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INTENSIVE CULTURE ON NORTHERN FOREST-INDUSTRY LANDS:

Trends, Expectations, and Needs

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ABSTRACT

Results of a survey of intensive forest-culture practices on forest-industry lands in the North. Timber-stand improvement and commercial thinning have been and apparently will continue to be the most popular practices undertaken. Estimated increases in recent annual harvests due to intensive culture averaged about 4 percent, and greater increases are expected during the next decade. Industrial managers expressed a high-priority need for more knowledge about genetic tree improvement, site preparation, fertilization, and species conversion.

KEYWORDS: cultural practices, industrial forestry, investments, research needs.

ONE WAY TO INCREASE wood supplies is to invest in intensive-culture practices that accelerate forest growth. The fact that National Forest and nonindustrial private lands *could* provide much additional wood through intensified forest management has been well documented *(U.S. Forest Service 1973).* Yet opportunities for intensive culture on industrial ownerships have received relatively less emphasis in recent studies of the timber situation.

There are obvious reasons for this. Because of their higher relative productivity, industry lands have been more amenable to intensive culture than have forest lands in other ownership categories. There is also a high degree of owner control on industry lands, and a record of substantial investments in recent years. Thus the ability and motivation to apply intensive culture techniques are greatest for the industrial ownership.

Intensive forest culture includes control of growing stock, fertilization, site preparation, species conversion, tree improvement, weed control, drainage, and short-rotation or silage forestry. (See appendix for definitions of practices considered in this study.) Effective use of these techniques requires a knowledge of how and where to apply them as well as the ability and desire to invest.

To evaluate trends of and needs for intensive culture on forest industry lands, and to determine potential impacts on future wood supplies, an industry-wide survey was conducted in 1975 *(DeBell 1976).* The survey included 41 industrial firms having registered Tree Farms or more than 50,000 acres of forest land in the Northeastern or North Central United States; 76 percent of the firms responded.

As part of the nationwide survey, our report focuses on the northern forest industry's experience with intensive-culture activities, forecasts of anticipated activies, and corresponding impacts on wood supplies. A better understanding of forecast and potential increases in wood supply from intensive culture of industry forests should facilitate decisions about what may be possible on lands of other ownership classes.

BACKGROUND

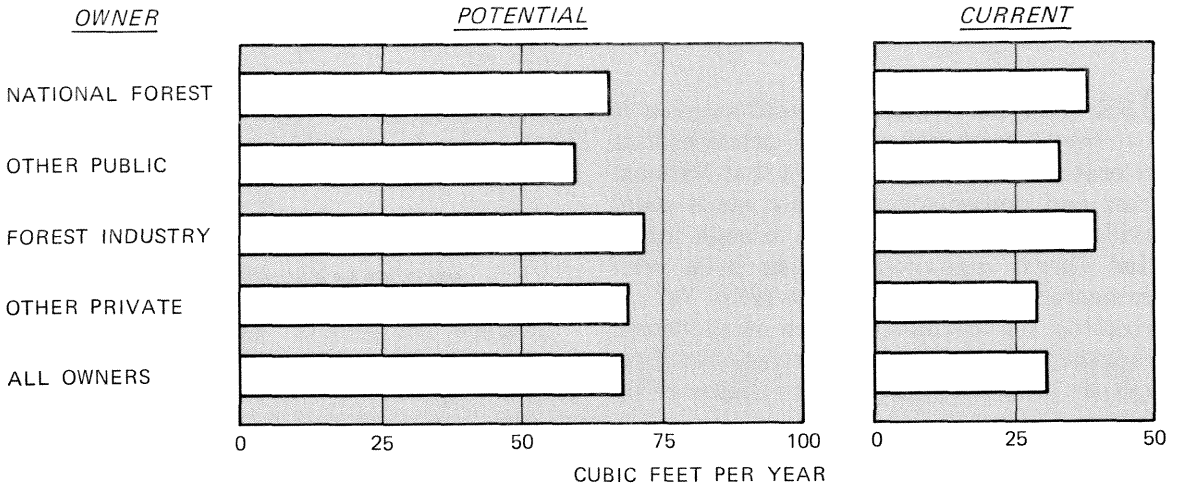
Average net growth figures for northern forests reflect a high proportion of land in lower productivity classes, the predominance of slow-growing hardwood stands, and the presence of considerable low-quality timber. In spite of recent substantial increases, net growth of timber is still much less than the potential yields attainable in fully-stocked natural stands (fig. 1). Even higher yields can be attained in stands under intensive management by use of genetically improved trees, fertilization, and spacing control.

