Chapter 4
Adaptive Management and Law

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Adaptive Management: From Theory to Practice

Adaptive management is increasingly recognized as a valuable approach to natural resource and environmental management challenges that involve high degrees of uncertainty. The legal rules and requirements that drive environmental protection efforts in the United States, however, are often considered barriers to successful implementation of adaptive management (Allen et al. 2011). A recent survey of adaptive management practitioners found that over seventy percent (70%) feel hampered by legal and institutional constraints (Benson and Stone 2013). While adaptive management has been widely discussed in the fields of ecology and conservation biology for decades (Holling 1978, Walters and Holling 1990), its incorporation into natural resource management in the United States is relatively recent. Examples include the U.S. Department of Interior's development of a technical guide for adaptive management implementation (Williams et al. 2009), landowner based habitat conservation planning under the Endangered Species Act (Ruhl 2005, 65 Fed. Reg. 25242 [2000]), and the compensatory wetlands mitigation protection program under the Clean Water Act (U.S. Army Corps 2002). In the context of federal lands management a standard definition, as adapted from the National Research Council, is as follows:

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> 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. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a 'trial and error' process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders. (Williams et al. 2009)

As a conceptual approach, adaptive management is a vehicle for operationalizing a systems-based understanding of social-ecological dynamics (Walters 2002). It is based on a recognition of non-equilibrium in social-ecological systems and the corresponding complexity, uncertainty and instability associated with both social and ecological systems and processes (Gunderson and Holling 2002, Folke et al. 2005). Adaptive management is therefore seen as a key strategy for fostering resilience of social-ecological systems (Lee 1999, Salafsky et al. 2001, McCarthy and Possingham 2007), and there is a growing area of scholarship examining practical applications of adaptive management (e.g., Berkes and Seixas 2005, King and Brown 2006, Allan et al. 2008, Brugnach et al. 2008, Schultz and Nie 2012).

Within this literature, scholars do not often directly consider the institutional constraints on adaptive management. Scholarship that does address institutional issues tends to emphasize other factors necessary for adaptive management to be successful, including polycentric governance, collaboration, social learning, and issues of scale (Bodin et al. 2006, Stringer et al. 2006, Pahl-Wostl 2007, Pahl-Wostl et al. 2007, Brugnach et al. 2008, Raadgever et al 2008, Folke et al. 2007). Jacobson et al. (2006) looked at barriers to adaptive management implementation by surveying the staff of the Florida Fish and Wildlife Conservation Commission. This study based its questionnaire on a literature review that identified 47 potential barriers to use of adaptive management. Legal and regulatory requirements were not listed explicitly, though related issues regarding management flexibility and availability of agency resources were listed among the categories of logistical and institutional barriers. This survey revealed that logistical issues were the most problematic of all barriers for respondents, who specifically cited lack of agency resources and the time consuming nature of adaptive management protocols. Similarly, Butler and Koontz (2005) surveyed 345 U.S. Forest Service managers regarding their experiences implementing the agency's ecosystem management objectives, of which adaptive management is one component (Grumbine 1994). Their results established that managers view adaptive management as the most difficult element of ecosystem management to implement. Among the reasons for this, according to managers, were the significant institutional changes required, the immense costs of monitoring and the lack of public and political support. One interviewee was quoted as stating: "Adaptive management happens, but is a reach for the agency. We don't have all the mechanisms in place to do it well, and there are legal, logistical, contractual and social constraints" (Butler and Koontz 2005).

While adaptive management is widely acknowledged as a valuable approach in theory, scholars are often critical of adaptive management in practice (Doremus 2002,

Zellmer and Gunderson 2009, Ruhl and Fischman 2010, Susskind et al. 2010). Within the legal scholarship on adaptive management, there have been two major areas of emphasis. First, there is an acknowledgement that virtually all of the efforts to integrate adaptive management strategies to date reflect attempts to fit adaptive management within existing legal mandates and protocols. While existing management mandates are usually sufficiently broad to encompass adaptive management approaches, "the disconnect between adaptive management in practice and adaptive management in law is quite palpable…. No other principle of natural resources law has so deeply permeated the practice on the basis of so little mention in law" (Ruhl 2008). As a result, adaptive management is being thrown like a blanket on top of existing authorizations and requirements, with little attention to how practitioners balance this new mandate in relation to other legal and institutional requirements. Critics of adaptive management have argued that without more specific legal grounding, adaptive management provides agencies with an undesirable amount of discretion (Doremus 2002, Houck 2009). In the same way, even adaptive management proponents have cautioned against lax standards for adaptive management that would, in essence, create a situation in which agencies use it as "rhetorical cover for requests for blanket preauthorization to reverse or revise policies should the agency later decide to change its mind" (Karkkainen 2005). In other words, unless adaptive management is given some legal definition and its application is enforceable in some way, the approach can be used as a smokescreen for open-ended and discretionary decision-making that fails to meet legal standards, lacks accountability, and fails to incorporate some of the most important aspects of the paradigm, including rigorous monitoring and feedback loops that inform an adaptive planning cycle (Schultz and Nie 2012).

