl, *Taking Adaptive Management Seriously: A Case Study of the Endangered Species Act*, 52 Kan. L. Rev. 1249 (2004).

[16] *See*, *e.g.*, Angelo, *supra* note 4 (Lake Apopka in Florida); Melinda Harm Benson, *Integrating Adaptive Management and Oil and Gas Development: Existing Obstacles and Opportunities for Reform*, 39 Envtl. L. Rep. (Envtl. L. Inst.) 10962 (2009) (oil and gas development in Wyoming); John H. Davidson & Thmas Earl Geu, *The Missouri River and Adaptive Management: Protecting Ecological Functions and Legal Processes*, 80 Neb. L. Rev. 816 (2001) (Missouri River); Alfred R. Light, *Tales of the Tamiami Trail: Implementing Adaptive Management in Everglades Restoration,* 22 J. Land Use & Envtl. L. 59 (2006) (Florida Everglades).

judicial scrutiny - under two conditions. But agencies must be more disciplined about its design and implementation. This includes resisting the temptation to employ adaptive management to dodge burdensome procedural requirements, substantive management criteria, and contentious stakeholder participation.

I. The Theory, Policy, and Practice of Adaptive Management

Adaptive management has moved amazingly fast from theory drawing board to policy marketing plan to practice production line. Along the way, however, it has been watered down to a weak lemonade of ad hoc contingency planning. Adaptive management as practiced by the federal resource management agencies just doesn't seem to have quite the same refreshing appeal as adaptive management in theory. In this section of the Article we explore this gap and identify the tensions it is likely to pose for adaptive management in the courts.

A. Theory. Over the past two decades, natural resources policy has gravitated to a model of nested, ever-changing, complex ecosystems, the essence of which demands a management policy framework every bit as dynamical as the ecosystems it seeks to manage.[17] This rapidly solidifying framework, known as ecosystem management,[18] has integrated policy implementation methods intended to move decision-making from a process of setting rigid standards based on comprehensive rational planning to one of experimentation using continuous monitoring, assessment, and recalibration. The dominant of these new decision methods emerged in the theory of adaptive management C.S. "Buzz" Holling laid out in influential book from the late 1970s, *Adaptive Environmental Assessment and Management*.[19]

Holling and his fellow researchers found conventional environmental management methods, particularly the environmental impact analysis process that lies at the core of the National Environmental Policy Act, at odds with the emerging model of ecosystem dynamics. They focused on the basic properties of ecological systems to provide the premises of a new assessment and management method.[20] Under a dynamic

[17] The development of natural resources law has taken many of its cues from environmental and ecological sciences, which themselves have evolved over time. *See* Fred P. Bossleman & A. Dan Tarlock, *The Influence of Ecological Science on American Law: An Introduction*, 69 Chi. Kent I. Rev. 847 (1994). With ecology in particular, the trend over the past half-century has been increasingly to focus on the complex flux qualities of ecosystems and to place less emphasis on conceptions of stasis and natural stability. *See* Reed F. Noss, *Some Principles of Conservation Biology, as They Apply to Environmental Law*, 69 Chi.-Kent L. Rev. 893, 893 (1994) ("Among the new paradigm in ecology, none is more revolutionary than the idea that nature is not delicately balanced in equilibrium, but rather is dynamic, often unpredictable, and perhaps even chaotic."); *see also* Bryan Norton, *Change, Constancy, and Creativity: The New Ecology and Some Old Problems*, 7 Duke Envtl. L. & Pol'y F. 49 (1996); Jonathan Baert Wiener, *Law and the New Ecology: Evolution, Categories, and Consequences*, 22 Ecology L.Q. 325 (1995).

[18] For the seminal works developing ecosystem management theory and policy, see *See* Norman L. Christensen et al., *The Report of the Ecological Society of America on the Scientific Basis for Ecosystem Management*, 6 Ecological Applications 665 (1996); R. Edward Grumbine, *What Is Ecosystem Management?*, 8 Conservation Biology 27 (1994). The legal contours of ecosystem management are comprehensively explored in John Copeland Nagle & J.B. Ruhl, The Law of Bioiversity and Ecosystem Management 311-1035 (2nd ed., 2006)

[19] Adaptive environmental assessment and management (Crawford S. Holling ed., 1978).

See, e.g., Kai N. Lee & Jody Lawrence, Restoration under the Northwest Power Act: 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).

[20] Adaptive environmental assessment and management, supra note 10, at 25-37.

model of ecosystems, they concluded, management policy must put a premium on collecting information, establishing measurements of success, monitoring outcomes, using new information to adjust existing approaches, and a willingness to change.[21] The traditional management approach of natural resources policy was "to attack environmental stressors in piecemeal fashion, one at a time," and to parcel decision-making "out among a variety of mission-specific agencies and resource-specific regimes."[22] In contrast, the adaptive management framework is more evolutionary and interdisciplinary, relying on iterative cycles of goal determination, model building, performance standard setting, outcome monitoring, and standard recalibration. Indeed, some versions of adaptive management incorporate an experimentalist element, in which management actions deliberately probe for information to evaluate testable hypotheses about the effects of active intervention in ecological processes, such as the effects a chosen action might have on invasive species.[23]

Adaptive management has evolved well beyond an idea. Indeed, from the earliest emergence of ecosystem management policy, there has been broad consensus among resource managers and academics that adaptive management is the only practical way to implement ecosystem management.[24] Recently, for example, the National Research Council branch of the National Academy of Sciences convened a committee of scientists to explore how adaptive management might be used to improve resource agency decision-making for ecosystem management in the Klamath River Basin, which straddles southern Oregon and northern California.[25] The committee synthesized the theoretical formulations to date to outline eight key 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 and management actions; (7) monitoring and ecosystem response; and (8) evaluation of restoration efforts and proposals for remedial actions.[26] The committee's description of the last stage provides some flavor of how adaptive management differs from conventional natural resources management in the way Holling et al. deemed most important:

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

[21] Id. at 1-21.

[22] Bradley C. Karkkainen, Bottlenecks and Baselines: Tackling Deficits in Environmental Regulation, 86 TEX. L. REV. 1409, 1439 (2008).

[23] See CARL WALTERS, ADAPTIVE MANAGEMENT OF RENEWABLE RESOURCES 232 (1986);

Karkkainen, Panarchy and Adaptive Change , supra note 4, at 70-71. Draft of January 25, 2010

[24] *See* Ronald D. Brunner & Tim W. Clark, *A Practice-Based Approach to Ecosystem Management*, 11 *Conservation Biology* 48 (1997); Paul L. Ringold et al., *Adaptive Management Design for Ecosystem Management*, 6 Ecological Applications 745 (1996); Anne E. Heissenbuttel, *Ecosystem Management–Principles for Practical Application*, 6 Ecological Applications 730 (1996). Indeed, the Ecological Society of America's comprehensive study of ecosystem management treats the use of adaptive management methods as a given. *See* Christensen et al., *supra* note 9, at 670.

[25] *See* Comm. On Endangered and Threatened Fishes in the Klamath River Basin, Bd. on Envtl. Studies and Toxicology, Div. on Earth & Life Studies, National Research Council, Endangered and Threatened Fishes in the Klamath River Basin: Causes of Decline and Strategies for Recovery (2004). In the interests of full disclosure: Professor Ruhl served on the so-called "Klamath Committee."

[26] See id. at 332-35.

The message for Congress is straightforward – provide more funding and clearer standards.

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.[27]

B. Policy. Federal resource management agencies have had difficulty translating the theoretical descriptions of adaptive management into policy. Rather than elaborating on the theoretical framework by providing details for implementation of the eight steps of adaptive management, agency's adopting adaptive management have gone in the reverse direction, condensing the policy of adaptive management into the bumper sticker sized slogan of "learning while doing."

For example, the Department of the Interior, in its *Adaptive Management Technical Guidance*, defines adaptive management using a long-winded version of the "learning while doing" theme:

Adaptive management is a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. … It is not a "trial and error" process, but rather emphasizes learning while doing.[28]

The mantra of "learning by doing" may capture the essence of adaptive management, but it hardly conveys how to do so. The picture gets no clearer as we move from policy guidance to formal regulatory definitions. For example, the joint regulation for compensatory wetland mitigation the Corps of Engineers and Environmental Protection Agency promulgated in April 2008[29] defines adaptive management as the development of a management strategy that anticipates likely challenges associated with compensatory mitigation projects and provides for the implementation of actions to address those challenges, as well as unforeseen changes to those projects. It requires consideration of the risk, uncertainty, and dynamic nature of compensatory mitigation projects and guides modification of those projects to optimize performance. It includes the selection of appropriate measures that will ensure that the aquatic resource functions are provided and involves analysis of monitoring results to identify potential problems of a compensatory mitigation project and the identification and implementation of measures to rectify those problems.[30]

The U.S. Forest Service's 2008 rule on national forest planning, which drips

[27] *Id.* at 335

[28] U.S. Dep't of the Interior, Adaptive Management Technical Guidance vii (2007).

[29] *See* Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19594 (Apr. 10, 2008).

[30] 33 C.F.R. § 332.2 (2008)

with references to adaptive management, provides even less definitional detail:

Adaptive management: A system of management practices based on clearly identified outcomes and monitoring to determine if management actions are meeting desired outcomes, and if not, to facilitate management changes that will best ensure that outcomes are met or re-evaluated. Adaptive management stems from the recognition that knowledge about natural resource systems is sometimes uncertain.[31] The point is that these and other legal definitions of adaptive management have done little to pin down what makes natural resources management "adaptive" for purposes of measuring and evaluating agency decisions. Further content is not generally supplied in agency substantive and procedural regulations. For example, the new Clean Water Act Section 404 wetlands compensatory mitigation program regulations require applicants to develop adaptive management plans as part of a larger permitting process and use it to guide decision-making over relevant permit time frames.[32] Thus, among the regulatory requirements for "planning and documentation" in mitigation plans, the rule requires compilation of an "adaptive management plan" to "guide decisions for revising compensatory mitigation plans and implementing measures to address both foreseeable and unforeseen circumstances that adversely affect compensatory mitigation success."[33] With the requirement of adaptive management plans in hand, however, the rule does not go much further in explaining how they are to be implemented, leaving it that local Corps "district engineer, in consultation with the responsible party (and other federal, tribal, state, and local

[31] 73 Fed. Reg. 21468, 21512 (Apr. 21, 2008), codified at 36 C.F.R. 219.16 (2008). This rule is currently enjoined by Citizens for Better Forestry v. U.S. Dept. of Agriculture, 632 F. Supp.2d 968 (N.D. Cal. 2009), and the Forest Service has requested public input on what direction the planning rule should take. *See* 74 Fed. Reg. 67165 (Dec. 18, 2009). The Forest Service adopted the same definition in its August 2007 proposed rules updating its procedures for National Environmental Policy Act compliance. *See* 72 Fed. Reg. 45998, 46003 (Aug. 16, 2007) (proposed definition to be codified at 36 C.F.R. 220.3). States do little better. California defines adaptive management, in the context of wildlife conservation planning, as "to use the results of new information gathered through the monitoring program of the plan and from other sources to adjust management strategies and practices to assist in providing for the conservation of covered species." Cal. Fish & Game Code § 2805(a) (2008). A Minnesota statute implementing the Great Lakes compact defines it as "a water resources management system that provides a systematic process for evaluation, monitoring and learning from the outcomes of operational programs and adjustment of policies, plans and programs based on experience and the evolution of scientific knowledge concerning water resources and water dependent natural resources." Minn. Stat. Ann. § 103G.801(1.2) (2008). Adaptive management in Oregon means "applying management or practices over time and across the landscape to achieve site specific resource goals using an integrated and science based approach that results in changes over time in response to feedback or monitoring," Or. Rev. Stat. § 541.351(1) (2008) (water resources code) and in Washington it means simply "reliance on scientific methods to test the results of actions taken so that the management and related policy can be changed promptly and appropriately." Rev. Code Wash. Ann. § 76.09.020(1) (2008) (forestry code).

