ENVIRONMENTAL AND HUMAN CHANGE IN OLD-GROWTH FORESTS

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ABSTRACT

For decades, federal foresters have tried to use science to maximize outputs from the public lands, hoping to minimize conflicts between different forest users. But maximizing production first required the liquidation of old-growth forests, a process that has proven anything but ecologically sustainable. Many managers now hope that science will guide us through the thickets of political controversy over old growth, enabling us to make unbiased choices for the benefit of the public good. In this paper, I analyze the use of science in conflicts over forests. My case study is the Blue Mountains of eastern Oregon, where for nearly a century, foresters attempted to use the best ecological research of the day to resolve conflicts over access to forests. The forest history of the Blue Mountains supports the conclusion that science alone cannot resolve forest conflicts, for they are ethical and cultural at heart.

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INTRODUCTION

Conflicts over old-growth forests cannot be understood, much less resolved, without understanding the historical and scientific processes that have shaped forests. From the beginning of the Forest Service, managers hoped that scientific expertise would provide them the authority to remove decisions from the public eye and place them in the hands of a few experts. Yet, because the practice of science is itself culturally shaped, attempting to use science to avoid cultural bias has only replicated a different set of cultural biases.

My case study in this paper is the Blue Mountains of eastern Oregon, where for nearly a century foresters attempted to use the best ecological research of the day to resolve conflicts over access to forests. The central problem was how to assure fair distribution of scarce resources. But, instead of acknowledging the fact of scarcity and using research to devise ways to manage within ecological constraints, the Forest Service tried to use science to *remove* those constraints. Scientific optimism held out the promise that people could simply create a brave new scientific forest that would produce enough for everyone without limits. The result was the ecological and political nightmare that now confronts us.

In 1853, a woman from New York named Rebecca Ketcham walked over the Blue Mountains of eastern Oregon on her way to the promised land of the Willamette Valley. She wrote in her diary one night:

> We left the Grande Ronde about seven this morning. Our road has been nearly the whole day through the woods, that is, if beautiful groves of pine trees can be called woods. I can almost say I never saw anything more beautiful, the river winding about through the ravines, the forests so different from anything I have seen before. The country all through is burnt over, so often there is not the least underbrush, but the grass grows thick and beautiful. It is now ripe and yellow and in the spaces between the groves of pine, which are large and many, it looks like fields of grain ripened, ready for the harvest (Ketcham 1991).

Ketcham found herself in a land of lovely open forests full of yellow-bellied ponderosa pines five feet across—fire resistant, insect resistant forests that had been growing for centuries. These were forests so promising that she and her fellow immigrants thought they had stumbled into paradise. But they were nothing like the humid forests to which Easterners were accustomed. Most of the forest communities across the inland West were semiarid and fire-adapted, and whites had no idea what to make of the fires.

If Ketcham walked in the same place today, she would find herself in a very different landscape. After less than 90 years of federal management, what once seemed like paradise has been irrevocably lost. The great ponderosa pines have largely vanished, and in their place are thickets of dying fir trees.

The pines were able to resist most insect attacks, but the firs that replaced the ponderosas were the favored hosts for numerous defoliators such as spruce budworm and Douglas-fir tussock moth. As firs invaded the old ponderosa forests,

insect epidemics became increasingly frequent and extensive throughout the dry Western forests. By 1991, on the five-and-one-half million acres of Forest Service lands in the Blue Mountains, defoliators had attacked half the forest stands, and in some stands nearly 70% of the trees were infested (Gast 1991).

Even worse, in the view of foresters and many locals, was the threat of catastrophic fires. Although light fires had burnt through the open pines every 10 years or so, few had become crown fires. But, as firs grew underneath the pines and succumbed to insect damage, far more fuel became available to sustain major fires. Starting in the early 1990s, one catastrophic fire after another swept the inland West, until it seemed as if the forests might entirely go up in smoke.

In 1991, the Forest Service (Gast 1991) stated that its own past management had helped to create a crisis in forest health, so those practices needed to change. But nobody agrees which past practices caused the mess, much less how to change them. Before we can attempt to restore these landscapes, and other damaged landscapes across the country, we need to understand the human and ecological causes of the alterations.