The second shared observation is that current legal and regulatory requirements do not generally support the iterative processes required by adaptive management (Thrower 2006, Ruhl 2008, Craig 2010). For example, the National Environmental Policy Act (NEPA) is the major federal law that requires agencies to take a "hard look" at the environmental impacts of proposed agency action (Schultz 2008, see Box 1). NEPA is built upon a model of predictive and rational planning and makes a number of implicit assumptions that are at odds with adaptive management, including that there is a single, final "agency action," rather than a series of iterative processes and that resource managers already have knowledge of natural systems needed to assess environmental impacts (Benson and Garmestani 2011). Several scholars have highlighted the challenges associated with engaging in adaptive management while also navigating the NEPA process and other legal constraints (Angelo 2009, Benson 2009, 2010, Zellmer and Gunderson 2009, Susskind et al. 2010).

Summary of National Environmental Policy Act

Passed into law in 1970, the National Environmental Policy Act (NEPA) is one of the most influential environmental laws in the United States. It requires all federal agencies that propose a "major federal action significantly affecting the quality of the human environment" to first assess the potential impacts of the proposed action (42 USC § 4332).

The resulting document is an "environmental impact statement" (EIS) that informs both the agency and the public regarding possible environmental consequences. An EIS is generally comprised of several elements, including:

1. The environmental impact of the proposed action,
2. Any adverse environmental effects which cannot be avoided should the proposal be implemented,
3. Alternatives to the proposed action,
4. The relationship between local short-term uses [the] environment and the maintenance and enhancement of long-term productivity, and
5. Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

42 USC § 4332(1)(C)(a). There are several stages to the NEPA process, including determining when an EIS is necessary and opportunities for public comment. While essentially "procedural" in the sense that it does not specify the agency reach any particular outcome (i.e., it does not require the agency to avoid environmental impacts), the information gathered through the NEPA process is generally considered a valuable part of the decision-making process.

The following are some important concepts and terms associated with NEPA implementation:

Environmental Impact Statement (EIS). A formal NEPA document that conducts the required "hard look" at the environmental consequences of the agencies proposed action. Must include an analysis for the environmental impacts of the proposed action, a reasonable range of alternatives to the proposed action and identification of any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Environmental Assessment (EA). An analysis, provided in the form of a public document, often used by agencies to determine whether to prepare an EIS. Also used to "tier" a project-specific agency action to larger, programmatic EIS that has already conducted the required NEPA analysis.

Finding of No Significant Impact (FONSI). A determination that an EIS is not required. Often accompanies an EA as the final conclusion of NEPA compliance. Mitigation measures taken by an agency to reach a FONSI are legally enforceable

Supplemental Environmental Impact Statement (SEIS). Additional NEPA analysis required when significant new circumstances or information relevant to environmental concerns or substantial changes in the proposed action that are relevant to environmental concerns may necessitate preparation of a supplemental EIS.

Given the legal challenges and the propensity of agencies to pursue their own administrative discretion in the form of flexible decisions, adaptive management in practice often manifests as something less than adaptive management in theory. Ruhl and Fischman (2010) explain: "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.'"

In sum, there is a recognition that more collaboratively-based, iterative processes are needed to promote flexibility and facilitate adaptive management (Gunderson and Light 2006). At the same time, given the political context in which adaptive management is applied, some enforceable standards for adaptive management are preferable to open-ended guidance, so that adaptive management in practice incorporates some measure of accountability to legal standards and to the public (Schultz and Nie 2012). A brief examination of the structure of the federal government—and particularly the role of federal agencies within the realm of administrative law—provides insight into this inherent tension between flexibility and enforceability.

Use of Adaptive Management by Federal Agencies

The federal government in the United States is comprised of three branches: the legislative, executive and judicial. Often described as a "separation of powers," each branch has a role to play in governing the nation: the legislative branch (*i.e.*, Congress) creates laws; the executive branch implements and enforces them; and the judiciary assures that the other two branches are conducting themselves in accordance with both statutory and constitutional provisions. What can be considered "law" is actually a compilation of a number of types of legislative, judicial and executive enactments that can be seen as a hierarchical structure (see Fig. 4.1). At the top, there are constitutional provisions; these laws cannot be changed without the

Fig. 4.1 Hierarchy of various laws and policies

rather onerous process of a constitutional amendment. Because there are currently no constitutional provisions for environmental protection *per se*, the second tier of law—statutes passed by Congress—are generally the highest level of legal authorization for environmental and natural resource management. Examples include NEPA, the Endangered Species Act, the Clean Water Act, etc. As statutes, these laws are generally enforceable in court, and litigation brought by concerned citizens (often referred to as "citizen suits") are in fact a primary means of environmental law enforcement.

Next in the hierarchy are administrative rules and regulations. Rules and regulations are developed by the executive branch's numerous federal agencies responsible for the implementation and enforcement of various statutes. For example, the Environmental Protection Agency is primarily responsible for the development of regulations for the Clean Water Act; similarly, the U.S. Fish and Wildlife Service is responsible for developing the regulations that give additional specificity to the provisions of the Endangered Species Act. As an overarching statute, the Administrative Procedures Act guides the development and enforcement of rules and regulations by federal agencies by allowing for public involvement and judicial oversight of the executive branch's interpretation and implementation of laws from Congress.

