

Evaluating Next-Generation Environmental Policy Tools:  
Adaptive Management in the Bureau of Land Management

By

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**ABSTRACT**

The U.S. Bureau of Land Management (BLM) has begun to embrace the concept adaptive management as an alternative to traditional natural resource planning and management models. Adaptive management may provide BLM managers with a means to evaluate the effectiveness of management actions, the flexibility to adjust actions that have not proved effective, opportunities for rapid learning relevant to improved management, and improved public support for resource management decisions. To realize these benefits, BLM must include two critical elements in its adaptive management strategies: 1) adaptive design of management objectives, actions, monitoring and evaluation protocols and 2) effective collaboration among BLM and interested stakeholders. I evaluate three case studies of BLM adaptive management and find that none of the cases have fully included the critical elements. While there are some encouraging signs, the cases collectively reveal several key shortcomings. The strategies have not capitalized on the potential to improve management through learning. Two cases illustrate the risk that adaptive management may be misapplied to remove requirements for predictive impact analysis and mitigation, putting resources at risk. The cases have not featured a joint fact finding collaborative structure to provide stakeholders with early and integrated roles in the adaptive management process.

I also identify a number of institutional barriers that have prevented BLM from consistently including the critical elements. If BLM cannot remove these barriers by providing agency-wide policy and guidance for adaptive management, capacity building for local staff and stakeholders and adequately funded, binding implementation commitments, the agency will not realize the benefits it seeks and adaptive management will not represent a significant improvement to BLM's practice of natural resource management.

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## **CHAPTER 1: Introduction**

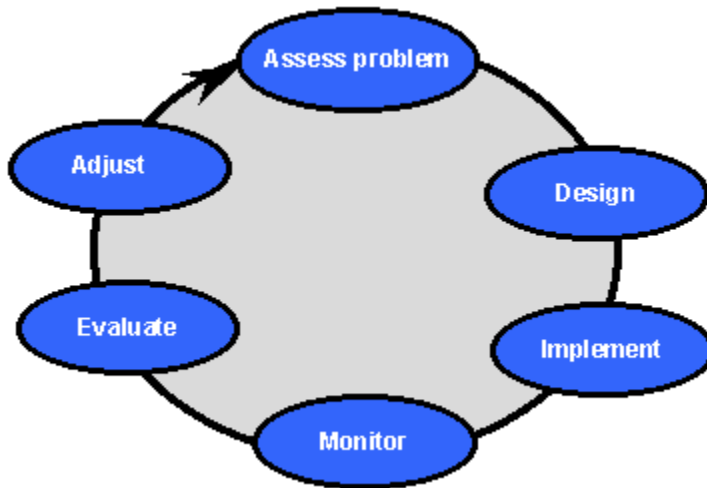
The Bureau of Land Management (BLM) has recently begun exploring, and in some cases implementing, adaptive management to address complex and challenging resource management decisions. The agency hopes adaptive management will allow it to acknowledge uncertainties surrounding the functioning of natural and other systems and what constitutes the “best” management actions, yet proceed with conservation and development projects based on current understanding of the systems. Monitoring of results and impacts of the projects would allow BLM to evaluate the effectiveness of management actions and, if necessary, rapidly adjust management to a set of actions that better meets the agency’s management objectives. This process of learning and refinement could, if implemented properly, ultimately produce policy and management outcomes that come closer to meeting resource management goals. By providing a role for stakeholders in defining goals, management actions and other stages of the adaptive management process, BLM also hopes to generate public support for management decisions.

The thesis presents two broadly defined elements critical to successful adaptive management projects: adaptive design and effective collaboration. I evaluate three current BLM efforts to implement adaptive management – on the Las Cienegas National Conservation Area, Steens Mountain Cooperative Management and Protection Area and in the Pinedale Anticline Oil and Gas Exploration and Development project – and find that they have inconsistently included the critical elements. I identify a number of institutional barriers that have led to the shortcomings in the studied cases. If BLM cannot overcome these barriers by providing the necessary policy and guidance, capacity building and funded, binding implementation

commitments, the agency will not realize the desired benefits and adaptive management will not represent a significant improvement to BLM's natural resource management practice.

### **Adaptive Management**

According to leading agency practitioner of the technique, the British Columbia (Canada) Ministry of Forests, "Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs" (Nyberg 1999). Walters and Holling summarize it even more concisely as, "Learning by doing" (Walters and Holling 1990). There are several points common to nearly all definitions of adaptive management: Resource managers and scientists do not and probably never will have complete knowledge of how natural systems function and how various management actions will affect those systems (Holling 1978, Walters 1986, Lee 1993). Adaptive management offers a way to move forward with resource management in the face of these uncertainties based on our current understanding of systems and interactions (Walters 1986, Lee 1999). By iteratively designing, implementing, monitoring and evaluating management actions, we can learn about the interactions among management and natural systems, gradually resolve some uncertainties and feed the acquired knowledge back into the process to develop policy and management options that better meet whatever goals have been defined by government and society (Holling 1978, Walters 1986, Lee 1993). Figure 1 graphically illustrates the iterative process of adaptive management.



**Figure 1. A simple adaptive management cycle (Nyberg 1999)**

Adaptive Management was originally conceived by C.S. Holling and others at the University of British Columbia in the late 1960s. To these resource ecologists, adaptive management represented an exciting new tool for testing hypotheses and assumptions about complex natural systems and learning how human interventions affected these systems. By combining management programs and research efforts, early proponents of adaptive management could account for the fact that many ecosystem functions are unique to the specific systems being studied (Walters 1986). Research emerging from actual management was genuinely representative of the systems being managed and directly relevant to its application in improving future management. Further, adaptive management allowed for the design of experiments with a scope and scale impossible in the laboratory or small experimental plot (Holling 1978).

Much of the literature on adaptive management focuses on applying management for research purposes. Ecologists describe in great detail a scientific method for defining uncertainties, developing hypotheses that might account for the uncertainties, using the hypotheses as a basis for elaborate models of ecosystem function and, finally, designing a range

of management actions – experiments – for the purpose of testing the hypotheses, validating the models and developing new knowledge as a basis for improving management (Holling 1978, Walters 1986, Walters and Holling 1990). The most valuable management experiments for learning are what Walters calls “disruptive probes” – “any change in management tactics deliberately intended to produce an informative response” (Walters 1986). A number of different probes may be implemented to test alternative hypotheses and models and to provide replication and controls for the experiment (Walters 1986, Lee 1993). This type of experimental program, designed to maximize learning, where multiple hypotheses and management actions are evaluated, is usually referred to as “active” adaptive management (Walters and Holling 1990). An oft-cited example is underway on the Colorado River at the Glen Canyon Dam. There a working group is testing a variety of hypotheses about how flow regimes affect fish habitat, recreation and other values (Meffe et al 2002, Lenard 2004).

Despite the focus on designing management experiments for maximum learning value, the literature of adaptive management also recognizes the need to balance research with more immediate management imperatives (Walters 1986, Lee 1993). Resource managers’ interest in resolving scientific uncertainties generally only extends as far as the new knowledge will help them meet their management goals and responsibilities which may include providing a stream of commodities for economic use, protecting endangered species, minimizing risk from natural hazards, ensuring compliance with laws and regulations, and responding to politicians and the public. These mandates can lead to lead managers to adopt a more conservative approach in which they avoid risky, large-scale management experiments that might compromise their ability to meet their objectives in the short term and be difficult to sustain over the necessary long term (Walters 1986).

Where management imperatives constrain research design, adaptive management plans are usually “passive.” Here, scientists and manager effectively select a single most plausible hypothesis and system model, assume its validity, and implement management actions expected to meet management objectives while testing the underlying hypotheses about system response (Walters and Holling 1990). In the Florida Everglades, it is assumed that engineering a water flow regime that resembles historic natural flows will improve wading bird habitat. Implementation and monitoring and evaluation will test this assumption. Managers contend that more “disruptive probing” of alternate hypotheses could pose an unacceptable risk to protected wildlife populations and would disrupt the human communities and economies of South Florida (Gunderson 1999, Walters 1997, Light et al. 1995). The accumulated weight of various non-scientific management imperatives and constraints has meant that the majority of adaptive management efforts to date have been passive.

Learning about ecosystems has real value only if the new knowledge eventually improves the ability to meet management goals and objectives (Walters 1986). Though scientists may have a longer-term perspective and managers a more immediate concern, both share the same overall goal in an adaptive management process: to improve the effectiveness of resource management efforts and the ability of managers to meet their objectives. Adaptive management actually provides a way of mitigating the tension between perspectives (Walters 1986). By working directly with managers, scientists are able to consider the applied utility of their research and better understand when, where, why and how their expertise can assist in developing better management strategies. Managers, in turn, are forced to acknowledge scientific uncertainties, the fact that neither they nor anyone else knows exactly what the “best” management strategies are, and that without a structured learning process, better strategies will evolve much more slowly

and only by luck and inefficient trial and error (Walters 1986, Lee 1993, Meffe et al 2002, Holling 1995, Gunderson et al. 1995).

Adaptive management is a tool for improving the ability to meet goals. It could be employed to protect the environment, maximize commodity production, manage for economic or social outcomes, or achieve a certain balance among different priorities. Along with mechanisms to meet goals and objectives, adaptive strategies for managing public resources must include a comprehensive process for defining those goals and objectives that accounts for the legitimate interests of stakeholders and generates public support for management decisions. In the following chapters I explore the processes for defining and managing for resource management goals.

### **Adaptive Management and BLM**

The Bureau of Land Management is among the public agencies that have begun to plan for and implement adaptive management. Within the United States Department of the Interior, BLM is responsible for 261 million acres of public land, primarily in the Western United States. These lands, amounting to approximately one-eighth of the area of the nation, include extensive rangeland and desert ecosystems as well as forests, high alpine, riparian and arctic resources. BLM also manages the subsurface mineral resources underlying an additional roughly 300 million acres. Like most federal resource agencies, BLM has a multiple-use mandate to exercise responsible stewardship and conservation of the natural and cultural resources under its control, provide a supply of commodities such as oil and gas, timber and grazing land for the nation's economy and provide access and recreational opportunities on public lands. Over the years, persistent controversy has surrounded BLM's efforts to balance these priorities.

Attracted by a potential for achieving its management objectives more effectively and efficiently, BLM has recently begun to implement adaptive management in a number of planning and management efforts characterized by high levels of uncertainty and public interest. BLM, joined by the Department of Interior, White House Council on Environmental Quality (CEQ) and other government entities, considers adaptive management to be part of a larger toolkit of “next-generation” environmental decision-making methods that are based on sound science and collaboration among stakeholders and government, are flexible and multi-disciplinary, often over entire-ecosystem scales, and integrate social and economic concerns along with environmental values (USIECR 2001, CEQ 2003, DOI 2004).

BLM has referenced a two-page Department of Interior (DOI) policy memo in most of its discussions of the adaptive management. The memo offers a decidedly passive definition of the approach, seemingly tailored for agencies dominated by resource managers rather than research ecologists: “A system of management practices based on clearly identified outcomes, monitoring to determine if management actions are meeting outcomes, and, if not, facilitating management changes that will best ensure that outcomes are met or to re-evaluate the outcomes” (DOI 2003b).

Adaptive management is applied to BLM lands and resources through the land use planning process. Land use plans, while not specifying every management action, form the basis for every action undertaken or permitted by BLM on public lands. The principles and processes of land use planning are dictated primarily by two federal laws. The Federal Land Policy and Management Act (FLPMA) requires that land use plans be prepared and that management be guided by the multiple-use and sustained yield concept, protecting environmental and cultural resources and providing for commodity production and public access. The National

Environmental Policy Act (NEPA) requires that the environmental impacts of all federal actions be considered and minimized where possible. Regulations implementing FLPMA and NEPA lay out a series of required process steps for preparing land use plans and environmental impact documentation. In practice, these steps are combined so that a single process yields a land use plan that also provides NEPA compliance. This process is referred to here as the “NEPA/Planning” process.

Resource Management Plans (RMP) are the top-level land use plans for each BLM Resource Area, typically multi-million acre tracts with diverse landscapes, habitats and uses. Under the framework of the RMP, further specificity on management actions and geographic scale is provided in project-specific implementation plans. Most of BLM’s experience with, and documentation of, adaptive management has been in preparing and implementing these land use plans.

BLM’s land use planning regulations describe a hierarchy of required planning decisions where specific goals and objectives must outline desired outcomes and subsequent management actions to achieve those goals and objectives are identified (BLM 2005). Below is a simplified and hypothetical example of this planning model (in practice, most goals will have multiple associated objectives and objectives will call for numerous management actions):

*Goal:* Manage to increase the desert tortoise population;

*Objective:* Increase the number of tortoise breeding pairs by 10% within 3 years;

*Management action:* Limit off-highway vehicle use to existing routes in critical tortoise habitat areas.

BLM adaptive management efforts have built upon this planning model and map closely to the DOI policy definition, establishing a process for evaluating the effectiveness of management actions in achieving the plan’s goals and objectives and adjusting the management

actions if they are found to be ineffective. The hypothetical tortoise example and the basic adaptive management framework illustrated in Figure 1 are generally representative of typical BLM adaptive management efforts:

1. *Assess problem:* Establish goals and objectives relative to desert tortoise;
2. *Design:* Develop management actions predicted to meet goals and objectives, including, “No designation of new off-highway vehicle routes in critical tortoise habitat areas;”
3. *Implement:* Enforce OHV restrictions in tortoise habitat;
4. *Monitor:* Document any change in number of tortoise breeding pairs;
5. *Evaluate:* What were the effects of OHV use on breeding pairs? Did management meet goals and objectives?
6. *Adjust:* If not, adjust OHV management actions, based on new information, to better meet goals and objectives.

For BLM managers, the potential to act in the face of uncertainty (Lee 1993, Lee 1999, Lee and Lawrence 1986, Walters 1986), evaluate effectiveness, and rapidly adjust management actions in response to new information are key attractions of adaptive management (BLM 2003, Brandenburg 2005). Currently, NEPA, other planning requirements and associated litigation have resulted in decision-making processes taking so long that decisions and management actions may be obsolete before they are implemented. Monitoring plans, where they exist, are often inadequate to determine whether predicted outcomes have been realized and even minor adjustments to management can invoke a re-initiation of the full-blown NEPA and planning processes (USFS 2002). NEPA/Planning decisions that call for monitoring to validate impact predictions and evaluate the effectiveness of management actions and enable efficient adjustments may represent solutions to what the U.S. Forest Service has termed a “process predicament.”

Consistent with an increasing emphasis on collaborative resource planning and management, adaptive management is seen by BLM as a process that can generate public support for agency decisions by facilitating participation of affected agencies and stakeholders (BLM 2003, DOI 2004). While the earlier, conceptual literature does not include stakeholder participation as an important definitional element of adaptive management, more recent work focusing on implementation or evaluation of adaptive management has called for varying degrees and forms of collaborative process as requirements for defining management goals and objectives and maintaining a durable, publicly-supported adaptive management program (Lee 1993, Lee 1999, Margoluis and Salafsky 1998, McClain and Lee 1996, Norton and Steinmann 2001, Shindler and Cheek 1999, Shindler et. al. 1999).