In part, the landscape changed for straightforward ecological reasons. When foresters suppressed fires in open forests dominated by ponderosa pine, firs grew faster than pines in the resultant shade, a successional change that left firs dominating forests. Heavy grazing, which eliminated the grasses that had before suppressed tree generation and kept forests relatively open, also contributed to the changes. High-grading, or logging that removed old pine while leaving firs behind, encouraged the replacement of open pine forests with dense fir stands. When droughts hit, firs growing on dry sites succumbed to insect epidemics (Langston 1995).

But the story is much more complex than this. Changes in the land are never just ecological changes; people made the decisions that led to ecological changes, and they made those decisions for a complex set of motives. Many environmentalists claim that things went wrong in the inland West because of simple greed: the Forest Service worked hand in hand with the industry to cut trees as fast as they could, and this devastated the forests. The problem was too much management. Excessive harvests, soil compaction, high grading that removed ponderosa pines and left only firs behind, combined with even-aged management—all this led to a simplified ecosystem that became increasingly susceptible to epidemics.

Many other people claim just the opposite. The forests fell apart, they say, because the Forest Service bowed to the demands of sentimental preservationists and refused to manage intensively enough to save the forest from its natural enemies: fire, insects, and disease. In their view, the best way to make forests healthy is to manage them as intensely as possible.

These two perspectives on the history of forest health problems obviously lead to radically different management prescriptions. Neither of these stories, however, tells the whole truth. Forest problems did not come about because of greed,

incompetence, or poor science; better science alone would not have prevented the current crisis.

Across the inland West, the troubled history of land management has its roots not in ignorance but rather in American visions of the proper human relation to nature. Foresters shaped the Western landscapes according to a complex set of ideals about what the perfect forest ought to look like and what people's role in shaping that perfect forest ought to be. But foresters' ideals—like all ideals—were also shaped by material reality. Logging technology, developing markets for lumber products, the economics of silvics practices and what Rich Harmon (1995) called "the unrelenting pressures . . . aimed at government officials to make public resources available for private profit" all affected foresters' visions of the ideal forest, and they also shaped the ways foresters managed the land.

ECOLOGY OF THE BLUES FORESTS

To understand what went wrong in the Blues, we first need to consider the complexity of the dry Blues forests. These were disturbance-prone landscapes, marked by varying patterns of change. Fire, wind, floods, and droughts shaped a shifting mosaic, where patterns of forest types and grassland and sagebrush were anything but stable.

Whites who first arrived in the Blues found a land completely unlike the humid forests of home. What seemed familiar at first glance proved to be different, and this was unsettling. People expected forests to be moist and fertile, but these forests seemed too dry, too open, and not very fertile. Fires burnt much more often than people thought was normal or desirable, and no one understood how forests could survive these constant fires. Sagebrush typically indicated poor soil, but the soil under this sagebrush seemed better than much of the forest soil. Rivers normally drained to the sea, but many of these rivers drained into the Great Basin—a salty, barren, frightening place—and never flowed out. The canyons were far too steep; people could not believe the evidence their eyes gave them. Trees grew on top of these steep canyons but not down by the water, where trees were supposed to grow. It seemed as if someone had turned the world upside down.

Part of what seemed strange to Easterners, especially to those used to the vast stretches of climax forests in Maine and the Midwest, was the diversity of vegetation types within the Blues (Langston 1995). When the government forest inspectors came to classify the Blues forests at the turn of the century, the variety of trees, habitats, and forest types astonished them. The inspectors walked through steep treeless grasslands covered with sagebrush and bunchgrass, and then crossed into juniper woodlands. These gave way to ponderosa forests with stately trees five feet wide, spaced in as open and pleasing a pattern as any that the inspectors knew from the landscaped parks in eastern cities.

Along the creeks, strips of lush cottonwood forests shadowed the waters, and these cool riparian zones offered shelter from the brutal summer sun. When the inspectors crossed from the south face of a canyon to the north face, they moved out of the ponderosa forests into much denser forests dominated by Douglas fir, grand fir, and larch—communities they called the north-slope type, or fir-larch forests. At first glance, these north-slope forests appeared uniform, but when the foresters looked more closely, they realized that there were many small patches of larch, fir, spruce, and pine jostled together.

The inspectors climbed higher into the hills, finding themselves in thickets of lodgepole pine. Their way become nearly impassable, as piles of dead wood and tangles of wind-thrown lodgepole blocked the route. If the men kept climbing, they would enter high, eerie forests filled with the stumps of subalpine fir and contorted, wind-twisted whitebark pines. Where fires had burnt in small, hot patches, lush meadows interrupted the high forests, and finally the forests gave way to mats of wind-cropped fir and then rock and snow (Thomas 1979).

