Chapter 8

Best Practices: The Concept, An Assessment, and Recommendations

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ABSTRACT

The *Best Practice* (BP) concept is an important tool for improving environmental and conservation management practices. Our objective in this paper is to facilitate the development and use of more effective BPs in large scale conservation. BPs are ultimately about improving the decision making process. Although many BP innovators focus exclusively on substantive improvements, they can be used to spur both substantive and procedural improvements. Adopting practical models of decision making, innovation, and diffusion processes can enhance the utility of BPs and facilitate more rapid improvements. Most BPs rely on rules of evidence and inference derived from positivism; however, broadening the epistemological foundation of BPs to include post-positivistic methods that attend to contextual factors can enhance the utility of BP prescriptions. Prototyping is a context-sensitive learning strategy that may be the most practical means of rapidly testing, adapting and diffusing new BPs successfully.

Key words: *Best practices, best management practices, innovation, decision making process, environment*

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INTRODUCTION

Best practices (BPs) are prescriptions for improving (on) the status quo. They are used to communicate potential practices for improving management or policy outcomes. Although BPs have been used since the beginning of the human skill revolution millennia ago, recognition of their potential utility is increasing in many sectors of society. The popularization of BPs in business is widely attributed to the book *In Search of Excellence* (Peters and Waterman 1982). However, the concept has numerous antecedents and is currently being used in diverse fields (e.g., engineering, medicine, government). For example, since the late 1970s, state and federal agencies have formulated *best management practices* (BMPs) for forestry and agriculture to address non-point pollution sources. BPs typically represent an expert opinion, based on a mental model of how the system works and how to enhance outcomes given a person's goals/objectives. The utility of BPs turns on many contextual factors, including how the problem is defined, the innovativeness of originators and promoters, as well as a host of diffusion and restrictive forces and factors.

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We feel that the full potential of BPs to spur incremental improvements in large scale conservation projects, as well as in environmental management practice more generally, is not currently being realized. Our aim is to facilitate the development and use of more effective BPs in large scale conservation. We offer a problem oriented description of the BP concept, introduce a typology for classifying BPs, illustrate the role of BPs in the decision process, and recommend ways that BPs might enhance policy and management outcomes. Our argument in brief is:

- First, a better understanding of the conceptual basis of BPs, including their substantive/procedural focus and their epistemological foundation, will allow people to be more contextual in their use of BPs.
- Second, a familiarity with the complete decision process will facilitate formulation and use of superior BPs.
- Finally, knowledge of the innovation and prototyping processes will expedite spread of superior, context sensitive BPs to a wide audience for use. This approach opens up new opportunities for future advances in large scale conservation projects.

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BEST PRACTICES: THE CONCEPT

The goal of people who promote and use BPs is to obtain superior outcomes in their realm of practice by using the best available standards and methods. BPs are commonly identified by surveying existing practices in a field (e.g., in benchmarking exercises, Jenkins and Hine 2003), developed based on a theoretical construct of the system under management (e.g., as has been done using modeling exercises, Boyd 2005), or originated by identifying successful prototypes (Brunner and Clark 1997). Although the use of the superlative "best" suggests a prescription imbued with finality and immutability, BPs are actually provisional statements reflecting the current state of the art. In fact, the term *best available practice* more accurately reflects the impermanent and evolutionary nature of BPs.

Given the varied origins of BPs, the range of substantive and procedural applications, and the contexts in which BPs are prescribed and used, it is not surprising that diverse epistemological standpoints are relied upon in the formulation of BPs. While the dominant epistemology in environmental management is positivism, other epistemologies (particularly post-positivism) are also in wide use. For example, the Conservation Measures Partnership (2007) has developed a strategic planning process (Open Standard for the Practice of Conservation) which leads participants through a consensual, rather than positivistic, process for developing conceptual models of and solutions to large scale conservation problems. Similarly, although the BP development process is often carried out using scientific principles derived from empirical studies, other methods (e.g., prototyping) are required when the system is poorly known.

