

Forest Ecosystem Health in the Inland West

R. Neil Sampson,¹ Lance R. Clark,² and Lynette Z. Morelan³

Abstract.—For the past four years, American Forests has focused much of its policy attention on forest health, highlighted by a forest health partnership in southern Idaho. The partnership has been hard at work trying to better understand the forests of the Inland West. Our goal has been to identify what is affecting these forests, why they are responding differently to climate stress than they did in the past, and what needs to be done to improve their health and resilience. Findings to date suggest that disruption of forest ecosystem processes and functions has significantly altered the natural role of fire in the region, particularly in the low-elevation, long-needled pine forest type. The result is millions of acres of unhealthy forest that do not meet the needs of society, and according to several scientists, may be on the verge of ecological collapse. The expansion of our early work has led to several features in regional and national media, and opportunities to share our findings and better inform interested members of Congress. A national survey on forest management commissioned late last fall gives us an indication that the public is generally supportive of management rather than letting nature take its course. However, public perceptions with respect to forest health and the role of fire suggest a need for more information and education on these issues. With the current volatile debate on salvage logging after the 1994 fires raging throughout the West, there is a considerable need to continue to raise awareness on forest health within the federal agencies, with the general public, and with policymakers.

For the past four years, a Forest Health Partnership consisting of American Forests, Boise Cascade Corporation, the Boise National Forest, the Idaho Department of Public Lands, the Intermountain Research Station of the Forest Service, and the University of Idaho has been hard at work trying to better understand the forests of the Inland West, a huge geographic region that stretches from the coastal ranges to the Plains; from Canada to Mexico. Our goal has been to identify what is affecting these forests, why they are responding differently to climate stress than they did in the past; and what needs to be done to improve their health and resilience.

As most people are aware, the forests in this region are discontinuous and spread out, often in

remote locations and harsh environments. Many of them, including many of the long-needled pine forests, are on the edge of forest adaptation, adjoining either deserts, grasslands or high alpine areas, and major environmental or ecosystem shocks could change them dramatically—even to non-forest.

Throughout the region, one can find forest sites where the presence of dead and dying trees is the most dominant and visible feature. These sites pose a critical wildfire risk, and the prospect of losing the entire forest stand looms large. Even where they look outwardly healthy, Inland West forests may be at serious risk. Dense stands of trees, often representing a much higher percentage of fir trees than what existed in pre-settlement times, occupy much of this landscape.

And we must keep in mind that when we are talking about forests, we're talking about entire complex ecosystems. A forest with its major vegetative component—trees—seriously out of balance

¹Executive Vice President, American Forests, Washington, DC.

²Forest Health Project Director, American Forests, Washington, DC.

³Ecosystem Coordinator, USDA Forest Service, Boise National Forest, Boise, ID.

cannot have normal stream flows, nutrient cycles, or wildlife habitats. The fact that these forests exist in a condition that today offers high recreation and environmental value is important. It is also subject to dramatic and sudden change. If we prize these values today, we need to consider how best to maintain them through our actions, because time is not on our side.

One of the major achievements of our Forest Health Partnership has been a series of reports and findings that are clarifying the urgency of forest ecosystem health problems, not only on the Boise Forest, but throughout the Inland West. Results also document the great need for effective management responses.

A June 1–3, 1993 Forest Health Symposium, "Forest Health in the Inland West," held in Boise, Idaho, outlined the nature of the emergency. Participants concluded that over-dense tree stands, species composition shifts from pine to fir, fire suppression policies, and past timber harvest practices were the primary, underlying causes of deteriorating forest health. They also recommended the use of prescribed fire and thinning through timber harvest, as urgently needed measures to reduce fir species, increase pine species, and restore ecosystem resilience (Adams and Morelan 1993). Most of the speakers equated the concept of forest health to ecosystem health, but others challenged the Forest Service to look beyond trees and their condition to "think for a minute about the entire forest ecosystem—the soil, the wildlife, the watershed, the fisheries" (Gehrke 1993).