Out of all these forests, what caught lumbermen's eyes were the ponderosa pine forests—millions of acres of open, productive parklands. Whites loved the ponderosa forests because they seemed like wilderness tamed and made easy—not by a gardener wielding a hoe and trowel, but by nature. Ironically, however, the pinelands *were* a managed landscape. Indian burning, not just natural processes, had shaped these forests (Hall 1977; Agee 1994; Maruoka 1994). But whites saw the frequent Indian-set fires as a threat to what they loved, rather than an essential part of what they loved, so they did their best to protect the forests from fire—a decision that led to changes nobody quite expected.

After 90 years of federal management, millions of acres had changed from ponderosa to fir, and then from healthy fir to drought-stressed, insect-defoliated fir. In the Wallowa Whitman National Forest in 1912, 71% of the stands were open and full of old ponderosa; by 1991, only 10% fit this description. In the Malheur in 1938, 78% of the forests were open ponderosa stands; by 1980, less than half were still ponderosa forests. Most of the remaining forests were dominated by young fir trees (Langston 1995).

Old growth faced the most drastic losses: probably less than a tenth of the presettlement old-growth forests remained by the early 1990s. Surviving old growth had become extremely fragmented; by 1993, 91% of the old-growth forests existed in patches of less than 100 acres (Eastside Forests Scientific Society Panel 1994). When the Forest Service first arrived, those mature forests stretched for hundreds of thousands of acres. For example, the Malheur National Forest once contained some of the finest stands of open ponderosa in the nation. In 1906, one report stated that an open, old-growth ponderosa-larch forest covered 800,000 acres south of the Strawberry Mountains (Erickson 1906). Fewer than 8,000 acres of these same old-growth ponderosa forests remained in 1993—less than 1% of what was present before the Forest Service began management. The forester R.M. Evans (1912) wrote that in the Wallowa and Minam Forests in 1912, there were nearly 600,000

acres of uneven-aged forests containing more than 80% ponderosa. About half a million acres—or 85%—of these ponderosa-dominated forests were old growth. By 1991, only 18% of the forests on the Wallowa Whitman National Forest were mature or old-growth stands, and very few of those were ponderosa. The rest of the forests were dominated by young fir trees (Langston 1995).

OLD GROWTH AND SCIENCE IN THE YOUNG FOREST SERVICE

What did the Forest Service do to bring about these changes? Many people in the Blues now say that the forests changed because early foresters knew little about ecology or succession or fire suppression. Nobody expected succession to happen. Foresters did not even think about succession; they were just ecological innocents out cutting trees. One day they woke up and noticed in a panic that their five million acres of lovely open pine stands had suddenly changed to tangled forests full of fire and bugs and dead firs. The implied moral of this story is that now that we know so much science, we will not make any more mistakes; we can use science and salvage logging together to solve the forest health problem. But the silvics reports make it clear that the first foresters in the Blues were among the best ecologists in the country at the time; many, such as Arthur Sampson, had been students of one of the most respected ecologists of the twentieth century, Frederic Clements. Moreover, they were obsessed with preventing the succession of pine forests to fir forests. Nevertheless, they accelerated exactly the changes they were trying to prevent (Langston 1995).

To understand what the Forest Service has done with the inland West, we need to understand the foresters' attitudes toward old growth, science, and politics. At the turn of the century, America was in a furor over land management. Disposal of the vast tracts of Western land was an enormously corrupt process, and to many Americans, the federal government seemed to be more corrupt than anybody else when it came to managing land. The new forest scientists stepped in and said: science will show us a way out of this chaos of political corruption, if you just leave it to us. By turning to the clear, calm, seemingly universal rules of science, foresters tried to avoid the morass of contentious politics and the contingencies of history. They felt that they could introduce science into the mess of land management, making a better society as well as a better nature. As scientists who had the interests of America and American forests at heart, they felt that they were beyond criticism. They alone could serve the public good, they felt, because efficiency rather than short-term profit was their goal (Hays 1959).

