PNW
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Science
FINDINGS

INSIDE

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

TACKLING RISKS AT THE BROAD SCALE IN THE INTERIOR COLUMBIA BASIN

The 145-million-acre project area encompasses parts of seven states. Seventy-two million acres of the area are managed by the Forest Service and BLM, the remainder by states, tribal, and private owners.

IN SUMMARY

Examining biophysical and social conditions, trends, and opportunities, the Columbia basin assessment draws a composite picture of the basin with two integrated measures: ecological integrity (the presence and functioning of ecological components and processes) and socioeconomic resiliency (the social and economic adaptability of a geographic area to outside economic influences like reduction of timber supply). The resulting picture is complex with great variation across the basin.

Scientists used these two measures to balance ecological risk, management opportunity, and public choice. An iterative process was developed for finding where risks to ecological goals are acceptable and output levels are achieved to the extent possible. The process brings up questions like "Are we willing to trade away timber output to save a single species?" and reveals unanticipated risks, for example, a program of controlled burning to reduce wildfire risk could increase sediment input to streams and raise smoke levels unacceptably. The scientists ultimately developed a set of three scenarios for using assessment information to play out the probable effects of various management approaches at a basinwide scale.

"As soon as questions of will or decision or reason or choice of action arise, human science is at a loss."
Noam Chomsky 1928–

In a huge chunk of the Western United States, a science-based approach to natural resource management will succeed only by people collectively making tough decisions about land management. Some people ask: Will the way the West was won—by independent pioneers who braved all to escape social and physical constrictions to their dreams—turn out to be the way the West was lost?

The interior Columbia basin was brought into the political spotlight in July 1993, when President Clinton directed the Forest Service to "develop a scientifically sound and ecosystem-based strategy for management of eastside forests."

The basin contains over 145 million acres, an area the size of France. Half that area is managed by the Forest Service and Bureau of Land Management (BLM), so the public is automatically involved. State agencies, tribes, and private landowners, who fiercely claim and protect their rights, manage the rest of it. The role of the PNW Research Station is to provide objective scientific information to these decisionmakers as they make difficult choices that will affect the entire basin.

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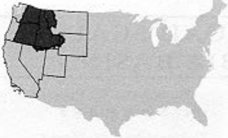
The decisionmakers face problems and risks their predecessors couldn't imagine: wildfires of unprecedented intensity and size, damaging noxious weeds, declining salmon populations, extensive insect infestation and damage to forests, and great change in how natural resources are viewed and used. These problems and risks are far too big to be tackled site by site.

And so the Interior Columbia Basin Ecosystem Management Project is, fundamentally, a challenge of scale.



Interior Columbia Basin Ecosystem Management Project

KEY FINDINGS

- Ecological integrity differs greatly across the basin. Although just 16 percent is rated as high, 84 percent of that is on Forest Service and BLM lands. Likewise, risks to ecological integrity and opportunities to maintain or restore integrity differ substantially across the basin.
- Nearly two thirds of the area is rated as having low socioeconomic resiliency, yet two thirds of the basin's relatively sparse population live in counties with high socioeconomic resiliency.
- On Federal, forested lands, the percentage of stand replacing wildfires increased from 20 percent to nearly 50 percent of the area, threatening ecological integrity, water quality, species recovery, and homes in rural areas.
- Salmonid populations are strong in less than 33 percent of their occupied range. Healthy populations may be rebuilt from many of the remaining core areas.

BROAD-SCALE SCIENTIFIC ASSESSMENTS IMPROVE DECISIONS AT FINE SCALES

"It's similar to flying at high altitude and characterizing conditions from that perspective. We established very rapidly that the data simply didn't exist at this level for the Columbia basin," says Tom Quigley, a PNW resource economist and the science advisory group leader for the project. "So our science team worked at the cutting edge of research into broad-scale relationships."

But surely the high-altitude picture runs the risk of ignoring tremendous amounts of detail? And thus the risk of some people feeling that their interests were not represented in the analysis?

