95-548 ENR
Updated March 27, 1998

Forest Health: Overview

Ross W. Gorte
Specialist in Natural Resources Policy
Environment and Natural Resources Policy Division

Summary

The pine ecosystems in the intermountain West are considered by many to be unhealthy. While the data are inconclusive, studies show at least localized problems of timber mortality and dense stands of small trees, including a shift away from the fire- and drought-resistant pines in mixed conifer stands. The comprehensive land management planning processes of the Forest Service and the Bureau of Land Management were intended, in part, to address such issues, but to date, efforts by the agencies, the interest groups, and Congress have focused on separate authorities and funding for forest health activities -- salvage timber sales, prescribed burning, thinning, and other timber stand activities.

What Is the Problem?

Many of the forests in the intermountain West -- from the Black Hills of South Dakota to the Cascades and the Sierra Nevadas, and from the Canadian border to Arizona and New Mexico -- are dominated by pines, especially Ponderosa, Western white, and lodgepole pines. The pine ecosystems of the West are considered by many to be in unnatural and unhealthy conditions, with excessive numbers of trees and excessive tree mortality, leading to insect and disease epidemics and to increased risk of catastrophic fire.[1]

Timber mortality in the intermountain West has risen since 1976 -- in total, per acre, and as a percent of inventory.[2] Timber mortality (per acre and as a percent of inventory) is often higher on the national forests than on other timberlands. However, mortality on

[1]For a further discussion of this relationship, see CRS Report 95-511 ENR, *Forest Fires and Forest Health*.

[2]Data on timber mortality, timber inventory, and timberland area are from: Douglas S. Powell, Joanne L. Faulkner, David R. Darr, Zhiliang Zhu, and Douglas MacCleery. *Forest Resources of the United States, 1992*. Gen. Tech. Rept. RM-234. Ft. Collins, CO: U.S.D.A. Forest Service, Sept. 1993. 132 p. (Hereafter referred to as *Forest Resources, 1992*.)

the national forests of the intermountain West appears to be no worse than on other timberlands -- timber mortality in 1991 was higher than in 1976 in nearly all regions for all landowner classes. Furthermore, timber mortality per acre is higher in the Pacific Coast States (Alaska, Washington, Oregon, and California), because the remaining dense old-growth stands have high mortality rates; timber mortality is a greater percentage of inventory in the Eastern regions (Northeast, North Central, Southeast, and South Central), because conifers have relatively short lifespans in the humid Eastern climates.

Although existing Forest Service data do not show abnormal timber mortality in the intermountain West, certain health problems might not be captured by those data. The Forest Service data are based on periodic inventories, typically on a 10-year cycle; thus, the 1991 data are, on average, at least 5 years old. If timber mortality in the intermountain West has risen because of the drought that began in the early 1980s, the data might not yet reflect that increase. Two other forest health problems also would probably not be reflected in the comprehensive timber data. One is excessive numbers of small trees, with little or no net growth, due to stand stagnation without mortality; this could be a particular problem for the Ponderosa and lodgepole pines, which are well adapted for dry and infertile conditions. The other problem, fuel buildup, is more likely in the intermountain West, because the arid conditions slow the decomposition of the wood.

The forest health problems of the intermountain region have been developing over a long period, although the deterioration of the forests may have been accelerated by the past decade of drought. The problem began with livestock overgrazing in the Western pine forests in the 1800s; this reduced vegetative competition for the trees, especially from grasses, some of which inhibit tree regeneration and growth. The problem has been exacerbated by logging, both before and since the national forests were established, that has emphasized cutting large-diameter old-growth pines, and leaving smaller trees and other species (particularly the true firs). However, the most significant cause may have been fire suppression over the past 75 years that virtually eliminated the natural cycle of frequent fires.

These anthropogenic factors have altered the Western pine forests. The pure pine forests (pure being defined by foresters as more than 80% of the trees in one species) have seen substantial increases in fuels and in seedlings and saplings. Historically, frequent, low-intensity fires in Ponderosa pine forests reduced the fuels and killed many of the seedlings and saplings. According to a recent study in northern Arizona, the Coconino National Forest averaged 23 trees per acre prior to settlement, but now has 851 trees per acre.[3] The frequency of stand replacement fires in lodgepole pine forests has also declined, leading to more trees and more fuels per acre than occurred prior to 1900.

The mixed conifer forests have been similarly altered, with substantial increases in the number of small diameter trees and in the quantity of woody fuel. However, the species composition of these forests has also changed, with much more Douglas-fir and true fir than existed 150 years ago. This is the result of logging the high-value species (the inland

---

[3]W.W. Covington and M.M. Moore. "Postsettlement Changes in Natural Fire Regimes and Forest Structure: Ecological Restoration of Old-Growth Ponderosa Pine Forests." In: *Assessing Forest Ecosystem Health in the Inland West*. [R. Neil Sampson and David L. Adams, eds.] New York, NY: Food Products Press, 1994. pp. 153-181.

