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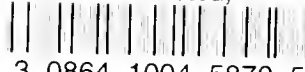
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DEVELOPING MONTANA'S FOREST RESOURCES

Forest Sub-Committee Montana Rural Area Development Committee 1969



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Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Torlief S. Aasheim, Director of Extension Service, Montana State University, Bozeman, Montana.

"DEVELOPING MONTANA'S FOREST RESOURCES"

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PREFACE

Rural Area Development has been defined as "Whatever rural people do to improve their economy and general well-being." Several federal and state agencies are available to assist them in surveying their needs and resources, and organizing for action. Although these agencies may provide information and suggest opportunities, it is the responsibility of the local citizens to decide the course of action to be taken. Usually the local group meets as a Rural Area Development Committee, a Soil and Water Conservation District Committee, or under the framework provided by another organized group.

In many cases the need for development is obscured by lack of knowledge regarding the resources, what can be done, and how to go about doing it. Modern forestry with its implied association with products utilization, shelterbelt practices, and protection programs, extends far beyond the boundaries of the forest.

It is hoped this publication will stimulate local committee interest in forestry-oriented activities, which will result in better living through a higher local economy, more beautiful surroundings, and improved general well-being.

Forestry Sub-Committee
State Rural Area Development Committee

MONTANA'S FOREST AREA

A look at Montana's forest resources reveals that one quarter of Montana's land area is forested, and one quarter of this forest land is non-productive. Statistics pertaining to local forest areas--their properties and potentials--are available in varying degrees of completeness and accuracy.

If compatible with land capability, each area of forest land should be managed for its maximum contribution to the economy. This may mean the utilization of an area for one or more limited purposes. However, forest lands will usually contribute most to the economy and to society if administered under the multiple-use concept of land management.

Local administrators of federal, state, and large private company forest land holdings have a wealth of information which can be adapted and used by local leaders in developing the forest resources of their areas.

More than 14,000 individuals own 4,857,000 acres of forest land in Montana--and 5,000 of these owners are farmers and ranchers who collectively own half the privately owned forest land in the State. The Office of Montana State Forester

through its Cooperative Forest Management (CFM) Program conducts a program designed specifically to provide technical advice and assistance to those people who own small areas of forest land or produce forest products on a small scale.

The forester advises the owner regarding the most profitable kinds of forest products, sales practices, selection of trees for cutting, on steps for improving the remaining stand and on how to reestablish a stand of trees through planting, seeding, or natural regeneration. He also assists landowners, loggers, and mill operators in the harvesting, processing, utilization, and marketing of forest products.

Forest management assistance for the timberland owner may be requested of the State Forester, the County Agent, Soil Conservation District, or any one of the public agricultural agencies. Any of them can assist him in meeting the nearest service forester.

MONTANA
LAND AREA BY MAJOR LAND CLASSES

	<u>Acres</u>	<u>%</u>
Forest Land		
Commercial	17,300,000	18.55
Productive Reserved	1,356,000	1.45
Unproductive	<u>3,392,000</u>	<u>3.64</u>
Total Forest Land	22,048,000	23.64 %
Non-Forest Land	<u>71,223,000</u>	<u>76.36</u>
TOTAL	93,271,000	100.00 %

MONTANA - COMMERCIAL FOREST LAND
 AREA BY STAND-SIZE CLASS, 1962

	<u>Acres</u>	<u>%</u>
Sawtimber stands		
Old growth	3,081,000	17.81
Young growth	<u>5,203,000</u>	<u>30.07</u>
Total	8,284,000	47.88 %
Poletimber stands	6,311,000	36.48
Seedling & Sapling stands	1,576,000	9.11
Non-stocked areas	<u>1,129,000</u>	<u>6.53</u>
TOTAL	17,300,000	100.00 %

AREA OF COMMERCIAL FOREST LAND
BY OWNERSHIP 1962

	<u>Acres</u>	<u>%</u>
Federal Total		
National Forests	10,578,000	61.16
BLM	612,000	3.54
Indian	595,000	3.44
Miscellaneous	16,000	.09
	11,801,000	68.23 %
State	601,000	3.47
County & Municipal	38,000	.21
Private	4,860,000	28.09
TOTAL	17,300,000	100.00 %

MONTANA

AREA OF COMMERCIAL FOREST LAND BY COVER TYPE

	<u>Acres</u>	<u>%</u>
Ponderosa Pine	3,656,000	21.13
Douglas Fir	4,555,000	26.33
Lodgepole Pine	5,357,000	30.96
Fir - Spruce	1,180,000	6.82
Larch	1,939,000	11.21
White Pine	181,000	1.05
Other Softwoods	33,000	.19
Hardwoods	399,000	2.31
	<u>17,300,000</u>	<u>100.00 %</u>

WATER

Water, according to many experts, soon, if not now, will be the most valuable resource received from Montana forest lands. Management of forest land to improve quality and quantity of useable water is therefore one of the most important tasks of land managers.

Forest management on watersheds can profoundly affect production of water, maintenance of soil stability, sedimentation, regulation of stream flow, pollution, fish habitat, and streamside values.

Soil conditions in well managed forests are particularly effective in reducing erosion and producing consistent water flow. Also important is the reduction of flood peaks due to short, intense rain storms. Forests influence the quantity, quality, and the timing of water yield.

Management of the forests for water is usually compatible with management for other purposes. Wherever water is a key value, forest landowners must recognize that it is their responsibility to employ land-use practices which benefit watersheds.

Studies indicate that the use of water in the U. S. will double by 1980, and triple by 2000, and that this

growth in use will take place most spectacularly in areas of fastest and greatest population growth. Areas outside the State are looking at Montana's abundant water supplies as sources to meet future needs. It behooves Montana to put its water needed for future growth to "beneficial use" soon, or the lack of water for use locally within the State may become the factor limiting further growth.

Some uses of water to help Montana expand and develop are:

1. Hydroelectric power
2. Irrigation
3. Recreation
4. Industrial processing
5. Urban, residential and domestic use
6. Sale to other States

Proper use of water developments and land treatment measures can greatly improve Montana's water resource. Water for irrigation, livestock, wildlife, home and recreation on individual farms and ranches, greatly enhances land values.

It should be noted that forest management practices may be varied to fit the peculiar needs of a given watershed. Shortages of water may indicate a need for one form of forest

management, periodic floods may indicate another. For example, a valley downstream is subject to spring floods, but during the rest of the year often suffers from water shortages. Again, the headwaters of the stream are covered with dense stands of lodgepole pine. Scientific thinnings of these stands may allow more moisture to accumulate without causing accelerated spring melt and runoff.

Management that produces the best combination of wood, wildlife, forage, and recreation is usually the best management for water production. Some items to consider in water management are:

1. Effect of cutting patterns on water yield.
2. Protection needed from fire, insects, and disease.
3. Location of roads to prevent soil movement.
4. Effect of logging equipment on soil disturbance.
5. Camps or other uses contributing to pollution.
6. Effect of domestic stock grazing on the watershed.
7. Compatibility of wildlife numbers with available forage.
8. Effect of present land use.
9. Areas in need of planting.
10. Forestry practices for improvement of hydrologic conditions.

AVAILABLE ASSISTANCE

All land management and natural resource agencies of the State and Federal governments are directly involved in watershed

programs. Local groups, such as sportsmen's clubs, 4-H clubs, farmers' organizations, chambers of commerce, civic clubs, and influential citizens, are also important in promoting water development. The Soil Conservation Service provides technical assistance for development of watersheds and cooperates with others interested in this resource. The State Forester provides technical help on management and protection of forest lands. Technical assistance is available without charge. Federal funds are also available for water use development and land treatment for improving the watersheds.

FORAGE

Montana forests produce a considerable amount of forage for domestic livestock. This is particularly true in the ponderosa pine and Douglas-fir types. These timber species usually permit an understory of palatable grasses such as blue bunch wheatgrass, Idaho fescue, June grass, spike trisetum, and others. Thinning of timber stands promotes the growth of the trees as well as the grass understory. Thinning also prolongs the time during which forage will be produced. This combination of timber and forage production provides, in many instances, the greatest benefit from forest lands.

Soil, species, age of timber, slope and aspect, are some of the many factors which need be considered in the management of grazing in forest types.