"When you're dealing with millions of acres of unhealthy forest and fragmented habitat," says Jim Sedell, research ecologist with the PNW Research Station, "the conditions and trends need to be tracked at a large, strategic scale. Otherwise, actions are reduced to tactics." With a strategy in place, he points out, tactics such as buffer strips and controlled burns become tools with a context.

Somewhere in the transition between scales, between strategy and tactics, lives a new and crucial challenge for both scientists and managers. Broad-scale scientific assessment, certainly 145 million acres broad, is new. The open scientific process still left some wishing it could have been more closely reviewed and monitored by peers. In the interior Columbia basin, it was painstakingly used to identify a hierarchy of risks and opportunities, to guide management decisions into the 21st century.

Management policy based on broad-scale ecosystem understanding is also new, utterly new. Until now, for example, the language and history of NEPA, forest planning and the Forest Service Standards and Guidelines, as well as local community pressure, have always encouraged activity and decisions at a far smaller, tactical scale.

"The notion of linked scales remains one of our greatest challenges," says Richard Haynes, Program Manager at the PNW Research Station, and co-leader of the project's economic component. "Not just different scales, but the ability to think a scale up or a scale down, to consider properly the ramifications at the next level. I believe we need first to learn to do linked-scale thinking, and then do it all the time."

Purpose of PNW Science Findings

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

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TEAMING UP

"We organized the science and management teams simultaneously in order to avoid the inevitable pressure on scientists to come up with management options," Quigley recalls. He speaks of protecting the "wall" between science and management teams, a wall he sees as essential to keeping scientists focused on providing the best understanding possible, and not being pulled into the policy arena. Participants in the project recall the unease with the spotted owl and FEMAT (Forest Ecosystem Management Advisory Team) processes for the Northwest Forest Plan: where some think the wall was breached.

"As information was transferred to managers, we tried always to talk about options and scenarios that would produce desired outcomes. We tried also to move beyond the search for a single solution," says Quigley.

"Planners and managers often quickly identify a problem, then devote the bulk of their efforts to developing solutions," Quigley notes, without intending criticism. "Effective ecosystem management requires a clear problem definition, a clear understanding of management goals and objectives, and a clear and solid assessment of biophysical and social conditions, trends, and opportunities." Only then, he emphasizes, should solutions be recommended and selected. Perfectly simple, if only you weren't trying to blaze this trail across 145 million acres.

Another critical part of the process was gaining public participation and understanding. As many as 200 people regularly attended the monthly open meetings during the 4-year process, bringing multiple perspectives and difficult questions. The challenge of incorporating public input into project assessments was matched only by the challenge of bringing scientists from many disciplines to the table and getting them to use a common language, then helping managers understand the implications of all the new information.

MANAGEMENT IMPLICATIONS

- **Effective ecosystem management requires an understanding of ecosystem links, an ability and willingness to create adaptive, flexible management policy, and a clear understanding of risk management.**
- **Linked-scale thinking—the ability to think up to a broader scale and down to a finer scale—is crucial in risk management. Balancing short- and long-term risk is likewise a key challenge.**
- **Risk management acknowledges and anticipates cumulative, integrated, and concealed risk effects, and is willing to reanalyze and adapt management activities accordingly.**
- **Society values different aspects of large-scale ecosystems differently, and perceives different levels of acceptable risk for different issues. Social values also may change over time, so stakeholders must be closely involved with management planning.**

DRAWING A COMPOSITE PICTURE OF THE BASIN

Integration was mandatory, at every stage of the project. The scientific assessment was conducted by resource area—biophysical, landscape dynamics, terrestrial, aquatic, economic, and social. All of those findings had to be integrated to develop a composite picture of the status of Columbia basin ecosystems.

Beyond finding common language between a research ecologist and a sociologist, between fish people and economists, between scientists and farmers, this means thinking about ecological aspects of the landscape, *while* you're thinking about how and why people value the land and its resources, *while* you're thinking about local, regional, and global economies. It means concentrating on overall ecosystem health, diversity, and productivity, by learning how different parts function with each other, rather than focusing on achieving a designated set of outputs.

This is ecosystem management, with integration at its beating heart. It's hard, it's different, and it's been called "the next intelligent evolution of multiple use."