[32] Section 404 of the Clean Water Act (CWA), jointly administered by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency, establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under Section 404 include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation (e.g. certain farming and forestry activities). U.S. EPA, Office of Water, Wetland Regulatory Authority, *available at* http://www.epa.gov/owow/wetlands/ (last visited Dec, 16, 2009)

[33] 33 C.F.R. § 332.4(c) (2008)

agencies, as appropriate), will determine the appropriate measures."[34] The upshot of the rule is that the adaptive management plan will be used when needed, only through monitoring will it be known if it is needed, and once the district engineer and regulated party know it is needed, they'll figure out how to adapt. This hardly seems what Holling and his adaptive management theory progeny have in mind. It is indicative of how an elaborate theory has descended into a vague promise of future adjustments without clear standards. The litigation described in Part II provides many other examples of this devolution from theory to a/m-lite.[35]

Some of the open-ended qualities of the Corps' adaptive management policy could be explained as necessary given the nature of Section 404 as regulating primarily private lands and actions, meaning the Corps takes proposed actions as they come and cannot know ahead of time how adaptive management can be effectively designed. But the story is little better for federal public land management agencies. There is no shortage of stakeholders interested in how public lands are managed and plenty of opportunities for them to challenge agency decisions. The U.S. Forest Service and the Department of the Interior (DOI) have led the way toward adaptive management among federal land management agencies. The Forest Service positioned adaptive management as the driver in its 2008 "environmental management systems" rules for national forest planning,[36] and the DOI adopted a broad adaptive management policy for all its agencies in March 2007.[37] Still, details are lacking.

The Forest Service's 2008 rule, for example, touts adaptive management over 20 times in the preamble, but only twice in the rule text: once to define it,[38] once to proclaim it is the essence of land management planning,[39] but never to explain how it is implemented. Instead, the agency adopted the concept of "environmental management systems" to, in theory (according to the preamble), capture all that is part of adaptive management and more.[40] The agency said it "believes incorporating EMS in the planning rule better integrates adaptive management and EMS in Forest Service culture and land management planning practices."[41]

The DOI approach is in one sense more substantive but in others more indirect. The Department has proposed, as part of its rules implementing the National Environmental Policy Act, that all its agencies adopt adaptive management, but does not therein define adaptive management or prescribe the contents of adaptive management plans.[42] Rather, the March 2007 DOI policy mandates use of a "technical guide" to define what adaptive management is and how it is to be implemented.[43] The DOI adaptive management website presents a series of case studies to illustrate the technical guidance in action, with contexts including multiple use lands, wildlife refuges, national forest restoration projects, and the Glen Canyon dam.[44]

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[34] 33 C.F.R. § 332.7(c) (2008).

[35] *See* notes x-y *infra*.

[36] *See supra* note 21.

[37] *See* Secretary of the Interior, Order No. 3270 (Mar. 9, 2007).

[38] 36 C.F.R. 219.16 (2008).

[39] 36 C.F.R. 219.3(a) (2008).

[40] 36 C.F.R. 219.5 (2008).

[41] 73 Fed. Reg. at 21475.

[42] 73 Fed. Reg. 126, 135 (Jan. 2, 2008).

[43] *See* U.S. Department of the Interior, Adaptive Management Working Group, Adaptive Management Technical Guide (2007)

[44] *See* http://www.doi.gov/initiatives/AdaptiveManagement/casestudies.html#case8 (last visited Jan. 22, 2010)

The guidance and the case studies do provide useful practical suggestions for adaptive management, but they do not aggregate into a coherent policy. The DOI nonetheless believes this approach "has great promise as an effective means to address significant resource management challenges under conditions of uncertainty."[45] That, of course, will depend on how it is put into practice.

C. Practice. Natural resource law is as much the management of conflict as it is the management of public lands, waters or species. The first generation of litigation over adaptive management highlights two key disparities that exacerbate conflict and misunderstanding as agencies attempt to translate theory into action. One disparity arises from the different values evident in law and management. The other disparity separates scholarly adaptive management theory from actual federal agency practice.

1. Perspectives on Agency Decision-making: Law versus Management

Modern U.S. administrative law and many of the environmental statutes enacted over the past forty years value the transparency and certainty of two-step decision-making. The first step is the pluralist debate during which groups comment on draft documents and debate various alternatives. The second step is the final agency action, when the government throws the switch and makes the decision which it will implement and defend if challenged in court. The legal system regards the point of final agency action as the phase change when the fluid period of deliberation ends and implementation/defense of a fixed record and plan of action begins.

This decision method relies on two central attributes: (1) use of "front-end" analytical tools comprehensively conducted *and concluded* prior to making the decision final,[46] and (2) the assumption of a robust capacity to predict and assess environmental impacts and overall costs and benefits of a proposed action. For example, regulations promulgated under the Endangered Species Act provide for consultations between the Fish and Wildlife Service ("FWS") and other federal agencies about the impacts of actions on protected species. These regulations require the FWS to "evaluate the effects of the action and cumulative effects" and decide "whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species."[47] In other words, FWS must decide, once and for all, whether an action taken today will jeopardize a species at some point in the future. The agency may revisit its decision only if the action remains subject to continuing federal control and either new information or modifications of the action present effects that were not previously considered.[48]

As shown above, adaptive management in theory employs a much more complicated, multi-step approach that values honing of predictive models and outcomes more than the fairness of the process. Adaptive management theory regards decision-making more as a series of fine-tuning steps that are continually reevaluated: nothing is ever final. The legal view of a resource management plan is that it comprehensively evaluates all rational considerations at once and

[45] Order 3270, *supra* note 28, at § 1.

[46] *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.

[47] 50 C.F.R. §§ 402.14(g)(3)-(4). The agency defines cumulative effects as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area." 50 C.F.R. § 402.02.

[48] *Id*. § 402.16.

then flips a toggle switch; the adaptive management approach twiddles the dial as information trickles in.

Adaptive management squares up much better with the needs of many contemporary resource management problems. The front-end, comprehensive assessment methods of conventional resource management will face daunting limits against problems such as climate change. The impacts of climate change necessitating human and environmental adaptation are excruciatingly difficult to predict.[49] Nonlinearities in change dynamics, environmental feedback properties, and the interactions of social and ecological responses will soon exceed the boundaries of knowledge and experience that have allowed environmental impact assessment and cost-benefit analysis to maintain what reliability and credibility they have.[50] Indeed, even before climate change adaptation became a pressing need, the challenges of front-end environmental impact assessment were evident in ecological contexts increasingly understood to be exceedingly complex.[51]

For example, a 1997 guide on considering cumulative effects under NEPA explains that "determining the cumulative environmental consequences of an action requires delineating the cause-and-effect relationships between the multiple actions and the resources, ecosystems, and human communities of concern. Analysts must tease from the complex networks of possible interactions those that substantially affect the resources."[52] The guide advises analysts to "gather information about the cause-and-effect relationships between stresses and resources" and to develop "a conceptual model of cause and effect ... Networks and system diagrams are the

[49] Many ecologists believe we face a "no-analog" future – one for which we have no experience on which to base projections of ecosystem change[40] and for which models designed to allow active management decisions as climate change takes effect are presently rudimentary and imprecise. *See* Peter Cox & David Stephenson, *A Changing Climate for Prediction*, 317 Science 207, 207 (2007); Matthew C. Fitzpatrick and William W. Hargrove, *The Projection of Species Distribution Models and the Problem of Non-Analog Climate*, 18 Biodiversity and Conservation 2255 (2009); Douglas Fox, *Back to the No-Analog Future?*, 316 Science 823, 823 (2007); Douglas Fox, *When Worlds Collide*, Conservation, Jan.-Mar. 2007, at 28.

[50] The scientific literature exploring these complex dynamics and exposing our lack of understanding about what lies ahead as temperature rises is legion. *See, e.g.*, U.S. Climate Change Science Program, Thresholds of Climate Change in Ecosystems (2009) (examining numerous positive feedback properties leading to nonlinear thresholds in climate change dynamics), *available at* http://www.climatescience.gov/Library/sap/sap4-2/public-review- draft; Almut Arneth et al., *Clean the Air, Heat the Planet?*, 326 Science 672 (2009) (examining the feedback effects between conventional air pollution control and climate change mitigation, concluding that complex positive and negative feedback links exist and that, on balance, the evidence and models suggest that "air pollution control will accelerate warming in the coming decades."); Gordon B. Bonan, *Forests and Climate Change: Forcings, Feedbacks, and the Climate Benefits of Forests*, 320 Science 1444 (2008) (explaining the complex and nonlinear forest-climate interactions); I. Eisenman & J.S. Wettlaufer, *Nonlinear Threshold Behavior During the Loss of Arctic Sea Ice*, 106 Proc. of the Nat'l Acad. Of Sci. 28 (2009) (describing the nonlinear "tipping points" in the ice-albedo feedback effect); Jerome Gaillardet & Albert Galy, *Himalaya-Carbon Sink or Source?*, 320 Science 1727 (2008) (explaining the uncertainties of the sinks and sources of the carbon geological cycle); Steven W. Running, *Ecosystem Disturbance, Carbon, and Climate*, 321 Science 652 (2008) (explaining the uncertainties of ecological sinks and sources such as fires and insect epidemics).

[51] *See generally* Daniel A. Farber, *Probabilities Behaving Badly: Complexity Theory and Environmental Uncertainty*, 37 U.C. Davis L. Rev. 145 (2003); 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).

[52] Council on Environmental Quality, Considering Cumulative Effects Under the National Environmental Policy Act vi (Jan. 1997).

preferred methods of conceptualizing cause-and-effect relationships."[53] Adaptive management seems more in tune with this approach than does conventional front-end decision-making.

The problem is that courts are used to reviewing toggle switching, not dial twiddling. As the previous section demonstrated, agency policies for implementing adaptive management arose in a statutory vacuum and are themselves largely devoid of legal content. While judges generally understand the rationale for adaptive management and worry about discouraging experimentation that will lead to better conservation outcomes, they struggle to evaluate agency adaptive management plans in the absence of legal standards. There are no statutory standards for oversight, no concrete legal definitions for determining what qualifies as adaptive management, and few binding steps in adopting adaptive management. In rejecting "cookbooks" for adaptive management, agencies have failed to fill in the gaps left by statutes that either predate, ignore, or simply mention adaptive management. Agency policies support adaptive management as "learning while doing," but courts are bound to review agency behavior in accordance with laws premised on a different paradigm. In Part II of the Article we review the court decisions and describe how judges reconcile this disparity.

2. Adaptive Management: Theory versus Practice

The second key disparity revealed in our study is between the theory of adaptive management as explored in the scholarly literature and the practice as manifest in the actual plans labeled "adaptive management" by agencies. The "learning while doing" policy approach to adaptive management, while formless in substance, could have accommodated implementation of adaptive management by agencies through plans fulfilling the theory of adaptive management. But the fiscal realities of natural resources management in the field demand bare-bones approaches to project planning and conservation. In this lean environment, the incentives for field level resource managers are to get the doing done through triage and save the learning for better times.

Indeed, as the agency polices discussed above and the cases explored in Part II illustrate, agencies in practice have employed what we call "a/m-lite", a stripped-down version of adaptive management that almost always neglects to develop testable hypotheses as the basis for management actions. Often a/m-lite fails even to structure a learning procedure, whether through experimentation, historical research, or modeling.[54] And, lack of follow-through plagues implementation. As the cases show, there are other dimensions to the agency plans that depart from adaptive management theory because of limited funding. This "a/m-lite", in its most extreme form, is open-ended contingency planning or "on-the-fly" management that promises some, loosely described response to whatever circumstances arise.

The difference between adaptive management, as practiced, and the adaptive management concept universally praised as essential for dealing with the complexities of natural systems does not illustrate a disagreement about how adaptive management should work as much as it reveals the budgetary and political limitations of agencies

[53] *Id*. at 38.

[54] Holly Doremus, *Precaution, Science, and Learning While Doing in Natural Resource Management*, 82 Wash. L. Rev. 547, 562 (2007).

responsible for implementation. Nonetheless, it raises an important concern about bait and switch. Agencies justify their departure from the conventional, comprehensive rationality model on the literature arguing that adaptive management is a superior approach. But, then agencies implement something different from the adaptive management approach supported by the research. The concern is whether the agency-implemented a/m-lite is enough of an improvement over comprehensive rationality to justify the loss of certainty and transparency. The concern is particularly important because adaptive management is most often invoked as a tool to handle decision-making in the face of uncertainty.[55] Theoretical adaptive management reduces uncertainty over time, as experiments yield insights about how ecosystems respond to various interventions. But a/m-lite, which typically neglects hypothesis testing, does not help in this manner.[56] Even when it does specify a hypothesis to test, management practice often shortchanges evaluation. Part II of the article examines the plans that have engaged the courts in disagreements about what constitutes legal adaptive management.