When federal agencies go through formal rulemaking procedures, there is generally public notice—published in the Federal Register—and an opportunity for comment. The resulting rules and regulations provide the details needed to further define the interpretation and means of enforcing the overarching, but often vague, statutory language. For example, the Endangered Species Act prohibits the "take" of an endangered species and provides a definition of "take" of a species as actions that "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" such species (16 U.S.C. 1533[19]). Regulations promulgated by the U.S. Fish and Wildlife Service provide a more refined definition of "take," specifically expanding on the statutory definition of ''harm'' to include "any act which actually kills or injures fish or wildlife, and emphasizes that such acts may include significant habitat modification or degradation that significantly impairs essential behavioral patterns of fish or wildlife" (50 CFR 17.3). In this way, the regulatory definition further explains the meaning of the statute. When rules are finalized, the rulemaking process and the content of the rule are reviewable by the judiciary. For example, the Supreme Court upheld the U.S. Fish and Wildlife Service's regulatory definition of "harm" in the case *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon* (1995). Once finalized, rules and regulations are generally legally enforceable in a court and represent the agencies official interpretation of the relevant statute.

Finally, there are a number of more informal agency policies, including departmental manuals, internal memoranda and guidance documents, etc., that are developed without formal rulemaking procedures under the Administrative Procedures Act. For example, the U.S. Forest Service has both a "manual" and "handbook" providing guidance to agency officials. The manual contains legal authorities, objectives, policies, responsibilities, instructions, and guidance, and the "handbook" provides more specialized guidance and instructions for carrying out the direction issued in the manual. Court decisions regarding the legal enforceability of these

types of management tools are mixed. Determinations are made on a case-by-case basis, and the outcome often depends on a number of factors, including the procedures taken, whether the policies prescribe substantive or interpretive rules, the agency's intent, and the Congressional mandate involved (Fischman 2007). Generally speaking, however, guidance documents are not legally enforceable in a court of law (Ruhl and Fischman 2010). As Fischman (2007) explains: "The majority of courts that examine the question closely find agency manuals to be non-binding, internal guidance unless some special circumstance raises the legal status of the policy. The few manual provisions promulgated under notice-and-comment procedures, though, are regarded by courts as binding on agencies."

The relative enforceability of various types of law becomes of particular importance with regard to adaptive management. At present, no statute explicitly defines adaptive management and agency regulations that do are generally silent about how to implement the approach. For example, the U.S. Forest Service's regulations define adaptive management as, "A system of management practices based on clearly identified intended outcomes and monitoring to determine if management actions are meeting those outcomes; and, if not, to facilitate management changes that will best ensure that those outcomes are met or re-evaluated. Adaptive management stems from the recognition that knowledge about natural resource systems is sometimes uncertain" (30 CFR § 220.3). The specifics of integrating adaptive management into federal agency management and planning, however, takes place informally.

The U.S. Department of Interior's approach for implementing adaptive management provides another example. The formal regulatory provision related to adaptive management is in the agency's regulations for its environmental impact assessment procedures under NEPA, where it states that the agency "should use adaptive management, as appropriate, particularly in circumstances where long-term impacts may be uncertain and future monitoring will be needed to make adjustments in subsequent implementation decisions" (43 C.F.R. § 46.14). In 2007, the Secretary for Interior issued an order requiring agency officials to use adaptive management whenever possible. That same year, the agency released a technical guide (revised in 2009) in order to "aid U.S. Department of the Interior managers and practitioners in determining when and how to apply adaptive management" (Williams et al. 2009). The Department of Interior's technical guide has already undergone one revision, and the agency recently released a companion applications guide (Williams and Brown 2012). This approach leaves the agency with a great deal of discretion regarding both when adaptive management is "appropriate" and how to conduct adaptive management.

The current integration of adaptive management in federal agency decision-making highlights the tension between flexibility and enforceability. As Fig. 4.2 illustrates, there is generally an inverse correlation between a management approach's enforceability by those outside the agency and the flexibility with which the agency can interpret and implement the approach. The major advantage of using informal guidance is the flexibility it affords. At the same time, relegation of adaptive management to agency manuals and guides leaves much of the agency's approach unenforceable. This

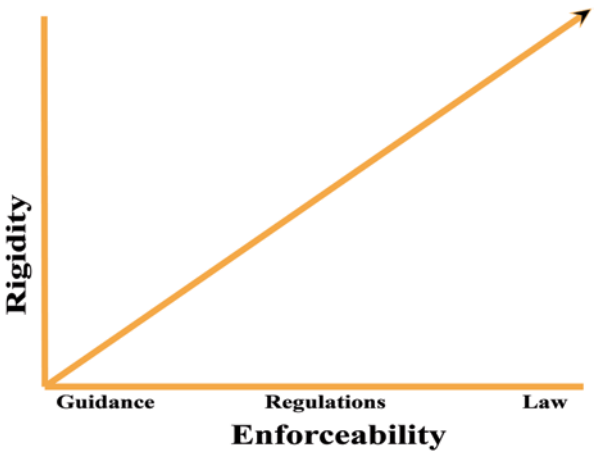

Fig. 4.2 The tradeoff between flexibility and enforceability

tension is worthy of further investigation, because, as demonstrated through an examination of several court cases below, successful implementation of adaptive management requires some measure of both.