Ecosystem management, particularly over large areas, requires a set of integrated measures, to help make sense of data from diverse and dynamic landscapes. In the interior Columbia basin, those measures were ecological integrity and socioeconomic resiliency. Ecological integrity measures the *presence and functioning* of ecological components and processes. Socioeconomic resiliency estimates the *social and economic adaptability* of a geographic area to outside economic influences, such as a significant reduction in timber supply.

So how's the basin doing? In general, according to Quigley, it was found that ecological integrity differs greatly across the basin. **Although only 16 percent of the land was rated as having high integrity, 84 percent of that lies under the jurisdiction of the Forest Service and BLM.**

Sixty percent of basin land is rated as having low ecological integrity, though this rating should not necessarily be interpreted to mean "bad." For example, agricultural land most frequently receives the low rating, for altered systems generally have lower integrity. But still, agricultural land is often meeting the resource needs society has placed on it.

Nearly two thirds of the area is rated as having low socioeconomic resiliency, yet two thirds of the basin's relatively sparse population actually live in counties with high socioeconomic resiliency. [This part of the project will be discussed in greater detail in the next issue of Science Findings.]

With these kinds of numbers, and masses of supporting detail, the two integrated measures of ecological integrity and socioeconomic resiliency paint a broad-brush composite picture of the basin's current condition. The measures now become valuable scientific tools for objectively evaluating ecological risk and management opportunity. This information then can be used as people make difficult choices about managing the basin.

RISKS, OPPORTUNITIES, AND OPTIONS

"As we worked, we asked: Where are there opportunities to improve or restore ecological integrity? And where are there opportunities to produce desired goods, functions, and conditions with a low risk to ecological integrity?" Sedell explains.

To identify the greatest ecological and economic upsides and downsides, the scientists constructed a table of risks and management opportunities. Project assessments found that risks to ecological integrity and opportunities to maintain or restore that integrity differ substantially across the basin.

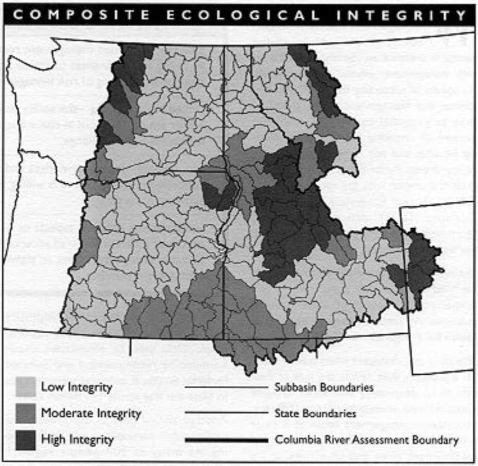
"This is the blueprint at the broad scale for where you'd best start with recovery plans and restoration of forest health," Sedell says. "It helps answer the tough question: How do you restore ecosystem health with limited dollars?"

"It was a constant struggle to get people to be clear-thinking about risk," Haynes recalls. "A key hurdle was keeping risk assessment and risk management separate. *Risk assessment* looks at how risk affects a component of the ecosystem; *risk management* looks at what the opportunities are for restoration or treatment of the area at risk."

Managers have been stymied in the past because they didn't understand integrated risk or how cumulative risks affect issues at a scale larger than an individual National Forest or BLM administrative unit. These are *big* issues such as insect infestation, catastrophic wildfire potential, and steep decline of salmon populations.

Understanding risk hierarchies becomes essential to managing the accumulation of risks in the basin. For example, if you want to do Treatment A to achieve Outcome B, then you potentially run Risks C and D. And changing Risks C and D might change Outcome B.

Also, a management opportunity can conceal additional, unanticipated risk, and so flexibility to adjust to circumstances becomes crucial. For example, a management opportunity to increase recreation that affects riparian areas could increase risk to fish spawning beds. Or a program of controlled burning to reduce wildfire risk could increase sediment input to streams and raise smoke levels to unacceptable levels.