Generally speaking, collaboration is seen by current DOI policy as necessary for dealing with complex resource decisions of large scale and scope that will impact the livelihoods of large numbers of people. BLM realizes that much of its process predicament is the result of conflict among stakeholders and that any solution will require mitigating that conflict and building support for agency decisions.

A number of adaptive management efforts are underway on BLM lands. The efforts hope to capture the benefits outlined above – timely action despite uncertainty, the ability to evaluate the effectiveness of management actions and make adjustments rapidly in response to new information and durable, supported decisions – to better meet management goals and objectives and fulfill the agency’s multiple-use mission.

Even the passive versions of adaptive management articulated by BLM have the potential to provide the hoped-for benefits and to ultimately provide better environmental, social and economic outcomes. Adaptive management is a long-term process and a new concept for BLM

and agency efforts, including the cases studied here, are still in the relatively early stages. They have written plans and implemented management actions and monitoring plans, but few, if any, have reached the “adjust” stage. My examination of the Las Cienegas National Conservation Area, the Steens Mountain Cooperative Management and Protection Area and the Pinedale Anticline Oil and Gas Exploration and Development project shows an inconsistent application of two critical adaptive management elements – adaptive design and effective collaboration – and a likelihood that the hoped-for benefits will not be realized. The risk is that adaptive management becomes either simply a method for monitoring the effectiveness of decisions and management, without a means for real learning and rapid improvement, or a convenient way for BLM to avoid making difficult decisions. However, there are lessons to be learned that may allow adaptive management to emerge as a prominent and effective decision-making and management tool for BLM.

## **Methodology**

I evaluate three current BLM adaptive management efforts, individually and collectively, to determine whether and how two critical elements of adaptive management have been included in design and implementation and whether these efforts can be expected to provide an improved ability to meet short and long-term management goals, public support for decisions, or efficiency of process. I also identify a number of institutional barriers that prevent BLM from including the critical elements and offer some recommendations for overcoming those barriers. None of the adaptive management strategies have been in place long enough to have produced the results necessary to definitively evaluate these outcomes, though some outcome-related observations are made where possible. I collected data through interviews with BLM representatives and

participating stakeholders involved in each project. Official and unpublished documents related to the projects, provided data as well.

## **Case Studies**

The cases, three of BLM's most comprehensive, well documented adaptive management efforts, were selected to illustrate a variety of settings and scenarios where BLM has determined that adaptive management is the favored approach. They are not intended to be a representative sample of all adaptive management practice within BLM. Additional background information on the cases is included in Appendix A.

### Las Cienegas National Conservation Area

Located in the Sonoita Valley of southern Arizona, the 49,000 acres of Las Cienegas National Conservation Area ("Las Cienegas") are managed under an RMP completed in 2003. The landscape is a high desert of rolling grasslands punctuated by important riparian areas and is home to outstanding natural, recreational, cultural and historic resources. The primary planning and management concerns on Las Cienegas are maintaining the health of the resources, providing appropriate public access, and ensuring the viability of traditional land uses. Stakeholders have been closely involved with the planning for Las Cienegas through the Sonoita Valley Planning Partnership (SVPP).

### Steens Mountain Cooperative Management and Protection Area

The Steens Mountain Cooperative Management and Protection Area in southeastern Oregon ("Steens Mountain,") approximately 430,000 acres, and the surrounding 1.2 million acre Andrews Management unit are managed together under an RMP approved in 2005. Steens Mountain itself is a 30 mile long fault-block mountain that rises from the surrounding sagebrush

to near 10,000 feet. The area boasts outstanding scenic resources and hosts a diversity of ecological communities. There has been persistent conflict between local residents primarily concerned with maintaining ranching and other traditional uses on public lands and environmental interests who feel that the resources of Steens Mountain should receive greater protection. The federal legislation that designated the Cooperative Management and Protection Area also created the Steens Mountain Advisory Council (SMAC) to formally represent stakeholders, advise the BLM in managing the CMPA and promote “cooperative management.”

#### Pinedale Anticline Oil and Gas Exploration and Development Project

Pinedale, Wyoming sits in the Green River valley of western Wyoming. From just outside the city limits, the Pinedale Anticline, a geologic formation thought to contain at least 9 trillion cubic feet of natural gas, stretches south and east for 30 miles. The 197,000 acre project area also provides crucial habitat for important wildlife species and holds other valued natural, historic, scenic and recreational resources. In 1998, several oil and gas companies (“operators”) holding mineral rights for the area proposed to develop the natural gas resources on the Pinedale Anticline. BLM’s project plan for the Pinedale Anticline Oil and Gas Exploration and Development Project (“Pinedale Anticline project”), approved in 2000, permits up to 900 well pads and places a number of other conditions on the development intended to limit impacts to the surrounding resources.

Local residents and environmental interests were strongly opposed to the project, due to the potential for negative impacts to the highly valued resources located, literally in some cases, right on their doorstep. A significant public participation component was included in the NEPA/Planning process and part of the adaptive management strategy is the establishment of a Pinedale Anticline Working Group (PAWG) of various local interests and oil and gas operators

to advise and assist BLM. When the project plan was approved in 2000, one of the operators filed a lawsuit, challenging the authority of BLM to implement adaptive management and the PAWG structure, which delayed implementation of the strategy until mid-2004. Meanwhile, development of the natural gas resources on the Pinedale Anticline has proceeded at a pace more rapid than even the most aggressive estimates considered in the planning process.

## **CHAPTER 2: Critical Elements of Adaptive Management**

Adaptive management, particularly with the scope of issues and the geographic scale common to BLM efforts, is a complex process. The work of scholars and agency practitioners has provided a wealth of advice on how adaptive management strategies should be designed and implemented. Drawing on this work, this chapter identifies two critical elements that must be included in adaptive management strategies for BLM to manage responsibly in the face of uncertainty, validly evaluate management actions, rapidly adjust in response to new information and produce durable, supported decisions. The critical elements are:

- *Adaptive design* – to ensure that management actions are developed, monitored and evaluated to maximize the potential for effectiveness and learning;
- *Effective collaboration* – to provide a shared vision of management goals and broad agreements on ongoing management decisions, ideally through a joint fact finding process;

These elements do not amount to a comprehensive list of important adaptive management ingredients but represent the considerations most relevant and most critical to BLM's application of the adaptive management concept. In this chapter I define the elements, outline the rationale for including them in adaptive management strategies, and discuss some of the risks of not including them. In later chapters I discuss the elements as applied to three cases and identify barriers that must be overcome for the elements to be included in future efforts.

### **Adaptive Design**

Designing an effective adaptive management strategy requires thinking carefully about how information and uncertainty will be considered to shape management actions, monitoring plans and evaluation and response protocols that optimize the imperative of effectively meeting

short-term goals and objectives with the imperative of developing new knowledge that can improve the effectiveness of future management efforts. Adaptive design describes the nature of the decisions and evaluations that need to be made to develop and implement an adaptive management strategy – what managers need to do to manage adaptively.

Goals and objectives define what management is trying to achieve and guide the development of management actions, monitoring protocols, and the other components of adaptive design. Adaptive management plans need goals and objectives in the form of specific, measurable performance standards to serve as benchmarks for management. Returning to the desert tortoise example from Chapter 1, the objective to increase the number of breeding pairs by 10% might be difficult to measure and might later need to be adjusted to better meet the underlying goal of increasing the tortoise population, but it is a specific, measurable benchmark.

As important as developing clear goals and objectives is an explicit identification and acknowledgement of the uncertainties that adaptive management must contend with – questions about how different elements of the managed systems interact and how the systems will respond to various management actions. Uncertainties are identified by synthesizing existing knowledge and seeing where the gaps in this knowledge are. The complexity of these systems and interactions will never be fully understood and modeled. The need to proceed with management despite these persistent uncertainties is a fundamental reason for pursuing an adaptive management strategy (Walters 1986, Lee 1993).

To proceed in the face of uncertainty, actions must be based on informed hypotheses about how systems function and interact with management. Managers should use available scientific models and literature, baseline data and other predictions of management impacts and effectiveness to select actions considered most likely to meet goals and objectives. In the tortoise

example, the decision to limit OHV use in critical habitat areas would follow an acknowledgement of the uncertainty surrounding how vehicle use impacts tortoise populations and would be the product of analysis of the best available knowledge on the subject and an informed hypothesis about what the impacts would likely be.

This may seem to be an obvious point – that to act responsibly despite uncertainty, BLM should use the best available information to move forward with the best available management option – but critiques of adaptive management require an emphasis of the precautionary principle. Some feel that the identification of uncertainties may be used by BLM as a reason to defer difficult but important decisions on specific management actions (Brandenburg 2005a, 2005d, 2005e). A further fear is that adaptive management may be misapplied to forego careful analysis and allow industry and others unregulated use of public lands (CEQ 2003). The American Petroleum Institute has interpreted recent CEQ discussions of adaptive management as supporting a framework that would allow for permitting oil and gas drilling while deferring any determination of mitigation requirements until after monitoring results are available (Dragoo 2004).

Clearly outlined uncertainties also suggest where opportunities for learning lie and allow for an adaptive design that can develop the new knowledge necessary for improving future management actions. Although unlikely to resolve all or even most uncertainty, even passive adaptive management actions designed to test hypotheses about system function can serve as the experiments envisioned by Holling and Walters (Bormann 1999). Actions that go beyond testing implicit hypotheses of simple effectiveness, such as “limiting OHV use will be effective to increase the number of tortoise breeding pairs,” to ask how and why limiting OHV use will effect the tortoise will yield the most useful new knowledge (Gunderson et al. 1995). Valuable

management experiments may include replication, comparison of alternative treatments or other controls. Failure to integrate explicit hypothesis testing into adaptive management actions will retard the learning process, generate new knowledge only by trial and error, and compromise adaptive management's potential to develop improved management more rapidly than traditional approaches (Walters 1986, Lee 1993, Gunderson et al. 1995, Meffe et al 2002).

NEPA language and the DOI policy memo on adaptive management call, in general terms, for planning to recognize uncertainty. The NEPA/Planning process, however, has traditionally not emphasized an explicit identification of uncertainties and hypotheses in management design (DOI 2003b, BLM 2005). BLM land use planning regulations do require that decisions, in addition to defining goals and objectives, "must identify the actions anticipated to achieve desired outcomes," and that these actions should be selected in the plan decision (BLM 2005). Planning documents for adaptive management strategies should outline specific actions that represent responsible, precautionary management in the face of identified uncertainties while providing opportunities for testing hypotheses and learning.

All discussions of adaptive management recognize that monitoring is a cornerstone of the approach. Monitoring provides the information required for measuring success relative to goals and objectives and for improving future decisions (Hilborn and Sibert 1988, Margoluis and Salafsky 1998, Noss and Cooperrider 1994). BLM planning regulations require that all land use plans, including those with no adaptive management component, be monitored for implementation – whether management actions been implemented as planned – and effectiveness – whether actions have achieved plan goals and objectives (BLM 2005). Agency policy is generally silent on a third critical role of monitoring in adaptive management – enabling real

learning from management experience. Monitoring needs to collect the data necessary to credibly test the hypotheses embedded in adaptive management actions.

Monitoring implementation is a fairly straightforward task of maintaining progress reports. Gathering the information necessary to determine effectiveness is more difficult. Testing underlying hypotheses to develop new knowledge further adds to this challenge as “How?” and “Why?” are added to the basic question of whether management was successful. Designing a monitoring plan requires a refining of plan goals, objectives and uncertainties to select representative variables and specific indicators to actively monitor. Connecting cause (management action) to effect (change in indicator values) in complex real-world systems takes a considerable level of scientific rigor and requires careful consideration of factors such as frequency of monitoring, sampling design, availability of baseline data, who will monitor, consistency over time and data management (Dresler 2005).

Inadequate monitoring plans risk collecting either unreliable, irrelevant or simply not enough data. Without strong monitoring plans managers will be unable to make the evaluations critical to the adaptive management cycle: how well management is working to meet planning goals and objectives and how it might be improved to better meet goals and objectives.

A final ingredient in adaptive design is a clear and unambiguous protocol for evaluating monitoring data, determining whether management actions have met goals and objectives, and, if necessary, adjusting actions based on newly developed knowledge (Hilborn and Sibert 1988). Initial BLM discussions of adaptive management have described adjustments as being “triggered” if monitored indicators are not meeting the performance standards outlined in goals and objectives (BLM 2003, Lessard 1998). What sounds like a simple process will, when considering complex systems, rarely follow a simple “If A then B” logic. Interpreting monitoring

data to determine if standards are met poses a difficult scientific and often subjective challenge (Ehrmann and Stinson 1999). Distilling new knowledge from the data and formulating an appropriate management response proves similarly complicated. For instance, sampling data on tortoise breeding pairs might yield competing interpretations of whether the population is actually increasing. Have we learned that OHV restrictions are effective in increasing the number of breeding pairs or is some other factor responsible for the increase? How, exactly, should OHV restrictions be adjusted, if at all?

Exactly how these evaluations and decisions are attacked can vary. What is most important is that the adaptive management plan include a clear protocol outlining the approach: defining the performance standards, the frequency of evaluations, who will be involved, the range of potential management adjustments and other important details. BLM policy includes fairly detailed guidance on conducting periodic evaluations of the implementation and effectiveness of land use plans. The guidance, though not specific to adaptive management, covers several key points and can serve as a valuable starting point for developing the required evaluation protocols. In the next section I discuss the importance of involving stakeholders in evaluation decisions, through a collaborative joint fact finding arrangement.

Adaptive design entails bringing scientific method and rigor to the process of designing management actions, monitoring plans and evaluation and response protocols. With careful analysis and evaluation of implementation and effectiveness, proper adaptive design increases the likelihood that management can accommodate persistent uncertainty yet be successful in meeting objectives. By asking, “What do we need to know, how do we frame the questions, what information do we need to answer and how will we go about answering,” adaptive design enables the learning necessary to rapidly improve management practices.

## **Effective Collaboration**

Where adaptive design describes the necessary decisions and evaluations of adaptive management, the effective collaboration element describes how stakeholders should be involved in making those decisions and evaluations. In this section I outline a collaborative joint fact finding process in which stakeholders are identified and engaged, have an integral role in the adaptive management strategy, and are able to reach consensual agreements on the decisions and evaluations of adaptive management. This type of process is necessary to ensure that decisions account for the legitimate interests of stakeholders, tap the knowledge and experience of stakeholders, and are publicly supported and durable.

BLM has embraced collaborative approaches to adaptive management, and resource management in general, for their potential to mitigate stakeholder conflict and generate public support for agency decisions. BLM hopes that this support will yield more efficient planning processes and a freedom from seemingly perpetual litigation. More fundamentally, the very definition of “resource management” implies that human interests will be at stake in these decisions (Walters 1986). Agencies such as BLM have been granted the authority to manage resources on behalf of the public, but stakeholders – members of the public – have a legitimate interest in, and should have a meaningful role in, making the decisions that guide management (Wondolleck and Yaffee 2000, Lee 1993).