In late August 1993, American Forests hosted a policy analysis of the Boise's Forest Health Strategy. This analysis was a follow-up to the June Symposium. A group of interested citizens, organizations, agencies, and partners gathered to discuss the Forest Health Strategy. They generally validated the strategy, but they also urged the Boise to merge the forest health strategy into a broader forest ecosystem health approach. The group strongly endorsed adaptive management principles for application in refining the forest health strategy (Sampson 1993).

The partnership convened a workshop in Sun Valley, Idaho, in November 1993, to assess the current state of scientific knowledge about the

health of forests of the Inland West. The workshop brought together a diverse group of scientists and forest managers to produce a current, accurate, and credible synthesis of information about forest ecosystem health (Sampson et al. 1994). Workshop participants agreed that in many areas of the Inland West, forests across large landscapes are dying faster than they are growing (O'Laughlin 1994). Participants also agreed that without application of needed silvicultural treatments within 15–30 years, including prescribed fire, and commercial and precommercial thinning, there is great danger that over the next century the region's forest legacy will be one of large, uniform landscapes recovering from wildfires and other ecosystem setbacks on a scale unprecedented in recent evolutionary time (Covington et al. 1994). Another key observation was that high fuel loads made up of largely dead and dying trees, resulting from the long absence of fire, result in fire intensities that cause enormous damage to soils, watersheds, fisheries, and other ecosystem components (Sampson et al. 1994).

Sampson et al. (1994) pointed out that the question of risk is at the heart of options facing people concerned with Inland West forests. They also stated that the current ecological conditions in the forests of the Inland West lead to the conclusion that ecosystem management will demand increased management. All participants agreed that the costs and risks of inaction are greater than the costs and risks of remedial actions, and that the challenge to managers on these threatened forests is to provide preventive treatment as a means of protecting ecosystem resources. Finally, participants accepted the concept of "historical range of variability" as useful in determining ranges of desired future conditions, and in establishing limits of acceptable change for ecosystem components and processes (Morgan et al. 1994).

This is consistent with the mission of American Forests, which for 120 years has been a champion for forest conservation based on the use of the most current science and public values. Obviously, over the years, both science and public values have changed, and so has our approach.

But some things stay pretty much the same—including our magazine, which has just celebrated 100 years of continuous publication.

One of the major goals of American Forests in recent months has been to bring the Inland West forest health situation to national attention. Along the way, we've identified some principles that we think are useful in thinking about forest health—in all regions of the world. First, we must recognize the major paradigm shift that has taken place in describing forest ecosystems. Instead of speaking about "natural balance," "equilibrium," or "climax conditions," ecologists today talk more about constant change, and the chaotic nature of that change. We also feel that any approach, to be successful over the long term, has to understand the adaptive nature of management, and the possibility that what we know today could significantly change as we go along, learn more, and watch forests respond to the combination of management intervention and environmental change. We are also convinced, however, that new federal policies are needed to allow federal forest managers to undertake truly adaptive ecosystem management, and to build the collaborative relationships at the forest level that are needed to institute truly successful management.

Another part of our recent work on forest health came about through the hearings of the National Commission on Wildfire Disasters, which was chaired by Neil Sampson of American Forests. In the Commission's field reviews, which extended right up to the Los Angeles firestorm of 1993, a consistent message was heard from land managers and fire fighters alike. If these forests are over-protected from fire, and under-managed to reduce fuels, the result is catastrophe. This is particularly difficult in the many areas where urban growth adjoins the forest. Even in areas where the dominant character of the land remains essentially rural, the presence of homes and other structures makes firefighting an enormously complex and dangerous task. The basic conclusion of the Commission was that the dry forests in the Inland West are going to burn. The question is not whether, but when. And in today's forest condition, virtually any fire will flash to the crowns of the trees and kill most, if not all of the stand. This isn't a normal fuel condition, and you won't have normal wildfire behavior. It is no coincidence that so many of the 1994 news stories quoted people as saying that they "never saw one behave like this before."