Most BPs represent the judgment of experts on how to improve upon the status quo with respect to some (often implicit) suite of values. Ideally goals and objectives have been clearly articulated prior to arriving at a BP prescription. Lack of clear goals and objectives can be an impediment to deriving BPs. Without clear objectives, it is difficult to identify the most important (driving) variables in the system, provide guidance on how to use knowledge about those variables to enact management improvements, or evaluate the effectiveness of a BP. For example, in Pennsylvania those who view wildlife primarily in terms of game species (e.g., the Pennsylvania Game Commission) and those who use a broader definition of wildlife (e.g., Pennsylvania Bureau of Forestry) have developed competing prescriptions for managing public forests for wildlife. The goal of one agency is to maintain a stable whitetail deer population, while the other agency would like to see the whitetail deer population decline in the expectation that the neo-tropical migrant bird population would increase.

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Efforts to identify BPs are always subject to human foibles, including inappropriate, self-interested simplifications, as well as disciplinary and epistemological biases. Such simplifications and biases can be especially problematic in the complex, poorly understood systems with which large scale conservation practice is concerned. Although experts must rely on previously developed expertise, new systems may differ from familiar systems in unexpected ways and even familiar systems may periodically experience abrupt shifts that make past research outdated (Hilborn et al. 1995). In such cases, "assumption drag" may prevent BP prescriptions from catching up with current conditions or the context on-the-ground (Ascher 1978). These and other problems limit the utility of BPs.

History

Attempts to identify, collect, and disseminate BPs have a history going back to antiquity and the search for BPs has played a major role in development of human civilization (Bunch 2004). For example, the Edwin Smith Papyrus, written in Egypt about 1,700 B.C. is a compilation of 48 case histories arranged by anatomic region of the human body. Each case describes a patient's symptoms, offers a diagnosis, and prescribes treatment (i.e., offers a best practice prescription). Although it is the oldest surgical text known, textual evidence suggests that the papyrus may be based on an earlier text written between 3,000 and 2,500 B.C. (Stiefel et al. 2006). Early Greek physicians built upon Egyptian practice to produce new BPs. The *Corpus Hippocraticum*, which gathered works attributed to the Greek physician Hippocrates, was complied during the third century B.C. for the library at Alexandria. Despite the rudimentary investigative methods available to the Greeks, Hippocrates' writings describe treatment methods still in use today. Panourias el al. (2005: 181) wrote that "trepanation, or trephination, which is still one of the most popular procedures in neurosurgery, is mentioned extensively in this treatise [*On wounds in the head*], together with its clinical indications, technique, and outcome." Both the Edwin Smith Papyrus and the *Corpus Hippocraticum* were attempts by medical practitioners to identify and use best practices based on the methods, and knowledge of the era.

Close empirical observation by practitioners has often been sufficient to arrive at a BP in the absence of scientific explanation. For example, when Louis Pasteur applied germ theory to the beer brewing process in his *Etudes sur la Bièr* (1876), brewing practice "underwent no revolution, for the best practice in brewing was already in line with Pasteur's teachings" (Sigsworth 1965: 549). Brewers had already adopted methods that prevented introducing germs into beer, even though the concept of germs was unfamiliar to them. It is notable that, "Works upon brewing most in use by brewers [in Great Britain during the late 19th century] provided much theoretically-based advice which was doubtless wrong, but they also contained much practical wisdom gained by empirical observation, for which the late nineteenth century provided scientific explanation" (Sigsworth 1965: 549). As this example illustrates, BPs can be clarified and can stimulate progress in applied fields, even in the absence of scientifically grounded explanation (Stokes 1997).

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Environmental professionals in the United States have been engaged in identifying, adapting and applying BPs since Gifford Pinchot pioneered the field of American forestry in the 1890s. Regarding a trip to Europe at the beginning of his career, Pinchot observed in his autobiography (1972: 19) that, "Nothing could have been more useful to a lot of foresters in the egg than this tour through some of the best-managed forests on earth. Even if we were not able to see everything we looked at, at least we built up some mental picture of what a forest under good management actually looked like—a standard against which to check our future work." He recognized, however, that even the best forestry practices of Europe could not be indiscriminately applied in the United States—the social and biological context was too different. Accordingly, his management of the Biltmore Estate in North Carolina, an endeavor that marked "the first example of practical forest management in the United States" (48), served as a prototype by which to identify BPs appropriate to the American context.