II. Litigation Over Adaptive Management

In a relatively short time, the adaptive management label for agency resource management plans has become ubiquitous. Since 1993 each of the major federal resource management agencies has made a policy commitment to employ adaptive management.[57] At one time, a casual reader of a draft EIS could predict which alternative an agency would likely prefer by identifying the one that included "balanced approach" in its title.[58] Over the past decade, the tip-off has become "adaptive."[59]

Therefore, it was inevitable that courts would be called upon to evaluate how well the "adaptive" alternatives selected by agencies meet legal requirements. Every year, more and more published federal court decisions employ the term "adaptive management." However, most cases using, or even discussing, the term "adaptive management" focus on issues peripheral to the key disparities at the heart of this analysis. Because an increasing majority of new federal resource management decisions use an adaptive management framework, a steady stream of challenges to federal

[55] *See supra* Part I.A.

[56] *See* Doremus, *supra* note 45, at 569.

[57] Many of these are discussed supra in Part II.B. The Northwest Power Planning Council was the most important early adopter when it employed "adaptive management" in its 1982 Columbia Basin Fish and Wildlife Program to address pervasive scientific uncertainty regarding salmon recovery. Northwest Resource Information Center v. Northwest Power Planning Council, 35 F.3d 1371 (9th Cir. 1994). Adaptive management continues to be the organizing principle for fish conservation in the Columbia Basin today. *See* Nat'l Marine Fisheries Serv., Fed. Columbia River Power System Adaptive Management Implementation Plan: 2008-2018 Biological Opinion (2009) *available at* http://www.salmonrecovery.gov/Biological_Opinions/FCRPS/2008_biop/docs/AMIP_09% 2010%2009.pdf (purporting to strengthen the 2008 biological opinion by, *inter alia*, establishing new biological triggers to activate short and long term responses, and providing a rapid response to any detected significant decline in fish populations. The original biological opinion was remanded in National Wildlife Federation v. National Marine Fisheries Service, 524 F.3d 917 (9th Cir. 2008).)

[58] *See, e.g.,* Oregon Natural Desert Ass'n v. Singleton, 47 F.Supp.2d 1182, 1195 (D. Or. 1998); American Motorcyclist Ass'n v. Watt, 534 F. Supp. 923, 928 (C.D. Cal. 1981).

[59] *See, e.g.,* U.S. Dep't of Interior, Record of Decision: Final Bison and Elk Management Plan and Environmental Impact Statement 4 (2007) (choosing "Adaptively Manage Habitat and Populations" alternative), http://www.fws.gov/bisonandelkplan/ROD.pdf. Increasingly, however, it can be difficult to find an alternative in a resource management EIS that does not purport to be adaptive.

resource management decisions need to discuss the framework to set the stage for evaluating the unrelated legal challenges.

A September 13, 2009 search of Westlaw and LexisNexis reported one hundred and seven federal court decisions containing the phrase "adaptive management." That group can be distilled into sixty-two cases[60] involving a challenge to adaptive management of environmental or natural resources. But, in most of those cases courts did not directly apply law to the adaptive aspect of the action. Instead, the courts employed the term to describe the action before getting to the legal issues dispositive to the case.

Nonetheless, twenty-eight federal court decisions do grapple with the legality of adaptive management. The United States lost more than half of these cases,[61] a poor record given the deference accorded to agencies under administrative law.[62] It is these cases that reveal the most about the two key disparities: between the principles underlying law and adaptive management, and between adaptive management, in theory, and a/m-lite, in practice. This study of the first round of litigation emerging from the federal consensus that natural resources agencies should practice adaptive management yields three key lessons about how those disparities have worked out in the courts: (1) larger scale plans are more likely to incorporate successful adaptive management plans than smaller ones; (2) the practice of tiering site specific environmental impact analyses to an earlier, overarching, cumulative study is well suited to adaptive management, and adaptive management can reduce the need for supplemental EISs; and (3) adaptive management procedures, no matter how finely crafted, cannot substitute for showing a plan will meet substantive management criteria required by law.

To set the stage for the analysis of these three themes, three sweeping observations are in order. First, is worth noting that a court upholding an a/m-lite approach does not necessarily endorse the practice as advancing the goals of either law or conservation policy. It simply means that the use of a/m-lite did not run afoul of any specific legal requirement, or substitute for a required finding or procedure. While courts may approve agency actions that involve terrible applications of adaptive management, it is fair to say that the most vague and incomplete plans have a greater likelihood of remand.

Second, many decisions applying the administrative law standards of deference to agency expertise do not involve adaptive management, but are relevant to understanding how courts regard adaptive management. For instance, the question of how rigorously an agency should explore the effects of similarly situated actions before committing to a

[60] The distinction between "decisions" and "cases" represents the fact that thirteen cases, e.g., Pacific Coast Fed'n of Fishermen's Ass'ns v. Gutierrez, 606 F. Supp. 2d 1122 (E.D. Cal. 2008), produced more than one court decision, but no one case produced more than one decision applying the law directly to adaptive management, which is the focus of this analysis.

[61] Not all of the government losses were due to problems with adaptive management. For instance, the courts overturned the 2004 Sierra Forest Framework for NEPA violations while upholding its adaptive management component. *See infra* notes 75-86 and accompanying text.

[62] While the loss record for the United States is poor in these cases compared to administrative litigation overall, natural resource challenges generally fair better for plaintiffs in court than one would expect given the deferential standard of review. *See e.g.* Denise M. Keele et al., *Forest Service Land management Litigation 1989-2002*, 104 J. Forestry 196 (2006) (of the 729 cases challenging Forest Service resource management decisions, the agency won only 56.7%).

new one is central to many natural resource cases.[63] The active learning component of adaptive management makes those cases relevant even if they did not review plans that purported to apply adaptive management. Therefore, we bring to bear on the question of how courts apply law to adaptive management more than just the relatively small sample of decisions that have already evaluated specific challenges to adaptive management.[64]

Third, regardless of the particular outcome of judicial review, courts generally wish to support the trend toward adaptive management. They seem to understand the arguments in the conservation management literature that all point to adaptive management as the best suited technique for making decisions about ecosystems. Indeed, at least one court has come close to *requiring* adaptive management in holding that ESA habitat conservation plans must contain some provision to respond to unforeseen circumstances.[65] Courts sometimes explicitly state that they do not wish to create disincentives for using adaptive management.[66] Even where adaptive management plans have run afoul of judicial review, courts are careful to state that it is not adaptive management itself that is illegal, just the particular application in the case at hand.[67] It is fair to conclude from the litigation that courts, despite their roots in the administrative law model of a phase change at the time of final agency action, generally give agencies wide berth within statutory constraints to alter traditional planning approaches to accommodate adaptive management.

A. Bigger is Better

Spatial and temporal scale is a critical component of adaptive management. Larger area, longer time-frame plans have tended to experience greater success in applying adaptive management. Though this may be due to the larger budget associated with developing (and to a lesser extent implementing) the plans, the primary advantage enjoyed by large-scale plans is slack. The larger the plan, the more room there is for trade-offs between competing interests; zones with different dominant uses, including control areas for experiments; and flexibility for revising management guidelines to reflect lessons learned.[68] Larger plans tend to employ a version of adaptive management that comes closer to the model in the scholarly literature than do smaller-scale plans. The literature addressing how conservation can adapt to climate change also highlights the greater utility of larger spatial and temporal scale planning.[69]

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[63] *See* The Lands Council v. McNair, 537 F.3d 981 (9th Cir. 2008), *overruling* Ecology Center, Inc. v. Austin, 430 F.3d 1057 (9th Cir. 2005). *See infra* note 147 and accompanying text.

[64] *See also* South Fork Band Council of Western Shoshone of Nevada v. U.S. Department of the Interior, — F.3d ——, 2009 WL 4360798 (9th Cir. 2009), *infra* note 136 and accompanying text (discussing the problems of open-ended contingency planning).

[65] Southwest Center for Biological Diversity, 470 F. Supp. 2d 1118 (S.D. Cal. 2006). See discussion *infra* note 127.

[66] *E.g.* Environmental Protection Information Center v. U.S. Fish and Wildlife Service, 2005 WL 3021939, *7 (N.D. Cal. 2005).

[67] For example, see Nw. Res. Info. Ctr., Inc. v. Nw. Power Planning Council, 35 F.3d 1371, 1380 n.18 (9th Cir. 1994), where the court described adaptive management as "scientifically sound," but rejected particular aspects of the government's implementation of the plan.

[68] This mirrors the experience of habitat conservation planning under the Endangered Species Act. Robert L. Fischman and Jaelith Hall-Rivera, *A Lesson for Conservation from Pollution Control Law: Cooperative Federalism for Recovery Under the Endangered Species Act*, 27 Columbia J. Envtl. L. 146-148 (2002) (summarizing the benefits of large-area plans).

[69] *See e.g.* Brad Griffith et al., *Climate Change Adaptation for the US National Wildlife Refuge System,* 44 Environmental Management 1043 (2009).

The litigation over adaptive management reflects the advantages of the larger scale plans. Four major adaptive management efforts constitute about half of the federal litigation grappling with the concept. With a few notable exceptions, discussed below, federal agencies in these four areas have experienced success in persuading courts to defer to their management choices and adaptive plans. Two of the efforts deal with forest management: the Northwest Forest Plan, covering 24.4 million acres in Washington and Oregon, and the Sierra Forest Framework, covering 11.5 million acres in California. The other two deal with water infrastructure: management of the Sacramento-San Joaquin River Delta (and its related infrastructure supplying water to the Central Valley) and operation of the Missouri River works controlled by the U.S. Army Corps of Engineers.

The Northwest Forest Plan ("NWFP") is one of the earliest large-scale adaptive management efforts,[70] and one of the most successful in attracting support from the courts for the adaptive management concept. Its age and scope make it the champion survivor of dozens of rounds of litigation. The NWFP resulted from a compromise brokered by President Clinton, who played an unprecedented (and, to date, un-emulated) personal role in shaping the contours of the compromise it represented between timber and environmental interests.[71] The immense plan is strikingly complex, but in general outline it consisted of four elements: land allocation, aquatic conservation strategy, survey and monitoring requirements, and adaptive management.

The goal of the NWFP, originally completed in 1994, is to allow for substantial timber harvesting while maintaining the forest characteristics that support viable populations of northern spotted owls, salmon runs that breed in forest streams, and hundreds of other species sensitive to logging operations. Adaptive management plays a leading role in two aspects of the plan: administration of lands specially designated for adaptive management experimentation, and as a general principle for implementation and revision of the overall set of management prescriptions for the NWFP. It is this second aspect of adaptive management in the NWFP that has generated litigation.

The land allocations zones fall into three categories. Some 78 percent of the lands covered by the NWFP are designated late-successional reserves, where maintaining and encouraging the development of old-growth forests is the primary aim. Some logging consistent with this aim, such as thinning to promote or enhance old-growth attributes, occurs in this category. But most of the timber output comes from the second category, the matrix lands between the reserves. The third category designates ten zones ranging from 100,000 to 500,000 acres to serve as "adaptive management areas," where experiments with adaptive management would be the primary purpose.[72] Though the track record of the adaptive management areas does offer some general lessons for improving adaptive management, the unique

[70] The Northwest Power Planning Council was probably the first agency to use adaptive management in a large-scale plan, the 1982 Columbia Basin Fish and Wildlife Program. Northwest Resource Information Center v. Northwest Power Planning Council, 35 F.3d 1371 (9th Cir. 1994).

[71] Steven L. Yaffee, The Wisdom of the Spotted Owl 141-143 (1994).

[72] Forest Ecosystem Management Assessment Team, Forest Ecosystem Management: An Ecological, Economic, and Social Assessment: Report of the Forest Ecosystem Management Assessment Team III-24 (1993).

mandate limits their application.[73] The true test of adaptive management in the NWFP is how well it guided the vast majority of lands designated matrix or reserve, where balancing timber production against environmental values generated and continues to generate enormous controversy.[74] It is the lands not specifically set aside for adaptive management experiments where the NWFP experience most closely resembles routine federal conservation policy challenges.