One of the major public policy challenges, clearly, is that the costs of wildfire suppression are

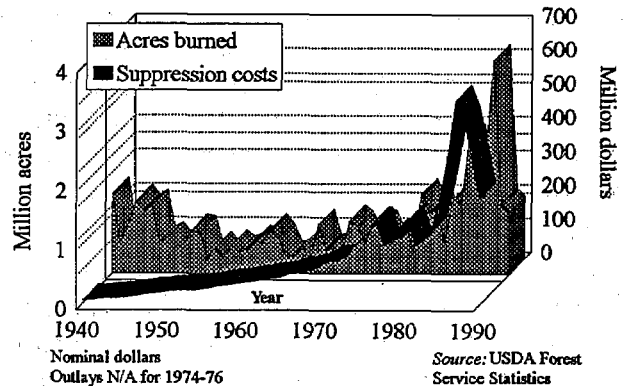


Figure 1.—Wildfire acres burned in 11 western states and Forest Service fire suppression outlays for the U.S., 1940–90.

rising dramatically. Although there is a great deal of annual variation, the recent trends are steeply upward, and the near \$1 billion federal fire suppression cost in 1994 is only the beginning of what could continue to be a rising public obligation (fig. 1). The Commission's conclusion was that, unless forest health was addressed quickly, by a major change in management approach on the federal forests, these costs would keep trending steeply upward (National Commission on Wildfire Disasters 1994).

The other side of that coin, however, is that there are solutions today that were unavailable only a few short years ago. The high price of wood makes helicopter logging feasible in many places, for example, even when the logs removed are only a thinning cut composed largely of dead and dying fir trees. The completed job will often be almost invisible, particularly where careful slash disposal and cleanup has been done. The forest will look virtually untouched, but it now has a chance to thrive, and to handle a wildfire without losing the overstory of valuable ponderosa pines. These kinds of results are often easier to achieve when a special kind of contract—called an end-results, stewardship contract—can be used instead of a timber or salvage sale (Sample and DiNicola 1994). These contracts, which have been tested on several western forests, will need to be authorized in federal law before they can be more widely used in the treatment of federal forests.

One challenge, of course, has been to make the forest health situation known to a national audience, including a skeptical Congress. Doing that required more than anecdotal evidence, and that is where the forest health partnership focused its efforts. Forest Service researchers documented the history of some forested plots, where evidence supporting forest composition extended backwards over four centuries. In a research plot on the Boise National Forest, for example, land that supported a savannah forest of 25–30 pine trees per acre for centuries is now trying to grow over 550 mixed pine and firs (Sloan 1993). Over half those trees are firs, and over half are dead. This is a change directly related to fire suppression, which is directly connected to the settlement of the region in the late 19th Century. Pioneers eliminated Native American fire usage, grazing livestock reduced the carpet of fine fuels that carried summer fires over huge areas, and settlers put out every fire they could handle, in order to protect their property. Fire suppression may have become much more organized as the Forest Service and state agencies gained capacity, but the attempts to eliminate wildfire from western lands started with the first wave of settlers, and has been effective in keeping fire out of some of these systems for over 100 years now (Pyne 1982).

The importance of fire exclusion in these systems can be illustrated by illustrating the way carbon is cycled through them, and comparing that to other types of forest. In warm, moist climates such as that which grows the great Douglas-fir forests of the Pacific Northwest coastal region, carbon is captured into wood by forest growth, and a very high percentage of that carbon is recycled out of the forest through decomposition. Organisms of all types live in and on the wood that falls to the forest floor, and although the large pieces rot slowly, most of the carbon is eventually recycled in this manner. Fire enters these forests very infrequently, maybe every 250 to 1,000 years, and recycles the rest of the growth. Over long enough time periods, the carbon cycle is probably fairly well balanced in this manner (fig. 2).