Pinchot adeptly combined both substantive and procedural elements. He not only developed and applied substantive prescriptions about how best to manage forests, but also transformed the process by which decisions about forest management were made in the U.S. Lessons learned at Biltmore were disseminated not only by Pinchot, who went on to become the first chief of the U.S. Forest Service, but also by others who worked the estate. Though Pinchot himself took some aspects of social context into account in the development and application of forestry BPs, the importance of accounting for social context in forestry practice has been a longstanding subject of debate (e.g., Behan 1966, Luckert 2006). This is reflective of a tendency to be overly reliant on positivism in developing and evaluating BPs.

Conditions

Many factors determine whether BPs are used or rejected and how BPs are first clarified, diffused, and adapted. The most basic among these factors are the people involved, their perspectives, the values at play (e.g., power, knowledge, skill, respect), and strategies they use (e.g., diplomatic, educational, economic, coercive). It is beyond the scope of this chapter to look at these conditioning factors in detail. However, one case in which these factors were documented was in the endangered black-footed ferret (*Musela nigripes*) recovery effort in the American West (Clark 1997). The search for BPs played a significant role in setting new standards for field surveys and population monitoring, capture and handing techniques, habitat mapping and management location of transplant/recovery sites, captive breeding, and program organization and decision making. In turn, substantively oriented BPs stimulated subsequent advances in recovery efforts. Because value dynamics were little attended to, however, progress was less rapid than it might otherwise have been. Specifically, the Wyoming Game and Fish Department's desire to maintain the appearance of authority and control made it slow to adopt the recommendations of outside experts on how best to conserve the remaining ferrets.

Projections

The term BP is increasingly being employed in diverse fields and disciplines. For example, in medical literature the term is linked with *evidence based practice*, an attempt to incorporate the best available evidence into up-to-date treatment prescriptions. Searches of databases of academic journals show the rising frequency with which the term *BP* is used by biological and social scientists (Table 1). We expect that BPs will continue to proliferate and BPs will take on greater importance in coming years. As access to the Internet expands, it will become easier to diffuse and harder to restrict BPs (e.g., The Together Foundation 2008). Furthermore, calls for transparency and accountability on the part of businesses, government, and individuals will encourage practitioners and decision makers to adhere to explicitly defined standards of practice, including those that call for openness and creativity. Examples include the use of generally accepted accounting principles (GAAP) for financial reporting and the requirement by the two major forest certification systems in the United States that forest managers comply with "Best Management Practices" (SFI 2004, FSC 2006). An ongoing challenge will be to find superior BPs and to balance the desirability of explicit standards with the need to be contextual, flexible, an innovative. A major limitation of traditional scientific management has been applying a pre-defined "single best way" instead of more contextually sensitive solutions.

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Table 1 Number of references by year to "best practice" in three academic databases

Year	Agricola	Medline	Sociological Abstracts
<1980	2	2	1
1980-1989	2	10	5
1990-1999	29	583	48
2000-2005	59	1997	144
2005-2009	126	2675	198
Total	218	5267	396

ANALYSIS: ANATOMY OF A BEST PRACTICES CASE

Successful intervention in large scale environmental systems requires adequate models of the natural systems involved, as well as the human systems in terms of the social and decision processes at play. Additionally, it is useful to understand the epistemological standpoint and biases of those who develop, seek, and use BPs. Assumptions about what constitutes appropriate epistemological rigor are embedded in the methodologies and professional norms people use to develop, apply, and evaluate BPs. Often these assumptions are not fully conscious or explicit. A lack of clarity about the epistemological standpoint and focus of attention of a BP will limit one's ability to learn from experience and improve BPs. In this section, we illustrate how articulating one's epistemological standpoint and adopting interdisciplinary models relative to a BP can contribute to the effective development and use of BPs.

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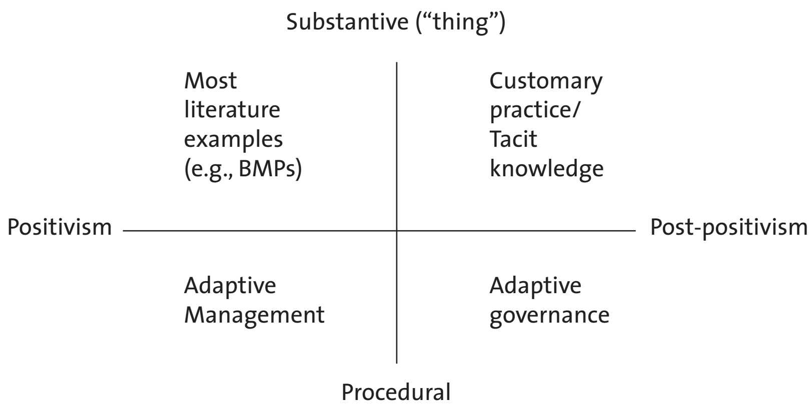
A typology for BPs

