Chapter 26

Old Growth in a New World: A Synthesis

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During the old-growth wars of the late twentieth century, a multitude of voices protested, planned, persuaded, and preached around this divisive issue. Although it seemed then that only two ideas prevailed—trees were for cutting or trees were for saving—the passing of time has allowed complexities and details to be teased out of the various perspectives, rendering considerably more nuanced ideas about old growth. Our body of knowledge about old-growth forests continues to expand, and our understanding of how we as individuals and as a society relate to them continues to evolve.

This book introduces the idea that one of the lasting products of the old-growth wars is the politically untouchable icon of big, old trees. The icon had the short-term effect of hardening the outlines of what many people conceive of as old-growth forests and creating a glare that made it difficult to see important complexities and subtleties of meaning central to the bigger problem of conserving forest biodiversity in a socially sustainable manner. It also had the effect of binding us to some principles of conservation that have arguably backed us into a tight corner when it comes to taking actions in the forest to restore and maintain biological diversity and human connections to the land. Although most of the authors in this book did not directly address the notion of old-growth forests as icon, all responded to

these consequences of the "iconization" of old growth. Questions continue to swirl around old-growth forests. We wonder if these questions represent a much larger twenty-first-century struggle to understand the tangled and messy connection between ourselves and our environment.

Three overriding themes emerge from the twenty-four invited chapters:

- Old-growth forests achieved their status as icon through a convergence of scientific complexity and spiritual mystery.
- Unlike the static view of old-growth forests as "complete," these forests continually manifest both ecological and social change.
- Issues related to old-growth forests reflect social values and how they play out in a context of science, economics, and politics.

Our changing understanding of these themes, especially the increased understanding of environmental complexity, suggests a twenty-first-century renaissance in the way we might manage old-growth forests. This chapter will first synthesize the findings of the authors and then consider some of the ideas that were not mentioned.

Complexity Meets Mystery

Old-growth forests achieved their status as icons—objects of uncritical devotion—through the convergence of our increasing scientific understanding of complex systems with the sense of awe and mystery many already feel in the presence of big, old trees. Scientists increasingly view old growth as a manifestation of complex systems, one that challenges the way we traditionally practice and think about science and forestry. Instead of trying to understand all the "parts" of old-growth forests—species and vegetation types, for example—in the hope that the sum of those parts will tell us about the whole that is the forest, scientists are recognizing the importance of scale, time, and space as dynamic variables that affect how we perceive the forest. And, as in most complex systems, forests have emergent properties—structure, functions, and habitats—that are not predictable across scales because of the particular relationships among the parts, processes, and context. To scientists, old-growth forests represent the myriad intricacies and diversity of ecosystems.

Although old trees are a necessary component of diversity, they are only one part of the web that is the forest and are not sufficient by them-

selves. New scholarship reinforces the importance of each successional stage, not just old growth, in the life of the forest. The idea of abandoning the exclusive focus on old growth as a stage in forest development emerged strongly from several of our chapters. Indeed, in the view of many authors, simplifying forest types in any fashion serves to endanger complexity, and thus, by default, to endanger biodiversity, which appears to depend more on forest complexity than it does on forest age. And complexity, as it is now better understood, ought precisely to be the most cherished aspect of any forest not managed for exclusive industrial use. Multiage management and intentionally managing forests to contribute to complexity are complemented by recognition of the importance of the natural young forests that have been as dramatically reduced across the Pacific Northwest landscape as old growth—another example of the danger in simplifying forest types. These forests make crucial contributions to regional biodiversity that are as critical as those from old growth.

Each old-growth forest also has what we might call a *vintage*—a term borrowed from the wine industry that reflects not just a time when it was born or came of age but also a place. No two old-growth forests will ever be exactly the same because each developed through a unique environment and history. To complicate factors even more, we are also starting to see a change in the rates and patterns of change itself as humans speed up (e.g., rates of disturbance) or truncate (e.g., fire frequencies, invasive species) processes critical to forest development. Scientists are wondering which, if any, characteristics of old growth are invariable across place and time. Structural complexity or "messiness" may be the best distinction between old and young, managed and unmanaged forests that we can devise at this time.

The excitement generated as scientists increase understanding of complex forests is matched by a sense of wonder that many nonscientists feel when entering a grove of old-growth trees. To nonscientists, the complexity of old-growth forests can represent a refuge for the imagination in a materialistic world where everything is counted and accounted for. Even the language used to talk about old trees—*ancient, cathedral, old growth*—reflects a traditional, mythic understanding of the world that holds respect for elders and their experience-based knowledge. As Moore reminds us in her chapter,

> Old-growth forests are old. At least in the Pacific Northwest, they are tall. They are complex. They are unspoiled. They are quiet. They are beautiful. They are all of these at once. These are their sources of spiritual value.

We wonder what those trees, some standing since before Columbus crossed the Atlantic, have seen over the centuries. If they could speak, what would they tell us about our history and our future as users of the forest?

At the height of the old-growth wars, early scientific understanding of the complexity of forests converged with the spiritual and aesthetic understanding of the place that forests hold in our history, imagination, and culture to create an icon of old-growth trees as something special to be protected at all costs. If old-growth forests are effectively irreplaceable, as many believe, should we not protect them now and into the near future? And, until science could give us a better explanation of how forests actually worked, putting old-growth forests into reserves that protected them from human encroachment seemed a reasonable approach. Ultimately, however, the iconic status of old growth could not protect forests from ecological change or evolving social values.

