WOOD PRODUCT POTENTIAL IN MATURE LODGEPOLE PINE STANDS

Bitterroot National Forest

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RESEARCH SUMMARY

Mature lodgepole pine stands in Montana's Bitterroot National Forest could yield 1.2 to 2.3 million cubic feet of wood annually. Three-fourths of this volume is suited for high value roundwood products. About 15,000 houselogs, 62,000 corral rails, and 110,000 fenceposts, plus one-fourth million cubic feet of fiber material could be harvested from land classed as "standard"--suitable and available for harvest. Additional volume could be obtained by salvage-cutting of dead timber.

Rapid growth in the past few years of plants using lodgepole roundwood products has created a brisk demand for lodgepole. Harvest of dead lodgepole increased tenfold from 1966 to 1975. However, much of the lodgepole resource is not accessible by existing roads and will require careful harvest to protect other resource values, particularly in high elevation fragile areas.

The lodgepole pine resource could provide employment to small logging operators or part-time loggers, particularly if a convenient market outlet such as a concentration yard were developed.

Increased use of lodgepole in the Bitterroot depends on location of the stands, economic conditions, harvesting technology and feasibility, and the level of harvest allowed in land management plans.

INTRODUCTION

During the past 3 years, the Bitterroot Resource Conservation and Development Committee (RC&D), the Intermountain Forest and Range Experiment Station, the Forest Service, and the Bitterroot National Forest have worked together to identify and evaluate alternatives for expanding forest-based industry in the Bitterroot Valley. The level of unemployment and underemployment is high among Bitterroot Valley workers who depend, at least in part, upon woods work for a living. At the same time, substantial volumes of available wood are not being utilized: extensive dead timber, smaller stems in stagnated stands, and material left on the site as residue following conventional logging operations (fig. 1). These conditions typify mature lodgepole pine stands, which until recently have been only lightly utilized for timber products.

Figure 1.--Typical logging slash in mature lodgepole pine. The sound dead material could provide up to 100 pieces per acre of houselogs, rails, and fenceposts.

In 1972, fieldwork was completed for the regular forest inventory of the Bitterroot National Forest. This inventory provides estimates of areas of various forest types and land classes, timber volumes, growth and mortality, silvicultural needs, and related data needed for forest management planning. The following year, supplemental fieldwork was done by the Intermountain Station in mature lodgepole pine stands to provide more detailed inventories and information on the utilization potential, particularly for the dead, down, and small-size material that frequently remains as residue after logging.

This report summarizes the utilization potential of mature lodgepole pine stands, including this "residue material." Comprehensive data on the timber resource for other forest types are contained in the various summaries and reports compiled by the Bitterroot National Forest and the Regional Office Timber Management Staffs.

AREA AND VOLUME OF MATURE LODGEPOLE PINE

The Montana portion of the Bitterroot National Forest outside of classified Wilderness has a total area of 829,771 acres. Of this, 749,969 acres is productive forest land--land capable of growing at least 20 cubic feet per acre per year of wood fiber. A portion of this productive forest land base is not available for logging under present land use plans. The status of National Forest Lands outside Wilderness areas is as follows:

	Acres
Reserved (Lost Horse Scenic Area)	5,225
Deferred (New Wilderness Study Areas)	28,861
Unregulated (Commercial use is not programed at this time)	184,685
Unproductive, nonforest, and water	79,802
Productive forest base (wood fiber production)	531,198
Total, land and water base	829,771

Lodgepole pine is the second most extensive forest type, accounting for about 19 percent of the area (table 1).

About 80,000 acres of lodgepole pine is mature sawtimber and pole-timber (table 2). About 32,000 acres of this mature lodgepole is in the standard or special forest land category available for timber management purposes, and will be programed for harvest.

The remaining mature stands--about 49,000 acres--are in the unregulated-forest category. This includes high unproductive areas, remote areas, and administrative areas. Occasional harvest may be permitted in a small portion of this component, but the land use plan does not include scheduled harvesting.

