

# Bioregional Assessments

Science at the Crossroads of Management and Policy

edited by

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foreword by

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# Acknowledgments

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Each assessment in this review is presented through the filter of individual experience. We wish to thank all our contributors, who generously provided their candid appraisals of the case studies. In many cases, we were asking these people to critique their recent life's work. We received, in every instance, a clear-eyed evaluation of strengths and weaknesses. Their honesty and insights are the backbone of this book. The opinions they share here are their own and do not reflect official policy of the agencies represented.

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# Foreword

Jerry F. Franklin

Direct incorporation of science and scientists into natural resource policy development is a relatively recent phenomenon. It is a phenomenon that owes much of its development to the environmental legislation and litigative history of natural resource policy development during the second half of the twentieth century.

When I began my forestry career in the late 1950s, resource managers commonly viewed scientific research as occasionally useful and generally harmless, a pursuit most appropriate for intellectuals not suited to a more active career (and, perhaps, best kept off the streets). Managers were most likely to be comfortable with research focused on improved implementation of existing methods and policies ("domesticated science"). It was a rare manager who encouraged research that probed the basic assumptions underlying current policy ("wild science"), such as clear-cutting or ecological values of old-growth forest.

It is not surprising, therefore, that regular, meaningful collaboration between managers and scientists in development of natural resource policies has been the exception rather than the rule during most of the twentieth century. When science was incorporated into policy, it was filtered through the management organization; discussions between the scientist and the manager were "kept in the family." Direct involvement of scientists with development of policy or with decision makers was strongly discouraged—largely by mutual agreement. Scientists didn't want the pressures and potential influences of policy making in their work, and managers didn't believe scientists would understand the compromises and practicalities of the real world.

The isolation of science and scientists from natural resource policy began to change in the 1960s, however, with the publication and popular acceptance of the book *Silent Spring* by Rachel Carson and other symbols of the emergence of ecology as a cultural element. New environmental laws were passed, major controversies over resource management surfaced, and natural resource policy began to enter the courts.

As the legal battles commenced, an incredible thing happened—appellants began bringing science and scientists into the courtroom. Agencies such as the Forest Service found themselves facing testimony damaging to their projects and

agendas from expert witnesses in their own employ. The agencies' own scientists and scientific data were being used to discredit current management practices and proposed new activities.

This was a most distasteful development. Consequently, in the 1970s and 1980s there were frequent comments regarding the need to "get the scientists under control" and to improve their appreciation of being "part of an agency team." However, the relative independence of research in agencies such as the Forest Service made control of the scientists and censorship of scientific publications difficult. Perhaps just as important was the transparency provided by a heightened public profile for science and more open flows of information stimulated by ever more sophisticated environmental analyses and counteranalyses and by the Freedom of Information Act. Natural resource policy was no longer the exclusive purview of resource professionals; indeed, policy was increasingly being made in a goldfish bowl.

By the mid-1980s, it was clear to most agency resource managers that they at least needed to be aware of the best and most current scientific information relevant to their projects. This information was going to surface, one way or another; they could try to incorporate it ahead of time, in their decision documents, or they could expect to encounter it in court. Still, an effective and acceptable method for systematically incorporating science and scientists in policy development and project analyses was not clear to agency managers. Scientists were, by their very nature, unpredictable and, therefore, risky participants in processes that had politically bounded, if not predetermined, outcomes. Agencies rarely could bring themselves to incorporate scientists directly in their decision-making processes, and decision screens—boundary conditions for acceptable management alternatives—sometimes existed unknown to either the scientific advisors or to the public (as described by Steven Yaffee in his book, *The Wisdom of the Spotted Owl*).

In the last decade, decisions were taken out of the hands of the resource professionals as the agencies lost their scientific credibility with the public and with all three branches of the federal government. Court injunctions stopped most timber harvesting activities in the Pacific Northwest and were threatened elsewhere. One judge directed the U.S. Fish and Wildlife Service to take a second, scientifically credible look at delisting the northern spotted owl, and another judge directed the Forest Service to develop a scientifically credible plan for management of the owl. Congress created its own scientific advisory group, the Scientific Panel on Late-Successional Forest Ecosystems (a.k.a. the Gang of Four). A newly elected President Clinton convened a forest summit and created his own scientific panel, the Forest Ecosystem Management Assessment Team (FEMAT).

