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FINDINGS

INSIDE

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"Science affects the way we think together."
Lewis Thomas

BEYOND THE LIMITS OF TRADITIONAL SCIENCE:
BIOREGIONAL ASSESSMENTS AND NATURAL RESOURCE MANAGEMENT

Managers, scientists, and stakeholders continue to work more closely together to define how to better integrate scientific, technical, and social concerns into land management policy.

IN SUMMARY

Bioregional assessments to deal with critical, even crisis, natural resource issues have emerged as important meeting grounds of science, management, and policy across the United States. They are placing heavy demands on science, scientists, and science organizations to compile, synthesize, and produce data, without crossing the line from policy recommendations to actual decisionmaking. There is no blueprint for their conduct, but lessons from past experience can help stakeholders—Forest Service scientists, Research Stations, land managers, policymakers, and the public—to proceed productively in future assessments.

"We are now entering a new era, in which science and scientists—along with managers and stakeholders—will be intimately and continuously involved with natural resource policy development...However, we are still very much at the stage of learning how the scientific, the technical, and the social can be integrated."
Jerry Franklin, 1999

Court ordered and crisis driven. A person could be forgiven for believing that's how natural resource decisions have been made over the past 15 years, and not just in the Pacific Northwest.

Traditional use versus potential development in New England's north woods, consumptive water use versus ecological values in Florida's Everglades, old-growth forest habitat versus logging in the Pacific Northwest, land development versus species conservation in southern California. There are many more.

"All too often, we find that these region-level crises have developed in areas where people have started to stew in their own juices in terms of natural resource use," says Fred Swanson. "There's even a plausible theory that some systems have been managed in ways that have led almost inevitably to ecological and social crisis."

Whatever the reason, the bioregional assessment is emerging nationwide as a first-step approach for addressing such crises. These large-scale assessments are efforts to build knowledge about a region—understanding the social and ecological condition, and possible futures, of a region—before decisionmaking and management action.

Although these assessments differ widely in approach and style, there is a common theme: a region that recognizes the latest brush fire as the sign of a far larger problem. Typically, the quest then begins for "science-based" solutions.

"Bioregional assessments are not new: Lewis and Clark could be said to have done one of the first in the Western United States. But what is new in recent years is the pressure Congress and science leaders are putting on the U.S. scientific establishment to focus more heavily on problems of immediate social and economic relevance," Swanson says. "Bioregional assessments have become an important medium for scientists responding to this charge."

KEY FINDINGS

- Bioregional assessments are playing critical, nontraditional roles in addressing issues of compatibility of natural resource uses. They are commonly born in natural resource crises, which adds greatly to the challenge of conducting the assessments and then developing socially acceptable management plans by using the assessment information.
- No standard blueprint exists for conduct of bioregional assessments, but devices are available to help structure their various stages, such as a charter, broad peer review, and subsequent science consistency checks.
- Scientists are not well prepared by traditional science training to participate in the broad scales and social contexts of bioregional assessments. This has implications for how research organizations accomplish assessments.

TAKING STOCK OF LARGE ASSESSMENTS

Bioregional assessments attempt to build information with relevant detail about the ecology and sociology of a region. The scientists involved neither make decisions nor advocate particular actions. Rather, says Swanson, they provide information, and in later stages, may assess whether all the science was considered and interpreted correctly, and whether the risks were revealed.

Swanson, a research geologist with the Pacific Northwest (PNW) Research Station in Corvallis, Oregon, participated in the Forest Ecosystem Management Assessment Team (FEMAT) assessment in 1993 from which the Northwest Forest Plan resulted the next year.

Because bioregional assessments were clearly expanding their influence, Swanson, PNW Research Station Forest ecologist Sarah Greene, Oregon State University professor of forest management Norman Johnson, and science writer Peg Herring convened a conference of people experienced with bioregional assessments in 1995 to discover what could be learned from regional experience with this new approach around the country. This resulted in the publication of a book summarizing and critiquing seven assessments (Johnson and others).

The assessments were already raising tough questions. What is the appropriate role of scientists in such projects? For which policy questions is science most likely to have useful answers? And from the cynics, is the bioregional assessment one more government-funded, technology-driven research exercise, with no useful outcome?