Specific BPs can be arrayed along two axes (Figure 1). A particular BP can be arrayed relative to other BPs using this typology. The first axis relates to the focus of attention of people creating the BPs and whether the target for improvement is largely substantive (e.g., trees, species, watersheds) or procedural (e.g., decision making, social process). The second axis relates to the epistemological standpoints in use. The two major epistemological standpoints held by scientists and managers today are positivism and post-positivism.

Customary management practices, though usually not described by their users as BPs, often serve as substantive BPs rooted in a pre-positivistic epistemology. The use of fire as a forest and wildlife management tool by native American and early European settlers is an historical example. Explicitly articulated BP prescriptions in natural resource management typically have been concerned with substantive rather than procedural issues. For people who have been thoroughly socialized into their respective disciplines, the appropriate goals of BPs may seem so obvious that they hardly need to be stated. For example, substantive goals are usually taken as a given by developers of forestry Best Management Practices for water quality (commonly referred to as BMPs): the goal of BMPs is understood to be reducing water pollution to a level compatible with previously determined water quality goals. However, most BMP developers do not expect BMPs to completely eliminate non-point source pollution, though this may not be clear to all BMP user groups (e.g., town wetlands commissioners). BMPs were developed by states in response to the goals set in the federal Clean Water Act. One of those goals—the nation's water bodies should receive zero discharges of pollutants by 1985—may have been infeasible and inappropriate. However, in the absence of clearly articulated goals, the lack of agreement on appropriate goals may not have been readily apparent until late in the decision process.

While most BPs in environmental management are substantively oriented, procedurally focused BPs do exist. Adaptive management as articulated by authors such as Walters (Walters 1986, Walters and Holling 1990) is a procedurally focused BP used by natural resource practitioners in which the target of improvement is the decision process itself. In this view, adaptive management is basically a prescription for using monitoring and evaluation techniques to learn and incorporate current best knowledge into decision making. In a discussion of the way in which adaptive management could be applied to ecosystem management, Rauscher (1999) noted that "we should devote as much creative attention to devising good ecosystem management decision processes as we do in assuring the quality of the decisions themselves." It should be noted that other practitioners of adaptive management subscribe to a more post-positivistic epistemology (Lee 1993).

Figure 1 A typology of professional's focus of attention/targets in the BP process along a "substantive vs. process" axis and along a "positivism vs. post-positivism epistemological" axis. Different professionals employ different standpoints along these axes in their BP work.



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Both BMPs and adaptive management are examples of Best Practices rooted in positivism. According to the positivist tradition in science, hypotheses are predictions derived from theory that can be falsified using carefully constructed and controlled, usually reductionistic, experiments. Strict positivists assume that they are unbiased, neutral observers; that their senses are reliable windows on the world; and that through careful, systematic observation they can know the world precisely and accurately hold that empirical evidence gives them an unbiased and objective view of the natural world that is free from the context in which the person learns about the world. Positivists often fail to recognize the importance of social facts that are mediated by social consensus rather than reflections of an objective reality. Consequently, positivists tend to see content and not fully appreciate process.

Complying with positivism requires that BPs be based on either empirical research results or scientifically (positivistically) deduced principles. Deriving scientifically defensible BPs is easier in some areas of environmental management than others. For example, the efficacy of checking hoses and fittings on machinery to avoid chemical spills on a logging site is unlikely to be contested. By contrast, formulating uncontested BPs for large scale conservation is more difficult for at least two reasons. First, it can be difficult to agree upon appropriate substantive goals (What level of protection is appropriate? At what economic cost? What ecosystem functions or services should be taken into account?). In fact, a strictly scientific (positivistic) endeavor, which strives to be value-neutral, cannot move from projection to prescription, which is unavoidably value-laden (Pouyat 1999). Second, best practices for large scale conservation cannot be easily reduced to a few scientifically derived rules of thumb because interactions between social, economic, and environmental conditions are complex and not fully understood. In fact, because ecological theories tend to be context specific, multi-causal, and probabilistic (Pickett et al. 1994), reductionism has proven difficult to apply in ecology, let alone large scale conservation. Additionally, the basic hypothesis of reductionism—that everything obeys the same basic set of laws—does not logically entail a constructionist hypothesis—that we can reconstruct any system, even the universe, if we know the fundamental laws. Consequently, it becomes difficult to transform data derived from a given reductionistic experiment into generalizable BP prescriptions, when interactions between multiple biophysical and social variables are taken into account.