Table 1.--*Forest area by type and land class, nonreserved land, Bitterroot National Forest*

Forest type	Forest land class[1]				
	Standard	Special	Marginal	Unregulated	Total
	Acres				
Douglas-fir	153,728	116,258	93,314	19,698	382,998
Lodgepole pine	54,590	10,151	1,416	67,649	133,806
Alpine fir/spruce	28,505	7,726	1,730	89,707	127,668
Ponderosa pine	11,129	43,852	8,799	0	63,780
Other	--	--	--	7,631	7,631
Total	247,952	177,987	105,259	184,685	715,883

[1]Standard: Available and suitable for timber production with present technology.
Special: Needs special timber production measures to protect other multiple use values.
Marginal: Areas not presently scheduled for harvest because of excessive development costs, low product values, or resource protection constraints.
Unregulated: Commercial timberland not organized for timber production, including administrative sites, recreation areas, high areas, unproductive and remote areas, etc. Some harvest may be permitted but not on a regular scheduled basis.

Table 2.--*Area of lodgepole pine type by forest land class and condition*[1]

Condition class	Forest land class				
	Standard	Special	Marginal	Unregulated	Total
	Acres				
Mature, high-risk stand	3,221	1,566	--	16,848	21,635
Mature, low-risk stand	27,303	230	--	27,257	54,790
Mature pole	--	--	--	5,263	5,263
Subtotal, mature	30,524	1,796	--	49,368	81,688
Immature and nonstocked	24,066	8,355	1,416	18,281	52,118
Total	54,590	10,151	1,416	67,649	133,806

[1]Acreage in this table and acreage in Bitterroot National Forest inventory printouts may be slightly different because some mature stands have been harvested since the inventory fieldwork, and some land has been reclassified.

The mature lodgepole pine on the Bitterroot is mostly quite old--in some cases more than 200 years old. Most of the lodgepole grows in fairly high, cold sites that get most of their moisture from spring snowmelt. Summer and autumn are often very dry. Under these conditions, lodgepole stands will remain more or less intact for more than 200 years unless fire occurs. However, mortality is fairly heavy, and there is a large accumulation of standing and down dead material. Growth of individual trees is negligible, and net growth of the stand is often zero or negative, due to mortality (fig. 2).

Figure 2.--Overmature lodgepole pine stands on the Bitterroot National Forest average about 4,100 ft^3 per acre of wood 3 inches and larger of standing and down material.

Forest habitat type is an important characteristic in evaluating management needs and productivity of the forest. The mature lodgepole pine stands included in this study are primarily in the alpine fir habitat types. Several other individual habitat types are also represented, but because there were relatively few samples in each, data were combined by major habitat series. The habitat types and areas are as follows:

		Acres
Alpine fir/(series) (Menziesia and Clintonia phases)	Moderately high productivity	3,558
Alpine fir/beargrass	Moderate productivity	36,031
Alpine fir/(series) (Luzula/Luzula-beargrass phase, beargrass/whortleberry phase, and dwarf huckleberry)	Low productivity	25,197
Douglas-fir/(series) (pinegrass and beargrass)	Moderately high	16,902
		81,688

Planning and land classification is currently progressing on the Bitterroot, based on the data now available from the recent timber inventory. A timber management plan for the period up to 1982 is planned for completion in early 1977. Although minor changes in land classification may occur, it is projected that of the 133,517 acres of lodgepole, approximately 66,000 acres would be available for management and utilization, with another 17,700 acres in which salvage would be permitted.

A large share of the unregulated portion of the lodgepole area is not available for utilization because productivity is so low, utilization is so costly, and management return so uncertain and low, it is not now practical to include in the timber base; or because of unacceptable adverse impacts to other resource values that would be incurred by roading and development:

	Acres
Total unregulated lodgepole pine	67,650
Sites so low in productivity no management can be justified	- 14,823
Areas not available in present planning periods; may or may not be in future	- 35,024
Areas now available for harvest primarily because there is now road access and some harvest has occurred. Future harvest will primarily be salvage of dead trees.	17,732*

*Estimated lodgepole pine proportion of a total 24,000 acres of unregulated land now available for some harvest.

Assuming that about 70 percent of these 17,732 acres are mature stands (based on table 2), the total mature lodgepole area available for harvest is:

Standard	30,524
Special	1,796
Marginal	--
Unregulated	11,827
	44,147

CHARACTERISTICS AND PRODUCT POTENTIAL

Utilization of mature lodgepole stands depends in part on the volume of sound wood that could be recovered. About two-thirds of the mature lodgepole stands have 4,600 ft^3 or more of sound wood per acre. Some lodgepole pine stands in the Douglas-fir series have over 10,000 ft^3/acre, primarily because there are a few very large Douglas-fir overstory trees mixed in with the mature lodgepole. At the other extreme, some stands have less than 2,000 ft^3/acre of sound wood. The area and volume class of sound wood 3 inches dia and over, including live and dead, standing and down, is:

Vol/acre (thousand ft^3)	*Area size (acres)*
<2.0	5,983
2.0 to 4.5	10,100
4.6 to 6.5	19,659
6.6 and over	8,595
All	44,147

The total volume of wood in mature lodgepole stands averages about 4,100 ft^3/acre, (table 3). About half the volume is in standing green trees; about one-third is down material, and the remainder is standing dead trees.