Adaptive Management and the Courts

As we have explained, a key long-standing question is whether and how adaptive management can be incorporated in the U.S. legal framework, which relies heavily on *a priori* planning and includes a number of substantive legal standards. Some scholars have made the case that adaptive management is, to a large extent, incompatible with the framework of U.S. administrative law (Allen et al. 2011). However, in the United States, courts are beginning to outline the legal parameters of how adaptive management can be applied within the context of U.S. environmental and administrative law. Ruhl and Fischman (2010) recently published an overview of adaptive management case law. They analyzed thirty-one federal court decisions—which they refer to as "the first generation" of case law—in which the judiciary speaks directly to the legality of adaptive management. They found that federal agencies lost more than half of the cases in which they used adaptive management. Several key findings emerge from their analysis (Table 4.1).

One key theme to emerge out of the adaptive management jurisprudence is that the courts demand assurances that adaptive management plans meet substantive management criteria required by law. Ruhl and Fischman (2010) explain: "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." For example, an important substantive legal standard is the re-

Table 4.1 Key court decisions regarding adaptive management in U.S. courts as of 2011 (Schultz and Nie 2012)

Case	Summary of Key Issues	Relevancy of Triggers/Thresholds
Center for Biological Diversity v. Rumsfeld, 198 F. Supp. 2d. 1139 (D. Az. 2002)	This case considered whether the Department of the Army's plan, outlined in its operating plan and associated Biological Opinion, to collaboratively develop a mitigation program to maintain minimum water levels was sufficient to satisfy its obligation under the ESA to not jeopardize species	The court found the Army's plan insufficient. It made several points: (1) Mitigation measures must be within the agency's power to implement; (2) Agencies must show that they will meet substantive requirements; and (3) Potential mitigation measures must be detailed and enforceable. As the court puts it, they must be "reasonably specific, certain to occur, and capable of implementation; they must be subject to deadlines or otherwise-enforceable obligations; and most important, they must address the threats to the species in a way that satisfies the jeopardy and adverse modification standards."
Natural Resources Defense Council v. Kempthorne, 506 F. Supp. 2d. 322 (E.D. Cal. 2007)	This case reviewed the biological opinion for the delta smelt, as affected by operation of two major California water projects. A key issue was whether the adaptive management framework to monitor and mitigate take of the species satisfied "no jeopardy" requirements under the ESA	The monitoring framework was clear, but triggered a discretionary process where actions *could* be taken but were not required. What was triggered in this case was an unenforceable and discretionary process, devoid of clear requirements to take action. This was legally insufficient for meeting requirements under Sect. 7 of the ESA
Pacific Coast Federation of Fishermen's Associations v. Gutierrez, 606 F. Supp. 2d. 1122 (E. Dist. Calif. 2008)	The court reviewed the BiOp for salmonid species affected by operation of the same California water projects. The question was the same: whether the adaptive management framework, put in place to deal with uncertainty about future effects, was sufficient to meet Sect. 7 requirements	In this case, triggered actions were an enforceable process under the terms conditions of the incidental take permit. Specific triggers points, including water temperatures at specific locations, were included that, if exceeded, would lead to violation of the terms of the permit and reinitiation of consultation prior to the announcement of the following year's water deliveries

Table 4.1 (continued)

Case	Summary of Key Issues	Relevancy of Triggers/Thresholds
Greater Yellowstone Coalition v. Servheen, 672 F. Supp. 2d 1105 (D. Mont. 2009)	The court reviewed the delisting decision for the Greater Yellowstone DPS of grizzly bears. At issue was whether the National Forest plan amendments and state management plans sufficed as adequate regulatory mechanisms to ensure long-term conservation of the species	Despite the presence of population standards and a monitoring program, the court ruled the strategy was unenforceable and non-binding. The monitoring program promised nothing more than good intentions for future actions. This is not an adequate regulatory mechanism if it cannot be enforced and there is no way to ensure anything will happen. The judge, citing Norton v. SUWA (2004), also noted that monitoring is generally not enforceable under the APA
Greater Yellowstone Coalition v. Kempthorne, 557 F. Supp. 2d. 183 (D. D.C. 2008)	In its ROD for its new Winter Use Plan, the National Park Service, determined that maintaining a higher level of snowmobiles would not impair resources, despite the fact that previously set thresholds for environmental impacts had been exceeded. Plaintiffs asked why the exceeding of these thresholds did not constitute an unacceptable impact	Without some "quantitative standard or qualitative analysis to support its conclusion that the adverse impacts of the [Winter Use Plan] are 'acceptable,'" the court found the justification in the ROD to be arbitrary. The lesson here is that all thresholds do not necessarily have to correlate with significance in terms of impacts; however, if thresholds are crossed and an agency nonetheless finds impacts to be less than significant, there must be a clear rationale offered as to how this evaluation is made
Klamath Siskiyou Wildlands Center v. Boody, 468 F.3d 549, 553 (9th Cir. 2006)	Plaintiffs challenged changes to the status of the red tree vole under survey and manage requirements of the NWFP, asking whether the changes required plan amendment and supplemental NEPA analysis. The question involved how much leeway an agency has to make changes under an adaptive management plan in light of new information	The court held that the changes in the vole's status contradicted what was contemplated in the NWFP's most recent amendments and associated NEPA analysis. When agencies make substantial changes to requirements in adaptive management plans, courts will require new analysis, in the form of plan amendments and supplemental NEPA analysis. This is the case when the new information or the permitted actions are outside the bounds of what was originally discussed in the NEPA document. Just because a plan contemplates possible future actions, this alone does not obviate the need to amend a plan or supplement NEPA analysis