Effective collaboration is required for publicly supported decisions because those decisions always involve non-objective judgments that different stakeholders, with different values, will have different perspectives on (Lee 1993). Adaptive management strategies are full of such judgments. In the case of desert tortoise example, what are appropriate goals and objectives for tortoise management? Should management seek to maintain or expand the

population? What is an appropriate timeline for meeting objectives? How should tortoise protection objectives be balanced with objectives to provide OHV recreation? Adaptive management's acknowledgement of uncertainty and the need to proceed with management despite uncertainty make these judgments, including those seemingly based on scientific fact, even less objective and more difficult: What OHV management actions will best meet tortoise protection objectives? How much up-front analysis is enough to decide on a management action? What indicators should be monitored to measure effectiveness? What are breeding pair monitoring data telling us about actual population viability? What is appropriate OHV management response to a given evaluation of monitoring data?

An effective collaboration process must go well beyond the standard NEPA "scope and comment" mode of public participation. Joint fact finding is a collaborative process designed for addressing this type of science-intensive non-objective decision and is the ideal means for enabling effective collaboration in adaptive management. In joint fact finding, stakeholders, decision makers and scientific experts are identified and engaged in a structured consensus building process that allows them to work directly with relevant scientific and technical information as well as their own interests and values to negotiate shared understandings on the issues underlying management decisions. From this basis of shared understanding, the parties move on to reach consensus on the actual management decisions. (Ehrmann and Stinson 1999, Ozawa and Susskind 1985, Susskind and Cruikshank 1987). By employing joint fact finding and providing stakeholders with an integral role in decision making, BLM can manage conflict and generate the series of agreements necessary for managing resources in the face of uncertainty.

Effective collaboration must ensure that the full range of potentially affected stakeholders has an opportunity to participate in the process. BLM's stakeholders might include local

residents, representatives of local government, commercial or recreational users of public land, other agencies with an interest in management and local and national environmental interests. Regardless of the substantive issues, the simple fact of being left out of the process is a primary source of conflict and litigation in resource management (Susskind and Cruikshank 1987). Full participation will allow for consideration of the full range of issues that need to be addressed in designing goals, objectives and the other components of adaptive design. In joint fact finding, important stakeholders are identified through a conflict assessment, a canvassing of interests and issues that proactively determines which stakeholders should be involved and what the important management issues are (Susskind and Thomas-Larmer 1999). Unlike a simple open invitation to participate, a conflict assessment can identify stakeholders that might be reluctant to participate and determine what the conditions for their participation are.

For collaboration to be effective, stakeholders and BLM staff must have the capacities to fulfill their roles (Margoluis and Salafsky 1998, Wondolleck and Yaffee 2000). The parties must understand the principles of adaptive management. An embrace of uncertainty and ongoing management flexibility will not come naturally to all parties and may pose a threat to some interests, such as commercial and environmental interests who have historically preferred regulatory certainty and guarantees of resource protection. Working directly with scientists and scientific data may be difficult for stakeholders without technical training. Finally, engaging productively with other stakeholders and working toward consensus-based agreements is more difficult than simply submitting comments under more traditional processes.

BLM staff or an independent neutral party must exercise the capacity to effectively facilitate the process. One or more interests must not be allowed to dominate the process by effectively excluding others or due to superior capacity to participate. In empowering

stakeholders as partners in decision making, BLM must retain its own role as the ultimate decision-making authority (Wondolleck and Yaffee 2000). By relying too much on outside interests for decision making or implementation, BLM risks undesirably or unlawfully and abdicating its responsibility to manage public resources (Coggins 1996, 2001, Singleton 2002).

The nature of stakeholders' and decision makers' roles and responsibilities within the adaptive management process must be clearly defined (Norton and Steinmann 2001). BLM and stakeholders need to agree on and articulate exactly what questions stakeholders are expected to help answer and how their contributions will be integrated into the adaptive management plan (Lee 1999, Ehrmann and Stinson 1999, Ozawa and Susskind 1985).

Stakeholders must be convened at the very beginning of the process, buy in to the adaptive management approach and develop a shared vision of the desired outcomes of management (Ehrmann and Stinson 1999, Shindler and Cheek 1999). This vision, in the form of goals and objectives (e.g. increase the number of tortoise breeding pairs by 10% within 3 years), is the basis for all of the subsequent stages of the adaptive design. Even with a clearly defined and shared vision for outcomes, continuing uncertainty and the ongoing cycle of non-objective, potentially controversial, evaluations and decisions (e.g. deciding how to manage OHV use to increase the number of breeding pairs and how to monitor OHV effects on breeding pairs, evaluating what monitoring results are telling us about OHV effects on breeding pairs, and deciding what to do in response), point to the need for an ongoing role for stakeholders in the process.

Rather than providing for mere review of and comment on BLM decisions, joint fact finding involves stakeholders directly in the work of framing, researching, and making these evaluations and decisions. Stakeholders and BLM should work, in a consensus building process,

to achieve agreements on each of the points of adaptive design, and document these agreements as the basis for official BLM adaptive management decisions. These agreements will allow adaptive management strategies to function efficiently, with public support, to design management actions, evaluate their effectiveness and develop and apply new knowledge to improved management (Shindler et. al. 1999). Where effective collaboration proves impossible, the greater adaptive management approach may also be unfeasible.

### **Critical Elements Summary**

BLM has embraced the concept of adaptive management for its potential to improve upon traditional planning and management methods. Adaptive management promises an opportunity to learn from management experience, flexibility to adjust management actions rapidly in response to new information and durable, publicly-supported decisions. To capitalize on this potential, two critical elements – adaptive design and effective collaboration – must be included in BLM adaptive management strategies. I applied the following evaluation criteria to three case studies of BLM adaptive management to determine the presence or absence of the critical elements.

*Adaptive design* is represented by:

- Official planning documents with measurable goals and objectives, keyed to specific resource conditions, to serve as performance standards for what adaptive management is trying to achieve;
- Written acknowledgement of the specific uncertainties that management must proceed in the face of and attempt to resolve;
- Management actions designed to test underlying hypotheses and to develop new knowledge applicable to improving future management. These actions include comparison of alternative and control treatments, replication or other evidence of experimental design;

- Adequate predictive analysis to select management actions hypothesized to be most effective meeting goals and objectives. Adequacy is determined by how specifically actions are outlined in planning documents and the depth of analysis as described in environmental impact statements and by BLM staff and stakeholders;
- Monitoring plans likely to collect the information necessary to determine implementation, effectiveness and to develop new knowledge; Adequate monitoring plans are based on peer-reviewed scientific methods or are being developed in consultation with scientific experts. Plans must include detailed protocols for data collection;
- Clearly defined, written evaluation and response protocols that describe the process for interpreting monitoring data, determining implementation and effectiveness, distilling new knowledge and deciding whether and what adjustment is warranted.

*Effective Collaboration* is represented by a joint fact finding or similar approach that includes:

- Participation from the full range of affected stakeholders. This is indicated by an absence of any claims of exclusion from the process, BLM staff or stakeholder comments that all important interests are participating, or strategies' having included a formal conflict assessment;
- Capacities, among stakeholders and BLM staff, to work collaboratively toward agreements on science-intensive issues. Adequate capacities are indicated by documented agreements or progress toward agreements within a consensus building process and productive work with scientists and scientific information.
- A clearly defined, early and ongoing role for stakeholders in the adaptive management process, intended to produce documented agreements integral to the design and implementation of adaptive management;

### **CHAPTER 3: Case Studies and Discussion – Adaptive Design**

Adaptive design is the planning work of applying information – existing knowledge and uncertainty – to shape goals and objectives, management actions, monitoring plans and evaluation and response protocols that meet both the short-term imperative of achieving effectiveness and the longer-term imperative of learning. In this chapter I explore how the three BLM cases have or have not included an adequate adaptive design in their adaptive management strategies. Collectively, the cases are found to have adaptive designs that may be sufficient for evaluating the effectiveness of management actions but that sacrifice much of adaptive management’s potential for learning and rapid development of more effective actions. There is also the risk that adaptive management may be misapplied to avoid making important decisions or to forgo some of the important up-front work of analyzing proposed management actions prior to their implementation.

#### **Las Cienegas National Conservation Area**

The Las Cienegas strategy has the best adaptive design of the three cases. Still, it does not capitalize fully on the learning potential of adaptive management. The Las Cienegas RMP lists goals related to particular resource classes along with specific objectives under each goal. Goals concern upland, riparian and aquatic habitats, fish and wildlife management, cultural resource management, recreation management and visual resource management. Associated objectives are specific, usually quantifiable standards such as, “Maintaining ground cover and protective roots on over 90% of upper and lower valley bottom stream banks” (BLM 2003a). The goals and objectives in the Las Cienegas RMP represent detailed and tangible benchmarks that should

serve as an excellent basis for selecting, monitoring and evaluating actions under the adaptive management strategy.

The RMP goes on to prescribe a detailed set of management actions intended to achieve the desired future conditions and meet the goals and objectives. Specific actions such as, “*Organized groups will not be permitted to access areas with nesting Southwestern willow flycatchers during the breeding season*” (BLM 2003a) were designed to meet goals and objectives after a hard, predictive look at existing monitoring data and research findings that were relatively plentiful for the Las Cienegas area (Brandenburg 2005b).

The RMP, however, does not describe the management actions’ potential to serve as experiments and generate learning. While BLM has recognized that uncertainty is the fundamental reason for an adaptive strategy (Brandenburg 2005b), nowhere in the RMP are particular uncertainties acknowledged or testable hypotheses identified (BLM 2003a). At the implementation level, planning has more directly acknowledged uncertainty and the value of management experiments for learning. Vegetation management projects to improve grassland habitat are being implemented with alternate treatments and controls to test hypotheses about the value of mesquite control for habitat quality and how systems respond to different management techniques (Brandenburg 2005b).

BLM and SVPP are working to establish, or in some cases already have established, monitoring programs for the resource groups on Las Cienegas: aquatic habitats, riparian areas, upland vegetation, water quantity, threatened and endangered species, native fish, wildlife and visitor use and impacts. A partnership is also in place with the National Park Service’s Vital Signs Monitoring Network to look at resource trends over the larger Sonoran Desert region. Much of the work on monitoring plans focuses on the need to link cause and effect for credible

evaluations of management actions (Brandenburg 2005b). In most cases, peer-reviewed scientific protocols are being customized to map more directly to the specific standards set by the RMP's goals and objectives and the implicitly hypothesized effects of the selected management actions (BLM 2003a).

Work on the monitoring plans has included the development of protocols for evaluating the collected data – what findings should be made, how often and who will be involved. In most cases, BLM's technical team of agency resource specialists and consulting scientists will take the lead on evaluating the data, then present preliminary findings to BLM and SVPP. All three groups will then jointly determine what, if any, adjustments to management actions and monitoring plans are necessary (Brandenburg 2005b).

In the case of grazing management, BLM has continued and refined a successful monitoring, evaluation and response system that was pioneered by a local rancher several years ago. Guided by the RMP's rangeland health standards and associated monitoring, ranchers, BLM's Rangeland Resource Team and any other interested parties review grazing practices twice a year and suggest changes to grazing regulations as well as the ranchers' discretionary practices (BLM 2003a, Brandenburg 2005b). Finally, BLM has partnered with The Nature Conservancy to synthesize, from monitoring data, a "state of Las Cienegas" report from that will complement the resource-specific programs to make evaluations and suggest adjustments at a whole-ecosystem scale (Brandenburg 2005b).

With an emphasis on learning and a scientific method, the definition of adaptive management contained in the Las Cienegas RMP mirrors the concept of adaptive design developed here and in the more scientifically-oriented literature on adaptive management:

*Adaptive management is a formal, systematic, and rigorous approach to learning from the outcomes of management actions, accommodating change and*

*improving management. It involves synthesizing existing knowledge, exploring alternative actions and making explicit forecasts about their outcomes. Management actions and monitoring programs are carefully designed to generate reliable feedback and clarify the reasons underlying outcomes. Actions and objectives are then adjusted based on this feedback and improved understanding.*

The program put in place at Las Cienegas exhibits a good adaptive design that meets most of these criteria, with detailed and measurable goals and objectives, specific management actions that have been carefully designed, based on current understanding, monitoring plans with good potential to enable credible evaluations and defined evaluation and response protocols. The design outlined in the RMP, however, appears to fall short of a “systematic and rigorous approach to learning.” Implementation-level planning for vegetation management has shown a more explicit identification of uncertainties and inclusion of hypothesis testing. Future implementation of management actions that follows this lead will capitalize on the learning potential of adaptive management and yield better management more rapidly.

### **Steens Mountain Cooperative Management and Protection Area**

The components of adaptive design are only vaguely outlined in the Steens Mountain planning documents. Rather than recognizing the need to proceed responsibly in spite of uncertainty, BLM’s response to uncertainty in this case has been to defer the design and analysis of specific management actions. Monitoring, evaluation and response protocols are also under-developed.

The Steens Mountain RMP identifies desired outcome-based goals and objectives for management of 24 different resource classes. Generally not as specific as those in the Las Cienegas plan, the Steens Mountain goals and objectives are only vaguely measurable. Objectives to “limit” erosion rates or “improve” water quality can not, without further clarification, serve as adequate performance standards in an adaptive design. Many of the goals

were dictated or influenced by the legislation designating the Cooperative Management and Protection Area and the contentious process that led to the legislation (BLM 2004). As a result, the individual goals and objectives often reflect competing priorities and, taken together, may come into conflict. They do not represent a consistent overall vision for adaptively managing.

Management actions prescribed under each objective are actions only in a general sense. There is very little specificity on what BLM intends to do to meet the goals and objectives. For example, under the objective of, “Achieve or maintain a rating of PFC (proper functioning condition) for perennial and intermittent flowing and standing waterbodies...,” the associated action is, “Management prescriptions would be implemented or continued at the activity plan level designed to maintain, restore, or improve specific attributes of riparian/wetland areas to maintain or progress toward attainment of PFC.” Other objectives rely on the implementation of current or prevailing Best Management Practices (BMP), but without any explanation of what the BMPs actually are (BLM 2004, Brandenburg 2005c). This lack of specificity for management actions is a part of BLM’s adaptive management strategy aimed at retaining flexibility (Brandenburg 2005c). As demonstrated by the prescription for waterbodies above, BLM’s plan is to defer the work of designing specific management actions and forecasting their effects until the implementation-planning stage. Some stakeholders, particularly environmental groups, have questioned this strategy and the RMP’s ultimate value, “Rather than make these required determinations in the RMP, the BLM relies upon the land use planning theory of ‘adaptive management’ to put off any real decision-making in the plan, including an assessment of areas suitable and/or “chiefly valuable” for livestock grazing” (ONDA 2004).