Much of the down material has rot, but only about half of this is crumbly rotten. About half the wood with rot in it is solid enough that it could be handled in logging and would provide fiber for some uses.

Standing trees have very little rot in them, even when they have been dead for several decades as is common in the area. This is probably because wood-decaying fungi do not thrive in the high-altitude, dry, cool climate where most of the lodgepole grows, and are active primarily on material close to the ground.

Total volume and conditions of wood varies somewhat among habitat type, but there doesn't appear to be any particular pattern and are probably due to sampling error. Therefore, we have used the average from all habitat types in the remaining analysis.

Based on the condition of wood in table 3, about two-thirds of the total volume would be suited for solid-wood products such as poles, posts, houselogs, and so on. Another 20 percent is suited for fiber products. This includes pieces with sound defects (excessive taper, crook, splits, etc.) and also pieces that have rot but are solid enough to be handled and used for pulp, fuel, particleboard, etc.

Size of pieces is an important factor in utilizing lodgepole pine, since handling many small pieces usually increases handling costs all through the harvest and processing procedures. Most of the volume is in trees 8- to 12-inch diameter (table 4). Standing trees have over one-fourth volume in trees 12 inches d.b.h. and larger; down material has very little volume in 12-inch or larger pieces.

Table 3.--*Volume and condition of wood per acre in mature lodgepole pine stands*

Type wood	Suited for solid wood products	Suited for fiber products	Not usable	Total
	Cubic feet per acre			
Down				
Crumbly rot			525	525
Solid rot		478		478
Sound defect		208		208
No defect	235			235
				1,446
Standing				
Green				
Lodgepole	1,533			1,533
Other	535			535
				2,068
Dead				
Sound defect		133		133
No defect	471			471
				604
Total	2,774	819	525	4,118

Table 4.--*Percent volume by diameter class of usable wood*

Diameter class	Standing live[1]	Standing dead[1]	Sound down[2]	Rotten (solid) down[3]
	Percent of cubic volume			
6 inches or less	8	6	19	37
8 inches	17	16	34	34
10 inches	27	21	17	20
12 inches	21	28	26	6
Over 12 inches	27	29	4	3
	100	100	100	100

[1]D.b.h. on standing, live and dead.
[2]Large end diameter on sound down pieces.
[3]Average diameter of piece on rotten down pieces.

Figure 3.--Field crew evaluating product potential. Much of the standing green timber and larger down dead pieces are suited for houselogs or saw logs. Smaller pieces like the one in the foreground are suited for rails, posts, or fiber products.

To further define utilization potential, the types of products that could be made (fig. 3) from lodgepole pine were estimated. This evaluation was mostly quick, visual appraisal, but should provide a reasonable estimate product potential. On the down material, species was not always identifiable, so the summary includes all stems. For the standing trees, only lodgepole pine is included because we assume that alpine fir, spruce, and so on would not be used for roundwood products. In evaluating the trees, field crews were instructed to estimate potential roundwood products, first houselogs, then corral rails, and last, fenceposts. Specifications (minimums) were as follows:

Houselogs.--9-inch diameter, 8-foot length, with no crook, sweep, rot, or checks that preclude use as houselog.

Corral rails.--3-inch diameter, 10-foot length, reasonably straight, no rot or major checks.

Fenceposts.--3-inch diameter, 7-foot length, no crook, rot, or major checks.

The houselog, corral rail, and fencepost products are not necessarily optimum utilization, but rather are representative of an array of size and quality specifications, and provide a visual image of product potential in the stand. These evaluations were made independent of sawlogs; most houselogs, some poles, and some posts would also be suited for stud logs.

The number of product pieces are summarized below:

Type Wood	*Houselogs*	*Corral Rails*	*Fenceposts*
		(pieces per acre)	
Live	31	135	289
Standing dead	7	31	25
Sound down	10	26	27
All	48	192	341

Although this would probably be a maximum-value recovery, some houselogs, poles, and posts could alternatively be used for saw logs or stud logs.