Table 4.1 (continued)

Case	Summary of Key Issues	Relevancy of Triggers/Thresholds
Oregon Natural Resources Council Action v. USFS, 59 F. Supp. 2d 1085 (W.D. Wash. 1999)	In the context of the NWFP, new information emerged regarding water quality, and species status was changed under the ESA. The court considered whether this new information required supplemental NEPA analysis	In this case, the court held that possible changes in conditions, and associated changes in management practices, had been adequately analyzed in the original NEPA document and were covered as part of the adaptive framework of the NWFP. Flexibility can be built into a NEPA assessment that anticipates changes in conditions and gives an agency the opportunity to adjust activities within certain limits
In re Operation of the Missouri River System Litigation, 516 F.3d 688 (8th Cir. 2008)	Plaintiffs challenged determinations made by the Army Corps of Engineers in an EA that changes in their management actions fell within the scope of a previous EIS	The court upheld the Corps' decision. It noted a supplemental EIS is only required when the change in management direction is one that was not within the spectrum of alternatives analyzed in the prior EIS. Even if an agency decides to implement aspects of an alternative not originally selected, as long as the impacts have been analyzed and no significant new information has arisen, supplemental NEPA analysis is not required

quirement under Sect. 7 of the Endangered Species Act that federal agencies not cause jeopardy to listed species (16 USC § 1536[a][2]). When enforcing Sect. 7, the regulatory agencies responsible for implementing the Endangered Species Act, as part of a process called "consultation," issue a Biological Opinion to the agency planning the action; this document guides and constrains the action agency's activities so that it will not cause jeopardy to the protected species.

Substantive standards such as this play a critical role in legal challenges to adaptive management plans. For example, *Center for Biological Diversity v. Rumsfeld* (2002) revolved around the adequacy of monitoring and mitigation strategies in an adaptive management framework that involved aquatic species listed under the Endangered Species Act. At issue were provisions in the U.S. Army's Fort Huachuca 10-year operating plan and the associated Biological Opinion from the U.S. Fish and Wildlife Service for water savings and monitoring of species status. The court found the plan for future management actions ambiguous and unsatisfactory in light of requirements under Sect. 7; it explained, "Mitigation measures must be reasonably specific, certain to occur, and capable of implementation; they must be

subject to deadlines or otherwise-enforceable obligations; and most important, they must address the threats to the species in a way that satisfies the jeopardy and adverse modification standards" (*Center for Biological Diversity v. Rumsfeld* 2002). These requirements, as articulated in this case, are now repeatedly cited in adaptive management case law.

A pair of cases reviewing adaptive management frameworks for operation of water projects on the Sacramento and San Joaquin Rivers is also instructive. At issue in *Natural Resources Defense Council v. Kempthorne* (2007) was the Biological Opinion issued for the Delta smelt *(Hypomesus transpacificus)*, a listed species under the Endangered Species Act. This adaptive management framework was designed to trigger management changes based on factors such as estimates of number of fish killed in water facilities, and spawning rates, and if thresholds were crossed, a working group could meet and submit recommendations that could potentially be undertaken by a separate management team. The court agreed with plaintiffs that this was too uncertain and unenforceable of a framework to support a "no jeopardy" conclusion. On the other hand, the same judge upheld the Biological Opinion for the anadromous fish species affected by the same water projects (*Pacific Coast Federation of Fisherman's Associations v. Guitierrez* 2008). In that case, the court determined that mitigation measures were adequately specific, requiring action if a certain water temperature was exceeded, and were included under the "Terms and Conditions" of the Incidental Take Statement, which, the court noted, is enforceable by law and therefore binding. The court was satisfied because mitigation measures were based on an enforceable standard, which triggered a non-discretionary mandate to reinitiate consultation with the regulatory agency before proceeding.

Another set of important lessons from the case law revolves around compliance with the procedural requirements of NEPA. Ruhl and Fischman (2010) note that larger-scale plans are often more suited to adaptive management then smaller projects or plans, due to the array of mitigation options available across large scales and the potential to "tier" analyses. Tiering of NEPA documents, where one NEPA document refers to analysis in another, often more broad and overarching NEPA document, appears to work well in the context of adaptive management. Adaptive management frameworks can be established at larger scales that consider cumulative impacts or programmatic standards, and more site-specific documents can tier to that analysis (Benson and Garmestani 2011). The challenge is striking the balance between adaptability in these large-scale plans with a satisfactory level of commitment to monitor results and take action if thresholds or trigger points are reached.