Where BLM has specified actions in implementation plans, such as in a plan for a restoration project to remove invasive juniper from a grassland system, they have been likewise

been accused of not applying the best available existing knowledge to design actions and analyze impacts (ONDA 2005). Implementation planning for the juniper removal project, however, has included identification of uncertainties and hypotheses about how different vegetation treatments will affect the grassland ecosystem. It has been planned with alternative treatments and controls which should make it a valuable experiment for developing new knowledge (Brandenburg 2005c). In this case there is an evident tension between different sources of knowledge – predictive analysis and learning from experience.

The RMP's lack of specificity certainly implies uncertainty – that BLM does not know exactly what to do to achieve goals and objectives. The “Environmental Consequences” chapter of the RMP includes an “Assumptions” section for each resource class which makes some general statements about how potential management actions might affect resources. This would be ideal place for the RMP to identify the specific underlying uncertainties – the reasons why BLM does not know what to do. While this would not necessarily enhance the short-term effectiveness of subsequent actions, it would help justify the adaptive approach and create a framework for building learning opportunities into those actions. Unfortunately there is no discussion of these uncertainties (BLM 2004).

Monitoring plans for Steens Mountain, like Las Cienegas, are organized by resource class. At the time of the RMP approval, monitoring plans for some resources, such as cryptogamic soils, were complete and, by outlining protocols and integrating existing science, showed some promise for collecting the data necessary for evaluations. Others were still being developed, often in the context of a project implementation plan, such as plans for monitoring grassland habitat and juniper invasion. Several monitoring plans identified in the RMP, such as

for off-highway vehicle use and impacts, did not exist in any form (BLM 2004, Brandenburg 2005c).

Evaluation and response protocols were in a similar state. Aside from the overall periodic plan evaluation called for by BLM regulations, the only thresholds or evaluation protocols were those contained in the completed monitoring plans. This lack of consistency and rigor in monitoring, evaluation and response protocols has led to concerns among stakeholders that credible evaluations and adjustment decisions may not be possible for some resources (Brandenburg 2005d).

The Steens Mountain RMP is missing many of the ingredients of adaptive design. While focusing on generally-defined desired outcomes at the RMP level and dealing with the specifics of uncertainties, management actions, monitoring and evaluation at the implementation-plan level may be permissible under BLM planning guidance, it represents an undesirable deferring of important decisions and on-the-ground action. One of the advantages of adaptive management, after all, is the ability to move forward with management despite uncertainty. Just because BLM does not *know* what will work does not mean the agency should not do what it *thinks* will work.

Concerns have been raised at Steens Mountain that adaptive management and the idea of learning by doing may be used as excuses to avoid doing the up-front work of applying the best available existing knowledge to the design of management actions. By not laying out the full adaptive design framework in the RMP, where people can see and understand it all in one document, BLM may be contributing to confusion about how adaptive management is intended to work.

## **Pinedale Anticline Oil and Gas Exploration and Development Project**

The rapid pace and significant impacts of energy development on the Pinedale Anticline, combined with a four-year delay in implementing the adaptive management strategy, have challenged the project's adaptive design. Although it shows promise, the Pinedale adaptive design, like the other cases, does not capture the full potential of adaptive management for learning from management experiments. There is also a concern that pressures for increased energy production will result in inadequate predictive analysis of proposed actions.

The goals and objectives included in the Record of Decision for the Pinedale Anticline project are specific to the various resources of concern and are mostly oriented toward protecting the integrity of those resources while allowing exploitation of the gas resource in accordance with the operators' valid existing rights (BLM 2000). Most of the goals and objectives include measurable performance standards which should be an adequate basis for managing adaptively. Others are less quantifiable and require additional refinement.

A key factor in BLM's decision to build adaptive management into the project plan was the extraordinary level of uncertainty surrounding the project. Uncertainty surrounding the extent of impacts was compounded by several underlying uncertainties: How much gas is actually present in the reserve? How many wells will be required to exploit it? How rapidly will the field be developed? Will new drilling and mitigation techniques be applied and effective? Was new federal policy on energy development or land management forthcoming? None of these things are in BLM's power to control through the NEPA/Planning process. Nevertheless, a plan was urgently needed and the ability to rapidly adjust those things that BLM can control may provide a means for meeting goals and objectives in the face of this uncertainty. The project plan's alternatives analysis acknowledged these basic uncertainties by using a "three-dimensional

matrix” that analyzed alternatives under each of several possible development scenarios (BLM 2000). The Pinedale Anticline plan represented the best acknowledgement of uncertainty of the three cases. The uncertainty discussion, however, is limited mostly to questions of how development will proceed and is not specific on how development and BLM actions might impact resources and how management should accommodate or resolve those uncertainties.

Like the goals and objectives, the management actions identified in the project plan relate to bounding the operators rights to develop the gas field in order to protect the various resources in and around the project area. The referenced actions are quite specific and range from fundamental conditions such as the number of well pads and drill holes that will be permitted, to BLM’s package of “standard stipulations” for individual well pads, including prohibitions against surface infrastructure within 500 feet of water resources and or riparian areas or within 1/4 mile of an occupied dwelling, to additional mitigation measures tailored to protect the unique resources of the project area, such as seasonal drilling restrictions to protect wildlife (BLM 2000).

The selected management actions collectively represented the “Resource Protection” alternative in the NEPA/Planning process, expected to provide the highest level of protection among the alternatives analyzed. BLM’s analysis of predicted impacts was extensive, as is typical for energy development projects where widespread impacts are virtually guaranteed (BLM 2000, Brandenburg 2005e). While specific and well-researched, the actions outlined in the project plan are not framed as management experiments, with specific testable hypotheses or other features of experimental design (BLM 2000).

A recent proposal to adjust management, approved in late 2004, illustrates the challenge of designing actions under an adaptive management framework. One of the operators on the

Pinedale Anticline approached BLM with a proposal to remove the restriction on wintertime exploratory drilling operations. The “no winter drilling” stipulation was intended to minimize impacts to mule deer on their crucial winter range. However, the year-round drilling proposal had the potential to significantly reduce other resource impacts by reducing the total number of surface-disturbing well pads and duration of drilling required to recover the gas resource and by eliminating 25,000 truck trips per year. The proposal was also framed by the operator as a management experiment – despite uncertainty, management could proceed and would yield important information about mule deer wintering and the impacts of development (Questar 2004).

Some environmental interests did not support the proposal or BLM’s approval. Experimenting on crucial winter range of one of the world’s most significant mule deer herds was seen as too risky and inconsistent with the precautionary nature of the resource protection alternative selected in the project plan. Further, they argued that the proposal and decision did not adequately consider existing scientific research on winter range issues (Brandenburg 2005f). Here again is the tension between relying on existing knowledge and predictions and learning from experience. Owing to the lawsuit and delayed implementation of adaptive management, the year-round drilling decision was made before a fully-fledged adaptive design was in place. A more mature adaptive design might have more clearly identified the existing knowledge and remaining uncertainty regarding winter range. The proposal could then have fully utilized existing knowledge and served as an experiment to address the uncertainty. Stakeholder conflict might have been avoided as well.

Monitoring plans and evaluation and response protocols were not completed prior to the approval of the project plan. Following approval, the Pinedale Anticline Working Group and

affiliated task groups worked for approximately six months to develop monitoring plans based on plan goals and objectives before the process was halted in 2001. A Department of Justice opinion related to the lawsuit determined that the PAWG had been convened in violation of the Federal Advisory Committee Act (FACA) and dictated that all of the PAWG's work be thrown out. Aside from limited monitoring for wildlife and surface water, required by sections of the plan that were not subject to the lawsuit, no monitoring has been done in the interim. Since mid-2004 the reconstituted PAWG has formed task groups to redevelop monitoring and evaluation protocols for seven resource themes: reclamation, wilderness, water resources, transportation, cultural/historical/visual resources, socioeconomic impacts, and air quality. Some of the protocols have been completed and will be implemented for the 2005 drilling season, while others are not expected to be ready until 2006 or 2007. Notwithstanding the four-year delay, the monitoring plans appear to have the scientific rigor necessary to enable credible evaluation of management actions and include the procedural steps for collecting data (Brandenburg 2005e, 2005f).

Specifically targeted objectives, uncertainties, actions, monitoring and evaluations create the credible links in an adaptive management cycle. As an implementation-level plan focused on one overriding management issue, the Pinedale Anticline project is afforded greater specificity on all of these points and is, after four year delay, beginning to yield a good, if not ideal, adaptive design. Circumstances on the Pinedale Anticline, however, have dealt this adaptive design a stiff challenge. Energy development in this case poses significant threats to highly valued resources and the development's unmonitored, four-year head start may have already precluded some of the objectives adaptive management hopes to achieve. Monitoring, evaluations and responses, once they are implemented, may not be able to "keep up" with the

rapid pace of development. The example of the year-round drilling proposal illustrates how an inadequate adaptive design can put important resources at risk, either by not applying the available existing knowledge to selecting management actions or by failing to adequately monitor and evaluate actions for effectiveness and learning.

## **Discussion**

My review of adaptive design factors in the three cases yields encouraging signs that adaptive management may improve BLM's ability to evaluate the effectiveness of implemented management actions. The cases show widespread, if not universal, evidence of goals and objectives with measurable performance standards, adequate up-front analysis of proposed actions with existing information and rigorous, specific monitoring, evaluation and response protocols. Two concerns, however, may compromise adaptive management's ability to provide better management in these cases, and should likewise be considered in the design of future BLM adaptive management efforts.

First, the cases have not fully capitalized on adaptive management's potential to provide learning about managed systems and how management actions interact with those systems. Not only does adaptive management provide an opportunity for developing new knowledge by learning from experience, but it also promises that learning can happen more rapidly, with less cost and with greater relevance to management, when compared to commissioning traditional research (Holling 1978).

Scientific analysis in the NEPA/planning process has traditionally been limited to predictions of impact for different management alternatives, usually with little or no acknowledgement of their uncertainty. All three of the cases reflect a reliance on this typical mode of analysis (BLM 2000, 2003a, 2004, Brandenburg 2005 b, 2005c, 2005e) Had BLM

supplemented this typical upfront work to include explicit identification of uncertainties and an integration of hypothesis testing along with the projects' more promising components, these adaptive designs would have provided a stronger basis for learning and developing new knowledge. As uncertainties are identified in only the broadest terms, in the appendices and introductory remarks of the planning documents for these projects, the management actions prescribed in the plans are apparently not intended to serve as experimental "probes" that can attack uncertainties and quickly develop new knowledge directly applicable to improved management decisions.

At the implementation level, several examples of specific actions, including vegetation management on Las Cienegas and Steens Mountain and the year-round drilling proposal on the Pinedale Anticline, have demonstrated aspects of experimental design that should yield useful learning. However, it is unclear exactly what uncertainties are being targeted and what hypotheses are being tested, as this context is not provided in an adaptive design in the RMPs or project plan.

There is also a risk that adaptive management's emphasis on experiential learning may lead BLM to forego the up-front work of clearly defining management actions and carefully predicting their effects. In the Las Cienegas and Pinedale Anticline cases, the use of predictive impact analyses to select management actions was generally well demonstrated. Steens Mountain and the Pinedale Anticline winter drilling proposal show cause for concern.

While the case studies did not reveal evidence of a widespread deficiency, it is interesting to note that some of the same examples of implemented actions cited above – vegetation management on Steens Mountain and the year-round drilling on the Pinedale Anticline – have generated criticism among stakeholders about inadequate analysis of existing knowledge and

predicted impacts. The fact that operators developed the proposed winter drilling action is also cause for concern, given the oil and gas industry interpretation of adaptive management, that would eliminate some or all up-front analysis in favor of experiential learning.

A failure to consider the best available existing knowledge in designing management actions may put important resources such as mule deer winter range or grassland habitat at unnecessary risk in the short term. Retaining the practice of carefully analyzing existing information will provide greater confidence in the initially selected actions and a safer “fall back” in the event that, for any reason, monitoring, evaluation and response protocols are unable to validate the effectiveness of management and suggest adjustments.

There is widespread interest in streamlining the NEPA/Planning process by reducing the amount of time, effort and money it takes to reach decisions and implement management on the ground (CEQ 2003). It is unrealistic to expect a well-designed adaptive management strategy to provide this planning efficiency through a reduced need for predictive analysis. The potential of adaptive design for enhancing BLM’s ability to meet goals and objectives comes, rather, from the ability to rapidly learn from experience and develop improved subsequent management actions, as well as the ability to efficiently adjust to these improved actions.

Strategies that would simply monitor the implementation and effectiveness of management actions, and try something else if actions are not working, have been advanced as “adaptive management.” So have approaches that, in pursuit of streamlining process, would forgo predictive design and analysis of actions and focus on learning from experience.

Depending on the manager’s priorities, either might represent an improvement to current natural resource management practice, but can they legitimately be called adaptive management?

Neither fit the definition of adaptive design I have developed. To fully realize adaptive

management's potential to produce better management, in short and long term, the best available information and a sound scientific method should be used for both predictive analysis and designing learning opportunities into management actions.

At Steens Mountain and the Pinedale Anticline, there has been tension between advocates of predictive analysis and experiential learning, but there need not be a trade off between these two priorities. In fact, each can leverage the other: analysis of existing knowledge can focus learning opportunities by narrowing the range of uncertainty and focused learning will provide relevant knowledge to apply to design of the next iteration of management actions.

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## **CHAPTER 4: Case Studies and Discussion – Effective Collaboration**

Most current discussions of adaptive management consider it to be a fundamentally collaborative approach involving some form of participation of affected stakeholders in management decisions. I describe effective collaboration as a joint fact finding process that allows BLM and stakeholders to forge durable, documented agreements around the science-intensive but often non-objective decisions and evaluations of the adaptive management cycle. In this chapter I evaluate the collaborative element of the three BLM cases, relative to the joint fact finding model, and find that only the Sonoita Valley Planning Partnership comes close to meeting the criteria for effective collaboration. The most significant shortcomings relate to capacities for reaching consensual agreements and addressing scientific questions, and stakeholder roles that were not started early enough and are not integral to the adaptive management process.

### **Las Cienegas National Conservation Area**

Though not explicitly designed as a joint fact finding process, the Sonoita Valley Planning Partnership comes the closest, of all the cases, to representing the ideal collaborative arrangement for adaptive management. SVPP's open participation rule and capacities for consensus building and science have generated agreements that are genuine and represent the widest possible range of stakeholders. Stakeholders have had a key and effective role in developing all parts of the adaptive management strategy, from the earliest stages of identifying goals and objectives to outlining alternative management actions to informing monitoring plan design. SVPP also has a well-defined and ongoing role as adaptive management proceeds.

Soon after acquiring the lands that became Las Cienegas National Conservation Area in 1989, BLM initiated a traditional NEPA/Planning process where public participation was limited to the typical input on scoping and comment on the draft plan. Intense public concern over the future of the lands and criticism of the limited opportunity for input contributed to BLM's decision to shelve the initial planning process and proceed with a more collaborative effort involving the Sonoita Valley Planning Partnership (Brandenburg 2005b).