In terms of inherent productivity, industry lands are of better quality than those in any other ownership class (fig. 1). This is one reason why intensive management is practiced most on those lands—it pays best. This also suggests that industry lands will have an absolute advantage for any future investments. Thus the expectations of industrial owners might be considered as the upper limit of what might be accomplished by other classes of owners.

To get a feeling for the intensive-culture/wood-supply relationships, managers of industrial forest land were asked a series of questions about:

- Trends in recent past (1971-74) and anticipated future (1975-85) use of 12 intensive-culture practices,
- Estimated impact of intensive-culture practices on recent past and future timber harvests,
- Information base used by the firm in making investment decisions on intensive-culture practices; that is, the source and quality of information and the manager's suggestions about priorities for future research and development programs.

Figure 1.—Potential and current net growth per acre in the North, 1970. Source: U.S. Forest Service *(1973)*. Potential growth is defined as the average net growth attainable in fully stocked natural stands. Greater growth can be attained in intensively managed stands.



RESULTS

Trends in Intensive-Culture Activities

Managers were asked to estimate the percentage of company land treated with specific cultural practices each year for the 1971-74 period. They were also asked to indicate the firm's intentions for the next decade (1975-85) for each cultural practice: increase use; decrease use; use it the same amount; or do not use it at all.

Averages for percentage of land area treated were weighted by acreage size class of individual firms (table 1). In viewing these percentages, keep in mind that most practices are applicable to or needed on only a portion of a company's land. Thus a small percentage of land treated may be rather significant in terms of accomplishing the needed task.

Application of timber-stand improvement, commercial thinning, and site preparation increased during the 1971-74 period; and greater activity is anticipated for most practices during the next decade. Exceptions to these trends are irrigation, drainage, silage forestry, precommercial thinning, and fertilization where past use was negligible and little use is anticipated in the near future.

As a percentage of northern forest-industry land treated annually, timber-stand improvement and commercial thinning were the major cultural practices undertaken. Most firms intend to maintain or increase their investments in these practices.

Firms that have less than 50,000 acres are doing weed control, species conversion, drainage, and genetic improvement on a greater share of their acreage than are larger firms (table 2). Otherwise, no distinct relationship is apparent between recent management intensity and ownership size class. Most managers anticipate increased activity in timber-stand improvement, commercial thinning, and genetic-improvement practices. For precommercial thinning, fertilization, and weed-control activities, the amount of planned future activity increases with ownership size class.

Impact on Wood Supplies

Using 1970 as a base for comparison, industrial managers estimated the actual increases (1971-74) and anticipated increases (1975-85) in annual harvests attributable to intensive-culture practices on company lands. Implicitly, these estimates have been adjusted for increased harvesting due to factors other than increased growth associated with intensive culture; for example, from more complete

Table 1. *Trends in intensive forest-culture activities; Northern forest-industry averages*

[In percentage of land area treated]

Cultural practice	1971	1972	1973	1974	1971-74	Percentage of all firms intending to maintain or increase use of practice (1975-85) [a]
Precommercial thinning	(b)	(b)	(b)	(b)	0.1	32
Timber-stand improvement	2.3	2.3	2.8	3.3	10.6	74
Commercial thinning	1.0	1.1	1.1	1.1	4.2	81
Fertilization	0	(b)	0	0	(b)	39
Site preparation	.1	.1	.2	.2	.6	55
Species conversion	.1	.1	.1	.1	.4	58
Genetic improvement	(b)	(b)	(b)	(b)	(b)	61
Weed control	.1	.1	.2	.1	.5	52
Short rotation or silage	0	0	0	(b)	(b)	26
Drainage	0	0	0	(b)	(b)	19
Irrigation	0	0	0	0	0	3
Intensified protection	.8	.9	.8	.9	(c)	52

[a] Remaining firms indicated that they would either decrease present use or not use practice at all.
[b] <0.1 percent.
[c] Not additive.