The overarching NWFP mandate for adaptive management through monitoring and evaluation involved multiple levels of planning to restrict disturbance to riparian areas in an "aquatic conservation strategy" ("ACS") and "survey and manage" (S&M") requirements for over 400 species, with some triggering population surveys before ground disturbing activity, such as logging. Courts rejected challenges to the original NWFP, including its adaptive elements.[75] Subsequently, the ACS and S&M provisions of the NWFP were common bases for judicial remands overturning timber sales.[76] Appropriations and political will were never sufficient for full implementation of these components of adaptive management, but the framework for forest management remains a workable process for some projects.[77] Still, the adaptive management requirements and the degraded conditions of the forests in the NWFP resulted in far less logging than promised.[78]

In response to the underperformance of the NWFP in getting out the timber cut, the George W. Bush Administration adopted amendments in 2004 that unsuccessfully attempted to relax two key of elements of adaptive management: the ACS and the S&M rules.[79] The issues with both actions are similar, and more thoroughly explored by the courts in the context of S&M. A district court overturned the 2004 amendments to the NWFP removing the S&M requirement for insufficient environmental analysis in the environmental impact statement

[73] On the track record of adaptive management areas, see A.N. Gray, Adaptive Ecosystem Management in the Pacific Northwest: A Case Study from Coastal Oregon, 4 Conservation Ecology (2000); G.H. Stankey and B. Shindler, Adaptive Management Areas: Achieving the Promise, Avoiding the Peril, General Technical Report (PNW-GTR-394) (1997); F.D. Fleischman, Bureaucracy, Collaboration and Coproduction: A Case Study of the Implementation of Adaptive Management in the U.S.D.A. Forest Service (unpublished manuscript 2008).

[74] The leading analysis of how well the NWFP modeled actual adaptive management is B.T. Bormann et al., *Adaptive Management of Forest Ecosystems: Did Some Rubber Hit the Road?*, 57 BioScience 186 (2007).

[75] Seattle Audubon Soc'y v. Lyons, 871 F. Supp. 1291 (W.D. Wash. 1994), *aff'd sub nom.* Seattle Audubon Soc'y v. Moseley, 80 F.3d 1401 (9th Cir. 1996).

[76] *See, e.g.,* Oregon Natural Resources Council Action v. U.S. Forest Service, 59 F. Supp. 2d 1085 (W.D. Wash. 1999) (emphasizing the importance of S&M to the NWFP process of finding new populations of sensitive species before logging so that protections may be put in place); and Pacific Coast Federation of Fishermen's Ass'n v. National Marine Fisheries Service, 265 F.3d 1028 (9th Cir. 2001) (emphasizing the ACS's short-term protections to ensure that habitat will support the migration cycles of salmon in finding that long-term recovery of aquatic habitat may not be sufficient to comply with the NWFP).

[77] Nonetheless, new circumstances, especially the incursion of aggressive barred owls and climate change, have prompted the Obama Administration to begin a thorough revision of the NWFP. April Reese, *New Threats Could Undermine Obama Administration's Plan for Northern Spotted Owl*, 10 Land Letter, April 9, 2009, at 9.

[78] Bioregional Assessments: Science at the Crossroads of Management and Policy 107- 108 (K. Normal Johnson et al., eds. 1999).

[79] Pacific Coast Federation of Fishermen's Ass'n v. National Marine Fisheries Service, 482 F. Supp.2d 1248 (W.D. Wash. 2007) (overturning the ACS amendments); Northwest Ecosystem Alliance v. Rey, 380 F. Supp. 2d 1175 (W.D. Wash. 2005) (overturning the S&M amendments).

("EIS").[80] The original 1994 EIS for the NWFP justified the S&M standard as needed to gain information to ensure viability for a host of species, a core adaptive function. The court agreed with the government that it could change its opinion about the best way to balance goals in the NWFP. But, a change the eliminates a fundamental standard of adaptive management requires thorough analysis and disclosure of the environmental consequences.[81] In other words, the adaptive framework of the NWFP depends on certain fundamental monitoring tools, such as S&M, that cannot be reversed without revisiting the original charter and analysis (in this case, the NWFP and its EIS). A similar effort by the Bureau of Land Management to eliminate pre-logging surveys for the red tree vole (prey for spotted owls) met the same fate for failure to revise the underlying, large-scale adaptive management plans.[82]

The Sierra Forest Framework is smaller, younger, and subject to fewer lawsuits. But, it presents a contrast with the NWFP in the use of adaptive management to modify a multi-forest management charter. In 2004 the Bush Administration significantly amended California's Sierra Forest Framework, which governs administration of 11 national forests in the Sierra Nevada Range. The changes shifted the "management emphasis from biodiversity conservation and prescribed fire to aggressive mechanical thinning" and timber production.[83] One particularly contentious aspect of the 2004 Framework expanded the number of trees that could be logged from those 12-20 inches in diameter to trees up to 30 inches in diameter. Although the Court of Appeals found the 2004 Framework flawed because its environmental impact analysis failed to consider a reasonable range of alternatives,[84] a district court evaluating a challenge to the adaptive management provisions endorsed the approach.[85] The adaptive management amendments were able to take advantage of the large scale of the Framework to employ different "modules" in different areas to comprise an "integrated research project."[86] This, along with the use of modeling projections, is a principal reason why the 2004 Framework survived the allegation that the Forest Service deferred taking the required "hard look" at wildlife impacts of more logging.[87] Along with the NWFP, the 2004 Framework is one of the only adaptive management plans considered by courts that explicitly employed different management regimes in different areas to create experiments testing hypotheses about effects on forest fires and old-growth dependent species. In upholding the adaptive management approach, the district court fairly characterized the 2004 Framework as providing "more flexibility to strategically locate treatments across the landscape."[88] The large area covered by the Framework made these elements of the plan easier to employ.

On the other hand, monitoring and mitigation modules do not necessarily

[80] Northwest Ecosystem Alliance v. Rey, 380 F. Supp. 2d 1175 (W.D. Wash. 2005).

[81] Id. at 1193.

[82] Klamath Siskiyou Wildlands Center v. Boody, 468 F.3d 549 (9th Cir. 2006).

[83] Robert B. Keiter, *Breaking Faith with Nature: The Bush Administration and Public Land Policy*, 27 J. Land, Resources & Envtl. L. 195, 231 (2007).

[84] Sierra Forest Legacy v. Rey, — F.3d ——, 2009 WL 2462216 (9th Cir. 2009).

[85] California ex rel. Lockyer v. U.S. Dep't of Agriculture, 2008 WL 3863479 (E.D.Cal. 2008).

[86] *Id.* at *19.

[87] *Id.* at *17-21.

[88] *Id*. at *8.

lead to learning that can or will be applied to reshape projects. Indeed, the State of California complained that the Forest Service had increased the logging intensity in 2004 without having applied data from the earlier, more conservative adaptive management approach in the 2001 framework.[89] A federal district court recently upheld individual forest plan amendments in the Sierra region against a challenge that reduced monitoring of sensitive species created a foreseeable risk of degradation through the activities, such as logging, authorized by the plans.[90] The court wrote that "it presumes too much to argue that [the previous, more detailed monitoring] obligations would have turned up information that would have inclined the Forest Service to significantly alter or modify a particular project."[91] Though one can view the court's decision as a skepticism about the value of the additional monitoring, it also speaks to the absence of enforceable commitments in most a/m-lite to revise projects in light of monitoring.[92]

It is also worth noting that the big plans often enjoy special appropriations associated with Congressional support of adaptive experiments.[93] In the case of the Sierra forests, the Herger-Feinstein Quincy Library Group Forest Recovery Act authorized special funding for pilot projects.[94] Combined with the national priority to address fire risk and forest health, the high-profile Framework was able to secure funds for monitoring and response of management experiments.[95] This is a rare but reassuring element of adaptive management practice that ameliorated the loss of certainty in management criteria occasioned by the 2004 amendments.

The most cited litigation endorsing the notion that adaptive management is compatible with NEPA and administrative law concerns the U.S. Army Corps of Engineers management of the Missouri River, which it controls through dams. After the D.C. District Court enjoined a river operating plan for failing to comply with the ESA,[96] a series of cases beginning in 2004 have upheld the Army Corps' approach of employing adaptive management to balance the needs of wildlife dependent on the natural seasonal variation in flows (especially for the imperiled pallid sturgeon, least tern, and piping plover) with the interests of flood control and navigation.[97] Though the

[89] Brief of State of California, Plaintiff, Lockyer v. U.S. Dept. of Agriculture 2 (Case No. S 05- 0211 MCE GGH) (E.D.Cal. Sept. 8, 2005).

[90] Sierra Forest Legacy v. U.S. Forest Service, — F. Supp.2d ——, 2009 WL 2767722 (N.D. Cal. 2009).

[91] *Id.* *20.

[92] Alejandro E. Camacho, *Adapting Governance to Climate Change: Managing Uncertainty Through a Learning Infrastructure*, 59 Emory L.J. 1, 47-48 (2009) (describing the problems with adaptive management implementation for Colorado River flows downstream of Glen Canyon Dam).

[93] *See, e.g.,* 103 Pub. L. 211 (1994) (earmarking funding for the NWFP). The Northwest Forest Plan program reported that it spent $50 million for monitoring. Valerie Rapp, Northwest Forest Plan—The First 10 Years (1994-2003): First-Decade Results of the Northwest Forest Plan 11(U.S. Dept. Agric. Forest Service Pacific Northwest Research Station General Technical Report PNW- GTR-720 2008).

[94] Pub. L. No. 105-277, Div A, § 401(f), 112 Stat. 2681-307 - 308(1998). Funding for the pilot projects totaled $25.3 million in 2008, more than three times the amount appropriated in 1999. U.S. Dept. agric.,Herger-Einstein Quincy Library Group Forest Recovery Act Pilot Project Status Report to Congress fiscal year 2008 4 (2009) *availab. at* http://www.fs.fed.us/r5/hfqlg/monitoring/report_to_congress/2008/fy08_report_to_congress_letter.pdf.

[95] California ex rel. Lockyer, 2008 WL 3863479 at *19.

[96] American Rivers v. U.S. Army Corps of Engineers, 271 F. Supp.2d 230 (D.D.C. 2003), found mere mitigation measures inadequate to meet the ESA, launching a new biological opinion that triggered the litigation in the Eighth Circuit.

[97] In re Operation of the Missouri River Sys. Litig., 516 F.3d 688 (8th Cir. 2008); 421 F.3d 618 (8th Cir. 2005), *cert. denied* 547 U.S. 1097; 363 F. Supp. 2d 1145 (D.Minn.2004).

courts have not grappled with the adaptive management approach as deeply in this litigation as in the other examples we discuss, its use on this scale by the Corps is a significant step in the spread of comprehensive adaptive management plans beyond the traditional public land and wildlife agencies.

Probably the most complex of all the large-scale plans addresses the vast infrastructure diverting huge volumes of water coming down the Sacramento River, around the delta it shares with the San Joaquin River, and directing it to users further south. The dams and diversions are operated jointly by state and federal agencies, and the environmental issues include wildlife, irrigation, flood risk, and potability of municipal water supplies for tens of millions of people. The Delta litigation challenging the adaptive management regimes pertaining to different species in the water system composes a mixed record.[98] As with the other examples discussed in this section, the large area covered by the watersheds and the large volumes of water certainly permit a wider array of trade-offs than can occur with smaller projects. But, in these Delta cases, the enormous complexity of the statutes, contracts, and governing bodies (both state and federal) likely undermined what would otherwise be a strong candidate for successful adaptive management. We will discuss how a single court approved one Delta adaptive management plan but remanded another in section C, when we discuss the relationship between substantive legal standards and the adaptive process.[99]

B. NEPA: Effective Use of Tiering and Reduced Need for Supplements

The environmental impact analysis required by NEPA is perhaps the grandest expression of the comprehensive rationality worldview rejected by adaptive management. So, it is somewhat surprising to find in NEPA practice a tool well suited to adaptive management: a/m-lite roots well in the soil of NEPA tiering. Tiering, a practice dating to the 1970s, permits agencies to proceed with broad programs without examining site-specific effects. In situations such as the adoption of a forest plan, or a regional methane leasing program, the agency may defer the details of impact analysis until such time as it proposes a timber sale[100] or receives applications for permits to drill.[101] The first NEPA tier concentrates on cumulative impacts of anticipated successive activities without evaluating the peculiar situations that may arise from any particular activity. Tiering relieves an agency from evaluating uncertain contingencies with tenuous connections to the overall impacts. The subsequent levels of NEPA compliance occur as particular, site-specific projects require approval. At that point, the general discussions of the first tier may be incorporated by reference, and the EIS or EA will focus on just those issues specific to the particular activity.[102] In fact, a subsequent EIS will often be unnecessary if a particular project creates only effects already anticipated in the first tier EIS. For site-specific projects, agencies commonly prepare environ-

[98] *Compare* Pacific Coast Federation of Fishermen's Associations v. Gutierrez, 606 F. Supp. 2 d 1122 (E.D. Cal. 2008) (upholding adaptive management plan) *with* Natural Resources Defense Council v. Kempthorne, 506 F. Supp. 2d 322 (E.D. Cal. 2007) (remanding the adaptive management plan).