The SVPP is informally organized with no designated members or officers. It is not incorporated and was not formally convened by BLM or any other entity. The SVPP arrives at decisions and recommendations on a consensus basis and participation is open to any interested individual, agency, or organization, at any time. Participants have numbered in the hundreds at any given time and a core group of 30-40, representing most key stakeholder interests has been actively involved throughout and has developed the capacity to work with scientists and scientific information and to work productively in a consensus-based collaborative setting. Although a formal conflict assessment was not used to identify stakeholders and issues, SVPP has reached out to certain stakeholder interests, such as motorized recreationists, who had not been as actively involved despite their significant interest in how the public lands are managed. Outreach and the open, voluntary nature of participation have resulted in inclusion of all affected stakeholder groups. This broad representation, and the sheer number of participants, has made it nearly impossible for any single interest or individual to dominate the process (Brandenburg 2005b).

Despite the SVPP's informal organizational arrangement, its work has been carefully structured and targeted at its mission to, "...work together to perpetuate naturally functioning ecosystems while preserving the rural, grassland character of the Sonoita Valley for future

generations.” SVPP first came together in 1995 at the roughly the same time that BLM re-initiated planning for Las Cienegas. BLM, as a participant, made it clear that SVPP would have a key role as the primary forum for developing the content of the RMP and adaptive management strategy (BLM 2003a, Brandenburg 2005b).

The SVPP has forged agreements on all of the components of adaptive design and BLM has incorporated these agreements in the official planning documents for Las Cienegas. One of the first tasks the group took on was developing and agreeing on a comprehensive list of desired future conditions for the various resources on public lands in the valley (Simms 2000). BLM has adapted and incorporated these desired future conditions into the RMP document as the formal goals and objectives that serve as the basis for adaptive management. Coordinating with the NEPA/Planning process for Las Cienegas, SVPP then agreed on a set of alternative management strategies, designed to meet the desired future conditions, which BLM developed into the alternatives for the Draft Environmental Impact Statement (EIS). SVPP’s consensus on the best management strategy became the selected alternative in the Final EIS and management actions listed in the RMP. SVPP is working with BLM’s separate technical advisory group and other scientific partners to develop the monitoring protocols for different resource classes (Brandenburg 2005b).

SVPP’s role will be similarly integrated as the adaptive management plan is implemented. Official language in the RMP and the 1999 legislation that designated Las Cienegas a National Conservation Area calls, in general terms, for continued collaboration with SVPP and others (BLM 2003a). Participation in the SVPP has swelled as management actions have begun to be implemented. On-the-ground management is what stakeholders are most interested in and implementation issues have generated the most significant conflict of the

process as stakeholders raise concerns that what is being implemented is not what is called for in the plan (Brandenburg 2005b). Recognizing that the issues involved in implementing adaptive management are significantly different than those in planning, a facilitated workshop was organized in 2004 to further refine the ongoing roles and responsibilities of SVPP and the agency (SVPP et. al. 2004). With reoriented capacities, SVPP's ongoing focus is on the agreements that will enable implementation, monitoring, evaluation and adjustment of management actions (Brandenburg 2005b).

Adaptive management on the Las Cienegas National Conservation Area has enjoyed nearly universal public support and the ongoing process will likely be allowed to proceed efficiently with minimal conflict.

### **Steens Mountain Cooperative Management and Protection Area**

Despite the mandates for collaboration in the legislation creating the Steens Mountain Cooperative Management and Protection Area, stakeholders do not have a well defined, integral role in the adaptive management process. The primary forum for participation, the Steens Mountain Advisory Council operates as a traditional advisory committee but does not serve as a truly collaborative partner. The BLM and SMAC's own limited capacities have also limited the effectiveness of collaboration.

Since the 1990s, when it became clear that the Department of Interior was seeking an additional level of protection for the BLM lands on and around Steens Mountain, stakeholders have been actively participating in planning for and managing the area. Most of the primary stakeholder groups were represented on an official task force that worked with BLM and Oregon's congressional delegation to develop priorities and write the legislation that designated the Cooperative Management and Protection Area. Although the process eventually produced a

unique designation that all parties could live with, the deliberations were plagued by conflict between environmental advocates and local supporters of traditional uses and access.

The Steens Mountain legislation called for the creation of a new Steens Mountain Advisory Council (SMAC) “to advise (BLM) in managing the Cooperative Management and Protection Area and in promoting (its) cooperative management...” The legislation specifies further that the Secretary of Interior shall appoint 12 members to represent specific stakeholder interests and that the group’s decisions and advisory opinions be determined by a majority vote of at least nine of the twelve members. Representation on the SMAC was not determined through a conflict assessment, but BLM staff and stakeholders believe that the SMAC’s structure does fairly represent the important interests on and around Steens Mountain, and that the process leading up to the designation legislation was valuable for identifying the key stakeholders (Brandenburg 2005c, 2005d).

This organizational structure, particularly the two-thirds majority decision rule, has limited the SMAC’s capacity to serve as an asset to the adaptive management strategy. Interaction has been focused more on defending interests, and making sure they prevail when votes are taken, than in developing the shared understandings that should be the basis for adaptive management and the documented agreements that should support ongoing adaptive management decisions. Delays in the appointment process left the SMAC without a voting quorum for much of 2004 and 2005. The capacities of BLM and SMAC to resolve the scientific and technical questions that adaptive management revolves around have been limited by a decision not to convene a science advisory committee specifically authorized by the Steens Mountain legislation (Brandenburg 2005d).

The SMAC was chartered and first convened as the process for developing the Steens Mountain land use plan was already well under way (Brandenburg 2005d). As a result of this late start and the need to immediately implement management changes to satisfy provisions of the Steens Mountain legislation, the SMAC never developed a shared vision for the of the goals and objectives of management (Brandenburg 2005d). Jumping right into the work of reviewing and recommending management actions and monitoring plans, the SMAC found itself putting out fires related the specifics of wilderness access and grazing management and facing the same deep conflicts that had plagued the pre-designation task force (Brandenburg 2005c, 2005d).

Although the SMAC had the opportunity to vote on many of the actions and protocols that make up the Steens Mountain RMP, they were not involved in the design of the overall adaptive management strategy and have not had the chance to develop a common understanding and ownership of the adaptive management process. It was a BLM decision, with little or no collaborative input, to apply an adaptive management strategy on Steens Mountain (Brandenburg 2005c).

The SMAC's ongoing role in the adaptive management strategy as the Steens Mountain plan is implemented is similarly dis-integrated. Though particular BLM management decisions may be brought to the SMAC for review, they are not considered in the context of adaptive management. Adaptive management has almost never been discussed by the SMAC, except as something BLM is doing (Brandenburg 2005d). If collaboration with the SMAC were better integrated into the adaptive management strategy, some of the conflict over management decisions might be avoided. The controversy over whether there has been enough up-front analysis of juniper removal could be mitigated with a shared acknowledgement of uncertainty and a commitment to collaboratively implement, monitor, evaluate and adjust if necessary.

BLM has also partnered with numerous other stakeholder organizations, separately from the SMAC structure, to implement management projects. Environmental groups working on ecosystem restoration, ranchers working on fencing issues and others are involved, but these stakeholders likewise have no formal role in the adaptive management process.

BLM has described the adaptive management strategy on Steens Mountain as a way to explain what they are doing and to reassure people rather than as way to integrally bring stakeholders into the process (Brandenburg 2005c). With no real role in the adaptive management process and a glaring lack of capacity for negotiating agreements and dealing with scientific issues, the Steens Mountain Advisory Committee will not provide the effective collaboration critical to a viable adaptive management strategy.

### **Pinedale Anticline Oil and Gas Exploration and Development Project**

The adaptive management strategy for the Pinedale Anticline project includes a collaborative arrangement that has been challenged, like other elements of the strategy, by the extraordinary series of events that have unfolded since the project plan was approved in 2000. The process has representation from all important stakeholder groups and relies on a consensus building decision model, but its capacities are being tested by the amount of work to be done. Stakeholders' role in the process is well defined and integrated with all of the key steps of the adaptive management cycle, though an earlier start to structured collaboration might have provided an opportunity to avoid conflict that led to a significant delay in the implementation of adaptive management. Collaboration on the Pinedale Anticline shares some features with the ideal joint fact finding model and, despite a few shortcomings, may be able to build the series of agreements necessary for a supported, efficient adaptive management process.

The project plan for the Pinedale Anticline was developed in the midst of intense public scrutiny and concern over how the natural gas project would impact the surrounding ecosystems, landscape and quality of life. Public participation in the planning process was a large contributor to the plan's goals, objectives and prescribed mitigation actions. Recognizing the uncertainty in exactly how the gas field would be developed, and the continued public concern over potential impacts, BLM incorporated an adaptive management strategy into the project plan (Brandenburg 2005e).

The strategy created the Pinedale Anticline Working Group to develop monitoring and evaluation protocols and to assist BLM in implementing adaptive management. Convened shortly after the project plan was approved, the PAWG consists of nine members, appointed by the Secretary, from the ranks of the oil and gas operators, local residents, environmental organizations, recreational interests, BLM and other interested government agencies. The PAWG also manages seven task groups organized around different resource classes. Between the PAWG and task groups, over 100 stakeholders are actively involved in the process and most involved believe that the full range of interests is represented in the collaborative process (Brandenburg 2005e, 2005f). According to BLM, the extensive, but less structured public participation in the development of the project plan effectively served as a conflict assessment, identifying key interests and issues (Brandenburg 2005e).

The task groups provide the technical capacity, with participation from agency and citizen scientists, to deal with the specific resource issues and membership is voluntary. Both the PAWG and the task groups reach decisions by consensus and many of the participants came to the process with the capacity to work collaboratively, developed from working on other projects in Wyoming, where collaborative approaches are relatively common. These factors enabled the

original PAWG and working groups, despite billions of dollars worth of vested interests, to develop a shared vision of environmentally sound natural gas production and to work toward agreements on the design of monitoring and evaluation protocols (Brandenburg 2005e, Mechem 2004).

The PAWG and task groups are facing a number of challenges to their collaborative capacities as they begin to implement adaptive management. Participation in the task groups has begun to show signs of attrition. The work involved has proved to be extremely difficult and time consuming and most of the non-agency, non-operator participants are volunteers who need to take time off from work receive and receive no compensation (Brandenburg 2005f). There is hope that, as the adaptive management strategy is implemented, tangible on-the-ground results of stakeholder participation will re-energize participants (Brandenburg 2005e). A corollary to the problem of burned-out volunteers is the fact that representatives of oil and gas operators are professionals who are paid by their employers for their time and travel and often possess superior negotiation skills (Brandenburg 2005f). Independent facilitators have been brought in to assist task groups that have encountered difficulty building consensus due to these imbalances or other reasons. BLM and other agency representatives, stretched thin by competing work demands in the booming gas field, are also struggling to fulfill their roles on the task groups, potentially compromising the task groups' access to important information and technical expertise (Brandenburg 2005f).

The adaptive management strategy for the Pinedale Anticline is clearly outlined in the project plan and depends on stakeholder collaboration at all stages. In addition to developing monitoring and evaluation plans, the PAWG and task groups have ongoing responsibilities, once the adaptive management strategy is implemented, to assist with monitoring, perform

evaluations, and recommend management adjustments to BLM (BLM 2000). Agreements reached to date on monitoring plans have been documented and incorporated in official procedures. Future agreements on evaluations and adjustment recommendations will also be documented and likely implemented by BLM. This well-defined and integrated role has earned widespread stakeholder support for the adaptive management strategy (Brandenburg 2005e) and provides the basis for the ongoing series of agreements needed for the process to retain support as it is implemented. Further reinforcing the shared ownership of the process is the fact that BLM's participation in the PAWG and task groups is as a participating member of a working group, distinct from an advisory group arrangement where BLM retains sole responsibility and might consult with stakeholders only occasionally.

Despite the PAWG and task groups' integral and ongoing role, and generally shared vision for adaptive management, the biggest challenge the process has faced might have been avoided had this collaborative structure been in place earlier. The oil and gas operator that opposed the adaptive management strategy filed suit after BLM's decision to apply adaptive management was included in the final project plan. Had the decision been made more collaboratively, with an opportunity for the operators to jointly develop the strategy and support for it, prior to its inclusion in the plan, the four-year delay in implementing adaptive management might not have occurred.

The four-year delay has hobbled all aspects of the adaptive management strategy, including effective collaboration. The example of the year-round drilling proposal, considered before the PAWG and task groups had been reconvened, illustrates the challenge of trying to manage adaptively without a structured, ongoing role for stakeholders. A documented agreement

on the implications of baseline mule deer data and remaining uncertainties, and a collaborative design of the appropriate management action, might have yielded a proposal with broad support.

When the adaptive management process was officially re-started and the PAWG re-convened in 2004, the collaborative structure, including broad representation, a consensus decision rule and the roles and responsibilities were retained. The extraordinarily rapid pace of development on the Pinedale Anticline since the project plan was approved has made it a struggle for the PAWG, task groups, BLM and the adaptive management process to catch up and keep up. However, there is still an estimated 10-20 years of natural gas exploration and 70-100 years of production activity anticipated that can be adaptively managed.

## **Discussion**

In all three of the cases, BLM's decision to apply adaptive management was made largely in response to high levels of public concern. BLM has acknowledged, in each case, an important relationship between public participation and adaptive management. The efforts, however, have pursued different approaches to enabling participation, none of which fully represent the ideal joint fact finding model outlined in Chapter 2. The approaches that are most like joint fact finding, led by the Sonoita Valley Planning Partnership at Las Cienegas, demonstrated the best results in achieving the shared understandings that form the benchmarks for adaptive management and the best potential for producing the ongoing agreements required for adaptive management to proceed, without conflict, through the cycle of decisions and evaluations. BLM's attention to issues of capacity, an early start and an integrated role for stakeholders should maximize the effectiveness of collaboration as the three projects move forward and can inform the collaborative elements of future adaptive management efforts.

Although none of the cases featured a formal conflict assessment, each has succeeded, according to most observers, in achieving the participation of all key stakeholder groups. This representation alone, however, has not been sufficient to avoid conflict and generate agreement on the various management questions. The organizational structures that include a larger number of participants have shown a greater capacity to resolve competing interests and work together on the substantive decisions of adaptive management. The sheer amount of work required in developing and implementing monitoring plans for a variety of different resource classes is more manageable with a larger group sharing the labor. The SVPP at Las Cienegas and the PAWG groups in Pinedale, each with over 100 participants have made real progress toward implementing adaptive management while Steens Mountain's 12-member SMAC has remained mired in conflict. These divergent outcomes are due to other factors as well but it seems clear that more people working on the challenges of adaptive management have been more effective than fewer.

The SVPP and PAWG's capacities for consensus building have led to agreements on monitoring and evaluation protocols. As plans are implemented, the consensus building process will encourage stakeholders to move beyond simply defending interests to definitively make the evaluations and decisions required of adaptive management (Brandenburg 2005b, 2005e). Building consensus can be frustrating and time-consuming, but is preferable to the conflict endemic to the Steens Mountain Advisory Council where a two-thirds majority decision rule has led to stakeholders fiercely defending their interests at the expense of agreements. Decisions that are reached at Steens Mountain may not be broadly supported and will be open to challenge from stakeholders on the short end of the vote (Brandenburg 2005d).