The Forest Service came to the Blues with the best of intentions: to save the forest from the scourges of industrial logging, fire, and decay. When they looked at the Blues, they saw two things: a "human" landscape in need of being saved because it had been ravaged by companies and the profit motive, and a "natural"

landscape that also needed saving because it was decadent, wasteful, and inefficient. Not only were federal foresters going to rescue the grand old Western forests from the timber barons; they were going to make them better. Using the best possible science, foresters felt that they were going to make the best possible forests for the best of all possible societies: America in the brand-new twentieth century.

In the eyes of the early conservationists, Western old-growth forests and timber barons shared a basic flaw: both were wasteful. As the historian Samuel T. Hays argued, the point of American conservation was to reduce waste and increase efficiency (Hays 1959). A Umatilla National Forest press released dated September 12, 1906, put it well: the intent of conservation was to "hunt down waste in all its varied forms" in waters, forests, lands, and minerals. Waste existed not when people overused resources, but rather when they failed to use them fully enough. Any water that was not used for irrigation was lost forever, any grass that was not eaten by a cow went to waste—or so the press release insisted. If people did not put everything to full use, it was a moral failure, not just an economic loss (Umatilla National Forest 1906).

Early government foresters had several strong articles of faith: First, the point of forestry was to reduce waste and make forests more efficient—which meant making them produce more timber, more quickly. Second, America needed wood, and demand would continue to increase as quickly as it had done after the Civil War. Third, if harvesting continued as usual, the country would run out of timber in 25 to 30 years. Fourth, forests ought to be used, but scientifically, to assure a perpetual supply of timber for a growing nation. Finally, scientists were best at solving land management problems, and so scientists, rather than politicians, ought to control the Forest Service (Clary 1986). Trained scientists—professional foresters—would redesign the old-growth forests, to improve them and so assure a perpetual supply of timber for a growing nation.

Two major tenets of scientific forestry developed: first, that foresters should encourage the growth of young trees by suppressing fire, and second, that foresters must replace old growth with regulated, rapidly growing forests. Fire seemed to threaten the forests by killing young trees, and since foresters were certain that young trees were the future of the forest, fire was clearly the enemy. Sparks from the logging railroads set alight piles of slash and dead wood left after cutting, and the resultant fires burnt so hot that little grew afterwards. The foresters decided that to protect the pine forests and the water supply, they needed to keep out fire and encourage reproduction.

The Forest Service was convinced that the more young pines they had, the more merchantable pine would necessarily follow. For example, managers suppressed fire because they thought that light fires would kill all the young trees. Competition, which dense stands of young trees fostered, would surely create vigorous, manly trees; without competition, weaklings would result—or so the foresters reasoned (Guthrie 1933). The opposite turned out to be true, unfortunately. Firs and pines failed to thin themselves, nor did they recover from sup-

pression when they were artificially thinned after their first decade or so. Without fires to thin them, what resulted was not a few big trees, but a thicket of stagnated trees all the same age.

The second, related tenet of scientific forestry was to liquidate old growth and replace it with a young, efficient forest. Attitudes toward old growth played a critical role in how foresters have transformed American forests, and therefore it is worth examining changes in these attitudes in some detail.

At the turn of the century, European foresters defined old-growth forests (also called "decadent" or "overmature" forests) as forests in which annual growth did not exceed annual decay. In contrast, scientifically regulated forests were young and still growing quickly, so they added more volume in a year than they lost to death and decay. More importantly, they were growing in an orderly fashion, so each year the exact same number of trees came available for harvest—ideally, for eternity (Parry et al. 1983). Scientific forestry, later known as sustained-yield forestry, required regulated forests, so that the annual net growth could be harvested each year. The reasoning went that, in a regulated forest, loggers could harvest the net annual growth forever without ever depleting the growing stock. The economic analogy is obvious: the harvest was equal to the interest; the growing stock was equal to the capital; and no sensible businessman and no sensible forester would want his investment in a bank that paid no interest, or in an old-growth forest that produced no net growth.

Within American forestry, the emerging hostility toward old growth developed not directly from European silviculture but rather from an American anxiety about how different American forests were from European, scientific forests. Most European foresters laughed at the idea of scientific forestry ever succeeding in America—too much old growth, they said, far too many old trees. Germans, in particular, said that American forests were ill-suited to scientific forestry because they were too big, too wild, and too decadent.

American foresters were frustrated by this scorn, for if the idea of American forestry was absurd, then American foresters were even more absurd. As Gifford Pinchot (1947), the father of the Forest Service and the father of American forestry, wrote in his autobiography: "We distrusted them and their German lack of faith in American forestry." When Gifford Pinchot persuaded his family to establish the Yale Forestry school, the school's purpose was avowedly American: "to produce American foresters trained by Americans in American ways for the work ahead in American forests" (Pinchot 1947, p. 152).