In contrast to positivism, post-positivistic epistemology holds that our understanding of reality is socially constructed (e.g., Berger and Luckmann 1966). Post-positivists assume that the "self" or "personality" does not stand completely apart from the rest of the real world and that our understanding of the world is thus a combination of "objective" and "subjective" constructs. Whereas an objective world "out there" exists, we can only understand it based on subjective mental models that are developed in dialogue with other people in our society. This epistemology implies that the most effective way to improve our understanding of the operation of the world "out there" is to use multiple methods to triangulate on a more robust mental model of reality. Such triangulation will necessarily take into account not only biophysical facts, but also social facts. Consequently, a post-positivistic epistemology is better equipped to deal with values. Furthermore, a post-positivist professional may formally and frequently use the positivistic method, but not the reverse. By granting a legitimate role to post-positivistic epistemology, BP developers can acknowledge their biases without undermining their rationality. Adaptive governance is an example of best practice for natural resource management that is rooted in post-positivistic epistemology and procedurally focused (Brunner et al. 2005).

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Evaluating BPs

Because most BPs target substantive rather than procedural improvements, the importance of having a functional model of the decision process is often overlooked. While substantive BPs can have a key role in improving environmental outcomes, technically inclined people ignore the decision process at their peril. Since all BPs are interventions in decision making, it is important to have a logically inclusive and comprehensive model of the decision making process. One such model includes six phases (Brewer and deLeon 1983, Table 2). Using such a model can facilitate evaluations of a BP's effectiveness. Evaluation is often a complex and always a critical task. Since BPs frequently involve applying current knowledge in new, partly unknown situations, ex ante specification of the conditions under which an intervention will work will necessarily be incomplete. Repeated failures may highlight an inadequate understanding of context, an incomplete decision process, or perhaps an inability to learn from experience. Consequently, it is important to know whether a BP succeeded or failed because of how it was applied (i.e., the application in the field did not closely follow the prescription) or because it was applied in inappropriate contexts (i.e., the intervention did not work under the particular field conditions in which it was applied). The first type of failure may reveal weaknesses in the mental model used to understand the social process whereas the second type of failure may reveal weaknesses in the model used to understand the biophysical system.

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Table 2 A functional decision process models (Brewer and deLeon 1983)

Phase	Description
Initiation	Potential problem first recognized.
Estimation	Contours of the problem and possible alternative solutions explored.
Selection	A course of action or a plan is decided upon and a prescription is promulgated.
Implementation	A program for work in the field is designed and carried out.
Evaluation	Monitoring and appraisal undertaken to determine if goals are being met.
Termination	Ends the current process and replaces it with another one or some other management effort.

Developing more effective BPs requires adequate evaluation of current BPs. Evaluations should (1) address both substantive and procedural goals, (2) determine whether goals were achieved and why/why not, and (3) determine who is responsible and accountable for success/failures. Lack of agreement on substantive goals early on can lead people to reach different conclusions when evaluating BMP efficacy. For example, after reviewing the scientific literature on streamside management zones, Castelle et al. (1994) concluded that wetland and stream buffers should be at least 15-30 m wide. However, most states recommend minimum buffer lengths less than this range (Blinn and Kilgore 2001). Castelle et al. (1994: 878) lamented that, "wetland buffer policies have often been established with significant regard for political acceptability but with little consideration of scientific data." In contrast, Ice (2004) estimated that BMPs reduce water quality impacts from 80-99% and considered them to be highly effective. What is not immediately clear is that the basis for comparison—hence the management target—is different. Castelle et al. designated watersheds that have not been harvested as their controls (basis of comparison) whereas Ice designated watersheds that have been harvested without the implementation of BMPs as his controls. Ice concluded that BMPs are effective because management that complies with BMPs is much better environmentally than what was done in the past. Someone using the work of Castelle and others might conclude that current BMPs are not good enough because they do not offer as much protection as not harvesting at all would offer. In this case, as in many large scale conservation cases, a realistic baseline that takes social context into account has not been agreed upon. Consequently, potential progress is hindered.