The total amount of such products available from the Bitterroot depends on various land management and harvest activities, which are discussed later. Based on estimates now available, the approximate potential output per year is as follows:

	Annual production
Houselogs	15,000 to 27,000 pieces
Corral rails	62,000 to 100,000 pieces
Fenceposts	110,000 to 145,000 pieces
Fiber	264 to 555 M ft^3

CURRENT HARVEST OF LODGEPOLE

During the past few years, utilization of lodgepole pine has grown dramatically in the Bitterroot. Several houselog plants have been established, along with several post plants. Existing post plants have expanded and sawmill operations have increased their use of smaller size lodgepole.

In the past 10 years the harvest of lodgepole pine rose from about 3 million bd. ft. in 1966 and 1967 to over 9 million bd. ft. in 1971. During the last few years use has been about 4 to 6 million bd. ft. The volume of older, dead material has increased severalfold:

Year	*Green*	*Older dead*
	(thousand bd. ft.)	
1966	2,600	300
1967	2,600	500
1968	3,500	700
1969	5,700	370
1970	6,400	450
1971	8,100	1,525
1972	7,300	670
1973	5,100	1,000
1974	2,200	1,900
1975		3,000

In addition to wood harvested for products, firewood permits average about 1 million bd.ft. per year, principally lodgepole pine. Total harvest is between 5 and 8 million bd.ft. or about 2 million ft^3 per year.

POTENTIAL FOR UTILIZING MATURE LODGEPOLE PINE

This analysis of the lodgepole pine resource was undertaken to determine the potential for increased utilization of mature and overmature stands, particularly dead material currently left as residue that would provide additional wood fiber and increase the local economy and employment.

There appears to be some potential for increased use, but realizing this potential depends on location, economic conditions, technology, and feasibility for harvest, and on land management plans.

Location

Key factors in the potential use of the lodgepole pine resource are its location and availability. In our analysis of the resource, we did not attempt to make any detailed logging or roading appraisal. However, the small-scale map (fig. 4) shows generally where most of the lodgepole stands lie relative to existing roads. A larger (½ inch = 1 mile) map that shows individual stands of mature lodgepole in more detail is available from the Supervisor's Office, Bitterroot National Forest, or the Intermountain Station's Forestry Sciences Laboratory, Missoula, Montana. A highly detailed (2 inches = 1 mile) map of timber types is available at the Bitterroot National Forest. This map is about 15 years old but is accurate enough for general planning.

The general map (fig. 4) shows that most of the mature lodgepole stands are located along the high divides, somewhat remote from roads and towns. A large portion is in the West Fork Bitterroot drainage and the high elevations between the West Fork and East Fork. There is also a strip along the crest of the Sapphire Mountain Range on the east side of the valley. Most of the lodgepole on the west side of the valley lies within the Selway-Bitterroot Wilderness (this portion not shaded on map).

Economic Feasibility

Because of the remoteness and the relatively low value inherent in at least some of the lodgepole stands, current efforts to sell these stands often appraise out "negative;" that is, after all the various harvest and manufacturing costs are deducted from market value, stumpage has a negative dollar value.

Although the real price of wood has risen constantly, it is not likely to go so high (at least on a sustained basis) as to give all the lodgepole stands a positive dollar value under normal appraisal procedures.

However, there are probably several ways in which these costs can be partially offset, such as road financing in total or in part from sources other than stumpage value on a particular sale; attributing some of the timber harvest cost to restoring