In the cold, dry environments of the Inland West, however, microbial decomposition is very limited. These climates are so cold in winter and dry in summer that microorganisms don't get much time to work effectively. Wood that drops to the ground

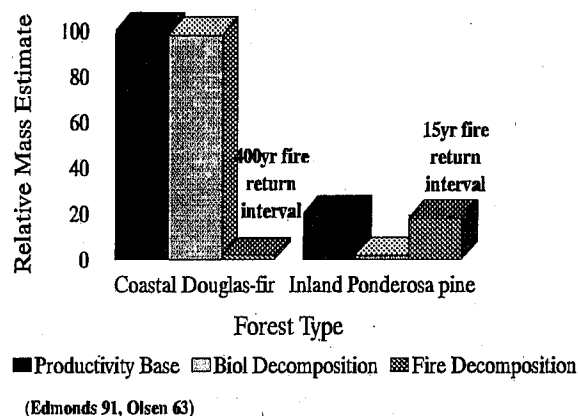


Figure 2.—Base productivity/decomposition.

may lay there for decades, and layers of pine needles and bark flakes build up around trees. In these systems, fire has historically provided the carbon recycling device. Before the region was settled, fire visited every 10–20 years or so, burning the fuels on the forest floor and recycling the carbon on a regular, but low-intensity basis (Agee, 1993). These ground fires killed small trees, but left most of the large ones unharmed. Thus, over time, a forest of fire-tolerant species such as pine or larch dominated much of the area.

Fire also liberated nutrients that were essential to all living things in the soil and forest, as well as favored those species that had grown to depend on fire as part of their life cycle. Thus, many of the forest's essential functions were changed dramatically as the forests continued to "miss" their normal fire cycles. A forest that has missed 6 or 8 wildfire cycles in the Inland West will now have huge carbon reserves awaiting recycling. In addition to huge loads of dead fuels in the trees, it may have larger-than-normal carbon supplies on the soil surface and in the top soil layers (fig. 3). When such a forest burns today, instead of a simple recycling of carbon that keeps both the aboveground plant growth and the soil carbon within normal ranges, the intense heats generated can result in significant soil carbon losses. This may translate into a damaged soil that cannot recover normally from the heat's damage, and thus, a forest ecosystem that may not be able to restore itself.

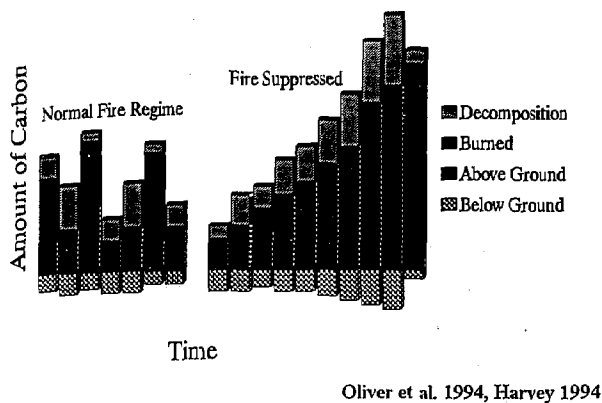


Figure 3.—Forest carbon cycle schematic.

The results of fire suppression show up in many ways, as researchers look to the forest for clues as to what is happening, and why. University of Idaho researchers, for example, looked at available timber survey records, which documented a major species shift in Idaho forests over the last 40 years (fig. 4) (O’Laughlin 1993). Ponderosa and western white pine are rapidly dwindling within Idaho forests, while Douglas-fir, true firs, and lodgepole pine are rapidly increasing. This forest has been changing rapidly through the last few decades.