Grazing can be very detrimental to forest land if not properly handled. In fact, damage in the past from over-grazing has led many foresters to the erroneous conclusion that timber production and grazing are not compatible. However, proper management and rehabilitation, where poor management has existed in the past, can in many instances permit livestock grazing on forested areas to contribute to the over-all economy while producing timber on a sustained basis.

Technical assistance is especially important in planning the best use of forest land for grazing and may be obtained from the County Extension Agent, Service Forester, and Agricultural Experiment Station.

RECREATION

The demand for out-door recreation in the nation is expected to triple by the year 2000. In Montana the demand is expected to increase at even a more rapid rate.

Although current statistics are not available, even those statistics we do have are impressive. For example, according to the State Fish and Game Department, in 1960 more than 248,000 sportsmen--hunters and fishermen--spent 4 1/2 million man-days in Montana pursuing their outdoor hobby. They drove 204 million miles, spent 10 1/2 million dollars for transportation, 12 million dollars for food, 2 1/2 million dollars for lodging, 5 1/2 million dollars for hunting and fishing licenses, and a million dollars more for other services. Each sportsman, it is estimated, spent, on the average, \$243. These figures surely have increased by 1969. They do not include sight-seers, picknickers, hikers, rock-hounds, water-users, skiers, snowmobilers.

Out-door recreation, until recently, has been considered a spring, summer and fall undertaking, but with the increasing interest in skiing and the development of snowmobiling, winter will soon see as many people out of doors as do the other seasons.

Many are inclined to believe that Montana will always have much of her outdoor recreation take place on public land. This may be true, but much of it now takes place on privately-owned lands and a higher percentage of it will take place in the future on privately-owned lands.

One of the objectives of Rural Area Development (RAD) is "To help develop in a rapid but orderly way a wide range of outdoor recreation facilities on both private and public land, thus providing a new source of income for rural people and new, more accessible recreation areas for city dwellers and suburbanites."

Almost any rural land can be developed for some sort of outdoor recreation use. Community action, either through cooperative private enterprise or through government agencies, can find ways to convert open rural land into improved recreation areas. Harmonizing recreation and other land uses, such as timber production, frequently requires some adjustment in both uses to obtain maximum contribution from the combination. This requires skillful land management.

Any RAD committee considering the recreational possibilities of its area of influence should keep in mind:

1. That income-producing recreation should be recognized in public assistance programs as an appropriate use of farm and other privately-owned woodlands.

2. That federal, state, and local governments should be encouraged to develop their recreation resources through normal methods of financing.
3. That authorities avoid the application of tax rates that tend to deter retention of open land in recreational use.
4. That through careful planning and evaluation of needs and opportunities, private landowners may be able to develop recreation enterprises to supplement their income or to provide themselves with a full-time business.

The people of every community need recreation facilities, and the demand for such facilities is growing steadily. Fulfillment of these needs will make the community a more satisfying place in which to live. This, in turn, will help young people in the community and will tend to attract new industry that will further strengthen the local economy. With transportation facilities available to many people, well developed local recreation areas entice many people, and their money, from areas outside the local community.

Most recreationists think of "Montana" and "hunting and fishing" as being synonymous, and therefore, to maintain this image in almost every community in our state there is need for work to see that sportsman-landowner relations are harmonious and profitable whenever possible.

In some places landowners are offering, for a fee, hunting privileges on their combined ownerships.

In other places, sportsmen are taking the initiative in making arrangements with groups of landowners to use their land for hunting. These arrangements often stipulate that hunters will help with habitat improvement in the area. As a result they have superior hunting with regulated access.

Soil Conservation District and other local farm and ranch organizations provide names of groups through which cooperative hunting and fishing arrangements might be made. State wildlife agencies may be able to help with such projects, too.

Also, small watershed projects in many areas enable urban and rural people to work together to make the best use of land and water for recreation.

Under the Watershed Protection and Flood Prevention Act, recreation can be one of the major purposes of a project. The Federal Government can bear up to one-half the cost of a reservoir, or other development needed for fish and wildlife or recreation. Whether it is or isn't built for recreational use, pools formed behind dams provide variety of fishing and other waterbased sports. Many civic clubs and municipalities have developed splendid camping areas, picnicking grounds, and boat launching areas on the shores of watershed project lakes.

Most communities also need group picnicking and camping facilities for its youth organizations, churches and other groups. Landowners can help by developing campgrounds and related facilities for these organized groups. Such areas are needed around communities even to a radius of ten, twenty, or more miles.

Where there are not enough private facilities, organizations or municipalities can usually acquire access to suitable tracts of land to develop campgrounds or picnic areas at modest cost.

The possibilities of winter sports areas have also expanded greatly during the past few years. Skiing facilities and areas and trails for snowmobiles soon may be, if not now, demanded in almost every community in Montana.

Every community in the state should also make an outdoor recreation survey. This survey should list the types of recreation that could be made available, i.e. hunting, fishing, boating, water skiing, camping, picnicking, hiking, snow skiing, snowmobiling, golf and others. The survey should also consider the places from where the users will come and should provide an estimate of the numbers of people expected to use the proposed facilities.

Technical advice and assistance needed to develop almost

any kind of land that may be available for recreation can be secured from federal agencies such as the Bureau of Outdoor Recreation, the National Park Service, the U. S. Forest Service, the Soil Conservation Service, and the Cooperative Extension Service. State agencies--the University of Montana and Montana State University, the Fish and Game Department, the State Highway Department, and the Office of State Forester--can also provide assistance.

WILDLIFE

Wildlife is a renewable natural resource of considerable importance to Montana. It is a product of habitat--the land, and the vegetation that grows upon it. The actions of a land manager, whether a small ranch owner or a large federal agency, directly affects the abundance of wildlife.

An understanding of the habits, needs, and life cycle of each species of wildlife is necessary to permit adjustment of land use practices to produce maximum benefit. These habits and needs for any given species are similar regardless of location. For example, the wild turkey in Montana requires water near its food supply as does the wild turkey in New Mexico.

The increasing demand for larger wildlife populations has resulted in much research into the "limiting factors" which hold down wildlife numbers. These limiting factors are also directly associated with the habits, needs, and life cycle of a species. The bulk of research everywhere points to lack of suitable habitat as the culprit restricting wildlife populations.

A place to live--space--is just as important to wildlife as it is to man. Not just any space, but the type of home ground the species requires. One kind of wildlife may require

an area no larger than the average home, while another needs several square miles. Specialized areas are also required by some, such as a high, steep, rocky area to be used as a breeding ground. Others may require marshy areas for nesting while others require a dry dusty area for drumming.

Regardless of the species, habitat must provide cover, food and space.

Cover provides a place to hide, both from predators and from the elements. It usually provides the nesting area for birds and the hiding place for the young of the animals. Man has no control over some types of cover; others he influences tremendously. For example, shelter belts and woodlots are ideal for pheasant and prairie deer.

Wildlife food requirements vary greatly. One species may thrive while another may starve on the same area. One species may travel 50 miles a day in search of food and another may not go more than a few hundred feet. Some types of food plants may be planted by man and successfully used by wildlife, whereas other food plants are "native" and must be protected from overuse by game animals. Snow cover may make large areas of food plants unavailable during the winter months. Thus, winter range may become a critical factor.

Harvesting wood products under sound forest management

practices can be of tremendous benefit to wildlife. The openings created by harvest increase the amount of edge area, an essential part of the "space" factor.

Harvesting and thinning of trees in forest areas allow the sun and moisture to reach the ground to increase browse and forage production, increasing the food factor. In addition, they permit the larger animals to penetrate these once dense forest stands and utilize them as a place of refuge, a part of the cover factor.

In many areas farms and ranches suffer winter damage caused by wildlife. A lack of proper winter range is usually a contributing factor. Either the winter range must be increased or the herd reduced to eliminate this degradation and starvation.

Prairie wildlife faces a different hazard--not enough trees. The limiting factor in the habitat is cover.

A shelterbelt designed for wildlife must be wide enough to provide a proper amount of cover for growth and survival. A planting just wide enough to stop the snow often serves as a trap for wildlife.

Shelterbelts designed with game in mind will contain berry and seed producing food species for winter use. It will be

wide enough to provide adequate winter protection. Water will be available within travel range of the species that are expected to inhabit the planting.