Table 2.—*Intensive forest culture activities; Northern forest industry averages by acreage size class*

Cultural practice	Less than 50 thousand acres		50-250 thousand acres		More than 250 thousand acres	
	Industrial land treated (1971-74)	Percentage of all firms intending to maintain or increase use of practice (1975-85) [a]	Industrial land treated (1971-74)	Percentage of all firms intending to maintain or increase use of practice (1975-85) [a]	Industrial land treated (1971-74)	Percentage of all firms intending to maintain or increase use of practice (1975-85
	Percent					
Precommercial thinning	0	20	0.4	31	(b)	40
Timber-stand improvement	5.7	80	3.9	69	12.5	70
Commercial thinning	5.4	60	5.8	94	3.8	60
Fertilization	0	20	(b)	38	0	50
Site preparation	0	20	2.0	69	.2	50
Species conversion	2.0	40	.9	63	.2	50
Genetic improvement	.2	60	(b)	56	(b)	60
Weed control	4.9	40	1.8	50	.1	50
Short rotation or silage	0	60	(b)	19	0	20
Drainage	1.4	40	0	19	0	10
Irrigation	0	0	0	6	0	0
Intensified protection	(c)	60	(c)	31	(c)	60

[a] Remaining firms indicated that they would either decrease present use or not use practice at all.
[b] <0.1 percent.
[c] Not additive.

utilization in harvesting, and for certain culture activities that do not result in increased yield, but do attain such objectives as increased product quality or changed species composition.

The estimated increases in annual harvest due to intensive culture on northern forest-industry lands, weighted by 1970 harvest figures, are as follows:

Period	Estimated increase due to intensive culture		Total roundwood harvest on northern industry lands in 1970 [b]	Additional annual wood supplies
	Range	Average [a]		
	(percent)		(million cu. ft.)	
1971-74	0-20	3.8	316	12
1975-85	0-40	8.9		28

[a] Weighted by 1970 harvest of responsing firms.
[b] Source: U.S. Forest Service 1973

Recent (1971-74) increases in annual harvest from industrial lands due to intensive-culture practices were estimated to be 4.5 percent on a nationwide basis. Estimates from the North were somewhat less (3.8 percent), presumably because northern forests have a high proportion of land in lower productivity classes and slow-growing hardwood stands.

As a result of applying intensive forest-culture practices, future (1975-85) increases of 14.0 percent are expected in annual roundwood harvests from industry lands across the nation. Managers of industry lands in the North are forecasting a much lower percentage increase, averaging 8.9 percent.

Although the increase forecast represents a substantial contribution to harvests from northern forest-industry lands, it will be less evident as part of the total wood harvest in the North. If 1970 harvest figures for all forest ownerships are used as a base, the forecast harvest from industry lands *due to intensive-culture practices* will increase total annual northern wood harvest by no more than 2 percent in the next decade.

The expectations from forest-industry lands may well indicate the practicable limits of accomplishment for investment in intensive-culture practices on other forest ownerships. Corresponding increases in northern wood harvest for the other ownerships would be 1 percent (20 million cubic feet) from National Forest and other public lands, and 6 percent from other private lands. Such increases are not very likely, however. For these ownerships the objectives, motivation, and opportunities for timber-growing make probable less implementation of intensive-culture practices than the forest industry is willing to undertake.

Information Base for Decisions

Managers were asked four questions about the information base used to make decisions about investments in intensive-culture practices. Two of the questions dealt with sources of information: is this information developed internally or outside the organization?; and what are the sources of outside information? The other two were concerned with adequacy of information: what is the quality of current information about specific practices?; and where should priorities for future research and development be put?

Most northern firms depend on sources outside the organization for information about new or little-used practices such as short-rotation or silage forestry, intensified protection, genetic improvement, and drainage (fig. 2). But decisions on traditional practices of growing-stock control, such as commercial and precommercial thinning, timber-stand improvement, and species conversion are based primarily on knowledge developed within the company.

Very few firms use consultants (fig. 3). State, university, and U.S. Forest Service research organizations are their principal sources for outside information. Most companies are involved in cooperative research programs. Cooperative ventures with universities and the Forest Service are common in the North.

Responses to questions about the adequacy of current information and priorities for research and development of cultural practices are summarized in figure 4. At least half the respondents felt that information available about irrigation, drainage, short rotation or silage forestry, and fertilization practices is, at best, poor. However, only one of these prac-

tices—fertilization—ranks high on their list of priorities for research and development. More than 40 percent of the respondents indicated a high-priority need for more knowledge about genetic improvement, site preparation, fertilization, and species conversion. Most firms felt that the quality of information available about commercial thinning and timber-stand improvement is rather good, but they still want to see more research and development of these two relatively popular practices.