Change Is Now and Forever

A strong component of old growth as icon is the notion of constancy—once an old-growth forest, always an old-growth forest—ignoring the realities of both ecological and social dynamics. Yet the importance of change was a substantial element of almost every chapter and surfaced as a key theme for the book. The dynamic nature of forests has emerged as one of the most compelling new perspectives of ongoing ecosystem research during the past three decades.

As noted by many authors, the primacy of the idea of a "climax" forest has run its course, and the concept is now frequently used as an illustration of how far we have traveled from earlier understanding of forests as staged and ordered. The static idea of a "climax" old-growth state was misleading in several respects and can be discerned behind the ecological and social consequences of policies such as "multiple use," continuous harvest, and even the more recently imposed old-growth reserves of the Northwest Forest Plan.

If we are convinced that old growth is a final "stage" in a linear sequence of forest development, we can comfortably lock up that specific group of trees for protection and move on. If, instead, we think that old-growth characteristics typically occur in a web of change in which the forest moves forward, backward, sideways, and inside out in response to disturbance and ecological development, we need to find new ways to manage the forest and also ways to understand change itself.

Several of the chapters point out that active management is needed to restore old-growth diversity in many cases; solving the issues of forest conservation and restoration cannot be addressed through isolation and preservation of a single stage of the forest. When we reframe the issue as encompassing multiple stages and types of forests, it is more apparent that forest conservation is something to which all landowners can contribute. Young, managed stands can be manipulated in ways that enhance the biodiversity of elements that are often characterized as old growth (e.g., species distributions, vegetation types).

Politics, economics, and cultural conditions, interacting with each other and the environment in various combinations, have also changed over the past thirty years, creating an equally strong dynamic affecting what we expect from forests. And, as noted by many authors, resistance to change has informed most environmental action, and the conflict over old growth is no exception. Ironically, this observation explains both the industry and the environmentalist positions: Industry supporters did not want to see their economic circumstances change in the drastic ways they anticipated, and environmental supporters did not want to see the timeless symbols of the region changed beyond recognition through continued clearcutting of old trees.

One outcome of the old-growth wars, courtesy of the Northwest Forest Plan, was to develop Adaptive Management Areas, where this wicked problem was to be taken on incrementally, in a learn-as-you-go mode. However, this experiment to manage continuous ecological and social change has not lived up to its promise. To date, AMAs have foundered on the risk-averse orientation of stakeholders, including many managers, environmentalists, and regulatory agency personnel. Challenges to the status quo, even ones that attempt to apply place-specific learning, are rebuffed through delay, denial, and outright hostility to new suggestions. This phenomenon is not unique to the forestry realm but rather one of the negative consequences of formalizing and institutionalizing practices that for the most part do help in getting work done efficiently and effectively.

Even as the old-growth wars heated up, technological changes were already playing a part in new approaches to forest management and were symptoms themselves of ongoing social change whose effects are just as far-reaching as those of large wildfires, regionwide insect outbreaks, or a new set of reserves in the affected ecosystems. The move by the end of the 1980s to an "agricultural model" of private forests (e.g., improved genetics, fertilization, density optimization) produced trees that could be processed by new and highly efficient mills that used second-growth timber grown on private

lands to produce uniform logs for emerging markets. Thus, a complicated combination of private land management and mill ownership patterns, plus federal rules prohibiting export of federal logs, had created a thriving wood processing industry that depended on the larger older logs from federal land. When the federal timber supply dried up at the end of the old-growth wars, many mills without access to private timber were unable to retool quickly enough to compete for private timber. The Northwest economy as a whole grew strongly during this period, but as the older mills closed, some rural communities went into economic and social tailspins as they grappled with declining jobs, populations, and economic opportunities.

Social Values, Institutional Values, Whose Values?

The strong role of science in the old-growth debate gives the impression that this is a scientific problem, perhaps crossed with economics. Ultimately, the authors tell us, the old-growth wars were not about scientific advances or specific stands of trees. They were about values and the complicated humans who hold those values. In many ways, the social resonance of old-growth forests reflects the need humans have for experiences that take us beyond our immediate materialistic world. This moves us into the realm of spiritual values, which only amplifies the force of the old-growth icon in social debates.

It is not difficult to imagine that the future of old growth will remain dependent on social factors, not scientific or technological ones. Forests in general, and perhaps old growth in particular, have long been defining factors in the sense of place of the Pacific Northwest, for both rural and urban inhabitants of the region. And therein lies the rub. Forests are valued differently by people who earn their living through forests and their products, people who reside near them, and people who live in removed or even distant urban settings. As environmental values extended their reach into both urban and rural communities, many Americans were first learning about public forests through the lens of the old-growth icon.

The idea that people with different values could have a say in the fate of federal forests generated a great deal of anger among both rural and urban residents. Rural communities had become accustomed to living on the revenues provided by nearby national forests and resented those who wanted to "lock up" the forests for nonutilitarian purposes and what were often viewed as personal reasons. Urban environmentalists tended to characterize rural residents as exploiters of the common good and despoilers of the "last

great places." These polarized positions contributed to and were modified by the growing general public expectation that federal lands could provide values other than timber. As a consequence of the public shift in preferences for noncommodity use of national forests (e.g., habitat protection, recreation, aesthetics), the stability rural communities had realized through reliable federal timber harvests disappeared and is proving difficult to replace in many locations.

New methods for valuation of old growth and other natural resources are starting to emerge to address peoples' different views of both commodity and noncommodity forest products and services. As our authors suggest, any revaluation should reflect the mystery and enchantment that many people feel in the presence of old trees if it is to reflect the full range of individual and social responses to old growth.