[99] Id.

[100] *E.g.* Klamath Siskiyou Wildlands Center v. Bureau of Land Management, 387 F.3d 989 (9th Cir. 2004).

[101] *E.g.* Wilderness Society v. Salazar, 603 F.Supp.2d 52 (D.D.C. 2009).

[102] 40 C.F.R. 1508.28.

mental assessments concluding in findings of no significant impacts (FONSIs) that go beyond those adumbrated by the original program's EIS.

Large-scale adaptive management generally involves a massive EIS intended to serve as an overarching analysis to which subsequent projects and adjustments may be tiered. This is how the adaptive charter works to guide subsequent projects for the NWFP,[103] and the national forests in the Sierra Nevada Range.[104] Indeed, the adaptive elements of the EISs may even reduce the need for subsequent supplemental EISs. In *Oregon Natural Resources Council Action*, a court remanded a timber sale because it did not include the S&M required by the NWFP.[105] The NWFP created binding law that the court ordered the agency to follow or amend. However, the court rejected a NEPA claim that the United States needed to prepare a supplemental EIS to consider a variety of new information about forests, wildlife and water quality that had emerged since the adoption of the NWFP. The court rebuffed the claim by relying, in part, on the adaptive management strategy in the NWFP. The court determined that adaptive management anticipated that new information would emerge and provided mechanisms for adjustment.[106] This is an example of how the flexibility of adaptive management can ease the burden for an agency needing to comply with NEPA over the course of a very long term project, such as restoring late-successional forests. A different judge in the same court later reached the same result in a challenge to a different timber sale after subsequent developments raised doubts about the NWFP's assumptions concerning logging on private land.[107] Again, the court relied on the adaptive management component of the NWFP to establish an assumption that no supplemental study would be needed absent a showing that the information could not be addressed by the adaptive process.[108]

On the other hand, a subsequent decision justified as adaptive modification may go too far in changing the terms of the original framework in the first tier. In that case, courts will require a supplemental EIS. For instance, in *Klamath Siskiyou Wildland Center*, the Ninth Circuit enjoined timber sales in part because a change in the survey requirements for the red tree vole went too far beyond what the tier one NWFP EIS anticipated, even with adaptive management.[109] The federal government had argued that the decision to change the vole's S&M designation was within the adaptive latitude created by the NWFP. The court examined the NWFP EIS and disagreed. The lesson from *Klamath Siskiyou* is that an agency cannot tier when revising a fundamental standard of an overarching adaptive management plan.

Another risk posed by the attraction of tiering is that an agency will defer making controversial decisions on the basis that it can work out the details of a fairly vague commitment to goals in subsequent tiers. The problem is that the agency may be setting itself up for failure if it is unable to secure the resources to

[103] *See, e.g.,* Seattle Audubon Soc'y, 80 F.3d 1401.

[104] *See, e.g.,* California ex rel. Lockyer, 2008 WL 3863479.

[105] Oregon Natural Resources Council Action v. U.S. Forest Service, 59 F. Supp. 2d 1085 (W.D. Wash. 1999).

[106] *Id.* at 1096.

[107] Hanson v. U.S. Forest Service, 138 F. Supp. 2d 1295 (W.D. Wash. 2001).

[108] *Id.* at 1304.

[109] Klamath Siskiyou Wildlands Center v Boody, 468 F.3d 549 (9th Cir. 2006).

adequately tackle the difficult analysis in subsequent tiers. Also, vague commitments that do not include site-specific criteria may simply allow political momentum to overwhelm the plan's objective. In the EIS supporting the elk and bison management plan for the National Elk Refuge and nearby lands, the agency defined the (ultimately selected) "adaptive management" alternative as a plan implemented through a "structured framework ... of adaptive management criteria and actions for transitioning from intensive supplemental winter feeding."[110] However, the plan neither describes the "structured framework" nor defines the "criteria." Given the strong local political support for maintaining supplemental winter feeding, opponents are understandably skeptical that such a vague commitment will result in a transition to more natural winter ranging behavior and lower elk populations.[111] The goal of the "adaptive management" alternative is to reduce the winter elk population of the region by nearly 20%[112], but the path to achieve it is not evident in the plan. Deferring a firm decision to take a critical action, such as terminating winter feeding, until a subsequent incremental adaptive process may be a recipe for failure.[113] Yet adaptive management and tiering can make it easier for agencies to yield to the temptation to dodge difficult, controversial decisions. It is not surprising, then, that courts frequently reject adaptive management plans as too amorphous.[114] Professor Glicksman has characterized some of this litigation as standing for the principle that agencies may not rely on adaptive management "as an excuse for deferring real planning" in favor of an approach that promises to deal with expected future problems as they arise.[115]

Even if not amorphous, a promise to adaptively manage problems may not fulfill the NEPA requirement that agencies take a "hard look" at the impacts of their action. For instance, *High Sierra Hikers Ass'n* overturned a Forest Service decision to liberalize the rules limiting fires in high country parts of a wilderness area.[116] Despite a record raising a number of problems with the decision, including disparate treatment of commercial pack trips compared to private backpacking, physical impacts from fires and

[110] U.S. Fish & Wildlife Serv. & Nat'l Park Serv., Final Bison and Elk management Plan and Environmental Impact Statement 65 (2007).

[111] Robert L. Fischman & Angela M. King, *Savings Clauses and Trends in Natural Resources Federalism*, 32 Envtl. L. & Pol'y Rev.129, 137-141 (2007). Defenders of Wildlife and other environmental groups have challenged the plan for these and other reasons. Complaint, Defenders of Wildlife v. Kempthorne, 1:08-cv-00945 (D.D.C. 2008).

[112] *See* U.S. Fish & Wildlife Serv. & Nat'l Park Serv., *supra* note 101, at 3, 126 (proposing a reduction in elk numbers from 13,000 to 11,000).

[113] Another example of deferring difficult decisions through adaptive management is the remanded decision to adopt grazing allotments in the Sawtooth National Forest. Western Watersheds Project v. U.S. Forest Service, 2006 WL 292010, *2 (D. Idaho 2006) (adaptive management strategy "did not define the protocols it would use or describe the monitoring that is the heart of the strategy"). *See also* Mary O'Brien, *Uneasy Riders: A Citizen, a Cow, and NEPA*, 39 Envtl. L. Rep. (ELI) 10632, 10633 (2009) (describing environmental impact analysis for Forest Service allotment management plans that respond to degraded conditions with "vague commitments to future adaptive management" without "clear triggers for applying the unspecified adaptive management measures")

[114] *See, e.g.,* Greater Yellowstone Coalition v. Kempthorne, 577 F. Supp. 2d 183 (D.D.C. 2008); Natural Resources Defense Council v. Kempthorne, 506 F. Supp. 2d 322 (E.D. Cal. 2007); Mountaineers v. U.S. Forest Service, 445 F. Supp. 2d 1235 (W.D. Wash. 2006); Natural Resources Defense Council v. U.S. Army Corps of Engineers, 457 F. Supp. 2d 198 (S.D.N.Y. 2006)

[115] Glicksman, *supra* note 4, at 871

[116] High Sierra Hikers Ass'n v. Weingardt, 521 F. Supp.2d 1065 (N.D. Cal. 2007).

their residues, and potential introduction of exotic seeds and pathogens through packed wood, the Service went forward with the looser rules on the basis that it could monitor and adjust in response to problems.[117] The court ruled that the agency could not rely on adaptive management to overcome an inadequate response to the problems raised in the record.[118]

Though adaptive management, in and of itself, does not trigger an EIS,[119] adaptive management is not an alternative to NEPA. A district court relied (in part) on NEPA itself to reject a 2005 rule substituting adaptive management for preparing environmental impact statements in developing national forest plans.[120] The court found that the administrative record failed to support a judgment that substituting adaptive management would result in no significant environmental outcomes.[121]

C. Procedures for Adaptation Cannot Substitute for Showing Compliance with Substantive Standards

Another temptation of adaptive management is to lavish attention on the iterative process at the expense of addressing the substantive management criteria required by law.[122] Courts are particularly attentive to substantive management criteria in statutes, such as the "no jeopardy" standard in the ESA,[123] and regulations, such as the "viability" standard for animal populations in national forests.[124] Since the 1970s courts have required agencies to develop records showing how they will meet substantive standards. The first round of litigation over adaptive management reveals that courts are holding firm to this principle. Promises to plan, collaborate, or manage toward compliance should environmental conditions degrade below the substantive management criterion are insufficient to survive judicial review.

The ESA is a prevalent vehicle for placing substantive management criteria on otherwise discretionary management of public lands and waters. The listing of a species often triggers new restrictions on longstanding management regimes, such as water allocations (for example in California's Bay-Delta) or timber harvests (for example in the Pacific Northwest). The ESA, therefore, often drives adaptive management plans to substitute for older ways of using public resources. Once a management issue triggers ESA compliance, the biological opinion of the Fish & Wildlife or Fisheries Service will essentially establish the boundaries for permissible management options.[125] The biological opinions determine which actions will cross the line into jeopardizing the continued existence of a species, and what measures will be required to protect an agency from liability under the ESA.

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[117] *Id.* at 1090-91.

[118] *Id.* at 1091.

[119] Environmental Protection Information Center v. U.S. Fish and Wildlife Service, 2005 WL 3021939 (N.D. Cal. 2005).

[120] Citizens for Better Forestry v. U.S. Dept. of Agriculture, 481 F. Supp. 2d 1059 (N.D. Cal. 2007). Nonetheless, a decision to do adaptive management does not, in itself, trigger the EIS requirement. Environmental Protection Information Center, 2005 WL 3021939 at *6.

[121] *Id.* at 1089-90.

[122] *See* Wiersema, *supra* note 4 (arguing that adaptive management by agencies pays insufficient attention to substantive goals).

[123] 16 U.S.C. §1536(a)(2).

[124] 36 C.F.R. 219.19 (1982-2001). Though formally revoked by the 2001 and subsequent planning rulemakings, the standard remained in place for forest planning through most of the Bush Administration as a result of a series of judicial rulings overturning new regulations.

[125] This is particularly true after the action agency has adopted the conditions of the biological opinion. Delta Smelt Consolidated Cases, 2009 WL 3823934 (E.D. Cal. Nov. 13, 2009).

The litigation reveals that it is these biological opinions that often prompt agency adaptive management.[126]

A pair of decisions by U.S. District Court Judge Oliver Wanger in the Eastern District of California provides a particularly illuminating contrast in the relationship between adaptive management and substantive legal standards.[127] Both cases concerned challenges to adaptive management plans for operating the vast water infrastructure that moves water through and around the Sacramento-San Joaquin River Delta in California. The ESA listing of the Delta smelt by the Fish and Wildlife Service and salmonid species occurring in the watersheds by the Fisheries Service triggered two different biological opinions in order to fulfill the legal duty not to jeopardize the continued existence of the fishes. The water project consulted separately with the two Services. This gave rise to two sets of adaptive management plans (one for the smelt and one for the salmonids) that generated two different law suits.

Both plans employed adaptive management but Judge Wanger upheld one and remanded the other under the usual judicial standard that an agency must provide "reasonable certainty" that it will meet a statutory requirement.[128] The explanation for these disparate results hinges on whether the adaptive management framework offered more than mere process. The salmonid adaptive management protocol, approved by Judge Wanger, contained definite, substantive criteria that served as triggers for reinitiating ESA consultation to revise management.[129] Also, the Fisheries Service's biological opinion imposed "enforceable definite and certain requirements" on the operation of the water works.[130] In contrast, the smelt adaptive management protocol failed to provide enforceable, precise criteria to bind operators of the system.[131] The adaptive management protocol for the smelt did not bind the operators, but it was procedurally elaborate. It involved a complex "risk assessment matrix" that contained criteria triggering a working group to meet. The group would then "consider" a range of management changes.[132] While the process itself was mandatory, the court faulted the protocol for failing to assure that the result of the process would be some kind of action taken to secure the continued existence of the smelt.[133] Judge Wanger did not assert that the agency meant to disregard its statutory responsibilities, just that the record of decision failed to ensure that they would be met.[134]

In overturning the smelt adaptive management protocol, the court contrasted another ESA case addressing a large-scale habitat conservation plan which would allow land development in the Natomas Basin of the Sacramento area to proceed notwithstanding harms

[126] *E.g.* Pacific Coast Federation of Fishermen's Associations v. Gutierrez, 606 F. Supp. 2d 1122, 1128, 1184 (E.D. Cal 2008); In re Operation of the Missouri River System Litigation, 421 F.3d 618,626 (8th Cir. 2005).