Douglas-fir subspecies is not nearly as valuable as the subspecies that grows along the coast and in the Cascades) and of suppressing the low-intensity fires (because pines are less susceptible to damage from fire). Furthermore, the Douglas-fir and true firs require more water than the pines, and thus the stress of the decade-long drought has increased their susceptibility to insect and disease attack, and possibly set the stage for epidemics.

What Can Be Done About It?

Many people are interested in improving forest health -- for immediate and/or sustainable wood supplies, for reducing the risks of catastrophic wildfires, and/or for sustaining and protecting other outputs and values from the forests (*e.g.*, water quality, recreation, and "naturalness"). One principal goal of forest health improvement is to reduce biomass -- small-diameter trees, dead or dying trees, and existing woody fuels; in mixed conifer forests, shifting the species mix back to pine dominance may also be a goal.

Much of the attention on improving forest health has focused on the national forests in the intermountain West, where they account for 60% of the timberland.[4] At a forest or landscape level, this could be addressed through national forest planning. The Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976 (NFMA), requires the Forest Service to prepare integrated, coordinated land and resource management plans for units of the National Forest System.[5] These plans are prepared using an interdisciplinary approach, "to achieve integrated consideration of physical, biological, economic, and other sciences," and with the public's participation, to assure that relevant concerns and issues are addressed. Furthermore, the plans are to be revised "from time to time when . . . conditions in a unit have significantly changed, but at least every 15 years." Many forests are beginning the process of revising their plans, thus providing an opportunity to address forest health concerns in forest planning.

Some have criticized forest planning as being slow, expensive, and unresponsive to current problems.[6] To date, efforts to direct the Forest Service to improve forest health have generally been external to the planning process. Proposals and draft bills have either ignored national forest planning under NFMA, or directed forest health decisions to override existing plans.

Several tools exist for improving forest health. One of the most frequently mentioned is salvage timber sales.[7] Salvage timber sales can be used to remove dead, dying, and threatened trees from the forest, and therefore can be useful in reducing biomass and in controlling insect and disease infestations. However, since commercial interest reflects

---

[4]*Forest Resources, 1992*, p. 43.

[5]Respectively: Act of Aug. 17, 1974, Pub.L. 93-378, 88 Stat. 476; and Act of Oct. 22, 1976, Pub.L. 94-588, 90 Stat. 2949. 16 U.S.C. 1600-1614.

[6]See: U.S. Congress, Office of Technology Assessment. *Forest Service Planning: Accommodating Uses, Producing Outputs, and Sustaining Ecosystems*. OTA-F-505. Washington, DC: U.S. Govt. Print. Off., Feb. 1992. 206 pp.

[7]For more information on this tool, see CRS Report 95-364 ENR, *Salvage Timber Sales and Forest Health*.

timber quality, salvage sales have limited potential for reducing small-diameter trees, and much woody material (limbs and needles) is left on the site. Environmentalists are also concerned about salvage sales, because little is known about the ecological consequences of extensive salvage sale programs, because the current definition of salvage does not limit salvage sales to dead or dying trees, and because inappropriate logging has contributed to the current problem.

Another common tool is prescribed burning. This is using fire (set intentionally or occurring naturally) under prescribed weather and fuel conditions to reduce the quantity of woody fuel on a site. It can be an effective tool for converting organic matter to minerals, water, and carbon dioxide (and other gases), but protecting air quality (particularly from airborne particulates) often limits the timing, location, and amount of prescribed burning that can occur. Prescribed burning is also a poor tool for eliminating small-diameter trees, because it is indiscriminate about which (if any) trees remain, and can be a dangerous tool when weather conditions change.[8]

Other forest management techniques can also be used to improve forest health and reduce the risk of catastrophe fire. One activity is precommercial thinning, to cut down trees that are too small to have any commercial value. Release -- killing competing vegetation chemically or manually -- can reduce timber stand densities. Pruning can eliminate low-growing branches, thus removing a "ladder" for fires to reach the crowns of the trees while improving the value of wood growth. Fertilization can accelerate tree growth, possibly overcoming stand stagnation. Planting on mixed conifer sites can help reestablish the natural variation of native forests, both on cleared sites and in stands with relatively low densities.

Oftentimes, these various tools and techniques need to be used in combination to achieve the desired goal -- salvage with mixed-species planting or prescribed burning after precommercial thinning, for example. Indeed, none of these approaches is sufficient to improve forest health alone; rather, a coordinated program combining relevant tools and techniques is probably necessary to improve forest health in the pine ecosystems of the intermountain West. However, it should also be noted that most of these tools and techniques are expensive, and the total cost may limit the ability of the agencies to improve forest health.