The old-growth turmoil of the last decades of the twentieth century is a symbol of large changes in our scientific and social understanding of the world. Considerable agreement exists among our authors that old growth as icon was solidified through changing ecological understanding of the complex forests that many viewed with awe approaching the religious. Changing technology as well as political alignments exacerbated the social change driving a reassessment of the value of forests for many who neither lived near nor were reliant on forests for revenues. The cross-cutting issues identified by these authors provide a thoughtful examination of the current state of our understanding of old-growth forests. Several issues, however, were either only briefly discussed or not mentioned at all and are worthy of consideration.

Emerging Issues

Among the core drivers of landscape change, increasing human population in the Pacific Northwest and the very nature of human behavior must surely be considered key to the likely future of most natural resource management. Whether growing cities and increasingly urbanized rural areas lead to a vast encroachment on resource lands, including forests of all kinds, or a more intense focus on the high value of remaining old-growth stands, the point is that old-growth forests will be affected either way. Population growth *will* have an impact on how and whether we manage these forests, and we would be foolhardy to imagine otherwise. Furthermore, we should not be ignoring the forces that affect public policy; individual and collective human decisions—typically acquisitive rather than conservative—tell us more

about the future of old growth than any polls supporting or opposing their preservation. Changes in land use, changes in climate, changes in population, and changes in values all get writ large upon the landscape.

The old-growth debate was conducted in some quite novel ways and forums, testing new ideas and bringing into question the potential for managing future natural resource issues. The power of new knowledge communities—interest groups that formed around either the whole old-growth issue or local pieces of it—has been growing during the past three decades. A great many factors contributed to this. Social ones include changes in values, strengthening senses of place, shifts in financial resources available to nonprofits at the national level, and new skills in issue identification and litigation. Technological factors include the spread of the Internet and all its communication capacities, new capabilities such as geographic information systems, and data mining contributing to new knowledge. The rise of small activist/collaborative groups and their ability to network via the Internet to know they are not alone, to build community and momentum, and to coalesce to form tangible political power suggest that they are becoming a force—albeit little recognized—driving significant social change. They will certainly be a continuing part of the old-growth issue, and the fact that some of them do not necessarily last very long is simply part of their narrative. Their mere existence raises questions about current and future knowledge management, its meaning for democracy, and its role in any twenty-first century decision- and policymaking.

The challenge of managing forests across ownership boundaries also has a quiet but powerful role to play in how we think about conserving native forest diversity, including old growth. A recent change in tax law, for example, has shifted thousands of acres of former industrial timber lands into the portfolios of private equity firms and related entities. How will the management intentions of such entities affect the trajectory of forest development across the larger landscape? How long these lands stay forested is more frequently a decision based on return on investment than on ecology. Policies for mitigating climate change are turning attention to the value of forests as carbon sinks, an ecosystem service that can be bought and sold in markets around the world. These issues help us remember that, in addressing social change, we tend to think in terms of economics, not ecosystems. We are as yet far from integrating those two large arenas in any meaningful way and certainly not in how they operate together or separately in the future and the management of old-growth ecosystems.

These, then, are some of the issues that swirl around the old-growth debate as it now stands, contributing a volatile mixture of complexity and

further uncertainty to a dialogue that continues to energize some sectors of the regional and national population every time it's mentioned. What the future holds is unclear, but we do know that the multitude and reach of events that have occurred since the environmental legislation of the 1970s has led us into a deeply changed era. Can this convergence of ideas and events be part of a larger renaissance in views about the environment and our increasingly complicated relationship with it?

Reconceiving the Forest: A Twenty-First-Century Renaissance?

The old-growth crisis fomented vigorous argument and changed many of the ways we understand forests. But the development of the old-growth icon almost guaranteed the narrowing and hardening of arguments, challenging our ability to come to any kind of agreement on the future. One example of such narrowing can be seen in demands to protect large swaths of the federal forest regardless of their age, structure, or health. When an icon becomes as powerful as old growth has, people can and will use it for all sorts of purposes. The thirty years since the beginning of the old-growth wars suggest that we could limp along without a policy fix for some time yet. But does our collective indecision reflect a far more troubling inability to think clearly about this and multiple future environmental tasks?

It does appear that we have many of the compass points required to define a renaissance of ideas about forest management: a fundamental upheaval in entrenched forest practices, a challenge to strong sets of existing scientific and social beliefs, a major shift in values both geographically and socially, new social and political communities, and a recognition that policy-making skills are not always up to the task. The old-growth wars may just have been a jolt that emerged at a time of multiple small revolutions, leaving us with the impression that they were the genesis of change, when in fact they were merely one symptom. And if indeed they were a symptom of fundamental change in how we think about environmental conflict and management, then it will be important to consider what new compass points we might follow for improving our orientation toward the future of managing ecosystems.

Complicating any future efforts to find solutions for complex environmental problems will be our ability to make decisions when complexity and uncertainty increasingly refuse to dissolve with time. Pursuit of knowledge, through the scientific method, as well as through less-formal or structured

means, will continue to generate numbers, ideas, and questions. Indeed, the growing masses of data may bury us under their sheer volume. If we're thoughtful about it, however, they can help more rigorously outline the scope of the questions we must address.