Science and scientists were catapulted into central roles in natural resource policy analysis by the need—legal and social—for development of scientifically credible plans for management of wildland ecosystems over entire regions. This also resulted in significant direct interaction between decision makers—especially politicians—and natural resource scientists for the first time. While there

have always been individual scientific advisors to high-level administrators and selected scientific testimony to Congress, the number of scientists and the extent of their direct involvement with decision makers greatly increased. As a whole, the scientific community began poorly prepared for such tasks by both training and inclination but quickly learned, on the job, how to develop and conduct meaningful analyses of various management alternatives.

We are now entering a new era, in which science and scientists—along with managers and stakeholders—will be intimately and continuously involved in natural resource policy development. Today, most resource managers genuinely want the most comprehensive and current scientific information available, whatever its implications for management. Scientists want to be a part of the process but not be co-opted by it. However, we are still very much at the stage of learning how the scientific, the technical, and the social can be integrated.

Bioregional assessments have provided our most important opportunities to learn how science can be systematically incorporated into resource policy development. This book is about our experiences in this new interaction, this new partnership of science with management and the public. It provides the student of policy development with the views of the scientist, the manager, and the policy maker, primarily drawing from seven important and contrasting case studies. These diverse studies and a synthesis chapter prepared by one of the world's foremost forest policy analysts make clear the ways in which we can improve how science is utilized in making decisions about natural resource policies and ecosystem management.

This is important because there is a great deal still to be learned about the best approaches to bioregional analyses with regard to both design of the process and usefulness of the products. For example, it is not clear that analyses developed with larger budgets and over longer periods are superior to those developed under very short time lines. Similarly, the relative merits of publicly open versus more closed processes are not clear; analyses conducted in a goldfish bowl may not necessarily produce results superior to those developed by scientific and technical personnel working in isolation. The diversity of approaches represented in this book will be very useful in helping to resolve such questions.

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# Introduction

Margaret Herring

Tension between development and conservation of natural resources exists in all parts of the country. Battles erupt over consumptive water use and ecological values in the Everglades, old-growth forest habitat and logging in the Pacific Northwest, and traditional use and potential development in the north woods of New England. These conflicts reflect a real limitation of resources and a growing list of the demands and values society puts on these resources.

Established planning systems failed to deal with these conflicts. Agency plans, local ordinances, and specific regulations seem to patch over spots while problems continue to spread well beyond the boundaries of recognized jurisdictions. Resource managers often receive the brunt of public anger as people are increasingly frustrated by decisions they feel are imposed on them that affect the well-being of their communities and their future. Opposing sides become polarized, and policy makers may see all choices as politically punishing. Lack of consensus causes delays, and the job of managing natural resources often passes to the courts.

An alternative to court-ordered, crisis-driven decision making is emerging across the country. This new tool has many names and many applications, as it develops not from explicit design but from necessity and innovation. We call this new tool *bioregional assessment*. It is the effort to build knowledge about a region prior to decision making and management action. Bioregional assessment is an essential part of ecosystem management. It is the first step taken in order to understand the condition and possible futures of a region. Just as a medical history and physical examination precede diagnosis and treatment, so a bioregional assessment precedes ecosystem management and conservation planning.

Bioregional assessments integrate a broad range of information about the social, economic, and ecological conditions within a region in order to provide a basis for making decisions and taking action. They are *bioregional*, which is to say they are ecosystem-based, delineated by natural processes and elements rather than by planning units and political jurisdiction. And they are *assessments*, including elements of study and evaluation rather than a full planning and implementation process. They examine natural and social systems at large landscape scales, and they consider changes to those systems that may be occurring over

long periods of time. Bioregional assessments turn traditional questions on their heads. Rather than asking, for example, what is the maximum sustainable yield of timber from the forest, they ask what are the trends in forest condition in relation to environmental, economic, and social systems within the region.

By providing a clearer understanding of current conditions and trends, bioregional assessments are meant to bring accountability to otherwise fractious issues of resource use and management. Instead of posing one side against the other, assessments attempt to bring together traditional opponents in a joint effort to assess conditions and possibilities within a shared bioregion. For example, a Republican governor and a Democratic secretary of interior have endorsed an assessment of the last undeveloped lands of coastal Southern California, encouraging the partnership of land developers and conservation groups in a region where rapid population growth conflicts with endangered species protection on private land. International agreements have commissioned a series of assessments in the Great Lakes region, where chronic environmental problems affect communities in two nations. In the West, where federal lands dominate the landscape, conflict over resource management prompted both Congress and the president to initiate assessments in the Pacific Northwest, the interior Columbia River basin, and the Sierra Nevada.