Cost sharing assistance is available through the Agricultural Stabilization and Conservation Service for:

Tree Planting

Shelterbelt Renovation

Forest Thinning

Pond Development

Cover and Food Crop Plantings

Many agencies are available to assist private land managers plan for the inclusion of wildlife production in their operations. Among these are:

The State Fish and Game Department

The Office of State Forester

Soil Conservation Service

Extension Service

U. S. Fish and Wildlife

TIMBER PRODUCTION

The timber-producing capacity of Montana's 15,727,000 acres of commercial forest land is one of the most important assets of the State. Forest products rank third in production of gross income in the State, with agriculture first, and mining second. Although the wood products industry has shown a substantial increase in income and employment over the past twenty-five years, there still exists many opportunities to expand further and to improve this industry.

Fifty-eight percent of the forest area lies in the one-sixth of the State west of the Continental Divide. In fact, 80 percent of the land west of the Continental Divide is classified as forest. This is considered to be some of the best timberland in the Rocky Mountains.

About 70 percent of the sawtimber volume is on publicly owned lands. The table below shows the output of timber products by ownership classes:

(TABLE)

Wood products are essential to our economy and standard of living. Because demands for other uses of forest land will prohibit expanding the area available for wood production, land devoted to growing forests for wood products must produce more efficiently to meet future needs.

Douglas-fir and western larch are Montana's most important species, with most growing in western Montana. Lodgepole pine, fast becoming an important timber species, is the principal lumber producing tree in the mountains of Montana east of the Continental Divide.

(TABLE)

Great opportunity exists for expanding the timber industry in Montana. However, it must be emphasized that this opportunity for expanding the cut is in types of wood only lightly used at present. That is, Douglas-fir, larch, and ponderosa pine are presently being cut above the allowable annual cut, while lodgepole pine and spruce

are being harvested at a rate 85 percent below the allowable annual cut.

The timber cut from private lands in farm or other ownership was estimated in 1967 to be 113 million board feet. This means that 24 percent of Montana's commercial forest land is contributing 11 percent of the State's total annual cut.

The age distribution of Montana timber is poor, due in part to many severe fires that occurred in the early part of this century. A high percentage of the trees are over 120 years or under 40 years in age.

Montana needs an intensified program of management and utilization to get better use of the timber resource. Many good timber growing sites are occupied with cull or dense, stagnated stands that will not be used in today's industry. These areas should be encouraged to contribute what they should in other forest uses--water, forage, wildlife, or recreation. Unfortunately after many years, industries are still using only part of the timber available to them. Trees that took 100 years or more to grow are still dying and falling to the ground, unused.

Action to improve development of the timber industry falls into three general categories: (1) improving growth rate, (2) reducing mortality, and (3) improving utilization

in markets.

1. Improving growth rate--Growth rate is only about one-half what it should be. Planting non-stocked areas is needed to increase the growing stock and to properly utilize these land areas. However, the problem of too many trees, rather than too few, exists on many naturally reseeded areas. Thick young stands need to be thinned to increase growth and concentrate the growth on fewer stems, thus increasing merchantable volume. Extensive areas of old decadent trees need to be replaced with vigorous, rapid growing, well stocked stands.

2. Reducing timber mortality--Progress has been made in reducing fire damage. Corresponding equal effort has not gone into insect and disease control. Losses will gradually diminish as old trees are utilized and stands are managed for faster and healthier growth. In the meantime, insect and disease control, as well as fire control, efforts need to be intensified. Access roads into timber stands permit use of timber that would otherwise be lost through mortality due to insects, diseases, fire, wind, and other weather elements. Access roads also reduce the costs of protection and management practices, and permit other uses of the forest land.

3. Improving utilization and markets--Certain sizes, species, and parts of trees, representing a major part of the volume, are not used in today's markets. Some material is merchantable in one part of the state and not in another. Of special need is a market for small-diameter trees to utilize a vast resource while making improvement cuts. New markets and improved methods of manufacture for handling timber products warrant special consideration.

Special forest products such as Christmas trees, wreaths, poles, posts, bark, pulp, and probably many other specialty items, have a potential for small, low investment businesses in many rural areas.

On small properties, the forest areas are too small, individually, to be anything but a sideline, but even so are in many cases neglected. Collectively these small tracts could and should contribute substantially to the local economy.

Service foresters employed by the Montana State Forestry Department are able to answer most requests for assistance. In addition, specialized assistance is available through the U. S. Forest Service, the experiment stations, and the University of Montana Forestry School for peculiar problems.

FOREST PLANTINGS

Approximately 1 million acres of idle, non-stocked, commercial forest land in Montana are contributing nothing to existing sawmills or to present landowners. Three-fourths of these acres are west of the Continental Divide, where milling capacity already exceeds the available supply. It is sometimes argued that, because it will take such a long time for planted areas to produce timber, new plantings will not be helpful. This is not true because the annual allowable cut is based on the amount of growing stock and the quality of the timber sites. The annual cut can be increased immediately following planting of idle lands without fear of exceeding the sustained yield.

Little can be done to improve stocking in sawtimber and pole-sized timber stands until the areas are harvested and a new stand is started. In the cases of poorly stocked seedling and sapling stands, productivity can be increased and stand composition improved by "fill-in" planting.

Montana's reforestation accomplishments can be seen from the chart below. The acres planted each year do not

equal the total number of acres bared by logging, fire and other means. Special efforts will be required to remove the backlog of planting needs.

MONTANA'S REFORESTATION ACCOMPLISHMENTS*

Forest Acres Planted or Seeded by Years

Ownership	1960	1961	1962	1963	1964	1965	1966	1967	1968
Federal	2,855	5,723	3,530	6,985	9,277	14,288	13,953	15,095	14,870
State	162	221	764	472	176	380	220	128	216
Private:									
Including Tribal Lands	549	556	439	1,211	1,001	941	1,906	1,775	2,039

*Source:

Forest and Windbarrier Planting and Seeding in the United States Tree Planter's Notes, U. S. Forest Service and unpublished records collected by Office of State Forester and U. S. Forest Service.

Good management of forest land requires an active tree planting program. Good sites capable of producing the most timber volume, should be given priority in any planting program. Much of the area in need of tree planting in Montana is on small farm ownerships.

For assistance and advice in forest planting programs, see the State Service Forester, the Soil Conservation Service, the County Extension Agent or the U. S. Forest Service.

TIMBER STAND IMPROVEMENT

Timber Stand Improvement includes all operations undertaken to improve the condition and thrift of forest trees. However, the two most widely used methods of timber stand improvement are thinning and pruning. Many forest stands in Montana are so overcrowded and stagnated that virtually no trees will reach merchantable size, even for pulpwood. If they had been thinned at an early age some merchantable products may now have been removed.

The effect of thinning is to concentrate growth on fewer trees. This produces larger volumes of usable wood--therefore a more valuable stand.

Assuming present values of timber will continue, thinning can more than double harvest values on good sites and can increase harvest values up to four times on poor sites. Thinning does this by helping speed nature's selection system. Under nature's system, seedlings which have germinated are locked in a continuous fight for growing space. The weaker trees are gradually crowded out, but while being crowded out have slowed the growth of the better trees. Thinning removes competition, releasing the remaining trees to grow to a merchantable

size more quickly, thus increasing harvest values.

Bar Graph I

Under a sound forest management program, thinning should always be thought of as a stand improvement measure. A woodland thinning should not remove the crop of trees and leave the weeds. The poorer trees should always be removed first in the thinning operation. After this is done, and depending on the composition of the stand, some cash crop trees should be removed in order to give other good growing trees room for additional development.

The cost of thinning will vary according to the size and density of the stand. Naturally, the more trees felled in a thinning operation the higher the costs. However, thinnings or improvement cuts in commercial size timber will usually produce enough revenue to cover the costs of thinning and provide a profit, too.

Bar Graph II

Three or four thinnings should be made throughout the life of a stand. If this is done in a conscientious manner, the harvest cut will show a substantially greater yield than if the stand were unmanaged. In addition, this increased harvest yield will be supplemented by the earnings from commercial thinnings.