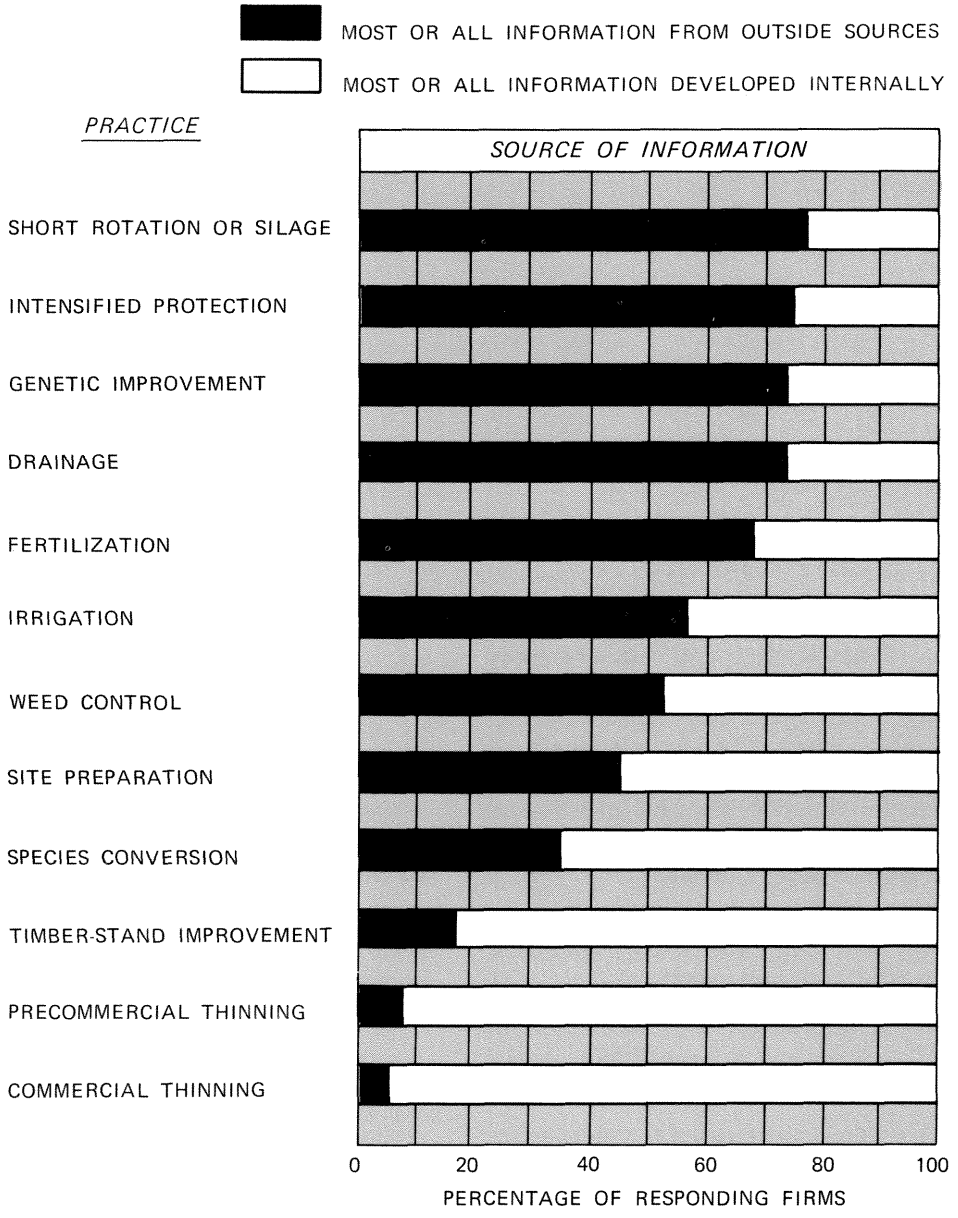