This is clearly the challenge with how to manage, or even think about, old-growth forests. For wicked problems such as how to conserve old growth and at what level, decision making is not typically rational. The most likely solutions will probably be "clumsy" attempts to cobble together policies that are acceptable to a wide range of constituents. Our ability to grapple with complex issues is poorly developed, and the classic fallback position of *symbolic politics*—more gesture than substance—has been shrewdly utilized in the old-growth management realm, a clear indication that it is too difficult to address directly.

But address it we must, for we are facing relentless social and environmental cycles that cannot be stared down. People will not abdicate their positions on old growth any time soon, and no matter how fervently some scientists may believe it, providing more scientific information will do little to change opinions. Furthermore, even supposing climate were a completely stable concept, the forests themselves will continue their cycles of change, established through millennia as the inevitable forces by which ecosystems evolve. If we add in whatever degree of climate change emerges in coming decades, a renaissance in how we think about forests will not only be likely, it will be essential. We need to think about forests as entities that change, *all* the time—at different rates, with no fixed ages or fixed structures. We need to think about social values that change, *all* the time, fluctuating around multiple and dynamic cultural, political, economic, and scientific ideas. We need to embrace the idea that science can provide us with many questions and many, although not all, answers. Science, however, cannot measure awe or mystery, and we are continuously reminded that it does not own all the measuring tools.

So we need not just to reconceive the forest as a dynamic and diverse system but to take our cue from what we have learned about old growth and reconceive forest management as a dynamic process that draws on multiple and often divergent knowledge, practices, and social expectations of natural resources. Changes in the way we think about both old growth and management have the potential to revitalize the role forests play as critical natural resources with the power to meet ecological, economic, and cultural needs of society. The challenge now is to move past the obsolete terms of the old-growth wars, prepared to embrace new and more demanding ways of thinking, and to explore untested approaches.

Chapter 27

Conserving Old Growth in a New World

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The most recent notion of old-growth forests captured the public imagination thirty years ago. An icon emerged, often as a romanticized vision of big, old trees, and environmentalists, policymakers, and scientists grabbed onto it to promote various competing agendas. But despite three decades of battles, conservation plans, and declarations of victory, there is no social consensus on old growth. It remains a mystery to many, a conundrum to managers and policymakers, and an unsure bet for those hoping to "preserve" it without change. Though the fires of old-growth conflict have died down, the issue still smolders, always threatening to flare up again.

The old-growth quandary will continue to dog us because it is so complex: there is little agreement on definitions and never will be, there is a great deal of geographic variation in old-growth forest structure and composition, the continuous changes within forests themselves foil attempts to manage exclusively for old growth, and no one knows how mounting human impacts will affect forests in the future. And most challenging of all are the fundamental differences in personal worldviews.

These problems make it difficult to get agreement, inventory the remaining areas of old forest, and sort out the "save it or cut it" arguments that have driven the old-growth wars in the past. We're coming to realize that the overwhelming challenge for land managers—public and private—

is not to maintain old-growth forests at any cost, but instead to protect and foster complex forest ecosystems in a world of unending social and environmental change. Policymakers who cannot stay on top of those waves of change may be plunged once again unprepared into future upheavals.

And the upheavals will come.

To even begin preparing for the future, we need to understand several difficult things:

- Society will never agree on a definition of old growth;
- The use of icons for complex ecological/social phenomena leads to one-size-fits-all short-term solutions and static thinking, and comes with ecological and social costs; and
- Current policies are layered and limiting, tattered and failing, and have many unintended consequences.

Our remaining old forests are both inspiring for the opportunity they provide for learning and humbling for revealing our inadequate understanding of the mysteries of forest ecosystems and how humans can best live with them.

Definitions

Given the diversity and dynamism we document in this book, we do not believe it will be possible to define old growth in a way that is agreeable to all parties. No one person or group "owns" the definition of old growth: it is a logical expression of the diversity of ways humans view forests and the diversity of the forests themselves. "The belief that nature is or can be measured and described before one decides what is important . . . is a dangerous illusion" (Norton, 1998). This belief might lead to defining old growth very simply—either by a single age (e.g., 200 years) or by a diameter of the tree (e.g., greater than twenty inches)—but such an approach does no justice to ecological and geographic diversity (fig. 27.1). Defining old growth and our goals for it will have to be a continuous process that engages managers, society, and scientists. Working definitions based on structure, composition, and processes are still needed by managers, but the idea of a final consensus is a fantasy. Provisional definitions should also recognize that the forest world is not black and white, that there are many shades of gray when it comes to old forest diversity, both in terms of the social landscape and the ecological landscape.