A non-commercial thinning is one that removes very small trees. This type of thinning produces no immediate revenue. It is an investment in the land and it will yield returns at a later date. Because overcrowding of trees begins at an early age, non-commercial thinning cannot be overlooked if maximum woodland returns are to be expected.

Pruning forest trees is an important means of increasing the value of timber in those species for which clear wood has a premium value. Pruning consists of removing the limbs from young trees so that future diameter growth will contain no knots.

Pruning is a more expensive measure than thinning. It costs about 40 cents to prune the first log (18 feet) of a tree. However, less than one dollar spent per tree to prune the first log should result in a five to ten dollar higher conversion value for the tree.

The potential pruning opportunity is best when trees are young. The physical gains from pruning will depend on (1) how well the pruning has done, (2) the size of the tree when pruned, and (3) the size of the tree when cut. If a tree is pruned when it is 4" in diameter and logged when it is 12", the butt log will produce 50% clear wood;

If it is allowed to grow to 32", the butt log will have 87% clear wood.

Pruned trees should be kept growing at a rapid rate, otherwise investments in pruning will be an excessively long time in yielding a return. Clear lumber of white pine, ponderosa pine, lodgepole pine, and spruce is worth from about \$250 to \$290, which is 278% more per thousand board feet than No. 2 common lumber. These values converted back to the forest indicate that if present costs and values continue, each dollar spent in thinning will produce 4 to 45 dollars in added yields, and each dollar spent on pruning will produce 9 to 45 dollars extra income.

3 MF Pictures of Pruning and Thinning

The Agricultural Conservation Program has practices available to share costs with private landowners who engage in timber stand improvement operations. Two such practices, the B-10 practice and H-3 practice are listed below.

Practice B-10. Improvement of a stand of forest trees on farmland--federal cost-sharing may be allowed for any of the following measures: (a) Thinning, (b) pruning crop trees, (c) release of desirable seedlings and young

trees by removing or killing competing and undesirable vegetation, (d) site preparation for natural reseeding, (e) fencing, (f) erosion control measures on logging roads and trails, (g) firebreaks for woodland protection, and (h) ponds for woodland protection. The area must be protected from destructive fire. Where seedlings are present or needed, the area must be protected from destructive grazing.

Practice H-3. Improvement of forest trees on private lands for beautification-conservation purpose. -- This practice provides for forest tree improvement on private lands for beautification benefits to the public. Approved conservation methods will be used to enhance the aesthetic quality and improve the natural resources of the land. Area near roads or other travelways that are visible to the traveling public are eligible. Technical assistance shall be utilized and the practice must be carried out in accordance with technical forestry standards for Practice B-10, as prepared by the Forest Service, copies of which are available at the county ASCS offices. Federal cost-sharing may be allowed for any of the following measures: (a) thinning and/or weeding of a stand of trees and control competitive brush or under-cover in a stand of trees, (b) pruning remaining trees, and (c) slash reduction. The area must be protected from

fire.

For further information regarding Thinning and Pruning, contact the State Service Forester of the State Forester's Office, the Agricultural Stabilization and Conservation Service, or the Soil Conservation Service.

TREE FARMS

A Tree Farm is a forested area of any size, privately owned, managed for growing trees as a business, and certified as such by the Western Wood Products Association.

Founded in 1941, the Tree Farm Program draws its name from the fact that trees are a crop that grows and matures like other farm crops, although more slowly. The program is active from coast to coast and is spreading steadily among land holdings of all sizes. In the 12-western state region, Western Wood Products Association, the Industrial Forestry Association, and the California Redwood Association are the Tree Farm certifying agencies.

Most forest product companies owning timberlands are certified Tree Farmers. In the early days of the program the companies began encouraging their neighbors--farmers, stockmen, and others--to join in the movement. Large numbers have come in and more are joining each year.

The program works in two ways. First, it aims for greater production and better earnings on member tracts through good management. This in turn tends to stimulate interest among other landowners to apply good

management practices to their forest holdings.

Tree farming is a do-it-yourself program by which the owner, through his own efforts, builds up the timber stand for continuous earning power of his property. As a certified Tree Farm member, the owner has access to information and advice on how to do it, and he has valuable contacts with other tree farmers in managing and marketing his forest products. Forest lands, like other farm lands, can produce better when one owner gives more attention to the crop. As of October 1968, Montana had 69 Tree Farms encompassing 1,043,282 acres.

Tree farming is not a get-rich-quick scheme, but rather an opportunity to get a fair return from the extra effort and time needed to raise forest crops. Through proper planning and protection from fire and pests, forest tree growth can be increased. This growth is saleable and it also builds an estate for the future.

Local forest industry payrolls depend on a continuing supply of raw materials from all forested lands in an area. Nothing is so helpful to a forest-dependent community as the steady influence of a sure timber supply.

Thus, Tree Farmers, by growing forest crops to

improve earnings of their property, are also helping maintain the economy of their community and state.

Tree Farm experience shows that cutting small merchantable trees before they are ready does not pay. Harvesting fast-growing young trees is like selling fast-growing lambs or steers before the animals have reached marketing weight. Tree Farm foresters can help guide the owner to the most productive method of harvesting for maximum production.

Professional foresters of the Office of State Forester are continuously working with the Western Wood Products Association and the Tree Farmers within the state to furnish technical on-the-ground assistance to forest owners wanting help in forest management.

Overmature or over-ripe trees should be harvested. Otherwise they will be lost to insects, disease or storm which is a most wasteful way because old trees usually contain the best lumber and the largest volume. Tree Farmers tend old-growth timber stands as a first point of action.

Owners of forest land in Montana are invited to join in the Tree Farm Program. No cost to the owner is involved in having forest land certified as a Tree Farm.

For further information, contact the Western Wood Products Association, State Service Forester in your locality, or the Office of the Montana State Forester, 2705 Spurgin Road, Missoula, Montana, telephone 543-3622.

UTILIZATION AND MARKETING OF FOREST PRODUCTS

General

Total U. S. consumption of wood was almost the same in 1904 as it was in 1964. There were 12.5 billion cubic feet used in the earlier year compared with 12.4 in the latter, and that portion of the total consumption used as structural lumber remained unchanged at slightly more than half the total volume. Shifts, however, in some other categories were great. The proportion used as fuel wood dropped from 34 percent to 8 percent; pulpwood rose from 2 percent to 29 percent; and veneer logs rose from a fraction of 1 percent to 9 percent.

The U. S. Forest Service project was for the year 2000, based on the assumption that total wood consumption in the United States will nearly double, show pulpwood as the leading timber product with about 44 percent of the total; sawlogs with just under 40 percent and veneer logs with 12.5 percent; fuel wood, less than 2.5 percent and other products will remain about the same.

Such an expansion of the market for wood products plus an increase in the area devoted to growing forests can assist Montana's timber industry. The mix of species, sizes, physical characteristics, and the economic locations of the timber

available for such expanded outputs will differ widely from the species mix represented by the current cut. With processing and marketing improvements much of what is now simply a physical material of the forest can become an economic resource.

The benefits derived from product refinement can be measured in gains in employment. For example, one million board feet of standing timber converted to sawlogs employs about three people for one year. If logs are converted to rough dry lumber and this to millwork, 15 people would be provided employment for one year by the same volume of standing timber. Similarly, the production of dressed lumber, plywood or paper produces substantially increased amounts of employment over that of the production of logs or rough dry lumber, for shipment out of the locality or the state. Conversion of one million board feet of standing timber to one of the following products in one year reflects gains in local employment made possible through diversification.

<u>Product</u>	<u>Employs</u>
Logs	2.7 men
Rough dry lumber	7.0 men
Dressed lumber	9.0 men
Millwork	15.4 men
Plywood	15.8 men
Paper	16.1 men

The manufacture and remanufacture of a forest resource into a refined wood product ready for consumer use will increase the value recoverable from the standing timber resource by 20 times. For example, a forest resource with a standing tree value of one million dollars is capable of generating a 20 million dollar consumer product value. The employment provided in making the transition from this same quantity of raw material to a consumable product will, in the process, generate 7 million dollars in wages and salaries. The long term economic impact is appreciable.