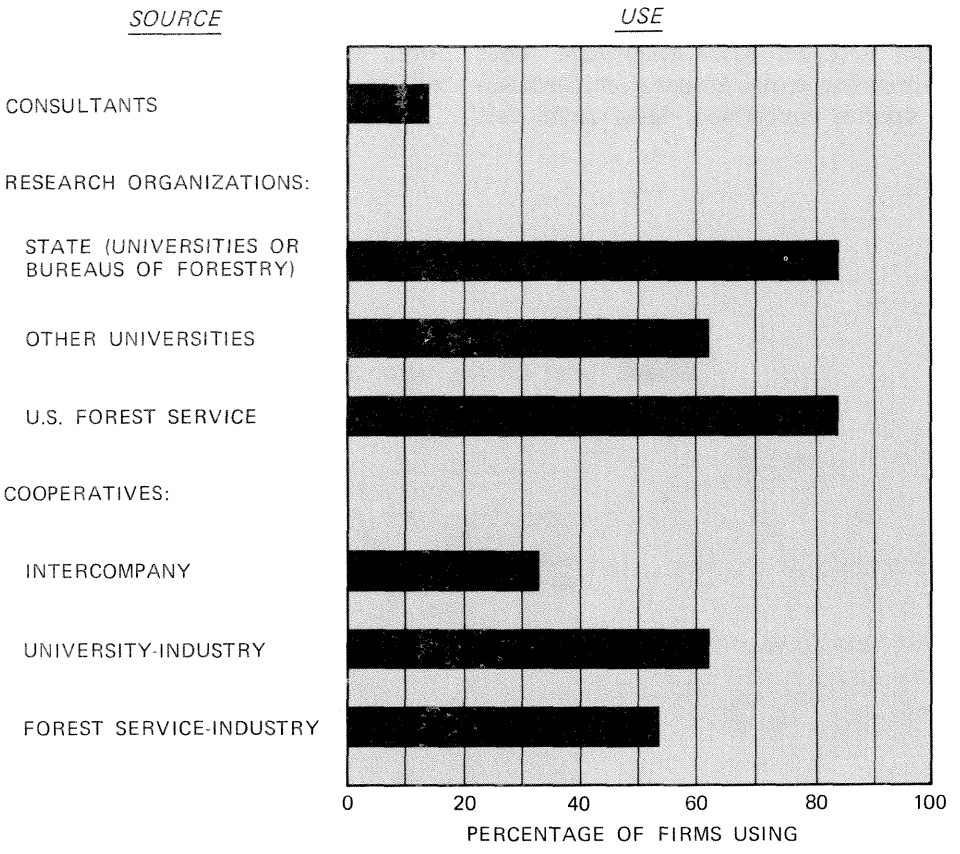


