MANAGEMENT LIMITATIONS AND BARRIERS OF LODGEPOLE PINE

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My assignment is to define the limitations or barriers that forest land managers must face and overcome in dealing with mountain pine beetle epidemics. The barriers and limitations, which I have defined, are those which I see as a manager of national forestlands in the United States. However, given a wide diversity of management situations, some of these barriers may not exist for other management situations. Conversely, I may not mention barriers or limitations that may be controlling in other situations.

As an "operational" manager whose primary task is seeing that timber on the national forest gets properly and efficiently grown, sold, and harvested; it is neither natural nor comfortable for me to discuss why I can't do something. My natural and strongly ingrained inclination is to spend my time and effort generating solutions—rather than enumerating problems.

Consequently, you need to be forewarned that I have not been able to confine myself exclusively to defining the problems; some suggested solutions or approaches to solutions have crept in.

SILVICULTURE OF LODGEPOLE PINE IN THE PACIFIC NORTHWEST

Lodgepole pine occupies about 2 million acres (or 809.4 thousand hectares) in the national forests of the Pacific Northwest. Current standing inventories are estimated at 15 billion board feet, or 5.6 billion cubic feet (67.95 million cubic metres). About 70% of the acres of lodgepole type are located in eastern Oregon and Washington.

Lodgepole pine grows under two distinctive ecological conditions. Firstly, lodgepole pine is a pioneer species that enters a site after a major disturbance—usually fire or insect epidemic followed by fire. The understory in such stands often consists of more tolerant species, e.g., true firs or, at higher elevations, mountain hemlock. This situation is typical of lodgepole types in the Cascade transition forests, the Blue and Wallowa Mountain, and the Okanogan and Colville National Forests in eastern Washington. Secondly, on Deschutes Pumice Plateau (Deschutes, Fremont, and Winema National Forests), lodgepole pine is the only commercial species capable of growing, due to soil, topography, and climate. In this area, pure lodgepole stands cover 860 thousand acres.

Stands originated on the Deschutes Plateau and northeast Oregon after large fires in the late 1800s and early 1900s. About 88% of these stands exceed 80 years in age. About 80% of their total volume (4.5 billion board feet) is in sawtimber-size trees (9"+ DBH). Average sawtimber volumes range from 4 to 6 thousand board feet per acre.

Many stands are heavily infected with mistletoe. Commandra rusts and western gall rust are also present in some stands. Epidemic conditions of mountain pine beetle have occurred sporadically for the past 10 to 15 years and, currently, are again widespread.

Silvicultural Management Objectives and Constraints

Where lodgepole pine exists as a pioneer species, the management objective should be to convert the stand through removal of lodgepole overwood, whenever commercially possible. The understory should be cleaned and thinned. The resultant tolerant species stand should be managed to rotation, then replaced with a managed stand favoring the tolerant species.

In mixed species types, management should favor the more tolerant species and remove the merchantable lodgepole pine in early and intermediate entries, along with any other more intolerant species, e.g., larch or Douglas-fir, then manage the tolerant species to sawtimber rotation.

In pure lodgepole types, the principle problem is a heavy imbalance to mature and overmature age classes. There is a need to schedule regeneration efforts towards creating a more balanced condition of age classes over the existing very large acreage of uniformly overmature types. Seed tree or shelterwood cuts in lodgepole pine are not often successful due to windfall, snowbreak, and mistletoe, but they may be needed where daily temperature extremes demand some amelioration of the microclimate for successful regeneration. The usual harvesting method for lodgepole pine is clearcutting 30 to 40 acre blocks or strip cuts followed by natural or planted regeneration.

Existing lodgepole pine stands in Region 6 have an average net growth of 24 cubic feet per acre per year (100 board feet per acre per year). It is projected that managed stands in Region 6 will have an average net growth of 39 cubic feet per acre per year (165 board feet per acre per year). A 63% gain is expected with prompt regeneration, i.e., within 3 years; stand-cleaning at 4 years for mistletoe; a precommercial thinning/cleaning at 12 to 15 years; and regeneration at 70 to 80 years. Target tree size at harvest is 14 to 16 inches DBH.

OPERATIONAL CONSTRAINTS

Market Constraints

The primary markets for lodgepole pine have always been either chips or random-length lumber and studs. Some 1 inch lumber is produced from green lodgepole but, because of log size, special kiln schedules required, and low grades of lumber produced, it does not compete well in the market with other common species. Dead lodgepole pine, because of grade specifications that substantially lower the value of blue-stained lumber, does not enter the normal board market and is confined primarily to studs or chips.

Lodgepole pine has always had a market history as a marginal species. During periods of normal and high markets, it has been readily accepted for dimension lumber and studs. During declining markets, however, it has been first to fall out of the market and last to re-enter a recovering market.

Figures 1 to 4 show the changes in costs of harvesting and processing lodgepole pine between 1973 and 1981. Costs for ponderosa pine are given for comparison.