LUMBER

Until the mid 1950's ponderosa pine one inch (1/4) and thicker boards were the mainstay of the Montana lumber industry. Since that time both Douglas-fir and western larch have exceeded it in the volume produced. By far the greater portion of these two species have been processed into two inch (2/4) dimension lumber. This is in turn used as structural members in wood frame construction. In these species the one inch (1/4) boards are confined to the highest quality upper grades of lumber or to the lowest grades of lumber found in jacket boards developed in the process of making dimension lumber.

Engelmann spruce has also increased in the volume used since 1950. This increase was brought about by the effort exerted to salvage stands of spruce killed by insect epidemic.

Other species, including lodgepole pine and the true firs, also have accounted recently for an increasing amount of Montana's total lumber production.

Most of the lumber produced is sold and shipped out of state as a partially finished consumer product. Lumber differs from its tree resource form in that it has definite size and shape and is segregated according to its quality, or grade.

Lumber in this partially finished form is highly desirable from a distribution standpoint. From this stage of completeness, due to the nature of wood, it can easily be modified to whatever form or size is desired, with the use of relatively inexpensive tools. This gives the retail distributor an opportunity to satisfy a variety of local demands and at the same time maintain a minimum inventory.

Montana softwood lumber production by species, selected periods, and years is shown in this chart:

Species	1904-1944 average	1945	1950	1956	1962
	(million board feet)				
Ponderosa pine	135	144	192	157	171
Douglas-fir	49	67	126	237	363
Western larch	96	110	160	147	235
Engelmann spruce	10	13	36	340	150
Other species	21	7	22	98	150
Total softwood lumber	311	341	536	979	1069

Source: Total volume from Bureau of Census. Species breakdown based on reported sawlog receipts for 1962.

PULPWOOD

Montana's vast reservoir of pulpwood is virtually untouched.

Two primary sources of raw material are currently being tapped in Montana. One pulpwood operation depending almost solely on roundwood as its source of raw material, is confined to the area east of the Continental Divide. All the pulpwood accumulated is exported from the State in the form of roundwood. A second pulpwood operation utilizes wood chips which develop as a residue in sawmills and plywood plants in the area surrounding a pulp and paper plant located in western Montana near Missoula.

Since 1957 the pulp plant in the Missoula area has provided a use for mill residues that, until that time, were considered to be primarily waste material. Pulp production in this area has added appreciably to the economic stability of the area's sawmills and plywood plants. Investigations are now being made to determine the desirability of also using roundwood material as a source of pulping material. The plant utilizes approximately 360,000 units of wood chips annually in its operation. (One unit of wood chips weighs 2,400 pounds and specially adapted railroad cars hold 22 units.)

Wood chips are shipped to the pulp plant from mill operations as much as 250 miles away.

This plant annually ships from Montana, eleven thousand carloads of line-board and pulp to all parts of the country, and adds some 18 million dollars to the economy of the State.

In addition to the wood chips utilized, it also uses, each day, 25 van loads of sawdust in the digester and 30 truck loads of waste wood and refuse for fuel in the power plant.

The species used in this operation are Douglas-fir, ponderosa pine, white pine, lodgepole pine, larch, spruce and hemlock.

Pulp and paper production provides the means by which forest utilization can be improved. It makes possible more sanitary logging operations and easier fire protection. It contributes to less costly rehabilitation and timber stand regeneration and makes possible harvesting of acres which until now have been economically unfeasible to manage.

PLYWOOD

Presently five plywood plants are in operation in Western Montana and consideration is being given to activating a sixth one.

Consumption of plywood has increased tenfold in the past fifty years. In 1966 alone, consumption was 6 percent over that used in 1965. Much of this very rapid growth in use is attributed to the substitution of softwood plywood for lumber, particularly for sheathing and subflooring in residential construction as well as in concrete formwork in non-residential construction. Recent studies indicate that most of the potential substitution has taken place and suggests that the high rate of increase in consumption is likely to slack off in the next few years. Total use, however, of softwood plywood is expected to continue to rise, but to be more in line with increases in construction and manufacturing.

Prices of peeler logs have shown an upward trend since 1962. These price increases and the rapid growth of plywood and veneer imports suggest that the veneer and plywood industries are experiencing difficulty in obtaining veneer logs of the kinds and quantities needed.

Plywood-like lumber is for the most part distributed in commodity form rather than as a highly differentiated product. Plywood also gives the distributor an opportunity to satisfy a variety of local demands with a minimum amount of inventory.

POSTS

The wood fencepost industry enjoys both a good market demand and an ample supply of raw material. Post operations are normally small and localized. The average annual production of a typical plant is between twenty and fifty thousand posts. A few operations exceed this production by several times.

Most post operators contract their woods work. A problem of many post operators is the finding of reliable woods operators who will furnish a continuous supply of properly sized and manufactured post logs.

Another problem confronting many post operators is the length of time required to season the posts. This, along with the fact that early spring and late fall are the times of peak demand for posts, requires that a post operator develop a large inventory during the summer and winter months. In some instances, post operators must limit inventory in accord with financial ability. Local assistance can often-times remedy this problem.

POLES AND PILINGS

The manufacture of poles and piling is more dependent on a well integrated forest industry than is the production of the other major uses of our forests resources. Telephone poles can be obtained only from straight trees meeting the certain standards as to top and bottom diameters. A manufacturer of lumber or plywood can use pole type trees. A pulp and paper manufacturer can also produce a lower valued product from these high valued trees. For this reason there should be a good interchange of logs that will direct the higher valued trees into pole products and at the same time provide an outlet and proper utilization of the lower valued materials.

FUEL WOOD

Fuel wood will continue to be used for many years. A small amount will be used domestically by reason of necessity in some of the remote areas. Most domestic consumption, however, will be for aesthetic reasons in recreation areas.

Many mill operations, currently equipped to convert fuel-wood to heat and power, will continue to use their mill residues for this purpose. As technology advances to allow improved methods of separating and handling wood and bark residues, less amounts of sawmill waste will be used for this purpose.

OTHER WOOD PRODUCTS

More than one billion board feet of timber is harvested annually in Montana. The vast majority of this volume is shipped from the state as green or seasoned lumber, or it is shipped as plywood, pulp or paper. Any additional processing that takes place in the locality of origin is of direct economic benefit to that locality and to the state. Studies in other states have indicated that the stumpage value of a standing tree can be increased by 20 times this value by being refined to consumer goods. The process of this refinement will generate 7 times the stumpage value in local wages and salaries. For example, if we would place an average stumpage value of twenty dollars per thousand board feet on one billion board feet annually, the dollar value per year would be 20 million dollars. If we were to refine all of this resource into consumer products, it would have a net value of 400 million dollars. The process of this refinement would generate 140 million dollars in wages and salaries scattered through many localities within the state. This would more than double the contribution of the timber industries to Montana's economy.

It is, of course, not possible to take complete advantage

of this opportunity. Montana's location in relation to the highly populated trade areas makes complete refinement, particularly that of assembled products, unfeasible. Montana's location in relation to other materials used as component parts is somewhat disadvantageous. Other components, such as hardware, metal parts, glass, plastic, are not available locally and would, of course, involve double transportation costs if many products were completed here.

SPECIAL PRODUCTS

Special products are those products of the forest that do not develop through the normal processes of conversion from timber to lumber or plywood to a finished product. Much of the material used is a natural development of the forest and involves a collection process. Such things as tree seeds collected for the propagation of plants, cones to be refined for pharmaceutical purposes and decorative materials for holiday greens, wreaths, curios and novelties. The demand for, and the value of, these products is dependent upon the skill and care with which they are prepared. These products provide money-making opportunities for church and civic groups. It is also possible with some assistance in the collecting of materials and distribution of the products, to provide work opportunities for senior citizens or physically handicapped persons who, although they may be confined to their homes, find such an activity a diversion from the routine and a source of extra income.

CHEMICAL PROCESS PRODUCTS

To this point only physical processing of the forest resource has been given consideration. The one exception is the production of pulp and paper which can be considered as involving both physical and chemical processes.

At the present time there are three chemical derivatives of wood being commercially produced in the state. Tall oil used in detergent, emulsions, and as a lubricating medium in paints, and turpentine are drawn off as a by-product of the pulp and paper industry. Calactan, a water soluble derivative of western larch, used in printers ink and as a binder in pharmaceuticals, is also a by-product of the state's timber industry manufactured under the trade name of STRactan.