Americans were determined to prove American forestry was possible, but they did this not by transforming the ideas of European silviculture to fit American forests but by transforming American forests to fit European ideals. This meant cutting old growth, because old growth was what made American forests different. Even while American foresters bragged about the grand, huge American trees that outdid anything European forests could offer, American foresters did their best to eliminate those trees and make their forests more European. In Pinchot's writings

and in the young Forest Service, a tone of impatience and hostility towards old growth emerged, as the emphasis on eliminating inefficiency and waste increased. The wild forest was thoroughly in the way of progress.

The logic of the new Forest Service was simple: If the United States was running out of timber, the best way to meet future demands was to grow more timber. According to Forest Service surveys in the early 1900s, more than 70% of the Western forests were old-growth stands, and this meant that Western forests were losing as much wood to death and decay as they were gaining from growth. Preserving old growth would only delay the timber famine and the end of American civilization—it would never prevent it. So, to prevent a famine, old-growth forests needed to be liquidated so that regulated, sustained-yield forests could be grown instead. The best way to free up the land for regulated production was by pushing sales of old growth. This logic shaped the Forest Service belief that, in order to protect the forest, it was necessary first to destroy it.

In 1911, C.S. Judd, the assistant forester for the Northwest region, reflected this logic in a lecture to the incoming class of forestry students at the University of Washington. A timber famine was on its way, unless the Forest Service did something quick. Since the forest was running out of trees, the way to fix the problem was to get national forest land to grow trees faster. As Judd put it, "the good of the forest . . . demands that the ripe timber on the National Forests and above all, the dead, defective, and diseased timber, be removed." The way to accomplish this was to "enter more actively into the timber sale business." This would get rid of the old growth, freeing up land to "start new crops of timber for a future supply" (Judd 1911). As Frederick Ames, another Blues forester (and eventually Chief of Silviculture for the nation) said at a supervisor's meeting in 1910: "From no point of view can we make any mistake in cutting timber of this class [old growth]. The more sales we make the better" (Ames 1910). The unregulated old-growth forest was something to be altered as quickly as possible—for moral reasons, not just economic ones—to alleviate what one Blues forester, Thorton Munger, termed "the idleness of the great areas of stagnant virgin forest that are getting no selective cutting treatment whatsoever" (Munger 1936).

Armed with their conviction that old growth was decadent and wasteful, foresters set out to clean up the forest and make it as productive as possible. Every early sales contract and management plan stipulated that contractors had to remove all snags, dead-wood, insect-damaged, and fungi-damaged trees from the cutting site (see Miles 1911). Foresters believed that disease, dead wood, old growth, and fire all detracted from efficient timber production. In other words, they were assuming that the role of the forest was to grow trees as fast as it could, and any element that was not directly contributing to that goal was bad. Whatever was not producing timber competed with trees that could be producing timber, foresters believed. Any space that a dead tree took up, any light that a fir tree used, any nutrients that an insect chewed up—those were stolen from productive trees. If timber trees did not use all the available water, that water was wasted. If young, vigorous pine did

not get all the sun, that sun was lost forever. These assumptions made it difficult for foresters to imagine that insects, waste, disease, and decadence might be essential for forest communities and that, indeed, the productive part of the forest might depend on the unproductive part of the forest.

LIQUIDATING OLD GROWTH

What effect did all these grand visions of scientific forestry have on the public forests themselves? Until World War I, the answer is "very little." For all the foresters' desire to cut old growth, the Forest Service sold minimal timber from the Blues until after the war (Evans 1912; Parry et al. 1983; Cox 1985; Clary 1986). Forest Service timber was inaccessible, prices were set so high that few contractors were willing to invest, and the industry still had enough private stock to make sales of federal timber unattractive. After the war, however, markets for National Forest timber opened up, and the Forest Service began to push sales of ponderosa pine in the Blues. This, in turn, enabled them to begin the campaign to regulate the forests by liquidating old growth.