Lodgepole is usable for other than sawmill products. **Table 1** lists these products, compares their value by oven dry ton, demand, percent of volume per acre usable, and the probable market. This table is by Thomas Fahey, 1980, The Forest Products Journal. It reflects market conditions in late 1979 and early 1980, an era of relatively high markets.

The ability to make commercial products from beetle-killed lodgepole pine depends on the market for these products and the relative cost of alternatives. The potential to use significant volumes **(Table 1)** depends on how well the resource meets specifications for products and the volume of products that the market will accept. There are problems with using beetle-killed lodgepole for any of the products discussed **(Table 1)**. The highest priced outlets for dead timber have very limited or moderate demand and can use only very select portions of the total available. The best solutions, in terms of land management, have relatively limited demand and, therefore, little potential for using volume from many acres. Lumber and veneer production has some potential for using relatively large volumes, but mills are more profitable operating on green timber sales.

Utilization of beetle-killed lodgepole pine will require creative timber appraisal and sales contract approaches. Log sorting, log concentration yards, and land management contracts—all "high cost" items—are the most common suggestions and probably the most appropriate. Complete tree logging, with sorting at the landing for roundwood and solid wood products, allows an in-the-woods chipper to operate on concentrations of wood that would not otherwise be commercially possible. Development of a structural particleboard product and energy fuel markets show the greatest potential for increasing the demand for dead lodgepole pine.

Table 1

Value, Probable Demand, and Potential of Various Products
To Remove Significant Volume of Dead Lodgepole Pine

Product	Value/Ton ($)	Demand	Volume/Acre Usable (%)	Probable Market
Power poles	300 to 400	small	5 to 15	small
House logs	110 to 260	moderate	30 to 60	moderate
Corral poles	120 to 150	small	10 to 20	small
Dimension lumber	90 to 130	large	70 to 85	large
Studs	80 to 120	large	70 to 85	large
Veneers	90 to 130	small	60 to 75	moderate
Paper (chips)	35 to 50	moderate	90	variable
Particleboard	5 to 15	none	90	none
Fuel	30 to 55	small	95	possible

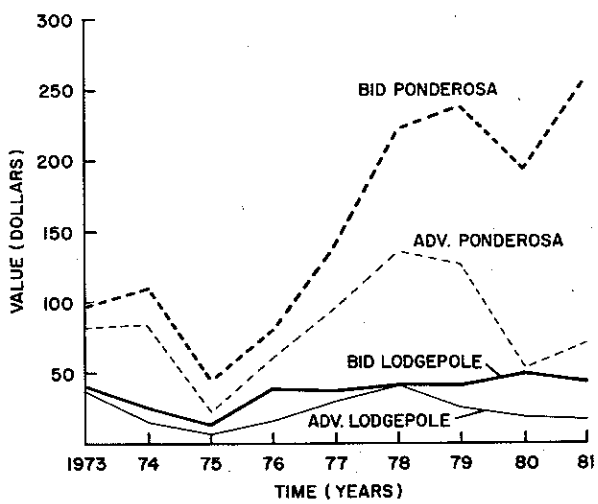

Figure 1

Advertized and bid stumpage per thousand board feet for lodgepole and ponderosa pine from 1973 to 1981.

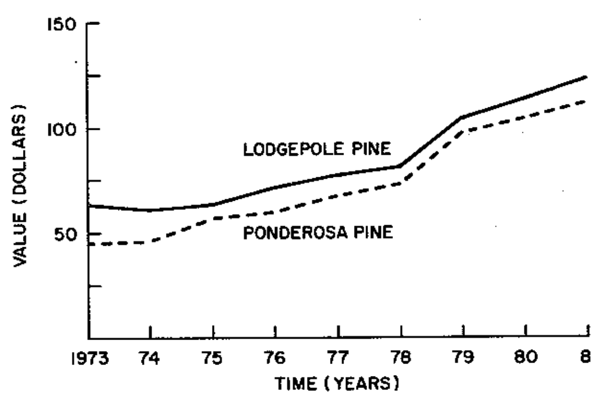

Figure 2

Logging costs, per thousand board feet, including transportation for lodgepole and ponderosa pine from 1973 to 1981.

Access Constraints

There are many large contiguous blocks of timber without road access. Individual sales cannot support the cost of a main arterial access. Normally, a sale will only support "on sale" log collection and spur road construction out of stumpage.

From a long-term standpoint, given the 63% potential increase from managed stands, the economics of preroading investments are reasonably attractive if:

- The discount rates used in any cost/benefit investment analysis represent "real dollar" cost and return rates of change, that is, with inflation effects removed. Such discount rates normally range between 4% and 7.5%.

- The true costs of "doing nothing" are completely and objectively assessed. Such an assessment would consider in detail: firstly, the increased protection costs for fire and insect and disease; and, secondly, the true dollar value of potential fibre, wildlife, and fisheries benefits which would be foregone under a "let nature take its course approach".