We studied the data on moisture conditions, as reflected in the snow surveys taken on major forest watersheds by the Soil Conservation Service, and compared spring snowpack conditions with the available Forest Service data on insect damage and wildfire extent (fig. 5). What we saw was that when

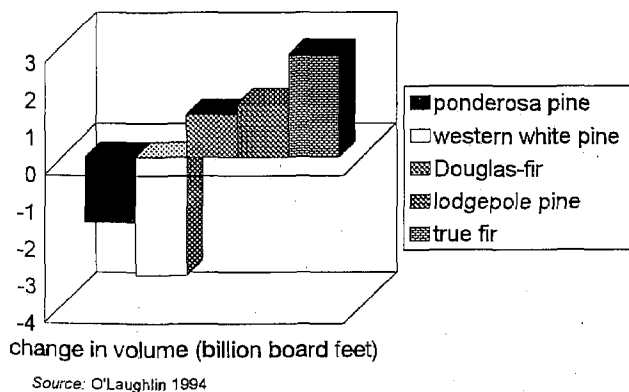


Figure 4.—Change in Idaho softwood growing stock volume on timberland for selected species, 1952–1987.

moisture stress rose in the 1980’s, the forest responded far differently than it did in earlier droughts (Sampson 1992), signalling that something different was happening this time, and raising the question “why?”

The papers from the Sun Valley workshop are contained in Volume 2, issues 1–4, of the *Journal of Sustainable Forestry*, and a hardcover book of those papers entitled *Assessing Forest Ecosystem Health in the Inland West*, is available through American Forests or the publisher, Food Products Press (Sampson and Adams 1994). The bottom-line conclusion from the workshop is critical. Any course of action in resource management entails risk—costs are usually immediate and certain; outcomes are usually uncertain. But today—given the situation in these forests—the costs and risks of doing nothing are greater than the costs and risks of taking action. It is promoted by some scientists, and widely believed in the environmental movement, that leaving wildland forests unmanaged and untouched is a way to protect values such as biological integrity and ecological protection. In a significant departure from that idea, which has attracted much controversy and debate, the scientists at Sun Valley said that the risks of severe ecosystem damage from doing nothing should be considered, and that they outweigh the risks and costs of treatment.

Our workshop report was given some publicity when it was released in March of 1994, but not all that much attention was paid until the wildfires of the 1994 summer began to break out. Then, tragi-

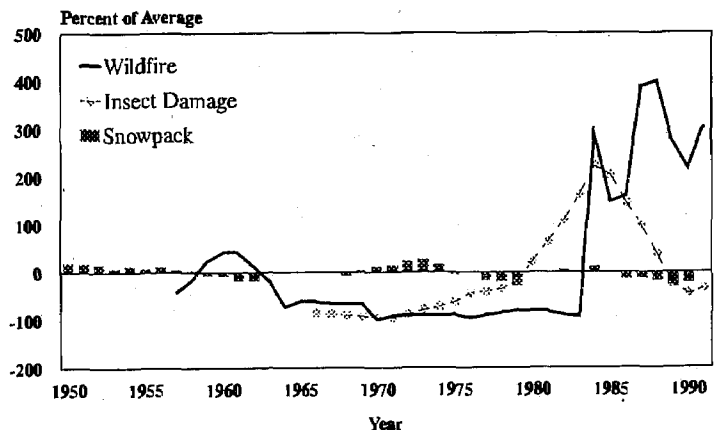


Figure 5.—Boise National Forest, forest health indicators.

cally, came the disaster on Storm King mountain, where the death of 14 firefighters brought the human costs of the wildfire challenge directly into every home in America.