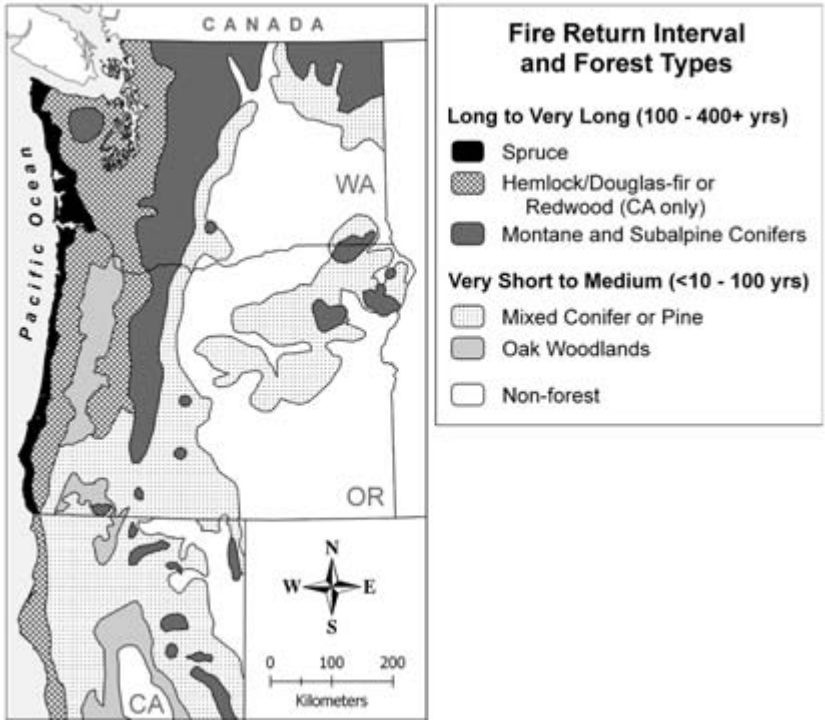

FIGURE 27.1. Fire frequency and forest-type regions of Washington, Oregon, and Northern California. Old-growth forest structure, dynamics, and definitions would differ across these regions. The need for active management to reduce fuels and modify structure would be greatest in the mixed conifer, pine, and oak types.

Moving Past the Icon

We are challenged to come to terms with a number of annoying facts, not the least of which is the geographic variation in old growth and the importance of disturbance in its development. Old growth is not only seas of huge and ancient trees. We can certainly find examples of these in the region, and landscapes where the stumps bear witness to their existence in the past. If we keep traveling mindfully through our unlogged forests, however, for every acre of iconic old forest we find another acre where the big trees aren't so big, numerous, or old, and also patches where disease, wind, and fire have created openings and young forests. Further probing leads to whole

watersheds untouched by modern humans, other forests that are young or middle-aged, and still others where no old trees can be found except perhaps as decayed fragments of wood from previous forests. And then the pine forests of central Oregon or the mixed-conifer forests of northern California show us other expressions where old trees are fugitives from fire, either mingling among patches of younger trees or hiding out in groups on moist, north-facing slopes. The aversion that many have to the death of trees at the hands of either nature (e.g., through fire or insects) or humans (e.g., through harvest) demonstrates that our innate preferences for life and stability impose a socially inflicted set of blinders. For example, the iconic view of old-growth forest as irreplaceable might drive an attempt to keep patchy fires, fuel reduction, or thinning out of all old-growth forest reserves.

Our fascination with old growth also might lead us to believe that it is the only stage of forest succession that is important to native forest diversity—it is not. Other biotic communities, such as open semipermanent meadows and young ecologically diverse forests, are also important and even rarer than old-growth forests in the Pacific Northwest region. When we put conservation dollars and efforts into protecting old-growth conifer forests, are we neglecting the needs of other threatened ecosystem types such as oak woodlands and lowland riparian forests, which are both threatened by development, or are we focusing too much on the public lands without considering the entire forest landscape?

Unintended Consequences of Current Approaches and Policies

Policies based on simple thinking and icons can lead to ironies and unintended consequences such as these: The forest industry—often seen as the problem—is essential to restoring and maintaining old growth; protecting spotted owl habitat in some fire-prone landscapes can increase the risk of high-severity fire in old growth; and protecting our older forests in the Pacific Northwest has just shifted U.S. sources of wood to natural older forests in Canada. Furthermore, our current federal policies were intended to resolve the controversy over how to protect the remaining old growth and provide some income and jobs for local communities. But they are not working that way. The recent policy may be a victory for old-growth conservation in the short run, but it generates mounting pressure (e.g., the lawsuit that forced the development of new plans that would cut more old growth on Bureau of Land Management lands) to produce more wood

from federal forests, so it could backfire for old-growth conservation in the longer run. In short, our policies are a patchwork of Band-Aids with unintended consequences.

Strategies to protect forest diversity that rely heavily on listed species may be politically powerful but ecologically weak and unrealistic. Species approaches can give the impression that stability is the norm when in fact stability is not characteristic of natural populations any more than it is of natural ecosystems. The case of the spotted owl, whose populations are now threatened by both the barred owl and habitat loss, demonstrates that the use of single indicators or flagship species for whole ecosystems has severe limitations. Species approaches do still have an important role to play, and a species can be a useful barometer of ecological change, but if we rely too heavily on them we may miss other signs and other measures that are equally if not more important in our struggle to conserve our native forest diversity.

Finally, another type of icon needs to be addressed here. It is the icon of the perfect "answer" to the old-growth conservation question, wherein we are bedeviled by the expectation that neat technical solutions can be found to such complex ecological and social issues. This delusion further complicates the wild and messy social and ecological landscape that is old growth.

Opportunities and Uncertainties

Despite the logging and burning of more than twenty-five million acres of forest in the area in the past 100 years, the Pacific Northwest and northern California are relatively rich in centuries-old forests: at least three to eight million acres, depending on how you define old growth. This forest legacy of nature and the decisions of humans who have gone before us create values and opportunity. The values—both ecological and social—derive from the national and global rarity of old-growth forests and their distinctive biodiversity and appearance. The opportunity lies in *creatively* using knowledge of these forests to improve the sustainability of all forest management in our region.