## Reviewing Bioregional Assessments

This review began as conversations between the editors of this volume and leaders across the country about the use of science in guiding environmental policy. It includes an in-depth examination of seven case studies from around the country. The first case study is of the Forest Ecosystem Management Assessment Team, an assessment in which my fellow editors were deeply involved through its many iterations from the Gang of Four to the president's plan. What we learned in FEMAT, and what we witnessed in other assessments, made us question how science is used to make decisions about management and policy in ecosystems.

Our review takes that question across the country to examine the assessment experience in other bioregions. These assessments invite comparison, but defy reduction to a single methodology. Our purpose, therefore, is not to prescribe steps for others to follow, but rather to review the steps that we and others have taken in order to learn ways in which science can be better used to guide management and policy of ecosystems.

Although agencies have printed voluminous documentation of individual assessments, there has been little comparison among examples or integration of lessons from experience. Each assessment has proceeded with little reference to what has been learned elsewhere, yet mandates and money for new assessments continue to appear. What has been tried in each case? What has been learned? Are these assessments effective ways of guiding management and policy decisions? This book begins to address these questions. The lessons offered from these examples provide a starting place for new assessments and help set a course for all those involved in regional planning and ecosystem management.

The case studies reviewed here began as a way for decision makers to use scientific information as a basis to negotiate conflicting demands on natural resources. Many of these assessments have been very costly, but rarely has their effectiveness been reviewed. This book attempts such a review. We considered our experience with FEMAT and other assessments and observed regional differences in the way assessments were conducted and the problems they were meant to inform. We observed temporal differences, too, as each successive assessment struggled to distinguish itself from the perceived mistakes of the past.

At the time we began our inquiry, there were dozens of bioregional assessments to choose from, and many more have been commissioned since. In selecting the case studies for this review, our first questions were empirical. We compared the extent of their geography, the length of time they had taken to complete, the variety of participants, and the issues they were meant to inform. In order to learn more about the role of science in assessments, we chose examples that had been commissioned to provide information about specific resource problems in a specific region; that focused on a large landscape with multiple ownership or management; that represented different regions and a variety of resource concerns across the country; and that included a mix of knowledgeable, credible participants from whom we could draw meaningful reviews.

As a result, forty-five contributors provide a broad mix of experience from seven precedent-setting assessments. Of the seven case studies, three are concerned primarily with the management of private land, and four with public lands. Two are focused on aquatic systems, two on terrestrial systems, and three focused on both. Four assess resources within the boundaries or influence of large urban areas, and three assess primarily rural, resource-based economies. The assessments lasted from three months to three decades, and implementation of the recommendations derived from the work continues at various stages. Despite their variety, all the examples were driven by questions from policy makers in bioregions where conflicts over the management of natural resources were intense.

We centered our review around three key questions:

- What policy questions is science able to answer?
- What scientific information is most useful to decision makers?
- How can assessments be effective in guiding management decisions?

In part one, we introduce bioregional assessments in practice and in theory. Jack Ward Thomas, speaking from his experience as a scientist, manager, and policy maker, opens with a hard look at the practical challenges that bioregional assessments present to resource agencies and managers. For the editors of this book, and for several of its contributors, the idea of bioregional assessments began in 1989 when Congress asked Thomas to head the Interagency Scientific Committee in order to find a scientifically credible conservation plan for the northern spotted owl. Thomas understood the science of the forest and its inhabitants, as well as the divisive politics surrounding the owl. From the owl forests of the Pacific

Northwest to his tenure in Washington, D.C., Thomas shares the lessons he has learned regarding bioregional assessments.

In his chapter, Lance Gunderson invites us to step back, to look at the theory and practice of bioregional assessments and notice that underlying both is uncertainty. Bioregions, Gunderson asserts, are an appropriate scale for recognizing uncertainty in natural and social systems. Uncertainty is what assessments should use as a compass to guide new research, management action, and policies that build understanding in and about communities. And so, Gunderson recommends keeping a "ruthless hold on uncertainty . . . as part and parcel to all phases of the assessment."

Part two looks specifically at the role of science in bioregional assessments. John Gordon introduces readers to the cultures of science and policy and discusses several early examples of science-based assessments. He examines possible models to describe how science influences policy making. Frederick Swanson and Sarah Greene describe the framework that science provides to build understanding of a bioregion's conditions and possibilities. They discuss the emerging field of bioregional science and the challenges this work presents to traditional scientific inquiry.