That attention galvanized serious journalistic investigations, such as the MacNeil-Lehrer Newshour, which could take 12 minutes of national TV time to try and explain a situation that is too complicated for 30-second soundbites (See Knudson et al. 1994). Most importantly, this kind of media allowed time to point out that, for many forests where extreme risk exists, there are also enormous values that can be protected if proper actions are taken. Millions of acres of federal forest are now growing trees that are more than half-way toward an old-growth ponderosa pine condition that could mimic what the pioneers found. But these pines are surrounded by smaller trees, and fuels reach from the ground to the top of the trees. If a wildfire starts now, it will climb those dead, dry branches and set this system back 100 years or more. The hopes of an old-growth pine forest will be lost, many forest values will vanish for years, if not decades, and managers 100 years from now could be faced with another even-aged pine stand that will need to have intensive management to avoid another wildfire that kills everything back again.

But if those forests can be thinned, and the logging slash carefully burned, many areas can be set on the path to long-term forest health. Nutrient recycling will start up again with the slash burning, and a more normal carbon cycle will have been created by removing excess wood from the forest both through the thinning harvest and the cleanup fires. In some places, prescribed fire can be used without first thinning the trees and reducing the amount of fuel present. This is a difficult and risky treatment, but may be the answer to starting the forest health restoration process where the conditions are right.

Unfortunately, there are cultural and legal obstacles to the widespread use of prescribed fire. Although prescribed fire is accepted in the Southeast, events early this century kept it from being used in the Inland West. The light burning controversy of the 1920s, an argument over using prescribed fire as the Native Americans did, was won

by advocates of fire suppression, aided by public fears from early fires such as the 1910 Big Burn in Idaho and surrounding states (Pyne 1982). Clean air regulations created to protect human health set allowable smoke levels during a period when fire suppression masked actual baseline levels of smoke. Prescribed burns have the potential to create higher than legal amounts of particulate matter from smoke, and there are serious and legitimate health concerns about these added pollution levels. In large fires—fires that are likely much larger and hotter than historical fires for the region—episodic pulses of smoke threaten the health of communities downwind. Scientists are hard at work trying to show that frequent low-intensity fires such as prescribed burns produce the equivalent or less than less frequent stand-replacing fires over time (Schaaf 1995). Policymakers will need to look hard at these tradeoffs in relation to the Clean Air Act and state air quality regulations. Prescribed fires presumably produce less smoke overall, and are manageable to mitigate health risks. Currently, the Western States Air Quality Resources Council, an umbrella group for local and state air quality regulators in the West, is attempting to take the lead on this issue (See WESTAR 1995).

These kinds of options were discussed at a September, 1994, conference in Spokane, Washington, and, again, given good discussion in the region's media (See Danielson and Sampson 1995; Knudson et al. 1994). Obviously, there are people who do not agree with these recommendations, and who still argue that the greatest danger comes from taking action to treat sick forests. Their voices have been heard by the public as well. Mainline media are quick to pick up on any controversy that exists.

As fall weather signalled the end of the 1994 wildfire season, an estimated 3.8 million acres of forest had been burned, and the controversy that made most headlines was over whether or not to salvage the dead merchantable timber from that land. The Forest Service, who were faced with most of the problem, are still caught in that controversy, which has now moved to the Congress and become even noisier and more divisive.

Most conservationists and managers agree that salvage is primarily an economic activity, and managers should be very conservative in applying

it to post-fire management. Salvage operations, either post-fire, or after other disturbances such as after insect-caused mortality, are valuable for economic reasons. They supply wood to mills that are now starved for raw material, and benefit local economies. More importantly, much of the money generated from salvage can and should go back to restoration work in unhealthy forests. Because of the ability for salvage sales to offset the cost of restorative treatments such as thinning, watershed rehabilitation, or prescribed fire, salvage is an important tool in overall restoration of forest health in unhealthy landscapes.

The forest health focus should be on restoration forestry, which is done mostly through treatments other than salvage. Although we have identified salvage as useful to the forest products industry and to offset costs of other treatments, it should be clear that a strategy focused on chasing volume of fire-killed timber salvage alone is wasting political energies, will not solve forest health problems, and disrupts managers and forest interests from working together to address real forest health problems.