But these learning opportunities are tempered by some significant conceptual puzzles and uncertainties. For example, forest time is a mystery. We can speak of the age of a Douglas-fir forest in western Washington as being 500 years—the time since the large fire that started the canopy cohort of this sun-loving species. This "500-year-old" forest is

actually composed of organisms that range from less than one to over 500 years (most are much younger than 500 years), and organic matter that ranges from less than one to over 1,000 years in age. It is even more difficult to speak of the "age" of the drier forests, where the age of the "old" trees spans hundreds of years, reflecting numerous patchy fires. No one can say when the forest actually "began." For the human mind and a modern society founded on the concept of beginnings and endings and short-term thinking, forest time is not easily comprehended. Perhaps aboriginal peoples, like those of Australia, who believed in different forms of time—for example, dreamtime—could more easily fathom forest time.

How can we have the audacity to think that we can manage and conserve a complex natural process that requires thinking over centuries about many different things? Management often requires shortcuts and simplifications to make actions feasible or economical, but such efforts can be antithetical to ecological complexity. On the other hand, given the amount of change we have already brought to the forests and landscapes of this region, how can we assume that these forests will be just fine if we quietly walk away and leave them alone with benign intent? Many old trees in fire-prone landscapes have been lost to fire and insects because of the effects of past human actions—effects that often now require rectification. There is no right answer to the questions posed above. No experiment can be done that will run for 500 years and then tell us how we should have done it in 2008 or should do it in 2508 after centuries of environmental and social change.

Such uncertainty may suggest we be guided by the precautionary principle, which puts the burden of proof for environmental decisions on those who would take action. But what if no action—for example, *not* reducing the forest fuels we contributed to by suppressing fire—is itself a profound action?

Despite these enigmas and uncertainties we find hope in the millions of acres of unlogged older forest that remain. This land lets us hope that we have sufficient viable old-forest ecosystems with which to face growing human populations, fire, development, and climate change. Without these large tracts, the questions of viability and significant restoration would be moot; for in most settings, when modern human societies impose themselves on old forests, the results are inevitable. We believe our millions of old-growth acres in the Pacific Northwest can help us achieve a different outcome.

In this final chapter, we want to consider our management options, blinders off.

Reinventing Management

We propose that any future old-growth management strategies have four elements:

- Rethinking reserves
- Thinking across landscapes and ownerships
- Developing a new economics
- Learning from and adapting to change.

Rethinking Reserves

Reserves or areas dedicated to the protection and restoration of old forest will always be part of an old-growth conservation strategy. But we need many kinds of reserves. For example, strict reserves are needed where natural processes can operate without the direct influence of humans. Such places can provide for old growth in forests where ecological processes are relatively unaltered by human activity, serve as controls for human-dominated forests, spread risk associated with the uncertainty of our management plans, and provide places of mystery and spiritual connection. Such reserves are most appropriate in wetter forest types where fire is infrequent (fig. 27.1). But many old-growth reserves will still be directly influenced by external processes such as wildfire, insects, invasive species, and climate change. A newer type of reserve, the ecological reserve or conservation area, is also needed, in which the particular ecological goals are identified and active management is used carefully to help achieve those goals. Active management in these reserves could include several tactics: thinning and mechanical removal of smaller diameter trees and eventually prescribed fire to reduce fuel levels and the risk of high-severity fire, planting or reintroduction of species that have been lost because of past human activities, and removal of invasive species either mechanically or even through chemical means.

Generally, in the case of ecological reserves, the larger and the more numerous the better. This assumption guided the development of the Northwest Forest Plan, where large (100,000+ acre) reserves were established in a network that was thought to have enough of a safety factor to allow old forests to persist. At first look, during the first ten years of the plan this assumption seems to have been borne out. The plan assumed some losses

to wildfire across the network of reserves. A closer look at what actually happened, however, reveals a disturbing trend. Within the fire-prone forest types, the losses of old forest during the first ten years were quite high: ten to fourteen percent in some fire-prone provinces. If these rates were to continue, in fifty years little old growth would be left in these areas.

In general, our current approach to reserves in fire-prone landscapes does not appear to be up to the job of conserving and restoring old growth. Fire, insects, and disease connect these landscapes in ways that make artificial delineation of them into "reserves" and "nonreserves," a recipe for failure. Indeed, the entire public forest landscape is needed to maintain and produce fire-resilient older forests. Instead of setting conservation goals in terms of acres of reserves, we need goals in terms of landscape distributions of forest conditions that provide for a diversity of successional stages that have different habitat potentials and degrees of resistance to fire, insects, and disease. We will probably never reach those distributions—nature will be a comanager with a mind of her own—but these goals can be a kind of receding horizon toward which forests move. If the goal is the conservation of old forests, old trees, and species associated with them, then active intervention is needed within many (but not all) fire-prone old-growth forest reserves. The Northwest Forest Plan for the federal lands recognized this, but it has not been implemented; the rate and extent of fuel treatments needed in fire-prone landscapes is not keeping up with the need. Furthermore, the exact amounts and patterns of these activities cannot be generalized. A one-size-fits-all approach does not work, and both local landscape and site knowledge are essential.

An additional motivation for rethinking the reserves stems from the fact that current reserves are centered on the remnant old growth—the remains of a more than a century of logging. Consequently, the reserves are located based on management history and not necessarily on the best pattern to conserve old forest diversity in the long run. Under the current design, high productivity sites and low elevation sites are underrepresented in the reserve network.

Active management in and between reserves for ecological goals is not just for the drier fire-prone systems. Plantations that were originally intended for intensive timber management but now fall in ecological reserves may need restoration thinning. These plantations can be structurally diversified by using variable density (not uniform) thinning, which can simultaneously speed the development of some species associated with older forests. Thinning would also provide some valuable revenue for local communities. Producing wood from federal lands through thinning, which

has widespread support, has been the most successful example of integration of biodiversity and commodity goals in the Northwest Forest Plan.