In the final chapter of this section, Hanna Cortner and colleagues challenge the assumption that science can deliver unequivocal answers to political problems. Assessments, they assert, are tools for learning, one part of a politically democratic process. They should not be allowed to consume the time, money, and attention needed to influence social action.

Part three presents a wealth of experience and insight from the practice of assessments. Regional leaders provide their retrospective in seven case studies from across the country. Each case study is followed by reviews of the science, management, and policy implications in each bioregion.

The work of the Forest Ecosystem Management Assessment Team (FEMAT) that begins our case histories provided an important turning point in the history of the Pacific Northwest forests, marking an end to pioneering exploitation of seemingly boundless natural resources, and turned management of the federal forest on its head. Several of this book's contributors refer to their experience with FEMAT, or with its predecessors, the Interagency Scientific Committee and Gang of Four. As we look beyond the borders of the owl forests, we find similar experiences in other parts of the country.

The second case study, a history of science-based assessments in the Great Lakes–St. Lawrence River basin, is an analysis not of one discrete assessment as much as of an ongoing, evolving process of more than twenty-five years, a succession of assessments to deal with a succession of emerging natural resource problems. Henry Regier documents the changing process of science, decision making, and governance in the Great Lakes bioregion, part of a major transformation toward an "Emerging Era." Many assessments have begun to explore these new conventions, and the Great Lakes story introduces them in terms of a mature assessment process.

In contrast to the Great Lakes, where the institutional infrastructure seems to be evolving toward a capacity to plan for ecological sustainability, the Everglades has struggled with institutional gridlock. A century of technological applications has transformed the Everglades, to the point that no one can predict exactly how the ecosystem will respond to the proposed restoration. Up until recently, litigation, or its threat, has set the agenda for much of the research, planning, and management in South Florida. John Ogden describes an independent assessment by a consortium of scientists in the region, which has offered a scientific basis for the restoration planning process but has yet to be embraced by agencies still debating how to proceed with the restoration.

The assessment area for the Northern Forest Lands Study encompasses a sprawling forest, largely private timberland, in parts of four New England states, intuitively understood and valued by the public as the north woods. The two-part assessment responded to concern for the protection of this piece of New England heritage, which was believed to be poised for new housing developments and change. Forest economist Perry Hagenstein was one of the first to suspect what international investors already knew. In 1987, he warned, "The increasing spread between the value of this land for timber growing and for recreation and development puts pressure on current owners." He described large land holdings as profit centers and predicted a "sea of change in forest ownership in northern New England." In this chapter, Hagenstein describes an extensive social assessment that preceded a science-based analysis of the northern forest and its economy. Town hall meetings garnered public opinion and contributed to setting regional goals in a traditional process that reflects some of the oldest and newest thinking about civic participation and public understanding of science.

Natural Community Conservation Planning (NCCP) is a coordinated state and federal response to the Endangered Species Act (ESA) developed to resolve the escalating conflicts between land development and land conservation in California. Dennis Murphy describes its first application, in the coastal sage scrub of Southern California, where the endangered California gnatcatcher lives amid some of the nation's most expensive real estate. By establishing a portion of the most critical lands as a managed habitat reserve system under NCCP, other lands are released for development or resource extraction without further restrictions from the ESA. Such planning promises to provide comprehensive, habitat-based species protection as well as "one-stop, once-and-for-all" regulatory permitting for developers and provides a model for conservation planning elsewhere in the state and nation.

A bioregional assessment of truly epic scale, the interior Columbia River basin assessment, attempted to answer growing concerns about forest health, wildlife, and anadromous fish across nearly 145 million acres in parts of seven states by assessing the ecological, economic, and social outcomes associated with federal agencies' management and policy. Building from the FEMAT experience, this assessment has worked hard to include the participation of local communities and county governments. The assessment, a collaborative effort among fed-

eral agencies in the region, has produced an innovative, dynamic database but as yet no blueprint for coordinated revision of forest and district plans throughout the region.

The Sierra Nevada Ecosystem Project grew from concern for a much loved, and well-studied, region that was in peril. The Sierra has been closely studied for over a century, and with two national parks and several national forests within the region, it would seem to have adequate protection from some of the threats that other bioregions have faced. And yet questions about its sustainability, fanned by the controversies in the Cascades farther north, sparked a comprehensive, three-year study of the condition of the range.

In addition to the retrospectives offered in each case study, we have included provocative reviews from the perspectives of science, management, and policy that discuss the implications of these assessments in their bioregions and beyond. These reviews provide a more focused look at the issues that concern scientists, managers, and policy makers. The following three examples illustrate the caliber of these outstanding reviews.