The policy trap that we face is that unless pre-fire treatments can be increased, larger, more intense, stand-replacing wildfires are certain. This means more and more fire-killed timber to fuel salvage controversies, and less ability on the part of the agencies or the woods-working industries to apply preventive treatment to a shrinking base of green stands that could survive future fires if properly treated. So—the more that salvage dominates the forestry agenda, the more salvage there will be to do. Until, of course, most of the untreated areas are burned over. Then, the 21st century forestry will face the challenge of protecting young recovering forests, with few, if any, timber receipts to help fund the work.

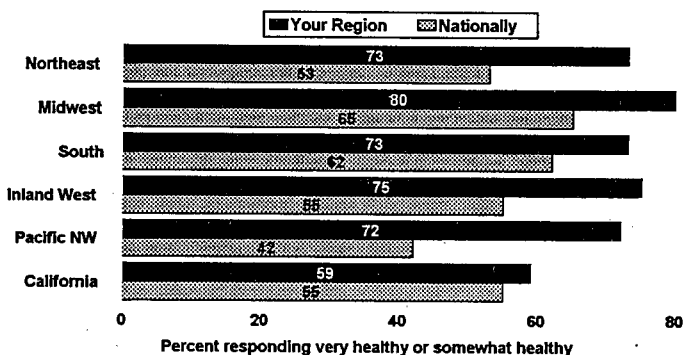
For the most part, at American Forests we tried to stay out of the salvage battle, which we believe ought to be waged locally by looking at each individual situation and making sensible decisions in consultation with affected people. Every situation is different, and there are enormously important values at stake that must be considered. We chose, instead, to launch a three-year public education campaign, because we think the problem is going to be with us for a very long time, and a far

greater level of public understanding and support is going to be needed before real solutions begin to emerge. If we allow millions of untreated acres to suffer needless wildfire damage, and spend our energy fighting over salvage options, we will have missed the entire point, and billions of dollars in public money, as well as enormous environmental values, will be wasted as a result.

We started this educational effort by commissioning a public opinion poll on the subject. Our rather simplistic notion is that, if you are going to set out to affect public opinion, it would be nice to know where you stand at the start. We commissioned the public opinion firm of Frederick/Schneiders in Washington, who polled a sample of 1,000 registered voters across America, for national data with an estimated error range of 3 percent. What we found is, we think, both interesting and important (American Forests 1994) (fig. 6).

The first question we asked was, how would you describe the condition of the national forests across the nation, as well as in your region? Interestingly, almost three-quarters say they think their region's forests are healthy, even in the Inland West where the problems are so visible. On the other hand, they are less positive about forests as a whole. Forest health is a problem, they say, but it's somebody else's problem. That is an attitude we need to change in several regions. The problems are at home, as well, for much of the American public.

We then tested voter awareness of the wildfire situation, asking if they thought 1994 experienced more, the same, or less wildfire than average. Here, half the people got it right, and almost two-thirds



American Forests, October 1994

Figure 6.—What is the condition of national forests in your region and across the U.S.?

of westerners recognized that 1994 was a high fire year. In case you think these percentages are awfully low in the face of all the media publicity, rest assured that our pollster tells us that when half of the voters recognize something, that's significant. Clearly, however, the public does not yet recognize the connection between wildfire and forest health. Even westerners who knew that wildfire impacts were high in 1994 still rated their region's public forests as "healthy." In other words, the connection between unhealthy forests and major wildfire risks is not widely known.

One of the questions tested the controversy over whether we should impose human management on these forests, or let nature take its course. Here, 52 percent of the people came out in favor of management intervention, and that opinion was, again, most widely held in the West.

There have been suggestions that timber harvesting should be completely stopped in the National Forests. We checked that idea, and found 47 percent of voters supporting the continued harvest of timber, with 44 percent agreeing that timber harvest should be eliminated. Again, there were significant regional differences of opinion, with almost two-thirds of the people in the Pacific Northwest supporting timber harvest on federal forests.