[127] *Compare* Pacific Coast Fed'n of Fishermen's Ass'ns v. Gutierrez, 606 F. Supp. 2d 1122 (E.D. Cal. 2008) (upholding adaptive management plan) *with* Natural Res. Def. Council v. Kempthorne, 506 F. Supp. 2d 322 (E.D. Cal. 2007) (remanding the adaptive management plan).

[128] Pacific Coast Fed'n of Fishermen's Ass'ns, 606 F. Supp. 2d at 1184; Natural Res. Def. Council, 506 F. Supp. 2d at 353.

[129] 2008 WL 2223070 at *62 (establishing a temperature trigger of 56 degrees to reinitiate consultation).

[130] *Id.* at *61 (imposing mandatory terms and conditions as part of an incidental take statement).

[131] *Id.*

[132] 506 F. Supp. 2d at 341.

[133] *Id.* at 352.

[134] *Id.* at 354

to listed species.[135] The Natomas Basin habitat conservation plan employed adaptive management to deal with the uncertainty of where and when development would occur (as well as how effective mitigation measures would conserve the effected species).[136] Judge Wanger distinguished the adaptive adjustment in the Natomas Basin plan as employing *well-defined* mitigation measures such as conservation land purchases, adjustment of conservation reserve size, and modification of agricultural practices.[137] He also distinguished the Natomas Basin plan for its quantified objectives and required mitigation measures, even though those elements could be adjusted.[138] These substantive distinctions allowed Judge Wanger to distinguish the Natomas Basin plan, which was actually more vaguely drawn than the smelt adaptive matrix. The pair of Wanger opinions is important for two reasons. First, they contain about the most thorough discussion of adaptive management's strengths and weaknesses as any other court decisions. They recognize a role for adaptive management within administrative law, allowing a balance between flexibility (adaptive management) and certainty (final agency action).[139] This is the fundamental trade-off that courts will continue to mediate in future adaptive management cases. Second, the opinions are important because they draw a line illustrated by two concrete examples, one on the legal side (salmonids) and one on the illegal side (smelt). This comparison is particularly significant because the smelt adaptive management protocol was not at all vague. It was far more detailed than most a/m-lite plans. Yet, when held against a substantive legal standard, the court could not find the reasonable certainty of compliance.[140]

It is not surprising that the ESA, with its famously uncompromising man-

[135] National Wildlife Federation v. Babbitt, 128 F. Supp. 2d 1274 (E.D. Cal 2000) (endorsing the adaptive management elements of the HCP/ incidental take permit while overturning it on a variety of other grounds related to the misfit between the scale of the plan and the governance/ commitment of the program).

[136] A subsequent case overturning a habitat conservation plan found that long-term take permits under the ESA require some procedure to deal with unforeseen circumstances. Southwest Center for Biological Diversity v. Bartel, 470 F. Supp. 2d 1118 (S.D. Cal. 2006). The court relied, in part, on National Wildlife Federation, 128 F. Supp. 2d 1274, to show that adaptive management may fulfill that necessary role. 470 F. Supp. 2d at 1144. The origin of the requirement to address unforeseen circumstances is in the original habitat conservation plan dealing with development of San Bruno Mountain, which the House Conference Report endorsed with legislation that ultimately authorized incidental take permits. Endangered Species Act Amendments of 1982, House Conference Report No. 97-835, Sept. 17, 1982, 1982 U.S.C.C.A.N. 2860, 2872-73. Courts now routinely approve habitat conservation plans that rely on adaptive management. *See, e.g.,* Center for Biological Diversity v. U.S. Fish and Wildlife Service, 202 F. Supp. 2d 594 (W.D. Tex. 2002).

[137] 506 F. Supp. 2d at 355-56.

[138] *Id.* at 356. In contrast, Animal Welfare Institute v. Beech Ridge Energy LLC, 2009 WL 4884520 (D. Md. Dec. 08, 2009), enjoined construction of a ridge-top, wind turbine project because of the likely harm to endangered Indiana bats. In language reminiscent of the smelt biological opinion, the state permit required the energy company to "*consult*" with a technical advisory committee regarding the "*potential* for adaptive management" and agree to "*test* adaptive management strategies." *Id.* slip op. at 67 (emphasis added by the court). The court found the adaptive management scheme too discretionary to overcome the need for an incidental take permit for the bats likely to be harmed.

[139] 506 F. Supp. 2d at 356.

[140] *Id.* Another ESA example concerns a recent decision overturning an agency designation for grizzly bear populations. Greater Yellowstone Coalition v. Servheen, No. CV 07-134-DWM, 2009 WL 3775085 (D. Mont. Sept. 21, 2009) (commitment to future monitoring cannot substitute for substantive findings required in the statute).

date,[141] would establish a boundary limiting weak forms of a/m-lite.[142] However, several other types of cases find that adaptive management fails to meet substantive criteria of agency law and policy. Agencies employing adaptive management to sustain FONSIs justifying a decision not to prepare an EIS have seen their efforts overturned by courts unconvinced that vague, a/m-lite will assure that the impacts of a project will not be significant.[143] In this respect, a/m- lite may be better suited to EISs, where mitigation need only be discussed, not assured, than to mitigated FONSIs, which must create a record of decision demonstrating the absence of significant impacts.[144]

However, it is possible for an agency to fail to provide enough detail about mitigation under the more flexible standards of an EIS. Mitigation as open-ended contingency planning is not unique to adaptive management. The Ninth Circuit recently found BLM's FEIS for expansion of a gold mine in Nevada to be inadequate because it failed to assess the effectiveness of mitigation proposed to address possible hydrologic impacts from mine dewatering.[145] Without an assessment of effectiveness, the court determined that mitigation cannot fulfill its purpose as described by the Supreme Court, to evaluate whether anticipated environmental impacts can be avoided.[146] In this case, the EIS described a monitoring regime and indicated that, if the monitoring indicated that mitigation measures were necessary, then the mining company would prepare a "detailed, site-specific plan to enhance or replace the impacted perennial water resources."[147] The absence of detail about the tools employed in such a plan, or on when exactly the plan would be triggered, is common in EISs employing adaptive management to defer some decisions to a later date.

Even the public land organic acts, which grant broad discretion to agencies, including the latitude to manage adaptively, sometimes provide standards that a/m-lite fails to meet.[148] Agencies run

[141] Tennessee Valley Authority v. Hill, 437 U.S. 153, 184, 194-95 (1978) (the ESA intends to "halt and reverse the trend toward species extinction, whatever the cost" and strikes a balance "in favor of affording endangered species the highest of priorities").

[142] An early case grappling with adaptive management's role in meeting substantive legal standards is Oregon Natural Resources Council v. Daley, 6 F. Supp. 2d 1139, 1158 (D. Or. 1998), which rejected Oregon's habitat restoration program, which included watershed councils, monitoring, and adaptive management, as basis for not listing coho salmon runs. The court found the program to consist of insufficiently certain "future, voluntary and untested habitat measures." *Id.* at 1159.

[143] *E.g.* Mountaineers v. U.S. Forest Service, 445 F. Supp. 2d 1235, 1250 (W.D. Wash. 2006) ("adaptive management strategies amount to a build-first, study later approach that violates NEPA") (internal quotations deleted); Natural Resources Defense Council v. U.S. Army Corps of Engineers, 457 F. Supp. 2d 198, 234 (S.D.N.Y. 2006) (adaptive management practices "provide no assurance as to the efficacy of mitigation").

[144] Theodore Roosevelt Conservation Partnership v. Salazar, 605 . Supp. 2d 263, 279 (D.D.C. 2009) (adaptive management fulfills EIS mitigation requirement, which only requires discussion of possible measures, not assurance that they will occur) (*citing* Robertson v. Methow Valley Citizens Council, 490 U.S. 332 (1989)).

[145] South Fork Band Council of Western Shoshone of Nevada v. U.S. Department of the Interior, - F.3d -, 2009 WL 4360798 (9th Cir. 2009).

[146] *Id.* at *6 (quoting Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 351-52 (1989).

[147] U.S. Dept. of the Interior, Bureau of Land Management, Cortez Hills Expansion Project FEIS 3.2-111 (Sept. 2008).

[148] *E.g.* Greater Yellowstone Coalition v. Kempthorne, 577 F. Supp. 2d 183, 195 (D.D.C. 2008) (adaptive management plan for snowmobiles "provides no quantitative standard or qualitative analysis to support" a conclusion of no impairment under the park system organic act); High Sierra Hikers Ass'n v. Weingardt, 521 F. Supp.2d 1065, 1091 (N.D. Cal. 2007) (agency may not rely on adaptive management to avoid a showing in the administrative record that it will meet the standards of the wilderness act); Klamath Siskiyou Wildlands Center v. Boody, 468 F.3d 549, 558-59 (9th Cir. 2006) (adaptive management modifications contemplated in a resource management plan do not shield subsequent management changes from complying with regulations setting out criteria for amending plans).

the risk of relying on adaptive management as an alternative to the harder work of showing how their plans will meet the substantive legal criteria for their land systems. Moreover, the focus on adaptive management in public land planning may distract agencies from hard work of establishing substantive objectives that translate statutory and regulatory goals into place-based standards.[149] Richard L. Schroeder's recent study of the comprehensive conservation plans that each unit of the National Wildlife Refuge System must prepare under its organic legislation revealed that the biological objectives, a key element of the plans required under implementing policy, seldom meet even two of the five criteria in the FWS handbook.[150] The handbook requires each biological objective to be: 1) specific, 2) measurable, 3) achievable, 4) results-oriented, and 5) time-fixed.[151] Schroeder describes the problem with the plans' neglect of substantive benchmarks:

If [the FWS] is to be able to manage in a manner consistent with the plans, and to practice adaptive management by monitoring progress, then the biological objectives in the plan must be specific and measurable, as recognized by the [FWS's] own policy. If the objectives lack specificity and detail, as the majority do, then [the FWS] will be unable to measure progress toward their achievement, and thus, will be unable to know if they are indeed managing refuge lands in a manner consistent with the plans.[152]

III. Lessons for the Next Generation of Adaptive Management

The picture that emerges from the first round of litigation over adaptive management should not surprise observers of conservation conflicts. The ambitions expressed in law and policy exceed the abilities of agencies to implement because of inadequate funding. Agencies attempt to maximize their discretion and minimize their exposure to political controversy from unpopular decisions. Interest groups, including environmentalists, seek to lock in promises through binding commitments early in the management process. Courts are attentive to substantive management standards in reviewing agency records for compliance with the law. Most every player in the environmental management game approves of adaptive management in theory; disagreements focus on application in practice. The key activity of structured learning during the course of a project often gets sidelined in the rough and tumble of implementation.[153] But from this ongoing fray some lessons for agencies and Congress can be extracted for further development of adaptive management in practice.

A. Lessons for Agencies

Our research confirms the intuition that adaptive management is one of the most

[149] *See* Refuge Planning Policy Pursuant to the National Wildlife Refuge System Administration Act as Amended by the National Wildlife Refuge System Improvement Act of 1997, 65 Fed. Reg. 33,892, 33,906 (May 25, 2000) (one of the eight goals of unit-level planning is "providing a basis for adaptive management by monitoring progress, evaluating plan implementation, and updating refuge plans accordingly"). Substantive statutory goals for refuges include ensuring "that biological integrity, diversity, and environmental health are maintained," 16 U.S.C. 668dd(a)(4)(B), and sustaining "healthy populations of fish, wildlife, and plants," 16 U.S.C. §§ 668dd(a)(4)(D) & 668ee.

[150] Richard L. Schroeder, *Evaluating the Quality of Biological Objectives for Conservation Planning in the National Wildlife Refuge System*, 26 George Wright Forum 22 (2009).

[151] *Id*. at 23 (citing U.S. Dept. of the Interior Fish and Wildlife Service, Writing Refuge Management Goals and Objectives: A Handbook 8 (2004)).

[152] *Id.* at 27.

[153] *See* Doremus *supra* note 45 at 569.

difficult tasks for agencies attempting comprehensive ecosystem stewardship.[154] However, the impression in agencies that lawsuits and appeals present a barrier to implementing adaptive management[155] is unfounded. When agencies lose challenges to their adaptive management plans, it is often because their preference for management latitude runs afoul of the need to show they can meet substantive and procedural standards in statutes, regulations, or even their own earlier plans.