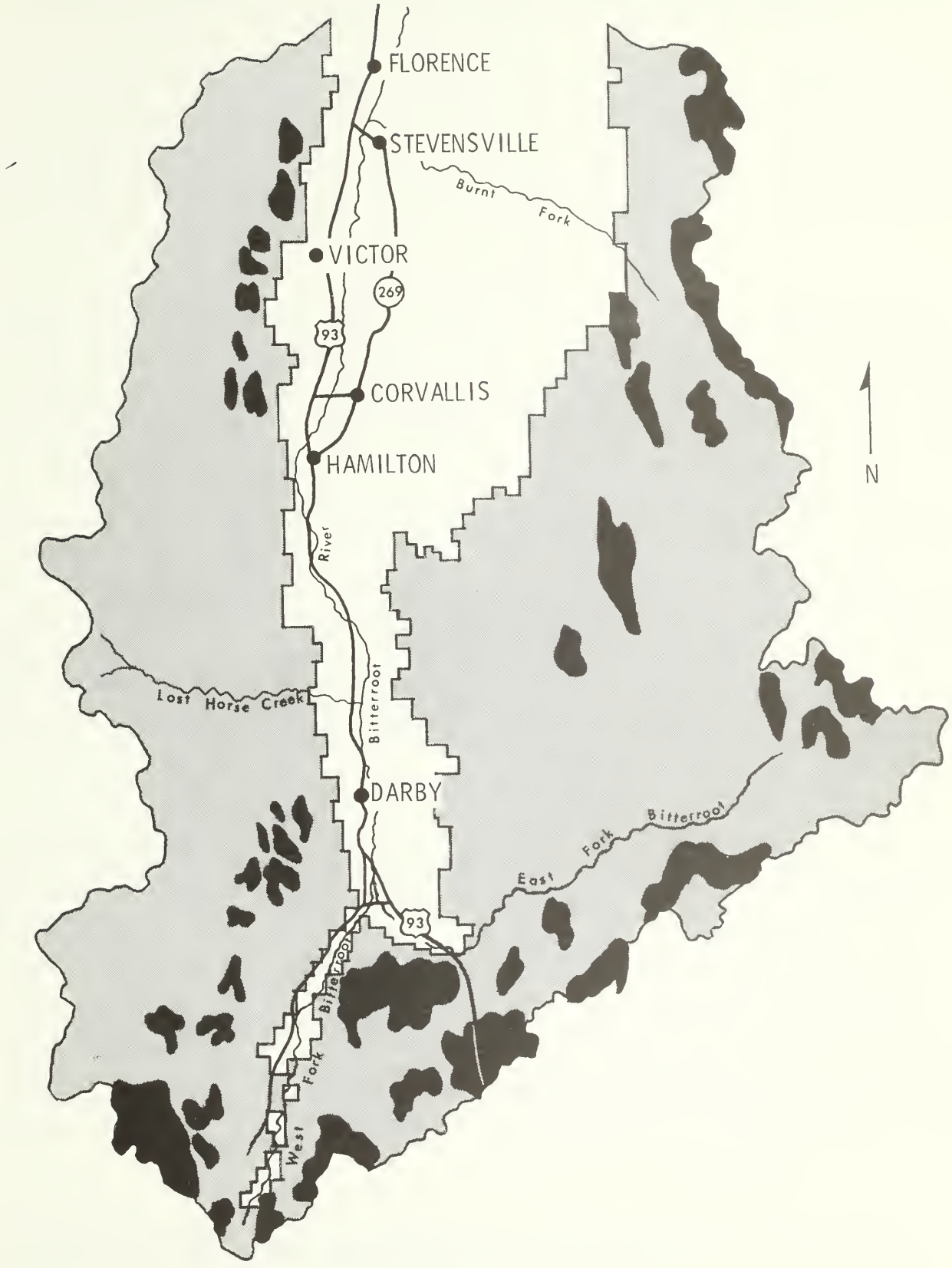

Figure 4.--Principal stands of mature lodgepole pine, Bitterroot National Forest.

land productivity; reducing fire or insect hazard; improving esthetics or wildlife habitat; or similar benefits that can result from properly conducted harvests of decadent stands.

For example, a recent study of lodgepole harvesting in Wyoming showed that removing and field chipping "residue" (nonsaw log) material from the site cost about $262/acre more than conventional saw log removal followed by piling and burning. However, if today's chip prices or roundwood product prices were applied to that residue material the dollar values would probably be nearly equal. In addition the need for slash treatment was eliminated by near complete utilization, some esthetic gains were realized, and more wood was utilized from the site.[1]

Logging Systems

During recent years, the output of lodgepole pine products has increased substantially in the Bitterroot. Post and pole plants have enjoyed good markets, and a boom in log homes has created several new operations. One sawmill has installed a mill capable of handling material down to 2½-inch scaling diameter. In most of these operations, either lodgepole pine stands were cut selectively (that is, only specific products were removed), or lodgepole was taken as a component of a sale with larger volumes of other species and bigger logs. A complete removal of all material has not been the normal operating procedure.

We have studied one logging operation in cooperation with the Darby Ranger District and several logging operators, in which all or most of the lodgepole pine was removed in an overmature, pure lodgepole stand. The stand was logged for saw logs, posts, and poles. Pieces with rot were not removed, but sound dead material was taken. Briefly, the study showed that three different skidding methods--small, rubber-tired skidder; small crawler tractor; and horses--were all technically able to handle this type logging job. These methods were used because they are within the means of a part-time, small-crew logging operator. Productivity and amount of material removed varied among the methods, but all appear to have economic potential for operating in lodgepole pine. (A full report of the study is currently being prepared: John R. Host, Production and utilization in small stem lodgepole pine stands, Intermountain Station, Forestry Sciences Laboratory, Missoula, Montana.)