Composite ecological integrity ratings reflect measures of how intact parts and processes of ecosystems still are. A system with high integrity rebounds faster after wildfires, floods, road building, and other disturbances. High, medium, and low ratings are relative across the basin; no absolute

"It becomes an iterative process," Quigley explains, "of cycling through the analysis until the risks to ecological goals are acceptable and the output levels are achieved to the extent possible. A significant part of the process is balancing short- and long-term tradeoffs in risks and outputs."

A further complication in balancing tradeoffs: society accepts different levels of risk for different issues, and what's more, people change their ideas over time—as they have regularly since European settlement.

Integrating social values is almost guaranteed to pose problems to managers of public lands, who have traditionally been risk-averse, according to Quigley. For example, are we willing to trade away a timber output to save a single species? Or a species for a higher ecological integrity rating—a better world for our grandchildren? These are hard questions, and most people have strong opinions on them.

The science team ultimately developed three management options, scenarios in which they used their assessment information to play out probable effects of various management approaches at a basinwide scale.

1. **Continue current management.** *This results in decreasing overall integrity and increasing risks to people and ecological integrity. Results would include declines in species habitat and populations, increases in fire severity, continued declines in fish habitat, and continued departures from historical disturbance processes.*

2. **Emphasize restoration.** *This results in stable or improving trends in integrity, and decreasing or stable trends in risks to people and ecological integrity over most*

of the area. Outcomes would be more consistent with long-term disturbance processes, and would generally halt the decline of salmonid fish habitats by building on healthy core areas.

3. **Manage public resources under a reserve approach.** *This results in mixed outcomes. Social and economic effects would be highly variable, recovery within reserves would be very slow, while trends in overall integrity and risk level will mostly be improving.*

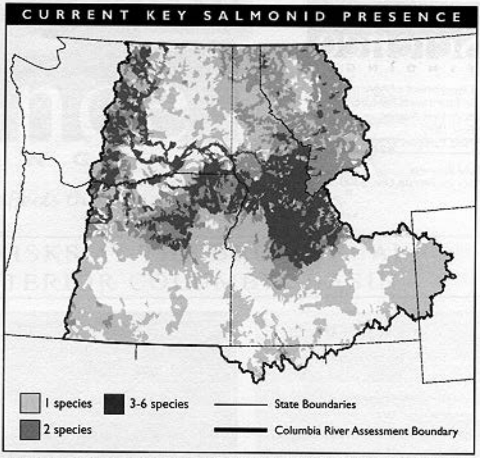
"When compared with traditional approaches, active management (option 2) seems to have the greatest chance of producing a mix of goods and services that people want from ecosystems, as well as maintaining or enhancing the long-term integrity of the basin," Quigley notes. The project now requires two environmental impact statements (EISs) as precursors to management decisionmaking.

What, then, is the possibility that ecosystem management will be adopted in the interior Columbia basin? Remember, all answers will be complicated by changing and competing public values, the constant march of science, and land ownership and jurisdictional patterns that do not correspond to ecosystem patterns.

Institutional barriers to implementation are many: The Endangered Species Act; draining resources away from broad-scale management; multiple jurisdictions, poor understanding of ecosystem management; risk-averse management styles; the Federal Advisory Committee Act shutting out some desirable forms of public input; current budgeting and contracting procedures; and money.

And yet, Quigley senses it might take 5 years to assimilate the masses of new information. He believes there is enough momentum, enough anxiety over the years-long process involving hundreds of dedicated scientists, that we may be about to cross an important threshold to implementation.

In the end, scientists provide objective information, others determine the fate of the basin as a matter of will, decision, reason, choice, and wisdom.



▲ *Change in composition, structure, and distribution of fish communities is widespread and dramatic. Depending on species, strong salmonid populations inhabit between 0.1 and 33 percent of their historical habitat.*

PNW Station leadership for team was provided by Thomas Quigley, James Sedell, Richard Haynes, Paul Hessburg, Bruce Marcot, and John Lehmkuhl. Over 300 scientists and technical specialists came together from several public and private institutions including the National Forest System, Bureau of Land Management, Intermountain Research Station, Rocky Mountain Research Station, Environmental Protection Agency, Fish and Wildlife Service, and the National Marine Fisheries Service.

WRITER'S PROFILE

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FOR FURTHER READING

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SCIENTIST'S PROFILES

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