1. Shoring Up A/M-lite in Substance

In order to wring the most benefits from a/m-lite, agencies should strive to do their best to create plans that include as many of the elements of adaptive management theory as possible, especially designing management actions as experiments so that they promote learning to reduce uncertainty. However, this crucial element of adaptive management is not generally required by law and courts will not impose it.[156] More structured learning would improve a/m-lite by capturing more benefits of adaptive management theory. This reform will need strong prompting from Congress, agency leadership, and administrative guidance. The courts will, however, impose some discipline on the use of a/m-lite.

The lessons for an agency embarking on a/m-lite require it to restrain its enthusiasm for discretion: the plan must be as detailed as practical. The more vague the a/m-lite, the more likely that a court will find it inadequate. Related to this lesson is that adaptive management cannot substitute for a showing of reasonable certainty that substantive criteria will be met. The pageantry of procedures and flow charts may distract agencies from their mandates to achieve specific environmental objectives. Agencies should resist looking at adaptive management as a short cut around the difficult task of compiling a record that substantiates claims about such key tests as viability, non-impairment, or no jeopardy. Adaptive plans, to be effective, must translate the substantive standards of statutes, rules, and manuals into place-based objectives. Adaptive management must have direction - it needs to deploy its procedural tools to home in on specific goals.

2. Improving A/M-lite as Procedure

While substantive standards, where they exist, helpfully constrain and focus adaptive management, there is also a set of lessons for agencies involving the procedural charter established by NEPA. Indeed, as the origins of adaptive management are found in Holling's critique of conventional environmental impact analysis, it is fitting that NEPA recently has been the subject of much thinking about how to promote adaptive management. In 1997, for example, the Council on Environmental Quality (CEQ) echoed Holling's assessment that under the traditional NEPA model "adequate environmental protection depends solely on the accuracy of the predicted impacts and expected mitigation results" and that NEPA should be reoriented around "adaptive environmental management."[157] Building on that theme, the 2003 NEPA Task Force report, *Modernizing*

[154] Tomas M. Koontz and Jennifer Bodine, *Implementing Ecosystem Management in Public Agencies: Lessons from the U.S. Bureau of Land Management and the Forest Service*, 22 Conservation Biology 60 (2008).

[155] *Id.* at 65.

[156] The Lands Council v. McNair, 537 F.3d 981 (9th Cir. 2008) (refusing to take a close look at whether the agency adaptively learned from previous logging before undertaking another, similar logging project).

[157] Council on Environmental Quality, The National Environmental Policy Act: A Study of its Effectiveness after Twenty-Five Years 32 (1997).

NEPA Implementation, contained a full chapter devoted to "adaptive management and monitoring,"[158] the gist of which was to use NEPA to help move federal agencies from the "predict-mitigate-implement" model to the "predict-mitigate-implement-monitor-adapt" model.[159]

NEPA, of course, imposes no enforceable substantive duties on federal agencies and does not mandate adaptive management. Moreover, environmental impact analysis performed under NEPA assumes the conventional front-end comprehensive pre-decisional form, so it cannot incorporate adaptive management as an assessment tool per se. But, the NEPA Task Force identified two ways in which adaptive management and NEPA can usefully intersect in ways consistent with our evaluation of the adaptive management case law presented in Part II.

First, federal agency actions that employ adaptive management may be in a position to reduce the need for new or supplemental NEPA analyses when changed conditions require changes in resource management.[160] Second, federal actions that employ adaptive management may be in a better position to argue that mitigation measures incorporated in the federal action and put into effect through adaptive management justify the decision not to prepare a full environmental impact statement (i.e., to mitigate to a finding of no significant impact, or FONSI).[161] Our review of adaptive management litigation bolsters the CEQ claims by showing that courts endorse these two ideas.

Hence, whereas the traditional NEPA model provides no incentive to federal agencies (or the state, local, and private entities sponsoring the projects federal agencies fund or authorize) to incorporate adaptive management in the actions being evaluated under NEPA, the Task Force used the prospect of avoiding having to prepare a full or supplemental EIS as an incentive to do just that.

Indeed, in 2007 the Forest Service proposed rules to update its procedures for NEPA compliance with numerous references to adaptive management built around the provision that "a proposed action or alternative(s) may include adaptive management strategies allowing for adjustment of the action during implementation. If the adjustments to an action are clearly articulated and pre-specified in the description of the alternative and fully analyzed, then the action may be adjusted during implementation without need for further analysis."[162] Similarly, in 2008 the Department of the Interior proposed revisions to its NEPA implementation rules directing that "bureaus should use adaptive management as part of their decision making processes, as appropriate, particularly in circumstances where long-term impacts may be uncertain and future monitoring will be needed to make necessary adjustments in subsequent implementation decisions."[163]

Another theme of NEPA reformers consistent with the case law on adaptive management has been to encourage more attention to large-scale or programmatic EISs.[164] Early-stage

[158] The NEPA Task Force, Report to the Council on Environmental Quality: Modernizing Nepa Implementation ch. 4 (2003).

[159] *Id*. at 45.

[160] *See id*. at 47.

[161] *See id*. at 48.

[162] 72 Fed. Reg. 45998, 46005 (Aug. 16, 2007) (proposed rule to be codified at 36 C.F.R. 220.5(e)(3)).

[163] 73 Fed. Reg. 126, 135 (Jan. 2, 2008).

[164] *See, e.g.,* Council on Environmental Quality, *supra* note 148, at 11-13

analyses can be difficult to perform because activities may still be nebulous. But, early and broad evaluations can steer agency in toward more effective and environmentally benign directions. They are the analyses most likely to actually help agency decision-makers. The bigger temporal and geographic scales representing the greatest agency successes in the adaptive management litigation bolster this general argument of NEPA reformers. Because adaptive management is expensive, agencies should place their highest funding priorities on large-scale efforts, which are most likely to yield useful incremental adjustments over time.

Despite its fundamentally different assumptions about knowledge and decision-making, adaptive management is compatible with NEPA. Adaptive management is well suited to the NEPA tiering that natural resources agencies are already adept at using. An added incentive for agency use of adaptive management in EISs is that it may raise the threshold for requiring a supplemental EIS should new information emerge. Agencies must be attentive to the obligation that mitigated FONSIs demonstrate that impacts will fall below the significance threshold. Adaptive management alone, without substantive triggers, may not shoulder the burden.

3. Extending A/M-lite to Pollution Control

The pollution control side of environmental litigation has not directly addressed adaptive management. The strong "cooperative federalism" structure of pollution control law introduces the complications of state implementation that go far beyond the Sacramento-San Joaquin Delta example.[165] And, pollution control involves far more regulation of private economic activity than does resource management.[166] But the relatively stronger emphasis on meeting substantive criteria, such as National Ambient Air Quality Standards ("NAAQS"),[167] in pollution control law will increasingly provide some lessons for implementing adaptive management. For example, the Fifth Circuit upheld the Environmental Protection Agency's ["EPA's"] approval of a Texas State Implementation Plan ["SIP"], which the Clean Air Act requires to demonstrate that the state will be able to attain NAAQS.[168] The SIP at issue purported to demonstrate that the Houston-Galveston area would comply with the NAAQS for ozone. The state was able to devise control measures that would achieve 94 percent of the pollution reduction needed to attain the NAAQS. In order to extract the additional 6 percent reduction, the EPA accepted the SIP's "enforceable commitment to adopt and implement" additional controls.[169] The SIP could not specify what those additional controls would be, but it did provide "a list of soon-to-be-available, cutting-edge technologies."[170] The court upheld the EPA determination under the *Chevron* standard of review.[171] The Texas SIP case illustrates how

[165] *See* Robert L. Fischman, *Cooperative Federalism and Natural Resources Law*, 14 N.Y.U. Envtl. L.J. 179 (2005) (contrasting the versions of cooperative federalism in pollution control and resource management).

[166] *See* Robert L. Fischman, *The Divides of Environmental Law and the Problem of Harm in the Endangered Species Act,* 83 Ind. L.J. 661 (2008) (discussing the characteristic differences between pollution control and natural resources law). The ESA is a resource management statute that straddles the divide and does regulate some private activities directly.

[167] 42 U.S.C. §§ 7408-09.

[168] BCCA Appeal Group v. U.S. Environmental Protection Agency, 355 F.3d 817 (5th Cir. 2004).

[169] 355 F.3d at 839-40.

[170] 355 F.3d at 841.

[171] Chevron U.S.A., Inc. v. NRDC, 467 U.S. 837 (1984).

pollution control benefits from large-scale plans that promise to meet substantive criteria through thousands of small steps. Texas benefited from the large scale in committing to additional reductions (the 6 percent) without specifying all of the specific sources of contribution to that goal. The court's deferential standard of review afforded the EPA flexibility to approve the experiment of meeting the standard through as-yet unavailable technology. This is a form of narrowing uncertainty over time that is widely viewed as an attribute of adaptive management.

On the other hand, the EPA recently refused to extend its flexibility in proposing to disapprove a Texas SIP revision employing a "flexible permits" approach to meet the Clean Air Act's new source review requirements for industrial sources of pollution.[172] The Texas program would allow individual sources to exceed standards as long as they provided cumulative emissions reductions on a case-by-case basis.[173] The EPA's proposed finding emphasized that the state program does not meet the statutory standards and fails to ensure accountability, compliance, and monitoring.[174] These are familiar criticisms of the a/m-lite plans reviewed in the natural resources litigation.

The EPA recently restructured its Chesapeake Bay Program ["CBP"] to emphasize adaptive management. The CBP covers a larger area than the Texas SIPs, or even the NWFP. In response to a 2007 congressional mandate, the EPA revised its CBP around four basic components, one of which is adaptive management.[175] In 2009, President Obama ordered the EPA to work with other federal agencies to implement adaptive management in the CBP.[176] However, in contrast to the SIPs, the CBP has few enforceable criteria (but many quantitative goals) and a multi-state dimension that tend to create adaptive management plans focused primarily on the process of coordination.[177] With diffuse responsibility, an emphasis on monitoring and study, and few interim targets, the new CBP has already received criticism as a helpless giant.[178] Nonetheless, we expect increased use of adaptive management in adjusting water quality standards and total maximum daily loads of pollutants for impaired bodies of water, such as the Chesapeake Bay.

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[172] 74 Fed. Reg. 48480 (Sept. 23, 2009). New source review regulations the modification and construction of certain stationary sources of air pollution. 42 U.S.C. § 7410(a)(2)(C).

[173] 74 Fed. Reg. 48485-86.

[174] 74 Fed. Reg. 48482.

[175] U.S. Environmental Protection Agency, Strengthening the Management, Coordination and Accountability of the Chesapeake Bay Program: Report to Congress (July, 2008) (report required by Consolidated Appropriations Act of 2008, Pub. L. No. 110-161,at p. 1255), *available at*: http://cap.chesapeakebay.net/docs/EPA_Chesapeake_Bay_CAP.pdf.

[176] Executive Order No. 13,508, Chesapeake Bay Protection and Restoration (May 12, 2009) (section 301(b) directs the EPA to draft pollution control strategies that are "based on sound science and reflect adaptive management principles;" section 801 directs the Departments of the Interior and Commerce to use "adaptive management to plan, monitor, evaluate, and adjust environmental management actions").

[177] *See e.g.* U.S. Environmental Protection Agency, *supra* note 166, at 26 (quantitative goals with adaptive management strategies) and 34 (CBP management system diagram illustrating a detailed procedural method).

[178] *See* Rena Steinzor and Shana Campbell Jones, Reauthorizing the Chesapeake Bay Program: Exchanging Promises for Results (Center for Progressive Reform White Paper # 903 2009). The detailed management system, U.S. Environmental Protection Agency, *supra* note 166, at 34, is reminiscent of the ecosystem management model skewered by Professor Houck for lack of substance and neglect of law-making. Oliver Houck, *On the Law of Biodiversity and Ecosystem Management, 81 Minn. L. Rev. 869, 937-939 (1997).*

4. Public and Industry Buy-In

The courts are not the only institution reviewing adaptive management. Private regulated interests have expressed concerns about the capacity of adaptive management to add continually to the conditions imposed by resource development authorizations without the security of finality. The Corps, for example, heard this complaint as it developed adaptive management provisions in the new wetlands compensatory mitigation rule:

One commenter suggested that if a permittee has made a ''good faith effort'' to meet performance standards, no additional compensatory mitigation requirements should be imposed other than an extension of the monitoring period. Several commenters said that requiring adaptive management efforts beyond what is currently required as remediation or contingency actions will impose additional financial and resource burdens on mitigation providers.[179]

The agency's response was a Solomonic mixed bag. On the one hand, the Corps acknowledged the reality that "there may be additional costs associated with an adaptive management approach, but we believe that such an approach is necessary to achieve compensatory mitigation project objectives, or to provide comparable or superior ecological benefits."[180] Yet the agency did clarify that the scope of adaptive management is not boundless, noting that "adaptive management does not require anticipation of all potential challenges, since that would be impossible to accomplish."[181] This is unlikely to be of comfort to regulated interests, however, as it leaves much to the details of the adaptive management plan and subsequent implementation. As we conclude from our case law evaluation, courts may find this approach too open ended if the plan is not sufficiently detailed to assure substantive compliance.