"In the recent past, bioregional science studies have addressed wide-ranging topics such as the history of land use, patterns of nitrogen cycling in response to atmospheric pollution, and ecological effects of urbanization," says Greene. "Bioregional assessments, however, have a distinctive emphasis on interactions between development and conservation, including biological and water resources. Thus, they require a greater breadth of understanding, as well as attempting to meet more immediate information needs for society."

For much of the early part of the century, the line between management and science has been distinct. Direct involvement of scientists with policymaking is strongly discouraged, both by managers and by scientific institutions themselves, leery of the potential influences on their work. As understanding of forest and range management has broadened and taken ecosystem function as a fundamental component, however, recognition of the increasing complexity and scope of the environmental problems to be tackled has pushed the research and management worlds ever closer.

Purpose of PNW Science Findings

To provide scientific information to people who make and influence decisions about managing land.

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Sherri Richardson Dodge, Editor
srichardsondodge@fs.fed.us

Carlyn Mitas, Design & layout
mitas@hevanet.com

Check out our web site at:

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Today scientists frequently find themselves on the front lines of natural resource issues. They can be attacked for not producing adequate data to support policy decisions at the same time as they are pushed harder to produce results on the deadlines imposed by policymakers. Sometimes, they are not brought in at the start of an assessment to help design its progress. Other times they are forced—along with managers and stakeholders—to work without a clear charter or set of objectives.

Nonetheless, the call for "science-based decisions" has become widespread. The role of scientists as key players in bioregional assessments is not unusual.

LAND MANAGEMENT IMPLICATIONS

- Managers participating in bioregional assessments can look at other cases and experience from around the United States to see how their counterparts achieved success or failure, in order to guide their own efforts toward maximum success.
- Social needs for information and the demand for "science-based" management are here to stay. Thus the difficult challenge of integrating information from different scientific disciplines, particularly the ecological and social, and especially over large areas, requires ongoing consideration and commitment from land managers.
- Institutional arrangements and information management ought to be configured to foster continued development and learning, in land management agencies as much as research institutions. Dealing with large-scale natural resource issues is not a one-time proposition, but one of continuous evolution.

THE GENESIS OF A NEW TOOL

As the extent of assessments across the country suggests, the spectrum of motivations is broad. Most often, a bioregional effort is born in a natural resource crisis, greatly increasing the challenge of conducting the assessment and developing socially acceptable management plans. Clearly, the bioregional assessment is not a one-of-a-kind creature.

FEMAT started out as a time-limited effort to deal with the challenge the condition of the northern spotted owl was posing to Federal timber sales in the Pacific Northwest, and grew into a review of hundreds of species, old growth, salmon, and human community issues. In the Florida Everglades, massive deterioration of the ecosystem from its native condition has generated two major assessments, the first (1989-94) a process ultimately limited by the boundaries of agency purview, the second (1993) designed to address restoration issues in all natural systems across ownerships of south Florida, and conducted in response to specific policy questions.

The northern forest lands assessment began without an immediate crisis. Instead, it faced a wake-up call in the form of a warning that a remote, relatively undeveloped part of the country could be affected with a changing pattern of ownership caused by development pressures in the 1980s, and could therefore face a different way of life. The onetime assessment was followed up by a flurry of conservation planning and additional assessment activity.

Locations of the seven bioregional assessments mentioned in Johnson and others (1999). Even this limited sample of bioregional assessments reveals that they have been concluded across many parts of the United States, with widely varying objectives and pressures.

In the interior Columbia basin, concern about forest and rangeland health, timber harvest, and the status of some fish and wildlife species brought Federal land planning into the spotlight. But Forest Service and Bureau of Land Management plans in the 1990s addressed issues on individual planning units with only limited focus on larger geographic areas. The recently completed assessment of conditions and trends in the basin will ultimately contribute to recommendations by managers for the 145 million acres of Federal lands involved, half the total area.

"While there is no blueprint for conduct or outcome of such assessments, they have all been important meeting grounds of science, management, and policy across the United States," says Swanson. "They are obviously important media for addressing compatibility of resource uses." And there is nothing simple about them.

WRITER'S PROFILE

Sally Duncan is a science communications planner and writer specializing in forest resource issues. She lives in Corvallis, Oregon.