Finally, SVPP and PAWG's capacities for collaboration are distinguished by the fact that BLM, while retaining ultimate authority, participates as a working partner. This has contributed to a sense of shared responsibility, ownership and, ultimately, support for the adaptive management strategies (Simms 2000, Mecham 2004). The SMAC arrangement, where stakeholders are more likely to merely review and advise agency decisions than to actively participate in making them, has not generated comparable levels of support (Brandenburg 2005d).

In the future, BLM should set up collaborative structures that include many individuals, representing the full range of interests, in a consensus building process with BLM as a working partner. This suggests the need for structures other than traditional advisory committees like the SMAC.

All of the cases featured extensive public participation and input from the early stages of planning. However, only the Las Cienegas process had a structured collaborative process from the beginning of the planning process through to implementation. The SMAC and PAWG, by contrast, were convened mid-way through and following completion and approval of the land use plans, respectively. The SVPP's early start allowed stakeholders to develop and understanding of, and support of, adaptive management before the decision to apply it was made. The SMAC, a product of the decision to apply adaptive management, never had the opportunity to develop an initial understanding and buy-in and jumped right into details. On the Pinedale Anticline, the failure to develop broad understanding and support early in the planning phase may have led to the delay in implementation that has threatened the viability of the entire adaptive management strategy. The volume of simple public comment received during of the Pinedale Anticline and Steens Mountain planning phases was not sufficient generate broad support. For future projects,

BLM should follow the lesson of Las Cienegas and establish a structured collaborative process prior to, or in the earliest stages of, the land use planning process.

The role of stakeholders in adaptive management must not only be defined and ongoing, but should be integral to each step in the adaptive management process. Agreement on each of the implementation, monitoring, evaluation, and adjustment decisions is best achieved when stakeholders have a defined role in actually making each of those decisions. The PAWG's responsibilities map directly to the steps of adaptive management and are clearly documented in the Pinedale Anticline project plan. SVPP, having completed its work to develop the Las Cienegas RMP has agreed on a detailed strategy for implementation that clearly defines the roles of the stakeholder task groups. The SMAC's ongoing role is defined, in general terms, by federal legislation, and they are active in working with management issues on Steens Mountain, but they are not plugged into the adaptive management process. By not integrating SMAC into the process, BLM has diminished the chances that it will be able to implement, monitor and evaluate and adjust management actions without ongoing conflict and delay.

In many existing BLM management scenarios, having access to an active advisory committee that represents all the important stakeholder groups might represent a significant improvement to BLM's collaborative capacity and ability to generate support for management actions. For adaptive management, as defined here, an arrangement such as the SMAC and its role in the Steens Mountain adaptive management process does not approach the ideal joint fact finding model and does not meet the requirements for effective collaboration.

Finally, it should be noted that the joint fact finding model for effective collaboration outlined here is necessary but not sufficient to generate the desired outcomes of shared understandings, durable agreements and public support that are the real critical elements of

adaptive management. The framework is a process recommendation, for how to deal collaboratively with the issues and interests at stake, but the nature of the issues and interests themselves matters as least as much as the process.

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## **CHAPTER 5: Institutional Barriers and Implications**

BLM's failure, in the three studied cases, to consistently include the critical elements in adaptive management strategies is due to a lack of centralized, agency-wide policy and guidance for the design and implementation of adaptive management, a failure to build the necessary capacity among local agency staff and stakeholders for productive, science-intensive collaboration and an absence of implementation commitments binding BLM to actually follow its adaptive management plans. Acknowledging that management must proceed despite persistent uncertainty, building experimental design into management actions and sharing authority with outside interests in an ongoing cycle of decisions are foreign concepts for BLM. Although it seems like a simple process, adaptive management strategies will require more than monitoring and setting up an advisory committee if they are to provide a significant improvement over BLM's current resource management practice.

In this chapter I look at the cases comparatively and collectively, and at agency-wide factors, to discuss some of the institutional barriers that have prevented the critical elements from being more consistently applied. I also offer some recommendations for removing these barriers so that future efforts can capture the benefits that adaptive management offers.

### **Agency-wide Policy and Guidance**

BLM planners and managers have been encouraged to pursue adaptive management, yet the agency has provided virtually no guidance for what adaptive management is or how it should be applied. Guidance is limited to a two-page DOI policy memo (DOI 2003b). BLM's Land Use Planning Handbook, revised in 2005, only references the DOI memo and offers that adaptive

management guidance will be developed in the future (BLM 2005). In each of the studied cases, the decision to apply adaptive management, the working definition of adaptive management and the design and implementation of the adaptive management strategy were products of local BLM staff, and in one case local stakeholder, initiatives. Although there is value in learning from the experience of these and other local efforts, BLM should not expect that these examples alone can define an effective new approach to resource planning and management. If BLM intends to adaptively develop the adaptive management approach, the agency should remember that adaptive design requires not only learning from local experience, but coordinated policy and guidance to provide a consistent definition of the approach and the required critical elements.

It is not surprising that the three independent efforts have inconsistently included the critical elements and show varying potential for providing the benefits that BLM seeks. Most lacking is guidance defining and mandating the components of adaptive design. The DOI memo devotes only a few sentences to the notions that adaptive management is a response to uncertainty and that actions must be monitored and changed if necessary (DOI 2003b). BLM's Land Use Planning Handbook offers general guidance for monitoring and evaluating plans for implementation and effectiveness, but little that could provide for developing new knowledge or suggesting what adjustments are necessary.

Some components of adaptive design, such as goals and objectives based on desired outcomes and analysis of the predicted impacts of management actions, were represented relatively well in the cases. These things are required under existing policy, and existing guidance details how to achieve them (BLM 2005). Furthermore, BLM has years of experience preparing goals, objectives and environmental assessments.

Policy and guidance requiring and explaining the newer adaptive design components, unique to adaptive management, would have enabled BLM to better acknowledge uncertainty, target management experiments and maximize learning opportunities in all of the cases. The Steens Mountain strategy would not have deferred most of the important adaptive design decisions, and adaptive management would not be applied on the Pinedale Anticline as a means to expedite decisions while placing valuable resources at unnecessary risk.

There is considerably more policy and guidance available within BLM and DOI for engaging stakeholders in collaborative resource management. Interior Secretary Norton has advanced a “4 C's philosophy: Conservation through communication, consultation and cooperation,” backed by official DOI policy statements (DOI 2003a, 2003c, 2004). BLM's land use planning handbook emphasizes engaging stakeholders in planning and includes an appendix on collaborative principles that echoes many of the points made here (BLM 2005). These resources have helped the Las Cienegas and Pinedale Anticline adaptive management strategies achieve measures of success in setting up effective collaborative structures.

Few of these resources, however, address the particular ongoing, scientific challenges of adaptive management and none prescribe the joint fact finding model that is ideal for addressing these challenges. Policy and guidance specific to adaptive management and joint fact finding would have enabled BLM at Steens Mountain to provide a larger number of stakeholders with a more integral role in adaptive management decisions and would have allowed the PAWG in Pinedale to make an earlier start and continuous progress on the work of adaptive management on a rapidly developing natural gas field.

To its credit, BLM has initiated an effort to develop agency-wide policy and guidance for adaptive management (BLM 2003, 2005, Brandenburg 2005). For BLM to realize substantial

benefits from current and future adaptive management efforts, policy and guidance needs to be comprehensive in defining the critical elements – the complexities of adaptive design and joint fact finding arrangements to facilitate effective collaboration – and the requirements for integrating them into adaptive management strategies. It is important that this effort produce results quickly, as adaptive management is already happening, and already facing challenges, on BLM lands. Competing definitions have been advanced by industry that would sacrifice much of adaptive management’s potential for rapidly achieving better environmental outcomes.

In addition to defining and requiring the critical elements, policy and guidance need to ensure that adaptive management strategies are consistent with the variety of existing legal and regulatory mandates that bound BLM’s practice of resource planning and management. BLM’s effort to develop adaptive management policy and guidance has focused on enabling an efficient adaptive design under NEPA and effective collaborative structures under FACA (BLM 2003, Brandenburg 2005).

### Adaptive Design and NEPA

A key attraction of adaptive management is the flexibility to rapidly adjust management actions in response to new information. Current policy for applying NEPA and FLPMA to BLM land use planning decisions, that requires a re-initiation of the time- and resource-intensive environmental assessment and plan revision process for many management adjustments, seems to constrain this flexibility. BLM has considered a number of distinct planning tactics for enabling rapid flexibility within the NEPA/Planning framework. Each tactic has strengths and weaknesses relative to adaptive design but more importantly, BLM policy has not authorized any of the tactics as viable or offered any other guidance on how to implement evaluation and response protocols under the planning statutes.

On the Pinedale Anticline, managers hope to propose adjustments that will qualify for Findings of No Significant Impact (FONSI) and require only minimal additional analysis under existing NEPA/Planning procedures (Brandenburg 2005e). This is a traditional and authorized approach, but it will not apply to many management adjustments that entail significant or complex changes and the likelihood of some environmental impact. It is likely that many, perhaps most, adjustments that will be proposed within an adaptive management strategy will not qualify for FONSI. In fact, any adaptively designed adjustment, with acknowledged uncertainty of results, should face difficulty qualifying for a forecasted FONSI.

A second tactic, considered at Las Cienegas and on the Pinedale Anticline, would leverage the initial alternatives analysis of the NEPA/Planning process to “pre-approve” a menu of management actions that can be selected as adjustments, without incurring significant re-planning (Brandenburg 2005b, 2005e). The initial analysis will be most valuable for adaptive design if, as in the Las Cienegas case, all of the initially analyzed alternatives can be reasonably expected to meet a single agreed upon set of goals and objectives. The pre-approval approach has been discussed by BLM planners in early attempts to provide guidance on adaptive management (BLM 2003). The decision of which pre-approved action to select as an adjustment will still need to be made. This approach will allow especially rapid flexibility if contingent agreements, specifying which actions should be implemented in the event of certain performance standards not being met, are reached ahead of time in a joint fact finding process (Potapchuk and Crocker 1999). The pre-approval approach, however, effectively ignores the critical role of learning and new information. Management actions designed, in part, as experiments will generate knowledge that was not available during initial planning and will likely suggest adjustments that were not considered or analyzed initially.

Las Cienegas managers are counting on a tactic that holds considerable promise for wide applicability and consistency with the learning imperative of adaptive design. By performing the initial NEPA/Planning analysis on the proposed adaptive management process, including as much detail as possible on actions, monitoring, evaluation and response protocols, roles, and funding commitments, and carefully documenting monitoring results and evaluation findings, the products of the process – management adjustments – should require less or no additional review (Brandenburg 2005b). This “analyze-the-process” tactic accounts for all scenarios and potential adjustments and maximizes opportunities to build newly developed knowledge into subsequent actions. Even if additional NEPA/Planning analysis is not required, however, it will still take time to design new management actions in response to new information, so flexibility will not be as rapid as with the pre-approval/contingent agreement approach.

The case studies reveal that, although BLM staff are hoping that these approaches will provide the desired flexibility, they have been neither tested empirically or addressed by agency policy and guidance (Brandenburg 2005b, 2005c, 2005e, BLM 2003). BLM needs to resolve the uncertainties around these approaches by developing policy that determines the viability of the tactics under the planning statutes, and guidance for when the tactics should and should not be applied. An adaptive management scenario might call for one or more of the tactics, depending on the nature of the proposed adjustment, the nature and amount of new information available to inform the adjustment, or a limited time frame within to make the adjustment. Where additional NEPA documents and plan revisions are still required, BLM should provide policy and guidance on how monitoring data and evaluations generated by a joint fact finding process can be applied to make this supplemental NEPA/Planning analysis as efficient as possible.

Local BLM staff have focused on these tactics for enabling flexibility and accommodating existing NEPA/Planning regulations because changing the regulations is not an option available to them. BLM, DOI, and CEQ should, in their national-level efforts to “modernize” NEPA implementation (CEQ 2003), consider revised regulations that accommodate the requirements of adaptive design and joint fact finding. These regulations should specify how adaptive management processes can document monitoring and evaluation results, new knowledge and the collaborative development of improved management actions as an alternative to the traditionally required EIS plan revision documents. This would satisfy the NEPA/Planning requirements for documenting an analysis of proposed management actions, with public participation. The intent of the planning statutes is consistent with the goals of adaptive management. Both are intended to produce better environmental decisions and better outcomes (Phillips and Randolph 2000). BLM, however, needs to clarify how the two will procedurally coexist.

#### Effective Collaboration and FACA

Like the planning statutes, the intent of the Federal Advisory Committee Act is also consistent with the goals of adaptive management. And as with NEPA and FLPMA, BLM staff in the cases faced considerable uncertainty in determining how FACA applies to their adaptive management strategies. FACA issues have frustrated collaborative efforts at both Steens Mountain and the Pinedale Anticline. Agency-wide policy needs to clarify the types of collaborative arrangements that are subject to FACA and guidance needs to assist staff in more efficiently meeting FACA’s requirements.

FACA is intended to limit the influence of special interests, and provide transparency and equal access to the general public, in government decision making (BLM 2005). Under FACA,

most committees or other stakeholder groups formally convened by BLM for the purpose of providing the agency with advice or recommendations require a formal charter from the federal Office of Management and Budget and members formally appointed by the Secretary of Interior.

Though their opinion has never received a formal legal review or challenge, BLM staff at Las Cienegas are confident that SVPP's open participation rule, lack of formal incorporation, and the fact that BLM did not formally convene the group, means that SVPP does not require a FACA charter (Brandenburg 2005b). By avoiding any FACA-related delays, the SVPP was able to get up and running before the planning process for Las Cienegas had even started and has maintained continuity through to the implementation phase. The open participation rule is in line with the intent of FACA and effectively precludes any possibility of parties challenging the SVPP on grounds that they have been excluded from the group.

The Steens Mountain Advisory Council was planned, from the start, as a formally structured, FACA-chartered group. Although the legislation designating the Cooperative Management and Protection Area called for the SMAC to assist in preparation of the Steens Mountain RMP, the chartering and appointment process took long enough that the group had not convened at the beginning of the planning process and was unable to reach critical early agreements, as discussed in chapter 4. As of March, 2005, the Department of Interior was ten months behind on appointing members and the SMAC had been without a quorum and had not met since November 2004 (Brandenburg 2005c).

During the planning process for the Pinedale Anticline, BLM put much thought into assuring that the PAWG could contribute to an adaptive design and enable effective collaboration, but paid inadequate attention to ensuring the group was legal under FACA. Despite broad representation that met FACA's intent to ensure equal access to government for all

interests, the fact that the PAWG was formally convened by BLM, with appointed members and an official role to advise and assist BLM, put the PAWG squarely under the purview of FACA. The consequences of this lack of initial coordination with FACA were severe, as development and implementation of adaptive management was delayed by four years until a proper charter and appointments were secured.