Legislative Proposals

102nd-104th Congresses. Congress has addressed forest health legislation several times over the past few years. The first comprehensive bill, H.R. 4980 in the 102nd Congress, the National Forest Health Act of 1992, was introduced on April 9, 1992. After July 1 hearings before the House Agriculture Subcommittee on Forests, Family Farms and Energy, the bill was marked up and ordered reported, but a report was never filed, and Congress adjourned without further action on the bill. Several bills were introduced in the 103rd Congress: H.R. 229, the National Forest Health Act; S. 459, the Federal Forests

---

[8] A prescribed fire in Michigan in 1980 escaped when weather conditions changed, killing one person and destroying 44 homes and buildings. See: Albert J. Simard, Donald A. Haines, Richard W. Blank, and John S. Frost. *The Mack Lake Fire*. Gen. Tech. Rept. NC-83. St. Paul, MN; U.S.D.A. Forest Service, Sept. 1983. 36 p.

Health Recovery Act of 1993; and S. 2456, the Forest Health Act of 1994. However, no hearings were held on any of these bills.

Following the severe wildfires in the intermountain West during the summer of 1994, the Administration proposed the Western Forest Health Initiative.[9] This program was, essentially, an acceleration of current planned, funded projects and of planned, unfunded projects, with improved coordination with the Environmental Protection Agency on monitoring, with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service on endangered and threatened species, with the National Wildfire Coordinating Group, and with State Foresters. However, this program was also criticized as a weak response to the magnitude of the problem in the West.

Two bills in the 104th Congress addressed forest health. The first was the Emergency Salvage Timber Sale Program included in the 1995 Emergency Supple-mental Appropriations and Rescissions Act, P.L. 104-19, directing an increase in salvage timber sales, with expedited procedures. The program was controversial, because it prohibited most challenges to agency decisions and reinstated certain previously-halted timber sales in the Pacific Northwest.[10]

The other bill was the Federal Lands Forest Health Protection and Restoration Act, S. 391. The bill would have established a complicated program to:

(1) review forest health conditions annually;
(2) designate emergency and high risk areas;
(3) select and publish a schedule of activities: (a) to arrest the decline of and to restore forest health; (b) to safeguard human life and property; (c) to protect natural resources; (d) to restore ecosystem integrity; and (e) to protect Federal investments and future revenues; and
(4) notify the public and respond to comments and challenges under expedited procedures.

The Senate Energy and Natural Resources Subcommittee on Forests and Public Land Management held a hearing on the bill on March 1, 1995, but a markup scheduled for late April 1996 was postponed to allow negotiations on a bipartisan substitute. The negotiations concluded in June without an agreement, and the bill was reported by the Committee, but saw no floor action.

105th Congress. Several bills addressing forest health have been introduced in the 105th Congress. H.R. 2458, the Community Protection and Hazardous Fuels Reduction Act of 1997, would direct Forest Service and BLM programs of fuel reduction in high risk areas of the wildland/urban interface, undertaken through requirements on timber purchasers who would be compensated with credits that could be used to pay for the timber. (This would parallel the Forest Service's purchaser road credit system for building access roads; for a description of this program, see appendix E (pp. 40-41) of CRS Report 97-14 ENR, *The Forest Service Budget: Trust Funds and Special Accounts*.) The House

---

[9]U.S. Dept. of Agriculture, Forest Service, State and Private Forestry. *Western Forest Health Initiative*. Washington, DC: Oct. 31, 1994. 66 pp.

[10]For more information on this program, see CRS Report 96-569 ENR, *The Salvage Timber Sale Rider: Overview and Policy Issues*.

Resources Subcommittee on Forests and Forest Health held hearings on the bill on September 23, 1997, and forwarded a marked-up version to the full committee on March 5, 1998.

H.R. 3530, the Forest Recovery and Protection Act of 1998, would enact a process for establishing standards and criteria, for identifying and ranking priority recovery areas, and for undertaking recovery projects on National Forest System lands. A scientific advisory panel would provide advice on the standards and criteria and on monitoring the results of the program. Projects would be funded with a new permanently-appropriated special account, the Forest Recovery and Protection Fund, which would receive moneys previously deposited in the Forest Roads and Trails Fund (*i.e.*, 10% of Forest Service revenues) plus any appropriations. The bill is a substitute for H.R. 2515, reported by the House Agriculture Committee on March 12, 1998 (H.Rept. 105-440, Part I); the House Resources Committee has waived its jurisdiction over federal forest lands to expedite floor consideration.

The Senate has not approached forest health directly in the 105th Congress. Rather, S. 1253, the Public Lands Management Improvement Act of 1997, would supplement both the National Forest Management Act of 1976 (NFMA; P.L. 94-588) governing Forest Service planning and practices and the Federal Land Policy and Management Act of 1976 (FLPMA; P.L. 94-579) governing BLM planning and practices. Forest health problems would then be addressed within the general planning and management guidance, as supplemented by S. 1253. The Senate Energy and Natural Resources Subcommittee on Forests and Public Land Management held several workshops on a draft bill in February and March of 1997, and hearings on the bill on October 30, 1997.