Also a study is being made of chemical additives for the purpose of modification of wood to improve or supplement the finer qualities and practical features of this structural material by treatment or combination with some chemicals. Application of various forms of paints and coatings to wood and wood products has found general acceptance; treatment with flame retardants and preservatives is practiced commercially for a variety of products; dimensional stabilization of wood has been extensively investigated and found occasional application with specialty products; plastic impregnation or

wood plastic combination has received much attention and publicity; there is also hope that basic research might lead to a clue for improving the resistance of wood to natural elements.

These newer forest industries based on chemical processes of breaking down wood structures to extract cellulose and various other chemicals, seem the most assured of continued markets and growth reasonably free from the fear of competition.

CHRISTMAS TREES

For many years, Montana has produced about 10% of the Christmas trees used in the United States. For the past several years, however, there has been a steady decline in the production of Montana trees. There are several reasons, including the widespread spruce budworm and needle blight infestations in the Douglas-fir stands in western Montana. The decline has also been due to stiff competition from both wild and plantation-grown trees from other areas. In spite of this, there is no sign as yet that the national market will not be able to continue to absorb Montana-produced trees. This will be especially true as quality stands are maintained and improved at a level to keep Montana trees competitive. Long-time producers of Christmas trees recognize these problems and have taken steps to maintain their level of production and even to increase income through sales of other products of the forest. For example, there have been several industries established in the western part of the State which produce evergreen ornaments in the form of wreaths, evergreen ropes, boughs and cone clusters. Producers are also using techniques which have been developed to culture wild trees to improve their form and grade, and consequently, the price they receive on the

market.

Due to the demand for lodgepole pine, Alpine fir and grand fir for Christmas trees an opportunity exists for many forested areas in eastern Montana to produce quality trees, too. There is also an opportunity to expand the evergreen ornament business state-wide. An extensive timbered area in eastern Montana could lend itself to producing Christmas trees and other products. Although much of this timbered area is in federal ownership, extensive stands can be found in private holdings.

Those who recognize opportunity and undertake Christmas tree production, can benefit greatly from the many years experience gained previously by western Montana producers. For example, several large Christmas tree producers have started Christmas tree plantations in Flathead and Sanders County on marginal croplands leased from farmers and ranchers. These plantations contain generally Scotch pine which is well accepted by Christmas tree users. The plantations are successful and are making money for the producers as well as the landowner. The possibility exists that many more thousands of acres of plantations can be established on marginal croplands state-wide. Although it takes 8 to 10 years to market trees from a plantation, the income per acre over the period

exceeds that which can be realized from any other crop. For example, one plantation in the lower Flathead Valley yielded 900 trees per acre after 9 years which was in total, far more revenue than could be realized from other uses.

Those contemplating Christmas tree production should be aware of the many factors which affect the successfully continued production of trees from either wild stands or plantations. Among these factors are soil type, species selection, care and culture, time of cutting, and cutting procedures. The availability of markets should also receive the concern of producers. There is a good national market for Montana trees. However, to take advantage of this, large tree shippers should be contacted. There is a limited local market for trees in individual communities. The market should be selected in advance of tree-cutting to avoid over production and/or waste.

Assistance for culturing wild trees or establishing plantations is available. The State Forester, through the Federal Cooperative Forest Management Program, and the Agricultural Stabilization and Conservation Service provide technical service to private landowners for this purpose. The State Forester also maintains a

nursery which produces conifer trees suitable for Christmas tree plantations. The U. S. Soil Conservation Service can provide soil analysis tests to determine the suitability of an area for tree planting. The Montana Christmas Tree Association is doing extensive work in tree grading, marketing and production and would welcome members from throughout the State. Marketing information is available through the State Forester.

Information pertaining to the location of timber stands suitable for Christmas tree production can be obtained from the various U. S. Forest Service Ranger District Offices, Bureau of Land Management offices and from County Assessors who have timber classification information on private lands.

ACCESS

The major transportation system for the utilization of Montana's forests consists of the state and federal primary highways, state highway secondary roads and county roads. Access from these public roads to the major forested areas has been, and will be, provided by the federal agencies administering the public lands in the various areas. These agencies include the U. S. Forest Service, Bureau of Indian Affairs, and Bureau of Land Management. Access to major forest areas is also provided by road systems constructed by large forest landowners such as the St. Regis Paper Company, Anaconda Company, Glacier Park Company and the Northern Pacific Railway. Access to other forest areas is generally over extensions from the above mentioned primary road systems.

Although access to most commercial forested areas is provided indirectly by one of these road systems, it is often necessary to obtain permission to use existing roads or to cross another owner's land to obtain access to one's own property. This access can be obtained in one of several ways, including verbal agreement, purchase, road cost-sharing and mutual construction agreements.

Access in itself sometimes may become a formidable obstacle involving surveys, rights-of-way, easements, and restrictions or limitations of use. The difficulty in obtaining access may depend upon the landowner and managing agency. It follows that one's future access needs should be thoroughly considered when dealing with others who are attempting to obtain right-of-way. Problems of access can often be solved by reciprocal use terminology included in the right-of-way easement or by cooperative agreement.

Consideration of the location of access roads in relationship to present and future needs, is perhaps, as important as access itself. Too often roads are constructed for a single, short term purpose rather than for all uses which may eventually be expected of a particular forested area. Too often roads are also constructed without proper regard for grade, soil erosion, drainage and siltation of water systems. It costs as little, hardly any more, to construct and maintain properly located and engineered roads than it does to permit unrestricted location and development.

Most road systems can be designed and located to serve several purposes. For example, a road constructed to remove timber or other forest products could be located

to serve watershed development activities, grazing access, stock movement, recreation, or access to an adjacent ownership. The uses and ownership of a large area should be considered before obtaining access for construction of roads for a single purpose. When boundaries permit, or an agreement among landowners can be arranged, access can be located to serve all most efficiently. (Legal methods of obtaining right-of-way easements or written agreements are often complicated and require proper interpretation of laws. A lawyer should be consulted to determine the proper way to obtain right-of-way easements). Cooperative agreements for road use and access, and new construction, should be initiated with representatives of local agencies. The Office of State Forester, through the federal Cooperative Forest Management Program, provides foresters who can help evaluate the potential use of multiple-ownership areas. These foresters can also help locate and design roads of the proper grade for soil conditions. They can also make recommendations for proper drainage to prevent soil erosion and stream siltation. The Agricultural Stabilization and Conservation Service (ASCS) provides payments for constructing barriers in logging roads and skid trails.

TRANSPORTATION OF FOREST PRODUCTS

Transportation of forest products usually goes through three stages: (1) the assembly of logs at a concentration point, usually accomplished by skidding; (2) the conveyance of these logs by larger loads, usually a truck haul, to the processing plant; and (3) the movement of the finished product, usually by truck or railroad, from processing plant to consumer.

Transportation of logs from the stump is essentially a process of collecting them in progressively larger quantities for movement to the point of processing. Log transportation normally follows the natural drainage system in the area, endeavoring to move always in a downhill direction. The movement of logs uphill is a rare exception.

Logging itself is essentially a transportation process. The fact that logs are not only round, but also tapered, accounts for a considerable amount of wasted space in any vehicle on which they are transported. As the size of logs decreases, the amount of wasted space increases on any given load. Studies indicate it is cheaper to ship a given footage of lumber than to ship the logs from which it is cut. The reason

is that lumber can be loaded with less waste space than logs, plus the fact that the waste in the form of slabs, edgings, and decayed material, have been removed. Lumber is often dried prior to shipment, thus reducing the weight still further and improving the weight-to-volume ratio. The nearer the mill can be set to the timber, the lower will be the unit cost of transportation.

When lumber leaves the processing plant it is normally shipped by truck, or rail, or both. The manufacturer usually sells his product at the mill to wholesalers or industrial consumers. However, the manufacturer has considerable interest in the cost of the shipment because the purchaser in one way or another deducts this cost. The cost of transportation between the processing plant and consumer can easily account for 25% or more of the price of the delivered material. Advantage naturally goes then to the mills and to those regions where the freight charge to market is least. Organized pressure from shippers and communities and public regulation tends to improve freight rates. Rail rates are based on a number of considerations besides weight, bulk, value, and distance. Forest products freight rates generally are based primarily on weight.