The Las Cienegas case revealed earlier and more effective collaboration, due, in part, to freedom from FACA chartering obligations. FACA-related problems encountered in the other cases led to moderate to extreme delays in convening and sustaining stakeholder collaboration. BLM should develop guidance clarifying whether informally structured groups such as the SVPP are, in fact, exempt from FACA requirements. The Las Cienegas model of collaboration may not be appropriate in every scenario. For these cases, BLM and DOI should redouble their commitment to timely chartering and appointments.

### **Local Capacity Building**

Effective collaboration and adaptive design have been compromised not only by a lack of policy and guidance from agencies at the national level, but, in some cases, by a failure to build the necessary capacities among staff and stakeholders at the local level. The work of designing and implementing an adaptive design in a joint fact finding process is complex, difficult, and involves more than simply deciding to monitor and setting up an advisory board. Chapter 4 described the variety of groups that have been organized to enable collaboration. Chapter 4 also described the varying levels of success the groups have achieved in working effectively to reach agreements on the scientific issues underlying adaptive management decisions and on the decisions themselves. These different outcomes can be traced to the steps that BLM and stakeholders took, or did not take, to build their own capacity for collaborating to negotiate

agreements and work with scientific information. To complement agency-wide policy and guidance, BLM needs to be sure that the necessary capacities are built among staff and stakeholders at the local level.

The Sonoita Valley Planning Partnership has achieved considerable success in collaboratively developing and implementing an adaptive management strategy at Las Cienegas. BLM staff and stakeholders have recognized the role that capacity and capacity building has played in enabling this success. One of SVPP's first steps upon convening was to establish ground rules for their process. Ground rules include open participation, a consensus-based decision rule and a commitment to focus on resolving issues and accommodating interests rather than defending positions on issues. A work plan was created that laid out the decisions that needed to be made and kept the group on track to document agreements on the desired future conditions and alternative management strategies that became basis for the Las Cienegas RMP. Scientists directly involved with the SVPP have been able to effectively communicate their expertise to stakeholders, providing the technical capacity for joint fact finding and adaptive management (Brandenburg 2005b).

Independent neutral facilitators helped the group build these capacities and also helped BLM staff develop the capacity for facilitative leadership of the group. Capacity building was critical for BLM to fill a multi-faceted leadership role where BLM all at once serves as facilitator of the group, a group member with equal responsibility in the consensus building process and as the agency with ultimate decision making authority. A neutral facilitator has more recently helped the SVPP reorient its capacities and develop new capacities as the group has transitioned into implementing the adaptive management strategy and has recognized the different demands of the implementation phase (SVPP 2004).

The story is completely different at Steens Mountain, where virtually no steps have been taken to build capacity among the SMAC membership and local BLM staff. As a result, stakeholders have been mired in persistent conflict over entrenched positions and have not developed a shared understanding of, support for, or contribution to, the adaptive management strategy. BLM staff are accustomed to operating under a traditional top-down interpretation of planning and management regulations and are not comfortable with the idea of sharing responsibility with stakeholders (Brandenburg 2005d).

The parties' capacities for joint fact finding and adaptive management have been further limited by the fact that an independent science advisory committee, specifically authorized by the Steens Mountain legislation, has not been convened due to inadequate funding to pay scientists and BLM's wariness of FACA requirements (Brandenburg 2005c). BLM's ability to set performance standards, outline specific uncertainties, perform adequate predictive analysis and incorporate experimental design into actions has been compromised by this expertise deficit.

Capacity building for joint fact finding would have brought stakeholders, agency representatives and technical expertise together to reach agreements on the science-intensive yet non-objective decisions and evaluations of adaptive management. It would have enabled the SMAC to manage conflict and work toward consensus despite its members' history and the majority vote decision rule nominally imposed by legislation. It would have allowed BLM to see adaptive management as a more comprehensively collaborative process requiring a more integrated role for stakeholders. And it would have caused all parties to recognize the critical role of scientific information and capacity in collaborative adaptive management.

Forging agreements among diverse, traditionally competing, interests and working with large volumes of technical data presents challenges that most BLM staff and stakeholders will

not be prepared for without significant capacity building. BLM and its partners should capitalize on training opportunities and draw on independent neutral facilitators and scientists to build the capacities necessary for collaborating, in a joint fact finding process, on the science-intensive work of adaptive management.

BLM's in-house "Partnership Series" offers multi-day training opportunities in various aspects of collaborative resource management to agency staff and interested stakeholders (BLM 2005). Current offerings cover themes of shared responsibility and consensus building. Courses on the specifics of adaptive design and joint fact finding could be developed and included in the series. Numerous other publicly and privately offered training courses, conferences and events are offered each year as well. BLM staff and stakeholders should take advantage of these training opportunities as part of any adaptive management strategy.

The SVPP used independent neutral facilitators and consulting organizations to good effect for capacity building. Independent facilitators, jointly chosen by the collaborating parties, can assist the parties in building most of the necessary capacities, including ground rules for joint fact finding, work plans, leadership training for staff and mediating between scientists and laypersons (Poirier Elliott 1999, Ozawa and Susskind 1985). Finally, involving scientists, with collaborative capacities of their own, directly with stakeholders to communicate and translate their technical knowledge, will greatly improve the capacity of the collaborative group to address the science-intensive decisions of adaptive management.

### **Binding Implementation**

Adaptive management is a long-term, ongoing process and requires sustained commitments to implement, monitor, and adjust management actions (Walters and Holling 1990, Walters 1986). Adaptive management strategies must be supported by binding commitments that

obligate BLM and its partners to actually implement the strategies as designed and meet their ongoing responsibilities at all stages of the adaptive management cycle (Susskind and Cruikshank 1987). The only documented implementation commitments in the three studied cases are the BLM land use plan documents, where the adaptive management strategies are described with various levels of precision and prominence. It is not likely that these commitments, even with support from stakeholders, will be sufficient. BLM needs to develop stronger commitments, including supplemental planning regulations and site-specific, binding agreements to ensure that the strategies are implemented as planned over the necessary long term.

The Las Cienegas RMP outlines the adaptive management strategy in general terms and includes detailed monitoring and evaluation protocols for those resource classes that had completed protocols at the time the plan was prepared. The SVPP's recently completed implementation strategy includes detailed actions, responsibilities and timelines for implementing adaptive management. The document is a written, negotiated agreement, but is not, in its current form, legally binding. BLM has described the continuing engagement of the SVPP and stakeholders' keen interest in seeing their work implemented on the ground, as planned, as the commitment most strongly binding implementation (Brandenburg 2005b, SVPP 2004).

With only a vague description of adaptive management and references to incomplete monitoring plans included in the RMP, there is little in official documents to bind BLM to implement and sustain an adaptive management strategy at Steens Mountain. The SMAC's lack of integration and investment in the adaptive management strategy means that stakeholders will not be active to prod and assist BLM either. In fact, most local interests and politicians have strong attachments to traditional uses and the way things have always been done on Steens

Mountain (Brandenburg 2005d). Changing the status quo of either planning process or on-the-ground actions will be difficult.

The Pinedale Anticline adaptive management strategy, with a step-by-step process, clearly defined roles and references to specific monitoring and evaluation protocols, is well documented in the plan, creating as strong a written obligation for implementation as the decision document can provide. The plan's prescribed management actions, mostly stipulations and mitigation measures imposed on oil and gas operators, can be legally enforced by BLM.

In this case, however, intense pressure to expedite energy production significantly constrains implementing an adaptive design. For example, BLM, nationally, has responded to the Energy Policy and Conservation Act of 2000 (EPCA) by issuing guidance directing managers, among other things, to waive stipulations that "are not necessary" (Norton 2001). During the 2002-2003 drilling season, 45 of 52 (86 percent) requests from operators for mitigation waivers were granted by BLM's Pinedale Field Office. Workload priorities for energy permitting have also led to problems with BLM non-enforcement of standing mitigation requirements (Brandenburg 2005f).

As the PAWG continues its work to develop and implement documented monitoring and evaluation protocols, stronger commitments and stakeholder pressure will be brought to bear. Until then and perhaps even then, a failure to bind implementation of the adaptive management strategy, in the face of other priorities, threatens the adaptive design of the Pinedale Anticline strategy and places BLM on a slippery slope, with the risk that the adaptive management concept could be misapplied to remove requirements for predictive analysis and environmental protections until monitoring proves they are necessary.

The descriptions of adaptive management strategies in the Las Cienegas and Steens Mountain RMPs – short theoretical descriptions of the adaptive management concept and references to monitoring plans that have not yet been developed – will not strongly bind implementation. Strategies that are more specifically outlined in, and more prominently a part of, land use plans are more likely to be implemented. Even so, land use plans have questionable value for binding implementation of an ongoing adaptive management strategy. History shows that many of the actions called for in land use plans never get implemented.

Regulations require BLM to follow specific NEPA/Planning planning steps such as analyzing alternative actions and preparing certain compliance documents and allow BLM to legally enforce decisions such as mitigation requirements for gas drilling. There are, however, no regulations, other than those that generally require BLM to abide by its plans, that obligate BLM to implement and follow an adaptive management strategy identified in a land use plan. BLM and DOI should amend FLPMA and NEPA regulations to require, where adaptive management has been planned, ongoing, step-by-step implementation of the adaptive management cycle, just as the specific steps of the traditional NEPA/Planning process are currently required. These procedural regulations, however, would be insufficient to cover the details of specific monitoring plans, evaluation protocols and timelines.

Planning documents and agency-wide procedural regulations should be supplemented, in all cases, with detailed, binding, site-specific implementation agreements – memoranda of agreement or other written products of a joint fact finding process – that reference specific protocols, outline the roles and responsibilities of BLM and its partners, and lay out timelines for implementation. SVPP's implementation strategy effectively captures these details but is not a binding document. Relying on informal commitments and the goodwill and peer pressure of

stakeholders may prove sufficient at Las Cienegas, but in a place with more competing interests, like the Pinedale Anticline, stronger “teeth” to bind implementation will be required.

## **Funding**

A final barrier to implementing adaptive management strategies that include the critical elements is the availability of funding and other resources. Funding issues have had some impacts on the ability of the studied adaptive management strategies to include the critical elements, but the real challenge will come as the strategies are implemented on an ongoing basis. BLM, in each of the cases, is concerned about the availability of funding. The agency, going forward, should recognize that adaptive management is most likely not a lower cost alternative to traditional planning and management approaches, and should make funding available for monitoring and other essential components of adaptive management.

Even the strongest binding implementation commitments will be ineffective without adequate resources. BLM budgets are shrinking and the agency has been asked to cut staff by 20% by 2008 (Brandenburg 2005c). The up-front work of identifying goals, objectives and uncertainties and analyzing alternative management actions is be comparable in cost to traditional planning methods and the logistics of an ongoing collaborative process will incur costs as well. The real challenge, however, is the support of an ongoing monitoring plan. Monitoring can be expensive and time consuming and must be conducted consistently, with the necessary scientific rigor, for the duration of the management application (Walters and Holling 1990, BLM 2003, 2005, Nyberg 1999).

While upper levels of BLM and DOI have been quite supportive of the collaborative, adaptive approach applied at Las Cienegas, and may make some additional funding available as a result, local BLM staff are not counting on agency resources to fully cover the required

monitoring and other costs of adaptive management (Brandenburg 2005b, BLM 2003a). It is expected that the network of partnerships developed with the SVPP and other agencies and organizations will identify additional funding sources. BLM staff are optimistic that adequate resources will become available, but they are proceeding with significant uncertainty (Brandenburg 2005b, SVPP 2004).

At Steens Mountain, local BLM staff have acknowledged that funding limitations will challenge their ability to conduct monitoring that can credibly evaluate management actions. The science advisory panel will likely not be convened for lack of funds (Brandenburg 2005c), further compromising adaptive design. As discussed in Chapter 3, BLM has been accused by environmental groups of neglecting responsibilities for predictive impact analysis and planning (ONDA 2004). This apparent deferment is likely due, in part, to a shortage of funds.

Costs for resource monitoring on the Pinedale Anticline were initially going to be shared between BLM and oil and gas operators. Given new budget realities, BLM has since shifted nearly all monitoring costs to the operators. Given the difficulties of requiring and enforcing stipulations on operators, relying on operators for funding is probably not a stable source for the necessary long-term, rigorous monitoring. As energy permitting duties have increased, BLM staff have reduced their role in the PAWG task groups and are relying on non-agency partners to do an increasing amount of the work of adaptive management in the PAWG structure.

BLM and its partners need to find ways to pay for adaptive management. Contributions from cost-sharing partnerships and other collaborative arrangements have already been demonstrated, but these may not prove sufficient or sustainable. It is too early to say whether adaptive management represents, on balance, a less expensive approach to achieving management goals and fulfilling BLM's mission. None of the cases reported cost savings as a

rationale for pursuing adaptive management. What is clear presently is that the studied projects will need continued funding for ongoing monitoring and evaluation. It is important that the positive outcomes of these and other early adaptive management efforts be documented and communicated to demonstrate the value of investments in monitoring and adaptive management generally (Brandenburg 2005c).

The studied cases' inconsistent inclusion of the critical elements of adaptive design and effective collaboration is due to a number of institutional barriers that have limited the potential of adaptive management efforts. BLM and its stakeholders must overcome these barriers by providing agency-wide policy and guidance and local capacity building for adaptive management. To ensure that well-designed strategies are implemented as planned, BLM needs to secure binding commitments for implementation and provide the necessary funding for adaptive management.

## **CHAPTER 6: Conclusion**

BLM has begun to implement adaptive management in the hope that it will improve upon traditional resource planning and management processes by providing the means to evaluate the effectiveness of management actions in meeting identified goals and objectives, suggest management adjustments that better meet goals and objectives, implement adjustments with a high degree of process efficiency, and generate publicly-supported management decisions.

At its core, adaptive management is a simple concept: improving the effectiveness of management by learning from experience. Adaptively managing complex resource systems in a complex institutional and political environment, however, requires that BLM incorporate a number of critical ingredients into its adaptive management strategies. I have grouped these ingredients into two critical elements: adaptive design and effective collaboration.

I evaluated three cases of BLM adaptive management efforts, each still in early stages of implementation, and found that they have inconsistently included the critical elements. If BLM cannot overcome a number of barriers to planning and implementing strategies that include adaptive design and effective collaboration, the agency will not capitalize on the potential of adaptive management for improving resource management practice and will not realize the benefits it seeks.

### **Adaptive Design**

BLM has demonstrated, in two of the three cases, a reasonably strong grasp of the principles of adaptive design. Land use plans with well-defined, outcome-based goals and objectives and detailed, rigorous monitoring protocols should prove valuable for evaluating the

effectiveness of management actions. Adaptive designs, however, fall short in two areas. First, BLM's strategies have not tapped adaptive management's potential to suggest improved management actions through learning. The specific uncertainties and hypotheses underlying the adaptive management strategies have not been clearly stated and most actions are not management experiments designed, at least in part, to proactively generate the new knowledge necessary for developing improved management actions.