For example, in his review of science in the Great Lakes assessments, Michael Jones articulates the concern of many scientists around the country. He describes a fundamental shift in how scientists bring their expertise to the policy table. "Scientists must convey to decision makers and stakeholders alike just how uncertain we are about these ecosystems we are trying to manage. We have to get over the hurdle that would have us believe that admitting uncertainty is to admit weakness, a hurdle that has deep roots in our adversarial system of decision making. . . . It is within the context of recognizing, indeed probing, uncertainty, that science can continue to play a pivotal role in environmental policy development."

In her management review of the FEMAT assessment, Judy Nelson points out the frustration that many managers feel with assessments that leave out practical questions of implementation. In the FEMAT process, as well as in other assessments, the effort was focused on resolving the legal and scientific debate, but it did not address the underlying value debate. The decision framework "became a simplistic trade-off between timber production and species protection," ignoring the larger questions of public values that have continued to hamper the decision-making process in the region.

In her review of policy in the Everglades, Maggy Hurchalla admonishes scientists to understand the political world in which assessments exist. "Scientists who remain detached from the political debate risk the detachment of their supporters. Scientific leadership, not just research, is necessary to achieve long-term goals in ecosystem restoration. Politicians are neither as stupid nor as clever as they seem. They grab for simple solutions and will need to be taught that the environment is not a decision of yes and no, but an ongoing acknowledgment of mosaics, diversity, patterns, and pulses."

In part four, Norman Johnson and I offer a synthesis of the collective experience within the case studies and an analysis of the assessment process. We discuss the effect these assessments have had on our understanding and management of

bioregions and conclude with a list of twenty-five observations generalized from the experience demonstrated by the case studies.

## Challenges for Bioregional Assessments

The bioregional assessments we chose to review began with questions posed from policy makers to a community of experts. There was not always a comfortable fit between the information requested by decision makers and the information provided by experts. Throughout these assessments you will find a mismatch between the desire for political certainty and the inherent uncertainty of natural systems. How can predictability in industry regulation, for example, be reconciled with unpredictability in nature and our own understanding? Policy makers are asked to provide predictable policies in an unpredictable world. Scientists reject the idea that knowledge is ever complete enough to ensure no surprises.

With or without a foundation of scientific understanding, management decisions will be made and are being made, even if by default. As all these case studies make clear, the choice of no action has specific consequences. Bioregional assessments offer a way of quantifying choices, so that consequences are better understood. Applying a scientific framework to the available information helps to organize what is known, and not known, about the condition of the bioregion; society has a stake in ensuring that we use the best available scientific information for forming policy.

There are no established criteria for success of bioregional assessments, so the temptation exists to study the problem until the money runs out, then hand off the report to someone else. We must be able to recognize where testable solutions lie and where there are additional researchable questions and what the difference is between the two. Decision makers can no longer afford to loop through interminable studies without resolution; nor can they wrap themselves in a single solution, closed off from new information. In these assessments there was rarely enough information to achieve scientific certainty, but often there was enough information to suggest options for policy action.

Sometimes scientists within assessments are perceived by some to have too much power developing policies. Conversely, sometimes they appear to have spent millions of dollars researching a question with no useful result. The boundary between expert advice and policy making has not always been clear, and often it is in this gray zone that bioregional assessments occur. Our hope is to shed light on this gray zone, to learn how policy makers pose questions, and to understand how science answers.

Much of what is discussed in this volume indicates a changing field for science, management, and policy. Bioregional assessments are a step toward managing land and resources in a new way, using an ecosystem approach to coordinate management across interconnected ecosystems and economies. They are a step toward conducting science in a new way, integrating information and techniques from many disciplines to help society solve some of its most difficult environ-

mental problems. And they are a step toward new policies that recognize the interconnection between healthy environments and healthy economies.

A review such as this is not without its limitations. Although it can be argued that bioregional assessments have been commissioned since the expedition of Lewis and Clark, the use of scientific information to make natural resource policy decisions still falls far short of being an exact science. Our understanding of ecosystem function is rapidly evolving. Our experiments at the crossroads are tentative at best. None of the case studies presented here provides a perfect road map to conflict-free resource management and policy; there are gaps between the aspirations and the accomplishments. Yet, we believe, the retrospectives shared by this remarkable collection of contributors provide both a milestone for measuring our progress and a marker along the path toward integrative science, ecosystem management, and collaborative decision making.



PART ONE

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**Practice and Theory of  
Bioregional Assessments**