The Forest Service believed that to ensure local prosperity, old-growth forests needed to be converted to regulated forests that could produce harvests forever. But to regulate the forests, planners needed markets for that timber, and they needed railroads to get the timber out to the markets. Railroads were extraordinarily expensive, particularly after the First World War. Financing them required capital, which often meant attracting investments by midwestern lumber companies. But these companies were only going to be interested in spending money on railroads if they were promised sales large enough and rapid enough to recoup their investments. The results in the Blues, as across the West, often damaged both the land and the local communities that depended on that land.

To increase regional railroad development in the 1920s, Forest Service planners encouraged the construction of mills which had annual milling capacities well above what the Forest Service could supply on a sustained-yield basis. On the Malheur Forest alone, for example, two large sales during the 1920s offered over two billion board feet of pine, out of only seven billion on the entire forest. Two mills followed—one capable of processing 60 million board feet a year, and another that could process 70 to 75 million board feet each year (U.S.D.A. Forest Service, n.d.). With mill capacities reaching 135 million board feet a year, it would take only 15 years—not the 60 years of the cutting cycle—to process the two billion board feet in these sales, and only 52 years to process all the ponderosa on the entire forest.

As the Forest Service tried to get contractors to buy their timber, they made extensive compromises in hopes of attracting business and liquidating the old-growth ponderosa as fast as possible. The Forest Service initially had a strong policy against high-grading—the practice of cutting out only the most valuable

ponderosa from a mixed stand, and leaving behind the less-valuable trees to form the basis of the future forest. But correspondence between sales planners make it clear that contractors were refusing to cut less valuable trees. Rather than force them to meet their contracts, the Forest Service quietly looked the other way. But soon contractors began demanding a reduction in stumpage prices, claiming that they should be given a discount on ponderosa if they had to cut any other species at all. At this point, in 1922, the Forest Service decided that continuing to insist on cutting firs would mean that no one would buy ponderosa, and so the policy against high-grading was dropped (Granger 1922).

Beginning in the 1920s, the Forest Service decided that the best way to increase harvests was by relaxing its conservative silvicultural ideals that required light selective logging, encouraged the retention of large trees for reseeding the logged over site, forbade high-grading, and regulated the use of destructive logging machinery. For example, in 1922 the Forest Service in the Blues began allowing contractors to remove 85% to 90% of the mature forest in each sale, leaving only 10% to 15% as a reserve stand for the next harvest cycle (U.S.D.A. Forest Service 1922). Loggers were allowed to skid out the timber with caterpillar tractors, even though before 1922 the Forest Service had discouraged tractor skidding because it damaged young growth. And finally, the Forest Service had originally required that big pines be left in the reserve stand as seed trees. But in the 1920s, they abandoned this policy and told contractors to cut all the pine over 15 inches in diameter on a sale area (U.S.D.A. Forest Service, n.d.). Although many foresters now argue that light selective cutting destroyed the ponderosa forests by encouraging fir, it was these silvicultural compromises of the 1920s, rather than light selective logging, that helped ensure that fir would take over the mixed-conifer forests.

Concern about the effects of intense harvests on local communities began to emerge in plans during the late 1920s, even though foresters did not allow this concern to decrease their recommended harvests. To make sure that every sale fit into the overall plan for regulation of the timber in each National Forest, planners broke each forest into several units called *working circles*, which were areas of land whose boundaries were defined by markets for the timber. A working circle usually included all the timber that would feed into a single large mill. Each working circle had a management plan which outlined the orderly harvest of the timber within that circle, and these were combined for each forest to produce a forest plan. In the Malheur River Working Circle Plan, starting about 1927, the planner attempted to calculate the annual yield that would be available for local mills beginning in the 1980s, during the second cutting cycle. He realized, with dismay, that harvests would drop by at least 40% in the 1980s if cutting continued at then-current rates (U.S.D.A. Forest Service, n.d.). The planner consoled himself with the thought that, because his calculations of growth rates were just rough estimates, perhaps they would turn out to be underestimates and there would be more timber than anyone expected. He also hoped that "utilization efficiency will greatly increase"—so less waste would mean more wood for future mills.