The more productive operations were the rubber-tired skidder and track skidder, averaging about 460 ft^3 of wood per man-day. Probably this could be improved to average 500 ft^3 per man-day or more. A portion of the mature lodgepole--probably 15,000 acres (mostly unregulated)--could be logged with such systems. The remainder would probably require skidding systems that keep logs off the ground (skyline or helicopter).

Alternative Marketing Schemes

Utilization of mature lodgepole pine stands throughout the Mountain States has been handicapped in the past because often the timber purchaser was interested only in the prime material such as saw logs and would leave smaller material in the woods. In addition, markets for most older dead and down material were lacking or erratic. One solution that has been proposed is to establish a marketing operation that would simplify the purchase of small log and "residue" material and provide a more stable means for both workers (loggers) and wood users to utilize the resource.

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[1]Benson, Robert E. 1974. Lodgepole pine logging residues: management alternatives. USDA For. Serv. Res. Pap. INT-160, 28 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

A feasibility study[2] was recently completed that considered several alternative operations for the Bitterroot. The simplest operation analyzed was a log marketing operation. Here the operator would arrange the purchase, harvest, and delivery of material to best utilize the available wood to meet the needs of wood users and provide work for loggers. He would maintain detailed and up-to-date information on location, availability, and logging requirements of small timber available from public land sale programs and private land sources. He would know specific needs of wood users and capability of operators, and would take care of much of the paperwork involved in public timber purchase. He would not take title to the wood (the sale contract would be between stumpage seller and either logger or wood user) but would collect $1/M bd.ft. (or the equivalent for roundwood or fiber products) for his service. About 33 million bd. ft. per year (roughly equal to 8 to 10 million ft^3 of small logs) would be needed to support this type operation.

Another type operation would be a concentration yard, where logs were sorted and stored. The operator could also provide much of the marketing services of arranging stumpage purchase and sales of logs to processors. Again, the operator would not own the logs, but would charge for the marketing, sorting, and storage service. If a $1/ton fee were used (a common basis for charging storage and handling operations) about 11 million ft^3/year would be needed to support the operation.

The most complete type of operation analyzed, a processing yard, would require only about 1 million ft^3/year, for feasible operation. (Of course a larger volume operation could also be established.) This would involve purchasing, sorting, and preprocessing (such as cutting to length, or chipping, etc.) for sale to the next processor or final user.

The actual feasibility of such operations of course depends on the economics of harvest, the availability of capital, participation by potential operators, and market conditions for final products. Furthermore, type and condition of wood available is such that the output could range from a fiber to a fairly large array of high-value roundwood or saw log products. The advantage of a marketing operation is that it could direct wood into active markets and take over the task of finding outlets for the wide range of products that occur in the mature stands.

Timber Harvest Schedules

Before utilization of mature and overmature lodgepole pine can be improved, the rate at which these stands might be harvested must be calculated. Obviously, rapid liquidation would minimize further mortality and loss to decay, and maximize the volume of wood available for immediate use. Such a plan, however, would have unacceptable impacts on other resource values, would ultimately lead to a decline in harvest after the rapid liquidation, and would require enormous initial road expenses. At the other extreme, if little harvesting is done in these stands, greater mortality, and ultimate loss of wood to decay or fire will result. Typically, the Forestwide harvesting schedule will remove high-risk stands first, then move into mature, low-risk stands. Protecting other resource values must also be weighed along with silvicultural needs and, even in the standard component, will temper frequency of cutting, size of harvest cuts, and types of harvest system. Generally, the mature lodgepole pine stands occur in relatively large-sized blocks (fig. 4). Due to the large amounts of down material,

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[2]Adair, Kent T. 1975. Stepwise development of a merchandizing-concentration yard. Outline and screening analysis, Bitterroot RC&D, School For., Univ. Missouri, Columbia. (Unpublished report on file at Intermountain Station's Forestry Sciences Laboratory, Missoula, Montana.)

harvest systems employed will usually be clearcutting or two-stage shelterwood cuts. Both systems require total removal of all stems on the area treated; clearcutting in one operation and shelterwood in two. Clearcutting will be involved on approximately two-thirds of the acreage in the standard component, with shelterwood for the remainder and shelterwood or group selection for the special component.