As in many debates about BPs in environmental management, there is an underlying procedural dimension that has not been explicitly evaluated. Just as different formulations of substantive goals for BMP programs can compete, so too can formulations of procedural goals. If BMPs are seen as a way of restoring the chemical, physical, and biological integrity of the nation's water to pristine, pre-Columbian conditions (a substantive goal), then efficacy should be judged based on a comparison of current stream conditions to a hypothetical, pre-Columbian baseline, perhaps. On the other hand, if compliance with BMPs is seen solely as a means of maintaining one's social license to carry out forestry operations (a more procedural goal), then efficacy should be judged in terms of whether the public continues to grant the company a license, irrespective of the actual impacts on water quality. Whereas few participants in the social process are likely to adhere to either of the two extreme positions presented above, an analysis of BMP efficacy should take into account both procedural and substantive goals, regardless. In fact, a rational decision process needs to be in place before a substantive goal can be set.

Adopting a flexible epistemology can be important in developing and evaluating BPs. Once a goal has been articulated, BP methods can be employed instrumentally to achieve that substantive goal. However, developing and deploying a BP using a narrow epistemology is likely to miss critical components of the context essential to the success of the BP. For example, getting ranchers to adopt management techniques that help to minimize negative interactions between large carnivores and livestock may be more successfully accomplished by appealing to their conservation ethic rather than relying on legislative remedies. Because management contexts vary, a BP process that is effective in one system may not work in another system in which the suite of participants and their goals differ. This fact calls attention to the need to be contextual. For example, community based natural resource management has been promoted as a method for pursuing biological conservation and more equitable economic development. In a comparison of five cases in Kenya, Nepal, and the U.S., Kellert et al. (2000) found that community natural resource management efforts in the U.S. were more effective at meeting these goals. They attributed this to contextual factors including stronger legal support for community based management, and a more organizationally developed and financially supported infrastructure. Evaluating a BP using a narrow epistemology will likely overlook key details that explain why it is successful or unsuccessful in a particular context.

Adopting a flexible epistemology can be important in developing and evaluating BPs.

Learning

Ideally, the search for BPs should engender a continuous, active process of appraising outcomes followed either by termination or modification of the old prescription and implementation of a new one. An unresolved issue in many processes designed to generate BPs is how to identify and incorporate the best available data. Typically, an attempt is made to match the current situation with past situations that are similar. In this section we introduce four methods by which learning can be enhanced—experiments, correlations/statistical analyses, prototypes, and case studies. The utility of a given learning method will vary with context and the order of presentation does not necessarily reflect their relative utility. Furthermore, use of one method does not preclude use of another method.

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Experiments

Randomized controlled experiments, which rely on the epistemology of positivism, are a good way to document tight causal connections. For example, the role of phosphorus in lake eutrophication was demonstrated using a series of whole lake fertilization experiments (Schindler 1977). Experiments are invaluable when it is possible to control for all relevant variables. However, the difficulty of constructing well designed, yet relevant experiments in large scale ecosystems is highlighted by numerous critiques of ecological experiments (e.g., Hairston 1989, Hurlbert 1984, Peterman 1990). Even when experiments can be designed, sufficient resources often do not exist to conduct all the experiments needed to control for all relevant biophysical and social variables.

Correlations and other statistical analyses

Often BP prescriptions require using data gathered through non-experimental methods. Correlations and other statistical analyses can be used to discern trends and possible relationships in data without actually experimentally intervening in the system under management. Island biogeography (MacArthur and Wilson 1967), which underlies many BPs in large scale conservation reserve design, is based on a series of correlations between the size and shape of islands and the number of species present. Statistical analyses can also provide information in cases in which direct experimentation is uneconomical, unethical, or otherwise infeasible. For example, benchmarking of environmental performance is an inexpensive technique to identify BPs for industry. Two important caveats exist when using statistical studies to develop BP prescriptions in large scale ecosystem. First, correlation cannot be equated with causation. Second, users must take care to avoid what epidemiologists term the "ecological fallacy"—inferring individual level effects based on population level measurements. Whereas statistical procedures used in quantitative research, including both experiments and studies of correlations, can be used to deduce the properties of the larger population to which a sample belongs, they cannot be used to deduce the properties of a sample from the characteristics of the population.