Just as regulated interests are concerned that adaptive management will lead to runaway land management burdens, environmental protection interests are concerned that it will lead to closed-door resource development approvals. For example, as FWS brought adaptive management on line for the HCP permit program under the Endangered Species Act,[182] environmentalists complained about inadequate access to meaningful public participation in the HCP negotiation process and the lack of an ongoing public role in the implementation of adaptive management over the life of the HCP permit.[183] By the late 1990s, environmental groups had begun to accuse the HCP program of making decisions without following "biological standards" and to demand more public participation as a result.[184] For example, in 1999 the Defenders of Wildlife issued a blistering critique of the HCP program, complaining that, among other things, "citizens from

[179] 73 Fed. Reg. 19594, 19647 (Apr. 10, 2008).

[180] *Id*.

[181] *Id*. at 19620.

[182] *See supra* note 2. For background on the HCP program, see the sources cited *supra* note 6.

[183] *See, e.g.*, Laura C. Hood, *Defenders of Wildlife, Frayed Safety Nets: Conservation Planning Under the Endangered Species Act* vi–xiii (presenting a pessimistic assessment of the HCP program); John Kostyack, *Surprise!,* 15 Envtl. F., Mar.–Apr. 1998, at 19, 19–24 (attorney for National Wildlife Federation presents extensive criticism of HCP program); *see generally* Robert D. Thornton, *Habitat Conservation Plans: Frayed Safety Nets or Creative Partnerships?*, 16 Nat. Resources & Env't 94, 95–96 (describing other organizations' criticisms).

[184] *See, e.g.,* Hood, *Frayed Safety Nets*, *supra* note 174, at 59-61, 80-81 (1998) (summarizing Defenders of Wildlife's critique of HCP program).

various stakeholder groups have no formal role in the HCP process except through the public comment period and…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."[185]

Since then, some HCPs have been found by courts to contain robust 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.[186] FWS has also joined other state and federal agencies to develop a detailed technical guidance for monitoring protocols to assist adaptive management in large-scale HCPs.[187] Yet public participation of the kind demanded has yet to be made a component of HCP adaptive management implementation. The pressure for more public input on this and other aspects of HCP permits thus continues to build,[188] And we expect similar issues are likely to develop in other permitting and approval programs using adaptive management.[189]

Neither the regulated industry certainty nor the pubic participation concern has surfaced in claims brought against adaptive management in the courts to date, and no court has expressed concern in either respect sua sponte. This probably is due more to the hybrid nature of a/m-lite than it is to the underlying justifications for the respective concerns. Agencies practicing a/m-lite do so against the context of conventional natural resources management laws, which tend not to specify conditions for regulated party certainty and which prescribe fairly minimal public participation in the form of notice and comment. So long as an agency satisfies the black letter requirements of statutes in these respects, courts are unlikely to nullify use of a/m-lite on these grounds. By the same token, however, the black letter law also constrains how far agencies can go with a/m-lite, as truly iterative "learning while doing" may at some point run afoul of permitting procedures and criteria, as well as the demands of public notice and comment. Our message to agencies in this respect is to not take the absence of these concerns registering in the case law to date as evidence that there is no limit to how far agencies can implement a/m-lite without regard to regulated industry and public interests. Stretch it too far in either respect and the lawsuits are sure to come.

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[185] *Id*. 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).

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

[187] See U.S. DEPARTMENT 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.

[188] For a recent evaluation of the HCP program, including a proposal for more public participation, see David Dana, Reforming Section 10 and the Habitat Conservation Plan Program, in REBUILDING THE ARK: NEW PERSPECTIVES ON ESA REFORM (Jonathan Adler, ed., forthcoming), available at http://papers.ssrn.com/abstract=1519515.

[189] For example, the public participation issue confronted the NEPA Task Force as well. *See* NEPA Task Force, *supra* note 149, at 51.

B. Lessons for Congress Even if agencies follow the lessons we have extracted from the existing case law on adaptive management, which we believe would reduce adverse judicial reaction, the most they could hope for is to be in a position to implement a disciplined form of a/m-lite. The courts cannot provide the funding necessary to support true "learning while doing," and neither can they supply more authority or clearer standards than exist in existing statutory text. Only Congress can let agencies break out of the a/m-lite mold without fear of public, industry, and judicial pushback. Of course, Congress is not bound to follow the lead the courts have given agencies, but we believe Congress would be well advised to codify the guideposts the courts have established for when the practical demands on adaptive management warrant departure from the pristine theory and when, on the other hand, the agencies have given themselves too long a leash.

On the funding question, it is time for Congress to consider supporting adaptive management plans through the purchase of annuities that would ensure a steady stream of subsequent funding for the development of management experiments, monitoring and revision.[190] Current appropriation practice, which provides most funding for the first stage of planning and not the subsequent iterations, is inadequate to reap significant benefits from adaptive management. Prior efforts, most notably through the Forest and Rangeland Renewable Resources Planning Act of 1974,[191] failed in disciplining Congress to make strategic investments in resource management.[192] The 1974 statute established an elaborate planning regime which viewed forests as capital assets requiring reliable future funding to maintain their value. It required an annual "statement of reasons" from the President explaining deviations of proposed budgets from the needed funds projected in long-term plans, but both branches ignored the well-intentioned legislation.[193] Creating endowments or purchasing annuities are more concrete assurances of follow-through, and deserve further exploration. This would be a timely project as Congress considers climate change legislation that may provide new revenues from sales of emission allowances.[194]

In addition to reforming the appropriations process, Congress could substantially improve the practice of adaptive management in natural resource administration. It is possible to establish clearer standards to ensure that an agency purporting to employ adaptive management actually does an adequate job. Congress should explicitly require adaptive management plans to (1) identify testable hypotheses and (2) state exactly

[190] Examples abound of agencies unable to afford the monitoring described in adaptive plans. A common scenario is national forests unable to fund the monitoring of populations of indicator species identified in forest plans. *See e.g.* Public Lands Council v. McNair, 537 F.3d 981 (9th Cir. 2008); Inland Empire Public Lands Council v. U.S. Forest Service, 88 F.3d 754 (9th Cir. 1996); Utah Environmental Congress v. Bosworth, 439 F.3d 1184 (10th Cir. 2006); Sierra Club v. Martin, 168 F.3d 1 (11th Cir. 1999). *See also* Western Watersheds Project v. U.S. Forest Service, 2006 WL 292010 (D. Idaho 2006) (inadequate funding to apply forest plan standards relating to grazing suitability using on-the-ground studies).

[191] *Codified, as amended,* 16 U.S.C. §§ 1601-1613.

[192] *See* George C. Coggins et al., Federal Public Land and Resources Law 690 (6th ed. 2007); National Wildlife Federation v. United States, 626 F.2d 917 (D.C. Cir. 1980).

[193] Coggins, *supra* note 183, at 690.

[194] *See* Glicksman *supra* note 106, at 873. The leading bills in both the House and Senate provide substantial funding for natural resource conservation. S. 1733 & H.R. 2454, 111th Cong. (1st Sess. 2009).

what criteria should apply in evaluating the management experiments. These two requirements would address the vast majority of non-budgetary problems with a/m-lite. With explicit learning goals and established measures of success, agencies could retain discretion to adjust their decisions while offering far greater assurances to stakeholders.

Assuring future funding and requiring that the experimental elements of adaptive management be more precisely defined would address both the disparities we noted at the beginning of Part II.C. of this Article. They would provide judicially enforceable benchmarks for oversight of natural resources planning and management. And, they would rein in the a/m-lite practices that serve as open-ended contingency planning by ensuring that all adaptive management plans get the benefit of the scientific method to guide future iterations. In narrowing the disparities, they would wring more benefits from adaptive management by reducing uncertainty as plans move forward.[195] True, adaptive management in practice would remain a somewhat grotesque hybrid of conservation policy's complexity theory and modern administrative law's approach to pluralism and finality. But, it would likely achieve more of the benefits we wish to extract from ecosystems with less rancor.

The federal government has noted that "[c]limate change creates new situations of added complexity for which an adaptive management approach may be the only way to take management action today while allowing for increased understanding and refinement tomorrow."[196] Commentators agree, and there are currently no viable alternative approaches to respond to the increased uncertainties surrounding conservation.[197] Therefore, the stakes are high for public agencies to refine their approach to adaptive management in light of the lessons from the first generation of litigation.

Conclusion

Our review of the first generation of adaptive management litigation provides more than an analysis of how the law applies or the reaction of the judiciary. It also opens a window into the actual practices that agencies have justified under adaptive management. Not surprisingly, implementation fails to mirror the finely wrought theory of adaptive management. The litigation reflects the practical and political compromises agencies make, whether applying adaptive management or any other model of natural resources management decision-making. It highlights how rarely real learning and reduced uncertainly result, and how haphazardly they feed back into agency programs. But it also points the way toward improved implementation and legislative reform.

The next round of lawsuits over adaptive management will likely focus on how well the procedures developed in large-scale plans have fulfilled their promise. Only the NWFP is old enough to have experienced much second-generation litigation. However, agencies should prepare by being careful about what they promise. The temptation to defer difficult and costly analysis, or punt on politically controversial decisions, may create problems for agencies down the line. What might have been a routine

[195] *See* Doremus *supra* note 47.

[196] U.S. CLIMATE CHANGE SCIENCE PROGRAM AND THE SUBCOMMITTEE ON GLOBAL CHANGE RESEARCH, PRELIMINARY REVIEW OF ADAPTATION OPTIONS FOR CLIMATE-SENSITIVE ECOSYSTEMS AND RESOURCES 9-5 (2008).

[197] *See, e.g.* Glicksman, *supra* note 106.

implementation project may explode into an expensive, complex task if the initial a/m-lite failed to commit to a course of action, applied only vague criteria for evaluating actions, or deferred substantial analysis of site-specific effects.

One must wonder, however, about how much time we have for lessons to come out of the second generation of adaptive management litigation. The pressure on Congress, agencies, the courts, and all natural resources policy stakeholders to further refine, implement, and work within a regime of adaptive management is not about to let up. There is widespread agreement that the effects of climate change on natural resources will be complex, dynamic, nonlinear, and frequently unpredictable over anything but short time frames, all of which are conditions that demand adaptive management responses.[198] Yet, although the first generation of litigation seems to have laid down some important foundational lessons for this effort, doing so took a span of roughly fifteen years. Adaptive management litigation now risks getting down in the weeds, so to speak, and must avoid letting the perfect be the enemy of the good at a time when decisive action is needed. Our assessment of adaptive management in the courts suggests there is a good model in place. If agencies follow it and courts enforce it faithfully, it may serve as a potent component of climate change policy notwithstanding its flaws.

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[198] For summaries in legal scholarship, see Camacho, *supra* note 4, at 60 (calling for "an adaptive methodology for assessing and adjusting government decision-making over time"); Robin Kundis Craig, *"Stationarity is Dead" – Long Live Transformation: Five Principles for Climate Change Adaptation*, 34 Harv. Envtl. L. Rev. [7] [57-59] (forthcoming) ("Be serious about using adaptive management – and change both natural resources and administrative laws to allow for it"); Glicksman, *supra* note 4, at 868 ("The land management agencies, in the planning process as well as in other contexts, must rely heavily on the management technique known as adaptive management."). Experts from environmental organizations, such as the Environmental Law Institute's Carl Bruch, concur in the important role adaptive management will play in climate change policy. *See* Carl Bruch, *The End of Equilibrium*, The Envtl. F., Sept.-Oct., 2008, at 30, 32 ("Incorporating adaptive management into laws and institutions can enhance the capacity of governance systems to adapt to changing climate conditions, to develop and deploy new technologies and techniques.").