For example, adaptive management plans have survived legal review in cases involving the Northwest Forest Plan and the Sierra Forest Framework, both large-scale land management plans completed by the U.S Forest Service and done in accordance with NEPA. Each of these management plans acknowledges uncertainty, includes monitoring and adaptation, and employs tiering and supplementation, whereby additional environmental impact analysis is conducted in accordance with NEPA in light of new information or a change of circumstances, to balance the need for a broad planning framework with site-specific analysis (Ruhl and Fischman

2010). An instructive case is *Klamath Siskiyou Wildlands Center v. Boody* (2006), which revolved around the issue of when, under an adaptive management plan, supplemental NEPA analysis is required. The Northwest Forest Plan of 1994 amended all National Forest plans and resource management plans for Bureau of Land Management districts in the Pacific Northwest; it also established "Survey and Manage" requirements for individual species that would not be adequately protected as a result of the land management allocations. In 2000, the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) issued a Final Environmental Impact Statement (2000 FEIS) for amendments to the Northwest Forest Plan. The 2000 FEIS discussed the status of the red tree vole (*Arborimus longicaudus)* and stated that approximately five years of data collection would likely be necessary prior to contemplating any changes to its status under Survey and Manage requirements. In the summer of 2002, after doing the first annual review for red tree voles, the BLM downgraded the species' status, and in December 2003 the BLM removed the vole from the Survey and Manage designation completely. Neither of these decisions was accompanied by any NEPA document, and plaintiffs brought challenges under NEPA and the Federal Land Policy and Management Act. With regard to the NEPA claim, the BLM argued that the 2000 FEIS contemplated changes in Survey and Manage designations as part of an adaptive management framework. The court disagreed, holding that simply because an adaptive management plan *contemplates* potential changes, this does not obviate the need to comply with NEPA. The court explained:

> BLM is partly correct: the 2001 [decision] contemplated that moving a species from one survey strategy to another or dropping Survey and Manage protection for any species whose status is determined to be more secure than originally projected could occur under the plan. However, merely because the 2001 [decision] contemplated this type of change, it does not necessarily follow that all contemplated changes fall under the narrow definition of plan maintenance in § 1610.5-4 [BLM planning regulations]. If that were the law, BLM could circumvent the mandates of § 1610.5-5 (i.e., requiring environmental assessments and impact statements, public disclosure, etc.) by merely designing a management plan that "contemplates" a wide swath of future change. (Klamath Siskiyou Wildlands Center v. Boody 2006)

The court held that if an agency takes action contrary to what they found in a previous NEPA document, it must explain the rationale for the action and complete a supplemental NEPA analysis. In this case, the original FEIS did not provide any basis for the BLM's decisions; therefore, the judge explained, the decisions were plainly inconsistent with the prior plan and FEIS. NEPA also requires supplementation when there is significant new information, as there was in this case.

On the other hand, in cases such as *Oregon Natural Resources Council Action v. USFS* (1999), courts have indicated that an agency does not always need to prepare supplemental analyses if the adaptive management actions and collection of additional information were covered in a prior, programmatic environmental impact statement (EIS). In this case, where new information emerged regarding water quality and the status of some species under the Endangered Species Act, the court explained, "The plan's adaptive management approach is adequate to deal with any

new information plaintiffs have identified. If circumstances warrant, the [decision] gives the Forest Service and the BLM the flexibility to reduce or halt logging in order to comply with their statutory mandates" (*Oregon Natural Resources Council Action v. USFS* 1999). In other words, flexibility can be built into a NEPA assessment that anticipates changes in conditions and gives an agency the opportunity to adjust activities within certain limits. New information does not always require the preparation of a supplemental EIS, unless it fundamentally alters the predictions in the original EIS or if the response to the new information is plainly contrary to what was planned or predicted in the original EIS.

Finally, a suite of adaptive management cases involving the Army Corps' management of Missouri River dams (Ruhl and Fischman 2010) provide several lessons related to tiering and supplemental NEPA analysis. In a 2008 hearing, the court ruled that it was appropriate for the Corps to utilize an environmental assessment (EA), a less detailed type of environmental impact assessment, to determine whether impacts resulting from changes in its springtime water release strategies were consistent with management strategies that had been analyzed in a 2004 Final EIS (*In re* Operation of the Missouri River System Litigation 2008). The Corps determined that the impacts resulting from the new bimodal springtime release strategy were within the range of impacts considered in the 2004 Final EIS and determined that no supplemental EIS was necessary. At the same time, they also determined that a finding of no significant impact (FONSI) was not appropriate, because significant impacts, which had already been analyzed in the 2004 Final EIS, were predicted. The court ruled that the Corps' method of complying with NEPA while navigating the incorporation of a change in management strategy was adequate. It noted a supplemental EIS is only required when the change in management direction is one that was not within the spectrum of alternatives analyzed in the prior EIS. Even if an agency decides to implement aspects of an alternative not originally selected, as long as the impacts have been analyzed and no significant new information has arisen, supplemental NEPA analysis is not required.

Although it may take artful navigation of legal requirements, the case law indicates that adaptive management is not entirely incompatible with the framework of administrative decision-making and environmental law. Even where clear substantive standards are relevant, adaptive management can survive judicial review, but only when mechanisms are built into a plan that require clear and meaningful actions that are triggered when specific conditions are met. Several large scale plans, including the Northwest Forest Plan, species management on the Sacramento and San Joaquin Rivers, and flood control on the Missouri River, have all seen several rounds of litigation regarding their approaches to adaptive management (Ruhl and Fischman 2010). These types of plans may be best suited to an adaptive management approach because they involve ongoing decisions with iterative monitoring and often require further NEPA analysis that is tiered to a programmatic plan.