Harvesting and Processing Constraints

There is a pressing need to accelerate the current slow transition in our logging systems towards efficiency in handling "small wood" like lodgepole. Traditional logging methods and machinery are not economic in small wood. The biggest need is for a consistent and assured level of "small wood" sale offerings and conversion of today's logging philosophy from "big, stout, and powerful is better" to "small, lean, and tight is right". For a substantial period, we will need to maintain both types of equipment. Sale offering programs in thinnings and in lodgepole management will need to be of significant size, maintained at a consistent level once started, and persist for at least 8 years, so that investment in the new skills and equipment required can be amortized. Without an assurance of such a consistent, significant, and maintained sales program, industry cannot be expected to make the substantial investments needed to efficiently harvest, transport, and manufacture products from "small wood".

OTHER RESOURCE USE CONSTRAINTS

In the Pacific Northwest, approximately 31 species of mammals and 47 bird species utilize lodgepole pine stands for feeding, reproduction, or cover. Several species of reptiles, amphibians, and invertebrates are also endemic to lodgepole communities. Rocky Mountain elk and mule deer are commercially important game species associated with lodgepole stands in eastern Oregon and Washington. Both species of wildlife utilize lodgepole stands as cover year round, as forage areas, and as fawning and calving habitat.

Given the extensive dense and unbroken expanse of lodgepole pine stands, astute scheduling and execution of properly designed harvesting activities could improve wildlife production. Habitat of the two prime ungulate species, deer and elk, can be improved by stand management to achieve a diversity of stand structure, size, and seral condition. Properly spaced and sized regeneration units would create edges between managed units, therefore, maintaining optimum forage palatability and providing cover. After "regulation" (i.e., an array of age classes), is achieved in lodgepole types, silvicultural prescriptions that follow the guidelines in Chapter 8 of Agriculture Handbook No. 533 would provide and maintain optimum wildlife habitat for most species associated with lodgepole stands.

Under the current mountain pine beetle epidemic, regulation has very little possibility of being achieved. The inevitable result of following "the bug" will be a reversal of the current situation from too much cover and too little and poorly distributed forage openings, to too little cover, particularly thermal and calving protection cover, and too much opening and forage area. Timber management, designed to mitigate the loss of this vital cover and to restore cover as rapidly as possible, can reduce the impact, for instance, leaving some uncut, dead stands to provide cover needs to be considered.

In riparian areas, the primary effect of mountain pine beetle infestations will be a reduction of shading with an increase in water temperature, some additional organic material in the streams, and, eventually, increased numbers of logjams. Uncut, dead areas may need to be left alongside streams where existing temperatures are critical to existing fisheries.

There are threatened and endangered species dependent upon lodgepole. In the Pacific Northwest, only caribou, on the Colville, is in this category. However, in the Rocky Mountains, grizzly bear, wolf, and caribou are included.

In areas inhabited by caribou, the forest management problems are the same as those for elk, maintaining an optimum cover-to-forage ratio, plus poaching and disturbance, and their effects on a limited population.

In areas inhabited by grizzly bear and wolf, most of the problems are conflicts between man and bear and wolf, rather than effects on vegetative habitats. Simply put, grizzlies or wolf and man don't mix. When they are brought into close and sustained association, conflicts occur and the wolf and the bear are the eventual losers.

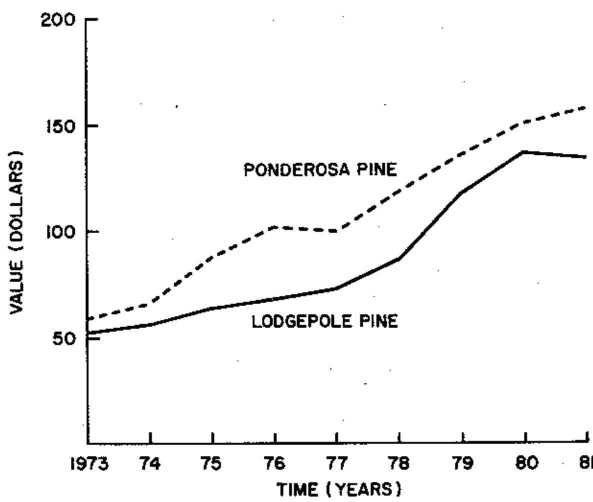

Figure 3

Milling costs per thousand board feet for lodgepole and ponderosa pine from 1973 to 1981.

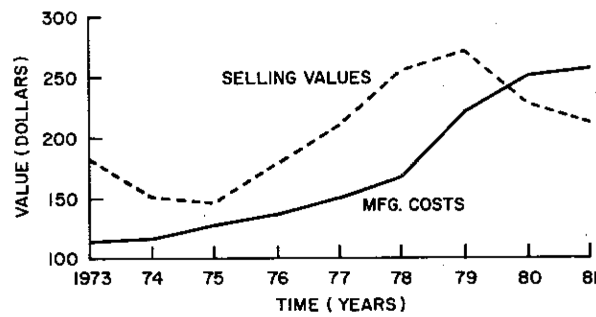

Figure 4

Lumber selling values, adjusted by overrun and manufacturing costs, from 1973 to 1981. Costs are per thousand board feet.