Thinking Across Landscapes and Ownerships

It is one thing to put lines on a map and say here we will produce biodiversity (i.e., *reserves*) and here we will produce timber (e.g., *matrix* also known as *general forest*). It is another to actually provide all of our forest values on the ground. What happens to this simplistic equation when we add disturbance and succession and organisms that do not happen to occur in the reserved areas? Adding these terms to our calculus requires that we also think more broadly, about whole landscapes. For example, the current approach to implementing the Northwest Forest Plan on federal lands is not sustainable over the long run. Much of the expected timber is now actually coming from small trees in plantations that are checkered across reserves. The volume that was expected from forests outside the reserves was slated to come from cutting older, larger trees. This has not happened. Once these plantations from the 1950s and 1970s reach eighty years, they will no longer be eligible for restoration thinning under current policies. The rate of thinning of these plantations on federal lands has not been high enough to affect all plantations before they reach eighty years. Consequently, restoration here will fall short of its potential.

Although increasing the budgets for this type of thinning on federal lands and using structure-based rules instead of age-based rules could alleviate this problem, it will not alleviate the longer term problem of the highly variable social acceptability of timber production on federal lands. Our best hope for conserving old-growth values and providing other forest goods and services may be through landscape-scale thinking, which implies thinking across all forest lands—not just reserves, not just public lands—and thinking in longer time frames—not just a few decades. In a different context, Dwight D. Eisenhower said, "If a problem can't be solved, enlarge it."

Much of the old-growth discussion typically revolves around federal lands. But the challenge of conserving native forest diversity cannot be met with either old growth or federal lands alone. Research has shown that many species associated with older forests do not stay within a single ownership and can find habitat in other forests that are structurally or compositionally diverse. It appears that much of our native biodiversity can be retained in landscapes that also contain forests managed for timber production,

provided those management schemes pay attention to ecological diversity. We have learned that forests develop and occur with incredible variety, the function of which we do not fully understand. We should be careful in assuming that our simple classifications of this richness (e.g., "old growth" and "not old growth") are the best foundation for conserving this diversity. For many reasons, not all forest lands, public or private, will be dedicated to producing classic old growth. However, these far-less-iconic forests can still make important contributions to conserving forest biodiversity.

To a significant degree, the fallout from the old-growth wars of the 1990s has turned our view of the role of the forest industry on its head. Restoration activities in both fire-prone and wetter forests need loggers, logging systems, and mills to pay for and process the wood. Large-diameter wood, once a highly sought and valued commodity from old-growth forests, is no longer so highly valued. The decline in supply of big trees has not increased demand and price but has instead contributed to a trend in which smaller diameter logs from plantations are now sometimes more highly valued than the big trees because they are used in manufacturing large wood beams. With modernization and the decline of federal timber, the number of lumber mills has also declined, especially in the drier, eastern parts of the Pacific Northwest region. The loss of this mill and woodsworker capacity jeopardizes the ability to conduct restoration thinning and fuel reduction in these areas. In a continuing spiral, as the distances between the forest and the mills increase, the transportation costs go up and the profit margins go down, so that removing small-diameter wood (the kind that constitutes most of the fuel buildup) becomes even less economically viable (Lettman, 2007). More mill closures would create a vicious cycle.

In our approach to fire-prone forests, we need to focus on managing stands in new ways and at landscape scales. For example, rather than expecting to cut larger fire-resistant old-growth pines and Douglas-firs from the overstory, we should focus on managing the understories—the smaller diameter trees and the shorter lived shade-tolerant species (e.g., grand fir). Such approaches can reduce fuels, regenerate the old pines and Douglas-firs that we lost through fire and logging, and create the denser forests favored by the spotted owl in places across the landscape where it is most likely to survive fire. Much of this activity will not be economically viable in terms of the old standards for wood products, but some larger economically viable non-old-growth trees can be found. In this context, wood products become a byproduct of creating more fire-resilient forests and restoring old-growth conditions. We have reached a deeply ironic point in the history of the Northwest forest industry: Logging of old growth has nearly stopped, but losses to fire have increased in recent decades, and a robust forest industry

is now needed to save the old pines, Douglas-firs, and western larches that were the former dominants of the drier old forests.

Developing a New Economics

Reconceiving our approaches to old-growth management relies on the third leg of our strategy: a new economics. The recognition of the new biodiversity and spiritual values related to old-growth and natural forests is not matched by a similar change in the accounting of those values in our economic systems: biodiversity, clean water, recreation, and spiritual values. Economists call these "existence values," for they cannot be translated easily into goods. That the existence values of old-growth forests are high is abundantly clear in the protests, headlines, and policy changes of the past twenty-five years. Yet many believe public-lands budgets to restore and protect these forests remain inadequate. More focused efforts to demonstrate the magnitude of ecosystem values to the U.S. government might generate more support for the actions needed to conserve and restore old forests. Ecosystem services and values can be captured in markets such as the emerging carbon-trading markets in Europe and the United States, although they are still being developed, and their future and effectiveness is uncertain.

One challenge is to make the carbon that is traded more tangible and visible to buyers—in other words, to make it more marketable. Given that there are few more-attractive forms of storage of carbon than an old-growth Douglas-fir forest, might the old-growth icon have another task to add to its job description?

The economic barriers to improving the biodiversity side of the ledger in a sustainable way on private lands are also significant. For example, growing trees on longer rotations, although producing more wood in the long run and storing more carbon, can be a significant cost to a landowner compared with short rotations. One way of mitigating this economic hit is through supplementing the income of landowners who undertake more costly ecological management approaches through the emerging ecosystem services markets.