In summary, to satisfy legal requirements: (1) agencies must show that they will meet substantive standards; (2) if agencies acknowledge uncertainty, they must show that they have a clear monitoring and mitigation strategy that is within their power to implement if unexpected or unacceptable effects are detected; (3) tiering

can be an appropriate tool for pursuing adaptive management while complying with NEPA; and (4) courts do not always require additional NEPA analysis when new information comes to light, as long as any changes in action and predicted effects are within the range of what was analyzed in the original NEPAdocument.

Legal Enforceability of Commitments in Adaptive Management Plans

Although adaptive management can be written into a plan and survive legal review, a critical question is whether monitoring and adaptive planning commitments are enforceable under the parameters of administrative law once an adaptive management plan is underway. This is an important issue, given concerns that adaptive management in name can be used as a vehicle by agencies to pursue open-ended and discretionary decision-making. What if promises made to conduct monitoring or undertake mitigation are not kept? When are they enforceable?

In the NEPA context, mitigation measures, which may be promised as part of an adaptive management strategy, are not necessarily legally binding. Agencies are not required under NEPA to implement mitigation measures that are discussed in an EIS. Mitigation measures are scrutinized more closely when agencies make mitigation promises as a way to justify a FONSI in lieu of preparing an EIS. However, even in these cases, courts have not "required absolute certainty or any binding legal commitment to mitigation measures" (*Robertson v. Methow Valley Citizens Council* 1989). The general judicial trend is to require a "moderately high level of assurance" that mitigation measures will be performed, with the recognition that funding for monitoring and mitigation often must materialize after the decision point has passed (Owen 2009/2010).

A number of courts have held that NEPA does not give rise to a "private right of action" to enforce promises made in EISs (McGarity 1990). In some cases, courts have acknowledged that commitments in a decision are legally binding, but generally in cases where agencies issued a FONSI. It may be challenging, in either case, to bring a claim that an agency has not fulfilled commitments in a decision document. If there is no remaining federal action, courts may not intervene to require compliance with a record of decision for an action that has been completed (McGarity 1990). The Council on Environmental Quality, which interprets NEPA, explains, in cases where mitigation measures have not taken place, "if there is Federal action remaining, it is appropriate for agencies to consider preparing supplemental NEPA analysis and documentation and to pursue remaining opportunities to address the effects of that remaining action" (Council on Environmental Quality 2010). If there is federal action remaining, NEPA sometimes requires supplementation where the assumptions or commitments in an EA or EIS and the associated decision document are no longer valid; still, this is different than requiring that agencies do what they said they were going to do. Nonetheless, if NEPA supplementation is triggered when an agency fails to conduct promised mitigation, this could potentially stop

further action until the agency has completed the supplemental analysis. Although this may lend adaptive management plans some accountability, some scholars point to NEPA's supplementation requirements as a real and potential obstacle to practicing adaptive management (Ruhl 2008, Benson 2009). Agencies practicing monitoring and information-intensive adaptive management could find that new information repeatedly triggers additional NEPA analysis, which is not cheap or quick. However, in theory supplementing NEPA analysis when significant new information arises could be an appropriate vehicle for meshing adaptive management and NEPA.

This issue of supplementing NEPA analysis and revising plans based on new information is particularly complex in the context of land use planning. The Supreme Court ruled in *Norton v. Southern Utah Wilderness Alliance* (2004) (*SUWA)* that a land use plan is not an "ongoing" major federal action requiring supplementation. In this case, the Bureau of Land Management did not have to write a supplemental EIS due to increased off-road vehicle use in the planning area. Several district courts have followed *SUWA* and ruled that there is no ongoing action requiring NEPA supplementation once an agency approves a land use plan or issues a license, even if the assumptions in the plan are no longer valid (Blumm and Bosse 2007). In these cases, new information came to light, such as an Endangered Species Act listing or evidence that protective wildlife measures were not working as predicted, but still the courts did not require a supplemental EIS to be prepared. One review of post-*SUWA* case law summarizes that "federal agencies have experienced considerable, if not universal, success in arguing that they have no obligation to supplement their NEPA analysis after SUWA," particularly when it comes to decisions in land-use plans (Blumm and Bosse 2007).

Also as a result of *SUWA*, agency commitments to monitor are especially suspect when they are made in a land use plan. The Supreme Court ruled that the Bureau of Land Management's commitment to monitor off-road vehicle use—"like other 'will do' projections of agency action set forth in land use plans—are not a legally binding commitment enforceable under [the Administrative Procedures Act]," because a broad commitment to monitor is not a discrete action reviewable under the Administrative Procedures Act. The result is that discretionary processes such as the implementation of monitoring and subsequent mitigation are not generally justiciable when they are written into land use plans. However, the Court acknowledged that monitoring commitments *could* be written in a way that is enforceable if the action was written as a clear and binding commitment. If commitments in plans are written in ways such that monitoring is required *before* an action can be taken, this is still actionable under the Administrative Procedures Act. For example, Survey and Manage requirements under the Northwest Forest Plan required some species to be surveyed prior to ground disturbing activities. A failure to comply with such guidelines would be reviewable in court. Likewise, environmental groups have successfully challenged the Bureau of Land Management in court when it approved grazing leases without monitoring resource conditions, when the land use plan explicitly stated that the monitoring would occur prior to the authorization of grazing (Blumm and Bosse 2007).