Preventing overconcentration of harvesting activities or large size of cutting units in any one area will generally be the primary constraint on rapidity of harvest. As stated previously, the majority of lodgepole pine stands are on the high divides at elevations exceeding 6,000 feet. Most are in the alpine fir/beargrass habitat type where recovery periods following disturbance range from 20 to 25 years. This means that high impact cuts will require a 20- to 25-year recovery period before similar cuts can occur in stands immediately adjacent thereto. Generally speaking, 1 acre in every 4 or 5 can be in a high impact cut in any 20-year period. Therefore, it will require from 80 to 100 years before the existing, mature high- and low-risk stands will be totally removed, and up to 120 years for shelterwood and group selection cuts. Most of the volume would be removed within a 100-year period.

Based on the above, and considering all usable green and dead products, average annual harvest would amount to 323 acres or about 900,000 ft^3 of solid products and 300,000 ft^3 of fiber (table 5). An assumption made here is that growth will be balanced by decay and that usable fiber per acre will remain essentially unchanged over the 100-year period.

Removal of dead material might possibly be accelerated on the 10,000 acres where tracked or rubber-tired skidders could be used. Usable dead material amounts to 1,525 ft^3 per acre. If access and markets are favorable, this material could be removed in about 20 years and perhaps sooner. This would mean an additional 500 acres per year (removal of dead volume only) or up to 400,000 ft^3 of solid products and 400,000 ft^3 of fiber. In addition, salvage could occur in that portion of the unregulated component that has already been roaded. Approximately 3,500 acres are suitable for the use of rubber-tired skidders. Again, using a 20-year period, about 175 acres could be harvested annually (removal of dead and recent mortality) or up to 160,000 ft^3 of solid products and 140,000 ft^3 of fiber (table 4).

In total about 2.2 million ft^3 would be removed annually (fig. 5) over a 20-year period. About 29 percent would be green material, the remainder dead; unless already roaded, access for removal of dead volume only would have to be provided from appropriated funds. High markets would probably be required to make most sales economically feasible. Thus, removals will probably not occur on a smooth annual basis but periodically during good markets and as appropriated funding becomes available for road construction. More detailed estimates of harvest scheduling and economic feasibility will be provided in the Forest's new Timber Management Plan scheduled for completion in 1977.

Table 5.- *Summary of potential average annual harvest in mature lodgepole pine stands.*

A. Most Probable - Harvest of all usable green and dead volume on 323 acres, per year (standard land)

Condition	Houselogs	Corral rails	Fenceposts	Fiber
	Pieces			*M ft³*
Live	10,013	43,605	93,347	--
Standing dead	2,261	10,013	8,075	42.9
Sound down	3,230	8,398	8,221	221.6
Total	15,504	62,016	109,643	264.5

B. Additional Possibilities - Accelerated removal of usable dead material only on 675 acre/yr (ground-skid and unregulated land)

Condition	Houselogs	Corral rails	Fenceposts	Fiber
	Pieces			*M ft³*
Live	--	--	--	--
Standing dead	4,725	20,925	16,875	89.8
Sound down	6,750	17,550	18,225	463.0
Total	11,475	38,475	35,100	552.8

C. Total - sum of most probable and additional possibilities

Condition	Houselogs	Corral rails	Fenceposts	Fiber
	Pieces			*M ft³*
Live	10,013	43,605	93,347	--
Standing dead	6,986	30,938	24,950	132.7
Sound down	9,980	25,948	26,946	684.6
Total	26,979	100,491	145,243	817.3

Houselogs, minimum - 9-inch diameter, 8-foot length
Corral rails, minimum - 3-inch diameter, 10-foot length
Fenceposts, minimum - 3-inch diameter, 7-foot length.