SHARPENING A NEW TOOL

The earliest challenge falls on scientists. "Scientists can play a variety of roles in these assessments. They can help sharpen the definitions of the resource-ecosystem-social problems. They can help define the capabilities of the biophysical system to supply goods and services, and they can help frame and execute the assessment," says Swanson.

And they can examine the consequences of solutions and alternatives, he notes, for the difficult task, which rightly belongs to managers or others making the policy decisions. It is the policy decisions, of course, not usually the science, that arouse the next level of furor.

But Swanson and Greene emphasize the importance of seeing bioregional assessments as just one step in a collaborative process of developing learning infrastructures. With this intent, people can begin to understand their regions better, hence being better prepared to avert crises before they develop. Scientists, managers, and the public alike have a stake in improving this understanding. In particular, interested segments of the public are more likely to support management recommendations to which they have contributed.

Because there are no established criteria for success, the temptation does exist to study the problem until the money runs out. This has been a major source of criticism from both insiders and outside observers. How much actual use are these huge accruals of data? they ask.

"These are far more than just library projects," says Greene. "The real tool is the concept, the idea that people will come together from an array of disciplines and work together on thinking in broad-ranging, interdisciplinary, large-scale geographic ways." They think, also, about current condition, and about future options.

The tool, then, is perhaps best used to change the way people think about, and work together on, natural resource issues. Thus the pass off of information from scientists to managers becomes a crucial pivot point: they are trying to light the way toward possible new futures, rather than actually designing the path.

ARE YOU SURE OF YOUR CONCLUSIONS?

But the problem of scientific uncertainty is naturally magnified by larger scales.

"Policymakers are asked to provide policies with predictable outcomes in an unpredictable world. Scientists reject the idea that knowledge is ever complete enough to ensure no surprises," notes science writer Peg Herring, in the introduction to the synthesis produced by the Swanson-Greene group. "Bioregional assessments offer a way of quantifying choices, so that consequences are better understood."

Swanson believes that it must be made clear from the outset that uncertainty exists, and what its nature and magnitude are. "Uncertainty in science is treated by attempting to define its causes, levels, and consequences by using methods such as sensitivity analysis. In most cases, uncertainty increases in more complex and large-scale systems."

He notes this renders the value of peer review, both by selected experts in the field, and by "blind" review, even higher than in traditional science. Other scientists have pointed out that admitting uncertainty should no longer be seen as a weakness. Rather, it is by recognizing and probing it that science can continue to play its best role.

"Bioregional assessments challenge scientific traditions by asking scientists for credible, objective information where the grand scale and complexity of issues prevent the usual methods of checking for uncertainty," says Greene.

A NEW KIND OF SCIENCE

Perhaps the most painful question of all for scientists involved comes from their colleagues: Is this really science? Most researchers pulled into bioregional assessments have at some point to address this dire professional question.

To a significant extent, assessments on this large scale are about compilation and synthesis of data. Without the usual appurtenances of experimental science—the hypothesis, the experimental treatment, the control, the replication, the field observations, the simulation modeling—a bioregional assessment does not fit the traditional definition and tools of "real science."

"The traditional roles of scientists generally lack the highly interdisciplinary, broad geographic scope, and political profile demanded of scientists in bioregional assessments," Swanson notes. "The questions posed by policymakers are less likely to be answered with the techniques of traditional science."

Specifically, scientists tend to limit their interpretations to the range of data. In particular, the fields of ecological and social science so central to bioregional assessments have emphasized work at fine spatial scales and short time scales of seasons to years.

Scientists are called on to produce a "value-neutral" synthesis of scientifically credible information to determine current conditions, which sounds doable.

"But even a task as apparently straightforward as objectively describing current conditions may be controversial, as in the case of assessing the population of an obscure species," says Swanson. "Interpreting patterns and causes of trends opens yet additional sources of conflict and uncertainty."

Invariably, at the beginning of the process, data may be sparse, uneven, and of unknown quality and coverage. Most assessments unearth these problems and offer suggestions for research directions to be pursued. Some even incorporate new research into the process.

LESSONS AFTER THE FACT

The bioregional assessments book summarized several emerging themes and trends derived from case studies from around the country.