Figure 3.—Source of outside information for decisions about intensive-culture practices in the North.



SUMMARY

Study results provide an up-to-date look at the trends in application and timber-supply potential associated with intensive-culture practices on forest-industry lands in the North. They give us valuable insight for assessing the role of forest-industry landowners as suppliers of timber and for identifying the needs and priorities for future research. Key findings for northern forest-industry lands are:

- Applications of timber-stand improvement, commercial thinning, and site preparation have increased in recent years.
- Timber-stand improvement and commercial thinning have been and will continue to be the most popular practices undertaken.
- Greater activity is anticipated for most practices during the next decade; exceptions are drainage, irrigation, silage forestry, precommercial thinning, and fertilization.
- Estimated increases in recent annual harvests due to intensive culture averaged about 4 percent.
- During the next decade, increases in annual harvests due to intensive culture are expected to average about 9 percent.
- Increased harvests from intensive culture on industrial lands will increase total annual wood harvest in the North by no more than 2 percent in the next decade.
- Industrial managers express a high-priority need for more knowledge about genetic tree improvement, site preparation, fertilization, and species conversion.

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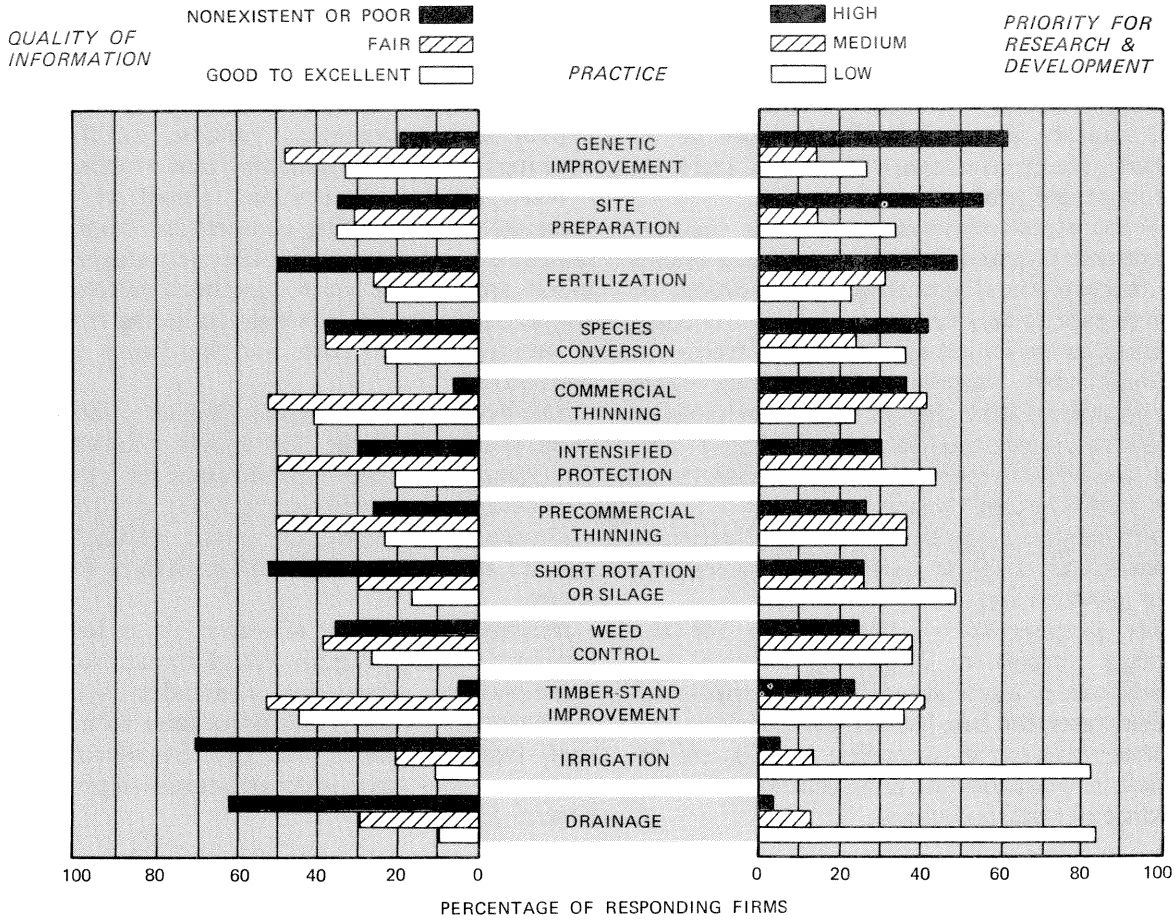
Figure 4.—Quality of current information and priorities for research and development of intensive-culture practices in the North.



APPENDIX

Practices Considered in This Study

Precommercial thinning.—A thinning made in immature stands for the purpose of increasing the growing-space of residual trees. No merchantable products are removed.

Timber-stand improvement.—This includes treatments imposed on intermediate-age stands to improve stand composition, condition, or growth rate. It may be accomplished by cutting, girdling, or poisoning of undesirable trees.

Commercial thinning.—This differs from precommercial thinning in that merchantable products are removed in the thinning; It also may be done to salvage merchantable stems that would be lost through mortality.

Fertilization.—Application of fertilizers to forest stands for the purpose of accelerating their growth rate.

Site preparation.—Action taken for the primary purpose of improving survival and growth rate of a new stand. Site preparation includes prescribed fire, herbicide application, and various mechanical measures; it does *not* include broadcast burning done primarily for fuel reduction or slash disposal.

Species conversion.—Actions taken to change the composition of a stand from one species type to another (for example, from hardwood to pine).

Genetic improvement.—Any of several approaches aimed at improving the quality of reproductive material (seeds, cuttings, seedlings) used in establishing new stands.

Weed control.—Operations aimed at suppressing or eliminating competition from undesirable vegetation during the early stages of a forest crop. Weed control includes cultivation and application of herbicides (including release of conifers from brush and hardwood competition).

Short-rotation or silage.—Coppice management of hardwoods at close spacing; for example, sycamore silage on rotations or cutting cycles of 10 years or less.

Drainage.—Removal of excess water from sites to enhance survival and growth of forest crops.

Irrigation.—Addition of water to sites for the purpose of increasing growth of forest crops.

Intensified protection.—Includes special measures to reduce losses associated with disease, insects, animals, and fire. Standard fire protection does not qualify as intensified protection.

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