The degree to which this new approach catches on is yet to be determined, but such efforts could fill an important niche and be promoted as scientific understanding and social forces align once again. We may witness a sea change as political currents related to fire, climate change, economics, and conservation merge. These currents include new social recognition of the need for fuel reduction in fire-prone landscapes; the need to reduce carbon dioxide emissions from the earth, including those created by large

wildfires; the need to store carbon in forests—something old-growth forests and forests grown on longer rotations do very well—and the need to consider alternative sources of biomass such as wood products, which could become a less environmentally and socially disruptive source of biofuels than corn.

Learning from and Adapting to Change

Social and scientific views as well as the behavior of ecosystems are in constant flux. We cannot predict the exact nature, place, or timing of these changes, only that they *will* occur. Our experience in dealing with ecosystem management objectives is less than twenty years old—about one-twentieth of the lifetime of a typical old-growth tree. Adaptive management and joint learning thus form the final leg of our strategy.

Adaptive management was a cornerstone of the Northwest Forest Plan, but it has not developed as many would have hoped, even though monitoring efforts have produced much valuable and surprising information. For example, it was monitoring that showed that, despite an increase in the area of older forest, populations of northern spotted owls have still declined. But the process of monitoring biodiversity is new and can be expensive to agencies with budgets previously tied to timber production. It remains crucial, though, to maintain and even bolster monitoring efforts, basing them on clear measures of environmental indicators and expected trends in those measures. More needs to be done, particularly in terms of monitoring or validating the assumptions that underlie any conservation or restoration plan. Setting benchmarks, assessing and reassessing indicators, and evaluating progress toward objectives will provide information that will continue to inform and may routinely surprise us. At the very least, it will improve our ability to make midcourse corrections before unexpected trends can become policy fiascos.

Adaptive management and monitoring will not succeed, however, without overcoming significant social barriers. Most people and institutions prefer the status quo and resist learning. Developing trust among stakeholders is critical to moving adaptive management from the lips to the landscape; for without joint learning about complex ecosystem management problems, the chance of progress in dealing with these forest conundrums remains depressingly low. We will need new and trusted forms of social engagement if we are to achieve social license for changing management approaches. One way this can happen is through manager–public-scientist partnerships that focus on real places and implement alternative actions on the ground and evaluate them over time, including through public discussion.

There are several examples in the region, including the Central Cascades Adaptive Management Partnership on the Willamette National Forest, where some alternative approaches to meeting the goals of the Northwest Forest Plan are being carefully tested by collaboration among federal and university researchers, U.S. Forest Service managers, and highly informed members of the public. One experiment has attempted to use natural disturbance regimes as a guide for improving the effectiveness of maintaining native forest biodiversity at landscape levels and producing modest levels of wood to bolster economies in rural communities. Another example is the Lakeview Stewardship Group in central Oregon, where stakeholders in the debates about public forests are working together to find common ground in the management of fire-prone forests.

The social environment for forest management is a deeply fragmented landscape of individuals and interest groups. The only binding force for such disparate interests and approaches to learning appears so far to be a sense of place, where a commonly held vision of the future has the power to overcome risk aversion and keep long-held conflicts in perspective. The questions remains, how to achieve this on lands owned by all Americans and just a few Americans?

Old-Growth Futures

What might the future hold for old growth and our relationship to it in our changing world? We don't know the answer, but we can imagine some alterative possible, but not mutually exclusive, futures:

- After the past few decades of old growth as a *cause célèbre,* it may fade into the background. The present conservation strategies may be considered adequate and the topic deserving of little attention as other, more-pressing forest issues emerge.
- Old growth may continue to serve as an important source of scientific understanding and model of natural systems used in development of fresh approaches to forest conservation and the management of production forests.
- But, if the coming decades are at all like the past few decades, old growth will play an emotive role in society. Will the loss of big, old trees from environmental change and natural disturbances instead of from chain saws maintain our concern about human impact on this heritage and the environment in general?

Final Thoughts

What we need to do about old growth today must be done boldly but also thoughtfully. Each of the four related conservation strategies above calls for a continual process of learning, recognition of risk and uncertainty, and awareness that the complexity that scientists and managers see is also the mystery that enriches us. The government won't do this for us, although it might help along the way. Private corporations won't shower money on the problem, although they might be intrigued enough to talk. Granting agencies won't suddenly free up research budgets, although plenty of researchers have data and ideas already that they'd love to see getting used. And the "attentive" public? Some will stay attentive, and plenty of these people know way more than they're given credit for. No one can do this alone: We are all partners in this uncertain venture.

Although the sciences of ecology, conservation biology, and forestry have given us new understanding and tools to obtain many things from forests, we should be careful to avoid technological hubris that leads us to think that science and management alone show us the way to relate to these forests. And, in case we might think that the spiritual valuing of ancient forests is a discovery of Thoreau in the nineteenth century or the environmental movement of the 1970s, Lee (chapter 8) demonstrates the deep roots of the spiritual valuing of old forests when he quotes Seneca (Van der Leeuw, 1963), a Roman philosopher from 2,000 years ago, who wrote of the "presence of deity" in a "grove of ancient trees." It has been our hope, from the first conception of this book, that we might hold up the old-growth icon to turn it about in the light of our shared experience and reveal its many facets so that our readers might also see the compelling, complicated, alarming, encouraging, and challenging array of choices for the future.

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