Perhaps the clearest need of all is that a charter should define the planned scope of the assessment, according to Swanson. Give and take between the policymakers and the assessment team leader in creating a charter defines the needed job and assures that it is doable. The conceptual framework of how the major pieces fit together is in the end much more important than mere data.

The eternal challenge of public involvement—a central issue in every bioregional assessment—has no simple solution. It can involve insurmountable tradeoffs, polarization, and lack of support. Or it can smooth the path to implementation of actions that benefit the region.

Clear questions are needed from policymakers, at the same time as scientists need to understand they will never evade the questions of policymakers. As Greene points out, a bioregional assessment does not set policy, it is neither an environmental impact statement nor a forest plan.

"It doesn't even necessarily answer the questions it sets out to answer," she adds, "but if it's good, it will generate its own good questions, especially around the extremely difficult issue of integration."

Perhaps not surprisingly, a short timeframe and a tight budget tend to constrain the assessment and address the immediate problems more successfully. Keeping people under pressure seems to help them think outside the conventions, discourage major digressions, and produce more creative solutions.

Devices used during the assessments include risk analysis and species viability assessment techniques. Policy analysis and various forms of peer review often are used at several stages of the assessment process. Science consistency checks of policy documents, in which an overview team evaluates whether all the science has been considered, and how appropriately data have been used in formulating policy, are starting to be used more widely.

BIOREGIONAL ASSESSMENT TOOLS

Tools and devices:	Possible uses and values:
Charter	Negotiate the task; set the course
Conceptual framework keep the work on track	Outline components and their relation to
Species viability assessments, risk analysis	Structure analysis of possible complex outcomes or alternatives
Peer review	Critical analysis of preliminary findings
Science consistency check	Confirm information exchange between information providers and decisionmakers; distinguish roles.

Successful bioregional assessments benefit from a variety of tools and devices to guide them at different stages of development. No assessment studied made use of all tools.

"Two areas of common shortcoming in the followup activities are commitment to monitoring, and research to test assumptions used in assessments and new policy," says Swanson. "This institutional inertia creates problems for scientists through lack of rewards and resources for continued regional work, and limits the institutions in their service to society."

And in service to society, how will scientists make time to play these new roles thrust on them, finding and translating data, neglecting their research programs for the duration? As difficult as this issue is for research institutions to face and reorganize around, the synthesis group concluded that bioregional assessments are advancing both science and public thinking about natural resources at the regional scale. Like it or not, scientists and research institutions must face this new challenge, which seems to be here to stay.

As Swanson notes, "There is much to be learned from their emerging, rich lore. They are an important part of society's changing relations with the ecosystems and natural resource systems we depend on and are part of."

"While scientists are being asked to function as philosopher kings less and less, they are being asked to provide conservation leadership more and more."

K. Norman Johnson

FOR FURTHER READING

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U.S. Department of Agriculture
Pacific Northwest Research Station
333 S.W. First Avenue
P.O. Box 3890
Portland, OR 97208-3890

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SCIENTIST PROFILES

FREDERICK SWANSON, a research geologist with the PNW Research Station, has been studying landslides, fire, and other disturbance processes in western Oregon for more than 25 years. Swanson is a leader of the National Science Foundation-sponsored Long-Term Ecological Research Program at the H.J.Andrews Experimental Forest. He is also a leader of the Cascade Center of Ecosystem Management, a research-management partnership involving Forest Service Research, the Willamette National Forest, and Oregon State University.

E-mail: swanson@fs.fed.us
Phone: (541) 750-7355

SARAH GREENE is a forest ecologist with the PNW Research Station Ecosystems Team. She manages the Cascade Head and Wind River Experimental Forests, and is a member of the Wind River Canopy Crane Research Facility. She is currently working on a history of the Wind River Experimental Forest. She is actively involved with the regionwide permanent sample plot group that is part of the Ecosystems Team. She administers the research natural area (RNA) program in Washington and Oregon and is the interagency RNA scientist.

E-mail: sgreene@fs.fed.us
Phone: (541)750-7360

SWANSON and GREENE can be reached at:
Pacific Northwest Research Station/USDA Forest Service
Forest Science Laboratory
3200 S.W. Jefferson Way
Corvallis, Oregon 97331