Again the benefits of remanufacture cannot be

emphasized too strongly. The manufacture and remanufacture of a forest resource into a refined wood product ready for consumer use will not only generate additional dollars as wages and salaries in the locality of their origin but it will cause Montana products to be more competitive with those produced in other regions on account of weight reduction.

FOREST PROTECTION

In a matter of hours, wildfire can wipe out extensive timber stands. Forest insects and disease work more slowly, but over a long period of time they are given credit for destroying more trees than fire. For the State to maintain its timbered areas in a productive condition or as cover for valuable watershed areas, it is necessary that adequate protection from fire, disease, and insects, be provided.

The protection provided a specific area should be commensurate with the value of the resource protected. The general public receives many benefits from Montana's forests, and therefore, some think it should share with the private forest landowners for the cost of adequate protection.

Damage other than from fire, insect and disease, can occur to forests and forest lands from rodent activity, overgrazing by wild game and by livestock, and man's recreational use. For example, porcupines cause extensive damage in ponderosa pine stands. Overgrazing can prevent reforestation and cause soil erosion. Poorly located, constructed and maintained roads can cause extensive soil and stream damage, which sometimes is irreparable.

The failure to properly dispose of slash after logging or thinning operations may create an extreme fire hazard which can support uncontrollable wildfire.

The use of any forest area should be planned in advance with all aspects of protection considered. State laws exist to provide fire protection for wild lands in most areas of the State. A forestry plan has been developed by the State Forester which, when approved by the State Board of Forestry, will establish a minimum level of fire protection on lands not now under recognized protection. A forest pest law also authorized the State Board of Forestry to establish zones of insect infestation and initiate control measures.

The Hazard Reduction and Management law provides that anyone cutting timber must enter into a hazard reduction agreement with the State Forester. This law along with the fire and pest control laws, provides only minimal protection to forests.

The value of forest land has been going upward for many years. This trend is accelerating as the need for recreation, wood products, and water, increases for an expanding population. It follows that more money will necessarily have to be allocated to protect Montana's forests from damage.

FOREST FIRE PROTECTION IN MONTANA

Organized forest fire protection began in Montana in the early 1900's with the Federal Government providing protection to the National Forest lands. However, a disastrous 1910 fire season clearly showed the privately owned lands need more organized fire protection and that the protection furnished the national forest lands should be intensified. During this period, the private forest protective associations were formed to provide organized protection for blocks of private company ownerships. The Associations left an unfilled need for forest fire protection over vast areas.

The 1939 Legislature created a State Board of Forestry and authorized this board to organize and provide forest fire protection on the privately owned forest lands throughout the State. The Board's initial action was confined principally to the commercial timber areas west of the Continental Divide. Fire districts were formed and single agency protection was designated for the protection of all the forest lands within each district boundary. Private landowners west of the Continental Divide participated in this protection by

paying their proportionate share of the total cost each year. The privately owned forest lands lying east of the Continental Divide never received organized forest fire protection, except that provided by the Federal agencies.

By 1959, when markets for smaller timber expanded and small-timber harvesting and manufacturing methods were developed, the "non-commercial" forests east of the Continental Divide became "commercial". As such they deserved more intensive fire protection. The Legislature, through a series of actions, amended the forest fire protection laws, taking away the powers of the Board of Forestry to create forest fire protection districts, and provided for the formation of forest fire protection districts dependent upon the affirmative vote of at least 51 percent of the landowners who own 51 percent or more of the forest land within the boundaries of the proposed district.

The State law makes the private landowner responsible for furnishing protection against the starting or the existence of a fire and to suppress the spread of fire on his own lands during the full period of each forest fire season. The State Forester has the basic responsibility to provide protection to the State-owned forest lands. The

Federal Government has the basic responsibility for protecting Government-owned or controlled lands. Privately owned lands lying within the boundaries of National Forests are presently being protected by the National Forests through agreement with the State Forester. Private lands lying outside the National Forest boundaries, and outside the boundaries of other Federal reservations, are furnished protection only at the wish of the landowner, depending upon the presence of an organized fire protection force.

The 1924 Clarke-McNary Law provides Federal cost-sharing in forest fire control for the States. This money is used to reduce the cost of protection to the State and private landowners within the State. Only landowners making payments for fire protection share in this money. The State Forester is also indirectly sharing in cost of protection for private forest lands by furnishing training and equipment to associations and county organizations that take on the responsibility of wildland fire protection within any given area.

(TABLE)

Montana, east of the Continental Divide, does not presently have adequate, organized forest fire protection available except in a few limited areas.

RURAL LAND FIRE PROTECTION

The large fire protection job yet to be done for Montana's rural lands can be summarized by stating that the 45 counties east of the Continental Divide do not have adequate organized fire protection.

How to provide fire protection to this 56 million acres of State and privately owned rural land is a basic question. This must be done with the least acceptable loss of property and resources and at a cost the landowners in the State are willing to pay. The economics of fire protection system are particularly important for eastern Montana because of the variability of the values involved. In many cases, protection is all that can be afforded, whereas the values increase and the investments become greater, a more intensive fire protection system may be developed.

In developing the fire protection program for the rural areas of Montana, especially those in the central and eastern part of the state, consideration should be given to making the fire control organization capable of handling both wild land fires and structural fires.

STATE-WIDE RURAL WILDLAND FIRE PROTECTION

It is hoped that, as rural and wildland fire protection expand, it can be devised, under a state-wide plan, to include mutual assistance in the use of equipment, overhead and manpower.

In devising State-wide fire protection there are several organization patterns that can be utilized to eventually attain the desired protection for the some 56 million acres yet remaining to be protected within the State. Although different in many respects, all of the basic patterns must consider several common items before a final system is selected. These items include the fire prevention program needs for the given area; the presuppression plans, including availability of manpower, communications systems and specialized fire fighting equipment that may be needed. Suppression problems and methods must also be considered as they pertain to the given area. Possible means of financing the fire protection program will influence the selection of the basic organization plan for the area.

Multiple financing is, of course, the more desirable. Multiple financing, means inclusion of the Federal, State, County and private landowner in the financing base for

any fire protection program.

The basic systems available to furnish adequate fire protection are as follows:

1. The forest fire protection district. The advantages are:
 - a. Planned detection.
 - b. Paid year-round overhead.
 - c. Trained nucleus of crews.
 - d. Equipment and communications are designed for forest fire protection and thus more efficient.
 - e. All of the forest owners within the district share the total cost of fire protection.
 - f. There is a planned prevention program that is coordinated with other units.
 - g. The Board of Forestry can provide the backup assistance in case of large fire activity.
 - h. Each owner under the law meets the requirements of adequate forest fire protection.

Disadvantages can be summarized in one statement in that this type of organization is not designed for structural fire protection.

This system requires the consent of 51 percent of the landowners within the proposed area owning 51 percent of the

land before a district can be formed.

2. County-State rural fire protection. The advantages of this system are:

- a. It is county-wide, covering State and private lands within the county.
- b. It is partially county-financed, and by taking advantage of the other financial units or sources, can furnish the broadest financial base of any of the systems that will be mentioned.
- c. Through the sheriff's organization this system provides the full-time answering services needed for fire activity.
- d. The administrative responsibility in this type of protection can be assigned as a job for a public employee.
- e. This type of organization can take full advantage of the Clarke-McNary available excess property equipment to provide better equipment at the lowest cost for fire protection.

There are several disadvantages to such an organization. Namely, that detection may be inadequate, and other than overhead or large fire activity, the fire force is usually volunteer which may not be available on a 24-hour basis.

Although there are some disadvantages to the county-state rural fire protection system, it appears that this should probably be the system that will be the easiest to organize and the most efficient from the standpoint of dollars invested. This is particularly true of the eastern part of the State.

3. Organized rural fire district. The advantages with this type of organization are definite boundaries and full financial participation. In addition, the men are registered and insured through the State. The Board of Forestry may recognize a rural fire district for assistance and, if trained, such a district is capable of fighting all types of fires. However, listed as disadvantages, a rural fire district is generally not equipped and trained only for structural fires. The fire detection system and communications system again are designed for structural protection and are generally not adequate for a good forest fire protection unit. Also, the rural fire district usually does not include a sufficiently large area to make an economic forest fire protection unit because of its initial nature of providing principally structural protection and including only structures rather than large expanses of wildland.