Two cases demonstrated the risk that, in the interest of avoiding time- and resource-intensive planning requirements, adaptive management strategies may sacrifice some of the up-front, predictive work of applying the best available existing knowledge to the design of specific management actions. BLM should be concerned that inadequate upfront planning may place important resources at unnecessary risk in the short term. BLM should seek efficiencies from more rapid development of relevant information, not from reduced up-front planning and analysis requirements. An improved ability to meet goals and objectives will be the product of more science, not less.

Going forward, BLM should develop guidance for adaptive management planning that confirms the role of specific, measurable goals and objectives and rigorous monitoring. More importantly, guidance should reinforce the importance of up-front predictive planning and building in the means for learning in adaptive management.

### **Effective Collaboration**

Adaptive management, in each of the cases, was applied partly in response to high levels of public concern over BLM's management of public resources. Only one of the cases demonstrated a collaborative approach close to the ideal joint fact finding model. The cases produced variable results in achieving the shared understandings that serve as the benchmarks

for adaptive management and show limited potential for creating the agreements necessary to support the series of evaluations and decisions of the adaptive management cycle.

Public participation strategies in each of the cases succeeded in providing representation to all of the important stakeholder groups, but the collaborative arrangements that included a larger number of participants, working within a consensus building process, with BLM as a working partner, demonstrated better capacities for effective collaboration.

In only one of the cases was a structured collaborative process convened from the very beginning of the planning process, enabling early support for and ownership of the adaptive management approach and constructive, collaborative work to develop it. Other cases realized less support for adaptive management strategies, corresponding to how late in the process structured collaboration was initiated.

Collaborative groups in each of the cases had defined roles, but these roles represented varying degrees of involvement with the adaptive management process. Strategies that provided stakeholders with a more integrated role in the development and implementation of adaptive management enjoyed greater overall support.

The findings suggest that BLM should encourage and facilitate collaborative structures other than typical advisory committees, with wide or open participation in a consensus building joint fact finding process and BLM in a partner role. Stakeholders' role should be integral to the adaptive management process and should start at earliest stages of planning.

### **Institutional Barriers and Implications**

Adaptive management efforts in each of the cases have been confronted with similar barriers and uncertainties that have prevented the critical elements from being included in

adaptive management strategies and will limit BLM's ability to implement the strategies as planned.

Inconsistent adaptive designs and collaborative arrangements are due, in large part, to a lack of agency-wide guidance and policy offering a consistent definition of the critical elements and requiring their inclusion. Each of the cases represented a purely local effort, with little or no top-down guidance. In particular, BLM faces uncertainty around how to enable management flexibility while meeting the requirements of NEPA and FLPMA, and how to set up effective collaborative arrangements within the context of FACA.

A failure to build capacities among agency staff and stakeholders at the local level has constrained BLM and stakeholders' ability to work with scientific information in a consensus building process to develop adaptive management strategies. It will also limit the parties' ability to implement the strategies in the future.

Existing commitments, mostly general descriptions of the adaptive management concept and references to incomplete monitoring plans, in BLM land use plans will not be sufficient to bind BLM and its partners to implement adaptive management strategies as planned, over the required long term. Uncertain funding for monitoring and other expenses may also complicate implementation.

These institutional barriers have constrained the design and implementation of adaptive management strategies in the three cases and have left the strategies with mixed prospects for success. Future efforts will be similarly challenged unless BLM can provide agency-wide policy and guidance that defines adaptive management and requires inclusion of the critical elements, and provides consistency within the statutory framework of NEPA, FACA and other applicable laws.

At the local level, BLM and its partners must build the necessary capacities for joint fact finding and the science-intensive work of adaptive management by providing training opportunities for stakeholders and staff, using independent neutral facilitators, and directly involving scientists in the collaborative process

To ensure ongoing implementation of adaptive management strategies, BLM and stakeholders must create binding implementation commitments. These should include more specific and more prominent commitments within land use plan documents, supplemental planning regulations that mandate the monitoring, evaluation and adjustment steps of the adaptive management cycle, and site-specific, collaboratively negotiated, binding implementation agreements among BLM and its partners which detail specific responsibilities and timelines for adaptive management.

There is little reason to believe that a continued reliance on uncoordinated, locally initiated efforts will consistently provide the benefits BLM seeks. If BLM can build on the existing potential of the Las Cienegas, Steens Mountain and Pinedale Anticline strategies by accounting for the factors outlined above and providing coordinated guidance to the field, this next-generation approach could indeed prove to be a significant improvement in the agency's practice of natural resource planning and management.

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## **APPENDIX A: Additional Background on Case Studies**

### **Las Cienegas National Conservation Area**

Located in the scenic and rural Sonoita Valley of southern Arizona, the 49,000 acres of Las Cienegas National Conservation Area and associated Sonoita Valley Acquisition Planning District (together “Las Cienegas”) were acquired in a land exchange in 1989 by BLM for their outstanding natural, recreational, cultural and historic resources. Congress designed Las Cienegas a National Conservation Area in 2000 to further protect these resources. Managed under the Las Cienegas RMP completed in 2003, Las Cienegas is surrounded on three sides by national forest and undeveloped state trust lands but is within an hour’s drive of the rapidly expanding Tucson metropolitan area. The landscape is a high desert of rolling grasslands punctuated by important riparian areas along Cienegas Creek, both rare habitat types, home to several endangered species. Cienegas Creek is critical to the city of Tucson for water supply and flood control purposes and two segments of the creek have been proposed for Wild & Scenic River designation. Historic ranch buildings on Las Cienegas are listed on the National Register of Historic Places. With the spectacular scenery and relatively mild weather, dispersed recreation opportunities are excellent. Hiking, mountain biking, off-highway vehicles and hunting are popular. The area has historically been used for cattle grazing and this use continues today.

As a National Conservation Area, the primary planning and management concerns on Las Cienegas are maintaining the health of the resources, providing public access, and ensuring the viability of traditional land uses. Compared with many other BLM lands, where commodity extraction, urgent endangered species concerns or other overriding issues have dominated, the different land uses and management goals at Las Cienegas are not as challenging to integrate and

conflict has not been as prominent. Planning and management issues on Las Cienegas include balancing grazing use with resource protection, determining the proper mix of recreational opportunities including siting of a segment of the statewide Arizona trail, managing habitat for at least five recently-listed endangered species, ecological restoration projects, road network designations, utility right-of-ways and protecting water quality and quantity.

Stakeholders have been closely involved with the planning for Las Cienegas through the Sonoita Valley Planning Partnership (SVPP). SVPP is made up of organizations and individuals and organizations that have identified a common interest in how public lands in the Sonoita Valley are managed. SVPP participants with an interest in management of Las Cienegas include residents of neighboring towns and the larger cities in Arizona. Some represent organized environmental groups, recreational interests, grazing interests and small-scale mining.

Government agencies have also participated through the SVPP, including the US Forest Service, Natural Resources Conservation Service, U.S. Geological Survey, Arizona Game and Fish Department, Arizona State Land Department, Arizona Department of Water Resources, and Pima and Santa Cruz Counties.

Adaptive management has been applied on Las Cienegas as part of an “Ecosystem Planning” approach that relies on ongoing collaboration, articulating desired outcomes, and managing ecosystems rather than individual resources, uses or jurisdictional units. Adaptive management is seen as necessary for a management approach that emphasizes desired outcomes rather than prescriptive management actions. The Las Cienegas plan is counting on flexibility to adjust actions in response to new information and surprises, without re-initiating the bureaucratic NEPA/Planning process.

Since the Las Cienegas RMP was approved in 2003, BLM and SVPP have been focused on implementation. In those two years, numerous management actions called for in the plan have been applied, monitoring has commenced and management of cattle grazing has actually closed the loop of adaptive management, having been implemented, monitored, evaluated and adjusted.

### **Steens Mountain Cooperative Management and Protection Area**

Steens Mountain is a 30 mile long fault-block mountain in southeastern Oregon that rises from the surrounding sagebrush to near 10,000 feet. The Steens Mountain Cooperative Management and Protection Area (“Steens Mountain”) was designated by congress in 2000 and is approximately 430,000 acres. The surrounding Andrews Management unit accounts for another 1.2 million acres and together these areas are managed under a single BLM RMP approved in 2005. The Steens Mountain area boasts outstanding scenic resources and due to its varied topography, hosts a diversity of ecological communities. Prominent wildlife species include elk, pronghorn, bighorn sheep, sage grouse, and threatened redband trout. The state’s largest stand of aspen trees is also on Steens Mountain. The legislation that created the Cooperative Management and Protection Area also designated 170,000 acres of wilderness, over half of which is restricted from cattle grazing. 29 miles of rivers were also added to the federal Wild & Scenic inventory.

Major issues on Steens Mountain include management of the Steens Mountain Wilderness Area relative to private inholdings and appropriate uses, managing grazing, which is a traditional and valued land use in the community, recreational issues such as trail and road designations and off-highway vehicle use, restoration projects such as juniper removal in sagebrush habitat and riparian area management

There has been persistent conflict among stakeholders regarding management of Steens Mountain. Many local residents, including ranching interests and representatives of Harney County are primarily concerned with maintaining traditional ranching and recreational uses in the area. Environmental interests, both locally and from beyond the local area feel that the unique resources of Steens Mountain should receive greater protection and have supported restrictions on traditional uses. Both sides are concerned about the impacts that a large increase in visitation, resulting from the special designation or further development of recreational opportunities, could bring.

The Cooperative Management and Protection Area designation for Steens Mountain contains unique language promoting both grazing and other historic uses along with wilderness and resource protection priorities. A call for “cooperative management” also distinguishes Steens Mountain from more typical National Monument or National Conservation Area designations. The legislation created the Steens Mountain Advisory Council (SMAC) to formally represent stakeholders and advise the BLM in managing the CMPA and promote cooperative management.

As in other BLM efforts, adaptive management has been included in the Steens Mountain plan in recognition of the fact that even where the goals and objectives of management are known, BLM does not know exactly how to reach them. The ability to make mid-course adjustments will better enable BLM to achieve those goals and objectives. BLM also sees adaptive management as a response to the mandate for cooperative management and hopes that transparency in acknowledging uncertainty, reporting monitoring results and proposing adjustments will help BLM communicate and build support for its actions.

The final RMP for Steens Mountain and the Andrews Management Unit was approved in spring 2005, so very few of its identified management actions and little of the formal adaptive

management plan have been implemented to date. However, the SMAC has been up and running since shortly after the special legislation was passed in 2000, and several specific habitat management projects have been planned that can be evaluated relative to the critical elements of adaptive management.

### **Pinedale Anticline Oil and Gas Exploration and Development Project**

Pinedale, Wyoming, a gateway to Yellowstone and Teton National Parks to the north, sits in the Green River valley of western Wyoming in the shadow of the Wind River Mountains. The town's economy and lifestyle depend on the natural resources that support oil and gas production and tourism. From just outside the city limits, the Pinedale Anticline, a geologic formation thought to hold at least 9 trillion cubic feet of natural gas, stretches south and east for 30 miles. The 197,000 acre project area also provides crucial habitat for the imperiled sage grouse and migration routes for world-class herds of mule deer and pronghorn antelope. Historic resources include one of the few intact segments of the Oregon Trail and Native American sites. Air and water quality in rural Sublette County have been documented as some of the cleanest in the United States and several pristine designated Wilderness areas lie in the National Forest lands of the Wind River Range, directly downwind of the project area. All of these resources and the previously undeveloped scenic vistas make for high quality recreational opportunities. Local citizens fiercely value these resources located, literally in some cases, right on their doorstep.

In 1998, several oil and gas companies ("operators"), which were already active in other nearby gas fields, approached BLM with a proposal to explore and develop the natural gas resources on the Pinedale Anticline. The companies had leased the rights to the mineral resources years before and, under U.S. mining laws, hold valid existing rights that allow them

significant latitude in developing the field. BLM implemented a NEPA/Planning process to outline conditions for the development. The Record of Decision and Final EIS planning documents for the Pinedale Anticline Oil and Gas Exploration and Development Project (“Pinedale Anticline project”), approved in 2000, permit up to 900 well pads, place a number of conditions on the project including density and spacing of well pads on the land, seasonal timing of drilling and stipulations on road use and construction. Additional actions to mitigate anticipated negative impacts are also identified. As a project-specific implementation plan, all identified issues relate to regulating development of the gas field and managing the development’s impact on the surrounding resources. The plan outlines an adaptive management strategy for adjusting these actions if necessary.

From the time the project was proposed in 1998, it generated controversy in the local community and beyond. Despite the industry’s contribution to the local economy, local residents and environmental interests were strongly opposed to the project, due to the potential for negative impacts to the highly valued resources in the project area and surrounding area. The operators’ valid existing rights and the near guarantee that the Pinedale Anticline field would be substantially developed only heightened stakeholder concerns. Recognizing the community’s interest in making the best of this project happening so close to the town and in the midst of so many important resources, BLM built a significant public participation component into the NEPA/Planning process and to heavily weight public comment in the analysis and selection of management alternatives.

Monitoring and the ability to rapidly adjust is seen in this case as a way to continue to accommodate stakeholder interests as the field is developed post-decision. Many environmentalists and others interested in minimizing the impact of the project see adaptive

management as vehicle for ensuring that resource protection objectives in the plan are met. Most operators are comfortable with adaptive management where it could eliminate costly but ineffective mitigation requirements. Part of the adaptive management strategy is the establishment of a Pinedale Anticline Working Group (PAWG) and issue-specific task groups to advise and assist BLM in developing monitoring protocols and implementing adaptive management. The PAWG was convened with members appointed to represent various local interests, oil and gas operators and BLM.

Another factor responsible for BLM's building adaptive management into the project plan was the extraordinary level of uncertainty surrounding the project. Uncertainty surrounding the extent of impacts was compounded by several underlying uncertainties: How much gas was actually present in the reserve? How many wells would be required to exploit it? How rapidly would the field be developed? Would new drilling and mitigation techniques be applied and effective? Was new federal policy on energy development or land management forthcoming? None of these things were in BLM's power to control through the NEPA/Planning process. The ability to rapidly adjust those things that BLM could control could provide a means for meeting management goals and objectives in the face of this uncertainty.

When project plan was approved in 2000, one of the oil and gas operators filed an appeal, that later became a federal lawsuit, challenging the authority of BLM to implement the adaptive management strategy and claiming that the establishment of the PAWG was a violation of FACA. Although the lawsuit was dismissed, the U.S. Department of Justice conceded that the organization of the PAWG was illegal under FACA. PAWG was disbanded in Spring 2001 pending reorganization under a proper FACA charter and, further, no part of the adaptive management strategy that PAWG had helped develop was allowed to be implemented. The

reconstituted, properly chartered PAWG began meeting in mid-2004 and has started over on the work of developing and applying an adaptive management strategy.

Meanwhile, exploration and development of the natural gas resources on the Pinedale Anticline has proceeded at a pace more rapid than even the most aggressive estimates considered in the planning process.