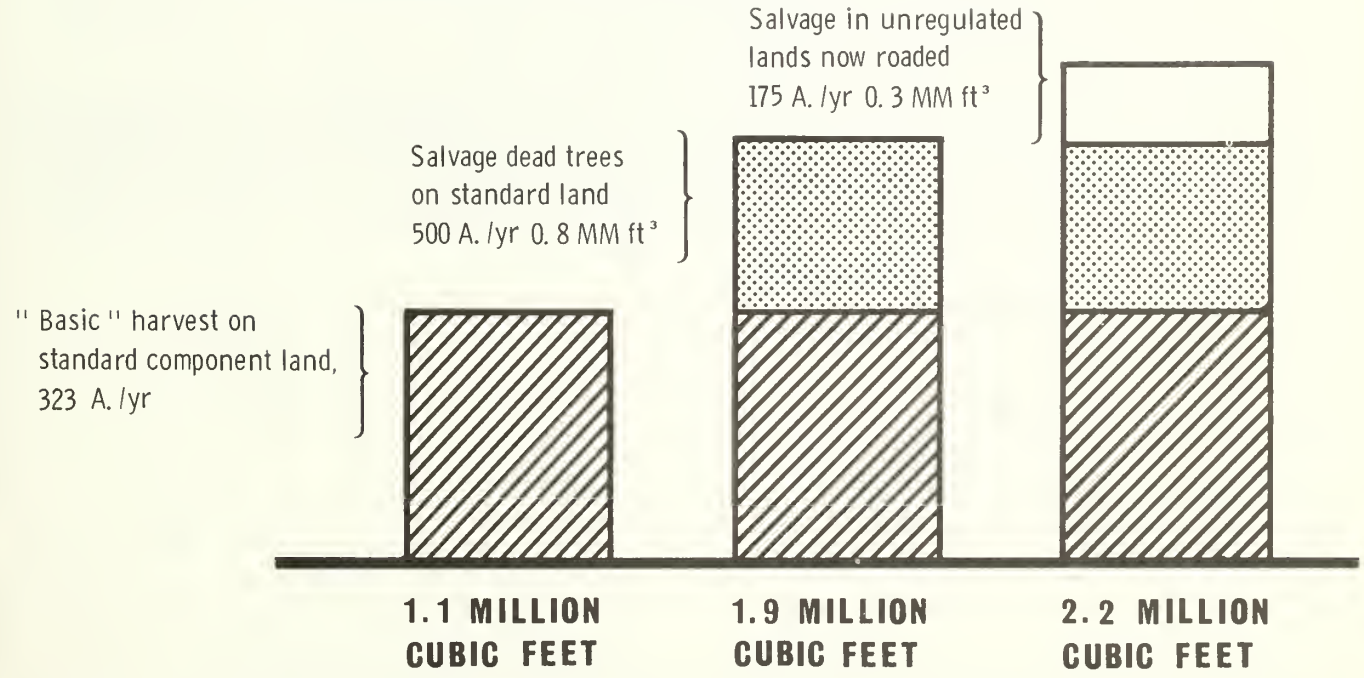

Figure 5.--Alternative potential harvest levels in mature lodgepole pine, Bitterroot National Forest.

CONCLUSIONS

A considerable wood volume--over 180 million ft^3--in mature lodgepole pine stands on the Bitterroot National Forest is not being fully utilized, but is available for harvest. Two-thirds of this wood is suited for fairly high value, solid wood products and another 20 percent is suited for fiber.

The key factors in utilizing this wood are the annual volumes available under the forest harvesting schedule, accessibility and roading, and market conditions and wood prices.

Under current guidelines for protecting watershed, about 1.2 million ft^3 per year could potentially be harvested on standard and special land. This volume could be produced by clearcutting about 323 acres per year.

Another 0.8 million ft^3 of salvageable dead material could potentially be harvested from standard and special lands. This partial cutting (on about 500 acres per year) would capture values in dead trees that might be lost by the time a final regeneration cut is made. About 0.3 million ft^3 more of dead material could be salvaged from unregulated areas that already have road access.

Most of the potential lodgepole will require roading to provide accessibility and harvest. Because of the low values in much of the overmature stands, it is not likely that these stands can support full road development costs.

There may be some opportunity for the lodgepole pine resource to provide part-time, labor-intensive employment for local residents. Thus, opportunity could be enhanced if a convenient and dependable market outlet for logs is available. Several alternative types of market outlet, such as concentration yards, appear to be economically feasible if the potential annual harvest from overmature lodgepole stands can be made available.

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1977. Wood product potential in mature lodgepole pine stands, Bitterroot National Forest. USDA For. Serv. Res. Pap. INT-194, 16 p. Intermt. For. and Range Exp. Stn., Ogden, Utah 84401.

Volume and characteristics of wood in mature lodgepole pine stands in the Bitterroot National Forest, Montana, are presented. Growth is low and deadwood volumes are high in these stands, but three-fourths of the total volume of these stands is suited for high value products such as houselogs, posts, and poles. Up to 2.3 million cubic feet per year could be harvested.

KEYWORDS: lodgepole pine, forest residues, regulation, utilization.

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