Cases

In contrast to the quantitative evidence derived from controlled experiments and correlations, case-based evidence is often qualitative and derived from actual practice and experience. For example, Clark (2008) uses case study research based on more than 3\0 years of local experience to diagnose problem of leadership in Greater Yellowstone. A disadvantage of case studies is that there is less agreement on appropriate standards of evidence (e.g., there is no equivalent of a statistical p-value). However, good case research goes beyond the anecdotal and can complement quantitatively based learning. Hypotheses can be formulated and tested, strength of evidence evaluated, and conclusions or lessons learned applied to new situations (Cashore et al. 2004). Whereas experimental or correlation methods are unlikely to account for all of the relevant contextual variables in complex human-environmental systems, case studies allow one to analyze situations in which there are more variables of interest than quantitative data points and triangulate on rational conclusions (Yin 2003).

Prototypes

Prototypes are small-scale trials used in actual management situations as a basis for learning. For example, starting in 1999 the U.S. Forest service started a pilot project to study whether stewardship contracting could be used to address forest stewardship needs through collaboration with local communities. Because they are designed as learning opportunities, the users of prototypes should not expect all prototypes to meet substantive or procedural goals for the system under management. Rather, the goal of the prototype is to generate knowledge so that future interventions will more successfully meet substantive and procedural goals. Some of the challenges to carrying out successful prototypes include: (1) accounting for the level of risk involved in learning, (2) producing useable results given the relatively high amount of variability in ecological and human systems, and (3) developing interventions that are potentially reversible.

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RECOMMENDATIONS

In this section we offer recommendations that will allow BPs to contribute more effectively to improving outcomes in large scale conservation. In brief these recommendations are (1) understand the role of BPs in the decision process, (2) broaden the search for BPs by using different epistemologies and taking into account the potential to make both make both substantive and procedural improvements in the process of environmental decision making, and (3) diffuse BPs to a wide audience of potential new users by understanding that the BP innovation and prototyping process must overcome restrictive pressures. We expand on these recommendations below.

Decision process improvements

One of the most important tools for successful intervention in a complex system is an adequate mental model of that system. A better mental model is one that allows practitioners to understand and effectively intervene in the system. Substantively focused models rooted in the natural sciences can be used to describe how the biophysical system works and whether it is likely to respond to an intervention. Such models are important in the formation of BPs, however, a successful practitioner will also need to be aware of procedural models if they are to generate BPs that are maximally practical and feasible. Procedurally focused models can be used to bring the social and decision processes into focus. They can be used to determine whether the human social system is likely to be amenable to BP intervention. Full models of the decision process, which combine substantive and process focus, can be used to capture how the decision process actually works (descriptive models) or ought to work (normative models) and how BPs can improve the process and outcomes. Professionals should use a realistic, functional model of the decision process as part of their efforts to come up with and diffuse new BPs. While not the only possible model, the decision process model by Brewer and deLeon (1983) is one that we and other people have found practical. Understanding and seeing that BPs can be part of any management decision process will facilitate improved environmental management.

Each phase of the decision process—initiation, estimation, selection, implementation, evaluation and termination—will involve different participants in different arenas. Environmental problems arise out of conflicting human values rather than the state of the world, per se. Any attempt to solve a problem without taking into account the human element is unlikely to succeed (Hilborn et al. 1995). Yet the social dimensions of environmental problems are often under-attended to in BP development processes. Consequently, the initiation and estimation phases can be improved by taking into consideration both biophysical and social systems simultaneously. In complex large scale conservation efforts, it may be impossible for all participants to agree upon a common formulation of the problem before action is taken. In such cases, the selected BP prescription may represent a compromise designed to address one of a number of competing formulations of the problem. Those who seek new BPs (e.g., stakeholders), those who develop them (e.g., scientists, managers, innovators), and those expected to implement them (e.g., managers) need to work together throughout the process. BPs tailored in this way will have an increased chance of being implemented as intended. Ongoing independent appraisal of BPs is necessary. However, when there are competing formulations of the problem to be addressed, it may be difficult to find consensus on the evaluation of a BP's efficacy. Finally, it is important to develop a termination plan for programs that have achieved their goals or that clearly cannot achieve their goals.

Understanding and seeing that BPs can be part of any management decision process will facilitate improved environmental management.