After explaining what thinning was supposed to accomplish in terms of restoring forest health, we asked if people favored its use as a forest treatment. A higher percentage (51 percent) support thinning, but again, there are strong regional differences in the support for this idea, with 70 percent support in the West.

Returning to the wildfire question, we asked whether the Forest Service should try to extinguish all fires or let some burn. What we discovered is that public attitudes still favor extinguishing all wildfires, by a 55 to 36 percent margin. Interestingly, that point of view was particularly strongly held by the women polled in the sample.

Even after explaining how prescribed fire could help forests, people are still not certain that it is a good idea. They agree that it should be used, by a margin of 49 to 42 percent nationally, but only in the Inland West was there as much as a two-thirds majority favoring the use of prescribed fire as a means of improving forest health. If forest manag-

ers believe that the increased use of prescribed fire is important in these forests, they have a significant public education challenge to address.

Over half (51 percent) of the respondents favored the salvage of dead trees following wildfires. Again, the regional differences of opinion across America were striking, with support for salvage strongest in the western regions. When asked whether appeals and other legal delays should be shortened to facilitate salvage, however, public opinion was split 45 to 43 percent. Clearly, attempts to limit appeals or shorten review processes will need to be done cautiously and explained well to the public and, even then, should be expected to meet stiff opposition. The current controversy over the salvage amendments in the Appropriations Bill reflects the divisions on this issue.

The most opposition will be encountered when forest managers propose to build roads into roadless areas. People oppose building roads into roadless areas by a margin of 55 to 40 percent at the national level, and that general opposition extends into all regions. People value roadless areas, and so long as they think these areas are safer without roads, they will make that opposition felt. Where managers feel that a roadless area faces a high risk of destructive disruption unless it is treated, and that road access is essential to that treatment, they will have to explain the situation openly in terms of the risks and losses incurred in building roads versus the risks and losses likely if the area is left untreated.

When asked whose opinion they most trusted about forest management questions, 43 percent of Americans identified university scientists as having high credibility. Federal agency and environmental organization scientists are trusted by more people than timber company experts, except in the Pacific Northwest.

Finally, since this forest health effort of ours is tied to public policy and federal legislative proposals, we asked people whether or not Congress should write prescriptive legislation setting out the details for federal forest managers, or whether they should give the agencies more flexibility to manage in response to local situations. Here, the most overwhelming public consensus in the survey emerged. Congress should provide policy tools

and guidance—not forest management prescriptions—say an overwhelming 74 percent of Americans.

Part of the reason for that view may be based on the trust that Americans hold in public agencies. You will hear from some advocacy groups that the public doesn't trust the Forest Service. That's false. Public trust in the Forest Service is high. Three-fourths of the sample say they have a "very favorable" or "somewhat favorable" impression of the agency. Only 8 percent have an unfavorable rating, and 19 percent say they don't know. Other agencies and types of organizations were also tested. If you are interested, a full set of the questions and responses used in this poll can be purchased from American Forests.

This poll shows that Americans do not have a solid grasp of how forests work, especially the linkages between forest health and the role of fire in the forest. Changing that is perhaps the major educational challenge we face. However, while all this information on public opinion is very helpful and interesting to those of us who are working to shape public policy, the fact still remains that it does little to solve the forest health situation—or the risk of losing significant values—over millions of acres of western forests.

Those lands, so highly important for so many reasons, to so many people, deserve better care than we have been willing—as a public—to give them. Over millions of acres, managers need to be able to respond more quickly to fast-changing conditions. If we continue to spend all our time in preparing studies and fighting over whether or not to address these treatment needs, the natural forces such as wildfire will take those decisions out of our hands, certainly for many years, perhaps, in the most seriously-damaged places, for centuries. These choices aren't easy, but they are critical, and time is not on our side. Forest health must become the new rallying cry for public forest management well into the next century.

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