On the Whitman Forest, letters between sales planners, the Forest Supervisor, and the Regional District Forester show that by 1927, the Forest Service was worried about the mill capacities they had encouraged. E.A. Sherman, the Acting Forester in Portland, criticized a draft of the management plan for the Baker Working Circle, complaining that the mill at Baker was too large and was using up too much wood, in excess of annual allowable cuts. He wrote that "the present milling capacity at Baker of between 40,000,000 and 50,000,000 feet annually . . . greatly exceeds the possible sustained yield from the Government lands in this working circle. . . . It does not look as if a reduction in the milling capacity at Baker sooner or later could be avoided" (Sherman 1927). The sales planner who had prepared the plan Sherman was criticizing agreed that harvest reductions would certainly come by the 1980s. Nevertheless, he argued to Sherman that they should do their best to meet the mills' current demands to avert possible immediate closures, even though such harvests would come at the expense of the next cutting cycle. Sherman reluctantly agreed and high harvests continued.

These documents make it clear that, in the 1920s, foresters set up plans knowing that harvests would drop by at least 40%, leading to probable mill closures, in the 1980s. This, unfortunately, is exactly what happened. Harvests collapsed at the beginning of the 1990s—not because of environmentalists or spruce budworm, but because planners set it up that way in the 1920s, figuring it was a reasonable price to pay for getting forests regulated as quickly as possible. Their motive, however, was not to gain profits from sales of old growth but to reshape the forests to fit their dream of scientific efficiency. They thought their goals were purely rational, their motives untainted by the desire for gain, their plans beyond question. What they failed to recognize was the degree to which their culture—a culture that stressed efficiency and loathed waste—had shaped their scientific definitions of an ideal forest. Foresters destroyed the forests not in spite of their best intentions but *because* of them—precisely because foresters' ideas of what was good for the forest were based on an ideal of deliberately transforming nature to serve industrial capitalism.

SCIENCE AND FOREST HEALTH

Today, many mangers still hope that, by appealing to science, they can step outside of public controversy and choose the right alternative. But, as the history of forest management in the Blue Mountains shows, this is a problematic strategy. The danger is not in the science itself, but in the temptation to use science to hide the ethical and political decisions that lie at the heart of public resource conflicts.

Current attempts to use science to resolve the forest health problem in the Blues illustrate this point. The restoration of forest health has become even more politicized since 1995, when President Clinton signed the Budget Rescissions Act, setting into motion a salvage logging program. The salvage rider attached to the

Budget bill suspended the Endangered Species Act, the Clean Water Act, the National Forest Management Act, and a host of other environmental laws across millions of acres—all under the guise of forest health. Proponents of the rider argued that heavy salvage logging would fix the forest health crisis and restore ponderosa pine to the inland West. The effect, in just the first few months, was to triple or quadruple logging in many areas.

Because many presettlement mixed-conifer communities used to be open and parklike, proponents of salvage logging have argued that we should log out the dense understory of fir now present in these forests. As Eric Pryne wrote in the Seattle Times, "Careful logging and burning would help return the forests to their original condition, and reduce the scope of future wildfires" (Pryne 1994a). Many managers and industry representatives immediately assured the public that ecosystem management meant intensive management. Environmentalists were dismayed when Steve Mealey, a former forest supervisor in Idaho with a reputation for pushing aggressive harvests, was appointed head of the Upper Columbia Basin Ecosystem Management Project, the government team developing a plan for ecosystem management in the inland West. Mealey voiced the feelings of many traditional foresters when he said: "In the inland west, ecosystem management may mean more management than before" (quoted in Pryne 1994b). Representative Larry LaRocco, the Democrat from Idaho who pushed hard in Congress for the salvage rider to "save" the forests, agreed with Mealey, adding that "the scientific consensus is going to carry the day" (quoted in Pryne 1994a). Fire and science, taken together, were suddenly providing managers with a justification for something that looked very much like business as usual.

Definitions of forest health are at the root of these justifications for salvage logging. These definitions of forest health reflect long-held cultural ideals of what a virtuous forest should look like. According to the Idaho Policy Planning Team, the best measure of forest health is when mortality is 18.3% of gross annual growth—the definition offered by the Society of American Foresters (O'Laughlin et al. 1993). By this definition, intensively managed industrial forests in Idaho are in a much healthier condition than nonindustrial forests, and old growth is in the worst condition of all, since mortality and growth are nearly equal. Therefore, the Idaho report concludes, intensive, industrial management is what keeps forests healthy.

Early foresters justified liquidating old-growth pine forests for exactly this reason—so that young, healthy, rapidly growing forests could take their place. This, unfortunately, led us into our current troubles. When human desires for commodities become the definition of health, managers must eliminate anything that detracts from high annual growth rates: insects, disease, decadent trees, fire, anything that does not directly produce timber. This definition of health is based on human conceptions of efficiency, not on an understanding of ecological processes of mortality and disturbance.