Targets of best practices

Those who seek, develop, and use BPs should have a clear understanding of their own standpoint and focus of attention. As noted above, people very much matter in the BP process, including the innovator(s) of BPs. Because most environmental professionals were trained as positivists, most BPs focus on substantive improvements. However, BPs can be used for process improvements too.

At present, the legitimacy of BPs tends to be judged using a positivistic epistemology. However, rigorously vetted quantitative data sought by positivists is not always available in environmental management problems that face practitioners of large scale conservation. Post-positivism is better suited to identifying problems and offering BP solutions in complex contexts. Reductionistic analyses could then be used to confirm the efficacy of the identified BPs. However, studies suggest that successful practitioners do not rely on purely reductionistic methods (Schon 1983). Consequently, we suggest that the case study method be used in the generation of BP prescriptions even when positivistic data are available and used. Once prescriptions have been generated, prototyping exercises can be used in implementation and learning.

We feel that a dual focus on both substantive and process improvements, and the simultaneous use of both positivistic and pre-and post-positivistic epistemologies offers the greatest likelihood that BPs can be found and diffused successfully. To limit oneself to a narrow focus of attention and a single epistemology is to be less than fully problem oriented, contextual, and multi-method. Furthermore, it is less likely to lead to the identification and diffusion of the best practices that are available.

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Diffusion process improvements

Widespread use of specific BPs requires identifying better solutions to the problems facing people and getting these likely solutions adopted, even in the face of resistance. A familiarity with the process by which innovations are diffused and adopted will expedite the diffusion of effective, context sensitive BPs to a wider audience for use. Rogers' (1995) conceptual model of the adoption process in innovation looks at the diffusion half of the equation (restriction is the other half). Innovations are diffused through a sequence—awareness, interest, evaluation, trial, and adoption. Although more recent authors have highlighted the fluid nature of the process (Van de Ven et al. 1999), we feel that Rogers' model has heuristic value for those interested in diffusing BPs. Innovation can be restricted and fail to be accepted at any of the five stages. For example, the practice can be discontinued (terminated) after being partially adopted, either because of dissatisfaction with the outcomes of the practice or because of the adoption of an even newer practice judged to give superior outcomes or for other reasons. An innovation will not be adopted if a person is ignorant of the innovation, is aware of the innovation but unwilling to adopt it, or is aware of the innovation but unable to adopt it. Awareness of an innovation depends on the characteristics of the innovator, the social system, the available modes of communication, and the time since the innovation was first implemented. People attempting to identify and promulgate BPs should look not only to academic sources for information on BPs, but should also actively harvest their own experiences and that of other people to find lessons and new BPs (Brunner et al. 2002).

A number of characteristics will make an innovation more likely to be accepted and, consequently, more rapidly diffused. The innovation should be: readily observable, and potentially reversible (i.e., it can be tested), compatible with existing values, easy to understand and use, *and* apparently better than current practice. Whereas there is a long history and large body of literature on how to diffuse substantive innovations, the diffusion of procedural innovations has not been as extensively studied. Because process targeted BPs tend to be more complex, less visible, and require changes in norms and standard operating procedures among people and institutions, they are slower to diffuse and more likely to be restricted or only partially adopted. The case study methodology can help to identify and document the substantive BPs. However, other methods can be used during too to understand the adoption process. For example, field trips, workshops, and other arenas can be developed to encourage dialogue between those who have developed or used the BP and people interested in adopting it. Small-scale prototypes can allow potential users to evaluate a BP on a trial basis without committing extensive resources to the practice.

CONCLUSION

The *Best Practice* concept is an important tool for improving environmental management and the practice of large scale conservation. BPs are provisional prescriptions for improvement that reflect relevant experts' best judgments and mental models. BPs are ultimately about improving the decision making process and its real world effects. Although many BP innovators focus exclusively on substantive improvements, BPs can be used to spur both substantive and procedural improvements. Adopting practical models of decision making, innovation, and diffusion processes can enhance the utility of BPs and facilitate more rapid improvements. Although most BPs rely on rules of evidence and inference derived from positivism, broadening the epistemological foundation of BPs to include post-positivistic methods that attend to contextual factors can enhance the utility of BP prescriptions. Prototyping is a context-sensitive learning strategy that may be the most practical means of rapidly testing, adapting and diffusing new BPs successfully.

The *Best Practice* concept is an important tool for improving environmental management and the practice of large scale conservation.

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