Even outside the context of land use planning, the courts are often reluctant to force agencies to conduct monitoring. Biber explains that there are three primary reasons for this: "an agency monitoring program is neither a 'final' nor specific agency 'action' that a court can review or mandate under the [Administrative Procedures Act]; the level of compliance by an agency with a mandatory duty is not for the court to review, as long as at least some compliance exists; or, the apparently mandatory language in the statute, regulation, or plan is in fact only hortatory" (Biber 2011). As was the case with *SUWA*, courts will make a distinction between the reviewability of discrete agency actions and ongoing agency operations or conduct, with which they are reluctant to interfere. Courts are also unlikely to review the quality and extent of monitoring taking place, as long as some monitoring is occurring. For these reasons, and because intermittent court decisions are unlikely to lead to an effective ongoing monitoring program: "courts are more willing to step in when a monitoring duty can be framed as a precondition to the agency being able to pursue some other activity that it seeks to accomplish (such as a timber sale or road construction)" (Biber 2011).

The lesson is that monitoring and mitigation commitments made as part of an adaptive management framework can be made enforceable, and in some cases, with the cases involving Biological Opinions for fish species on the Sacramento and San Joaquin river systems, they must be made enforceable for an adaptive management plan to survive a legal challenge. Generally speaking, in order to be enforceable, plans must include specific monitoring requirements and timelines tied, through the use of explicit trigger points, to clear mitigation requirements, along with specific implementation timelines. When such a monitoring/mitigation program is part of a legally binding agreement, such as in the case of a permit issued under the Endangered Species Act, enforcement is more possible, especially where monitoring serves as a precondition for renewal. If monitoring is written into a land-use plan or project level decision in a way that it serves as a precondition for future actions, this can also be legally enforceable. Furthermore, if such a program served as the basis for a FONSI and was not implemented, NEPA supplementation could be triggered. In other cases, there may be a requirement for supplementation under NEPA if commitments in a record of decision are not kept. Other statutes with clear legal standards may provide additional vehicles for challenges to a promised monitoring/mitigation program that is either not succeeding or not occurring at all. However, enforceability within the parameters of administrative law is a significant challenge and one that requires concerted attention to the details of the adaptive management strategy and the legal context within which commitments are made.

Conclusion

Adaptive management holds great promise as an approach to complex social-ecological challenges that involve high degrees of uncertainty. When placed within the context of already well developed legal systems and institutions, the challenge

becomes how to best take advantage of the strategies and practices adaptive management has to offer while also complying with existing laws and requirements. There have been several suggestions for explicit congressional action to better facilitate adaptive management. One major recommendation is to provide an adequate and constant source of funding of adaptive management via annuities or some other method. In making this suggestion, Ruhl and Fischman (2010) observe that "[I]n the absence of congressional action, agencies should at least use NEPA to disclose funding needs for adaptive management and the environmental effects that would result from failure to find the means for implementation of monitoring, mitigation, or adjustment." This is in line with proposals that recommend NEPA as a "regulatory home" for adaptive management, which, among other advantages, would encourage more uniform implementation of adaptive management across federal agencies (Benson and Garmestani 2011).

In addition to funding resources, Ruhl and Fischman (2010) provide three other recommendations for Congress, 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) clearly articulate measurable goals, (2) identify testable hypotheses (or some other method of structured learning from conceptual models), and (3) state exactly what criteria should apply in evaluating the management experiments. These requirements would address the vast majority of non-budgetary problems with a/m-lite.

These recommendations highlight the need to provide more explicit guidance for agencies, while also allowing adaptive management to be tailored to specific contexts. A recent Congressional Research Service report entitled *Adaptive Management for Ecosystem Restoration: Analysis and Issues for Congress* (Stern et al. 2011) also provided a number of recommendations for congressional action that echo those made above. These include: (1) designation of a federal representative or agency to be in charge of implementing an adaptive management program; (2) assignment of specific groups or numbers of stakeholders to committees to oversee and recommend changes to adaptive management efforts; and (3) congressionally specified procedures for carrying out adaptive management, "including how the results from adaptive management research and monitoring are to be tied to operational or project-based changes" (Stern et al. 2011). All of these suggestions are compatible with proposals from those who argue that Congress should enact a National Environmental Legacy Act that would be reflective of resilience principles and provide an overarching framework for the administration of adaptive management (Flournoy 2008).

Given the unlikelihood of congressional action, however, the tension in adaptive management implementation between the need for administrative flexibility and accountability will continue. In the absence of legislation, more explicit and enforceable regulatory provisions—that provide public notice and an opportunity to comment—would be a significant step towards establishing the legal context of adaptive management procedures and protocols. The challenge would be to design

such regulations in a way that successfully avoids a "one size fits all" approach and allows agencies to adjust their management actions to the specific task at hand.

In the absence of some more specific regulatory grounding, continued use of informal agency guidance will leave adaptive management as more of an implementation tool than a management approach. Courts will continue to look to the underlying legislative mandates and assess whether adaptive management strategies are sufficiently rigorous and detailed to achieve legal compliance. This is perhaps the most likely outcome with respect to the relationship between adaptive management and law, and also the most disappointing. In order for adaptive management to reach its potential to transform environmental and natural resource management, a more substantial integration of adaptive management principles into legal and institutional requirements is necessary.

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