The problem with using salvage logging to restore forest health is not that salvage is always wrong. Sometimes the technique can help heal a particular forest

stand. But salvage logging has become a political tool that tries to fix forests by focusing on just one element—changes in overstory composition—while ignoring the policies and the cultural ideas that led to the changes.

Foresters traditionally have believed that disease, dead wood, old growth, and fire all detract from efficient timber production. In other words, they assumed that the role of the forest was to grow trees as fast as it could. Any element that was not directly contributing to that goal was bad; if something was not producing timber, it was competing with young trees that would. Any space that a dead tree took up, any nutrients that an insect chewed up—those were stolen from production.

But these arid, disturbance-prone forests were anything but efficient; their very inefficiency—their redundancy, their seemingly irrational complexity—was what allowed them to persist on dry, marginal sites. For example, when early forest managers walked the forests, they noted that spruce budworm and Douglas-fir tussock moth were feeding on the needles of firs, and they urged removal of old growth as a way of controlling the pests (Langston 1995). But what managers could not see was that at least 120 different parasitic wasp and fly species, 150 spiders, and 32 birds—most of them dependent on old growth—were, in turn, feeding on the spruce budworm and Douglas-fir tussock moths (Torgersen 1993). In trying to eliminate forest enemies, managers instead destroyed the habitat for predators, making future outbreaks ever worse.

Insect infestation and fires are both an integral part of a healthy forest: without insects and fires, forest productivity declines. For example, insects and diseases can help create cavities for nesting birds, which then help control insect outbreaks. They increase the recycling of nutrients back into the soil, and they help to thin stands, both of which increase the vigor of surviving trees. They provide habitat and food for animals, which in turn help control pest outbreaks. Insects can increase diversity in the forest as a whole, by creating a mosaic of different-aged stands within the forest and also creating openings within the canopy, which allow for new growth (Perry 1995). Low levels of insect infestation actually increase tree health, by increasing light levels, changing plant structure, sometimes increasing photosynthetic efficiency, and triggering changes in plant chemistry that decrease herbivore efficiency (Stoszek 1988). The crucial point here is that insects and disease, like fires and dead wood, are part of a healthy forest ecosystem. The problem is not with fire, insects, dead wood, or diseases, but with the conditions that encourage devastating outbreaks and conflagrations.

Outbreaks, ironically, are often worsened by attempts to manage the forest. Timber harvest techniques can increase susceptibility to insect outbreaks, since soil damage from erosion and compaction can be intense, and uncut trees are sometimes damaged and left open to attack by pests. Both tussock-moth and spruce budworm outbreaks occur when forests are under drought stress and nutritional stress, since these conditions can reduce the ability of trees to produce defensive compounds. Even-aged stand management has increased stress (through overstocking) and also decreased soil quality, thus increasing susceptibility to pests. Outbreaks also tend to spread more rapidly in monocultures than in diverse forests (Perry 1988). Finally, defoliator infestations have been more common in middle-aged, single-species stands and less common in old-growth stands (Stoszek 1988).

Restoring the inland Western forests means not just focusing on ponderosa pine, but restoring the ecological processes that allowed forests to develop in a dry landscape. Death and decay are essential parts of these ecological processes; predators, insects, diseases, and fire are what enabled the forests to persist.

In trying to bring about maximum production, foresters increasingly relied on what the historian Paul Hirt (1994) has called "a conspiracy of optimism"—the myth that they could replace the constraints of place with an engineered dream of high-intensity silviculture. But the dream was flawed at its heart, since what foresters saw as waste and inefficiency was critical to the forest's ability to persist. People tried to simplify the complexity of ecosystems, with the hope of making them produce more of the things people wanted and fewer of the things people did not want. In simplifying complexity, unfortunately, they eliminated ecological functions that turned out to be critical for long-term productivity.

The Blue Mountains of eastern Oregon are a remote and little-known place, but what happened there offers lessons applicable to a wide range of current resource conflicts. Managers will always have to rely on limited science to make decisions, and managers will always have to choose among competing users, all of whom believe that science is on their side. The irony, however, is that while science alone cannot enable us to make difficult choices, without good science we are even less qualified to make these choices. The danger is not in the science itself, but in the temptation to use science to hide the ethical and cultural decisions that lie at the heart of resource conflicts.

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