4. Volunteer firefighting organizations. The chief advantages of this type of organizations are its low initial

money outlay because it is composed of volunteers, with a low continuing money outlay needed only for year-round employees. The personnel involved in such an organization are very interested and usually fight all types of fires regardless of their training and equipment level. There are strong disadvantages to a volunteer firefighting organization in that generally they are not equipped nor specifically organized to fight forest fires or range fires. Their detection and communications network is inadequate or non-existent, and there is usually no definite boundary and the financing is at best variable and not at a level that will provide an emergency base. Although there have been many excellent performances by volunteer organization which may or may not always be present when needed. In addition, a volunteer organization is not always available for the longer period of time that is necessary to suppress wildland fires. This type of organization cannot be recognized by the Board of Forestry for assistance.

5. Self-protection system. If no system is available, the individual landowner is required by law to provide self-protection. There are no particular advantages to this type of system. However, some strong disadvantages should be considered. The first is that the financial base and training base cannot provide the detection nor the

communication or equipment that will provide an adequate force to handle one large fire. As a matter of fact, one bad fire can be disastrous financially to the individual attempting to furnish self-protection. Here again, self-protection cannot be recognized by the Forestry Board for additional assistance either in training, equipping or financing a disaster fire.

In summary, the system that will probably furnish the best, quickest, and most efficient protection for a new area not now receiving fire protection is the county-state rural fire protection system. This system requires the concurrence of the county commissioners and the Board of Forestry in a written agreement outlining the responsibilities of the county and the State regarding the protection system to be furnished.

Detailed assistance regarding any of the systems or any question concerning fire protection needs for any given area within the State can be obtained from the Office of State Forester in Missoula, Montana. Representatives of this office will be glad to meet with county commissioners or citizen groups of any nature to help plan and devise a system that will furnish the fire protection needed for any given area within the State.

DEVELOPING PROTECTION FOR MONTANA'S FORESTS
FROM PESTS, INSECTS AND DISEASE

The presence of insects and disease in Montana's forests is a never ending threat to destroy timber and to reduce tree growth. Each year the State suffers losses of timber resources from bark beetles, leaf eating insects, tree and root rots, leaf diseases, and parasitic mistletoes. Rodents, such as porcupines, mice and rabbits destroy and deform many forest trees and although they are not insects or diseases, are included in the list of forest pests.

Insects and disease are called the silent killers of our forests. During the summer of 1967, parasitic plants, like dwarf mistletoe, were active on 1,351,000 acres of Douglas-fir, 309,000 acres of lodgepole pine and 994,000 acres of western larch stands in Montana. Estimated growth losses caused by dwarf mistletoe during the year 1967 in Montana are: Douglas-fir, 12,714,000 cubic feet; lodgepole pine, 59,631,000 cubic feet; and western larch, 12,489,000 cubic feet.

Also in 1967 Montana lost an estimated 50,000 trees in the Clark Fork and Flathead River drainages to a single species of insect, the Ips bark beetle. This number of

trees would fully stock more than 100 acres of forest land.

During the fall of 1968 foresters in western Montana prepared salvage sales covering thousands of acres of spruce stands attacked by spruce bark beetles. Literally, millions of spruce trees were killed in this bark beetle epidemic. Foresters hope that the immediate sale of this dead timber will enable its being manufactured into useful products. Actually much of the beetle-killed timber will be rendered useless by natural forces before needed roads can be constructed and logging completed.

Losses from insects, diseases and other pests require annual volumes of timber to be harvested on a sustained basis to be changed. The true impact of an epidemic lasts for many years.

Annual detection surveys which assess forest insect and disease damage accurately are an aid to the control of forest pests. Leadership and cooperation for such surveys is furnished by public agencies and forest landowners cooperatively through Forest Pest Action Councils.

Such surveys indicate the action needed to keep forest pest damage within practical, economic limits. Special emphasis should be placed upon prompt detection of epidemic conditions and evaluation of potential damage

to forest stands through forest pests surveys.

Greatly expanded programs in forest and insect research, including development of safe and effective methods of using antibiotic, biologic, and chemical controls are needed.

Stimulation of public awareness of forest pest problems is needed to secure and maintain support for adequate programs.

Information and assistance related to the control of forest pests is available from the Office of Montana State Forester, 2705 Spurgin Road, Missoula, Montana 59801.

OWNERSHIP ADJUSTMENTS

From the time the Montana Territory was settled, land has been acquired in several different ways. For example, the railroads received certain lands to support the construction of railways. In other cases, lands were acquired by individuals through homesteading. Also, other lands were purchased from the government, and still other lands were received by the State of Montana for the support of public schools and other institutions. The remaining area of Montana was reserved by the Federal Government for national forests and for public domain.

This pattern of acquisition has resulted in intricate intermingling of ownership in many areas. This pattern of ownership has caused landowners and land managers many problems in making full use of the lands. These problems include access, fencing, trespass, economic management, and adequate protection. Travel to scattered tracts is no small problem in itself. In this situation full stewardship of all lands is not realized.

Over the years, the federal government and large landowners have undertaken programs of exchange and consolidation. Similar exchanges should be made by all classes of ownership

to provide better management units with resulting social and economic benefits.

Landowners should examine the pattern of their ownerships to determine where an adjustment could benefit the management unit. Where adjustments are indicated, the surrounding landowners should be contacted to explore the possibilities. Independent land appraisers are available to help negotiate valuations. Exchanges are possible with federal agencies and legislation exists to permit the exchange of State-owned lands. Where exchanges are proposed between federal, state or private owners, benefits and effects should be examined and supported where it appears to be in the best interest of the public.

TREE WINDBREAKS AND SHELTERBELTS

Field windbreaks, often called shelterbelts, have been planted in the Great Plains area of the United States in order to reduce soil erosion due to wind.

A wind barrier of living trees and shrubs can accomplish other purposes, too. Windbreaks can furnish protection to farmsteads and provide shelter for livestock and feed for wildlife. Since the original plantings made for protection from wind erosion, shelterbelts have been established with other purposes in mind, such as providing wildlife habitat, beautifying the surroundings, preventing the blowing of snow, protecting livestock, increasing yield of field crops, and also, satisfying the landowners like for trees.

An adequate farmstead windbreak not only beautifies the homestead but it increases the personal comfort of the farmer and his family both winter and summer. It reduces fuel requirements for heating the home and the other buildings. It can be located in such manner as to help keep snow from drifting into work areas and driveways. It benefits the garden and makes it possible to have an orchard when it would be difficult, if not impossible, without the shelter provided by a windbreak. All windbreaks, regardless of their purposes, will benefit wildlife of some kind by providing shelter and nesting areas and food.

Most windbreaks in Montana provide enough benefits to their owners to make them worth the additional work of maintaining a row or group of trees. However, some Montana farmers have witnessed certain detrimental effects of the trees.

Complaints may vary with individual farms. One landowner may complain of weeds catching in his shelterbelt. Another may complain that water yielded from the melting snow accumulated by the windbreak has caused soil erosion and gullyng. Other complaints have been that portions of fields are not available for early spring work because too much soil moisture holds late into the spring or that the row of trees itself saps more moisture from the adjacent crop ground every growing season than it saves.

More specifically, the beneficial side, farmers who have planted field shelterbelts have found that trees reduce the wind velocity and thereby help control soil drifting. Trees for livestock protection have proven beneficial by helping reduce feed requirements during the winter months. Livestock protection plantings also help keep stock from wandering away during blizzards, help keep newly born animals from freezing, and help make winter feeding much easier. Other benefits of field shelterbelts are a reduction of the blasting or firing of crops caused by hot southerly winds, less lodging of cereal crops, less shattering of ripened grain prior to harvest, modified air and soil temperature, a reduction of moisture lost through evaporation and transpiration within the crop, improvement in distribution of

snow and soil moisture, and better distribution of water in sprinkler irrigation.

Planting trees for rural recreation is a new field of activity and is divided logically into two categories:

- (1) Plantings to accomodate the traveling public, and
- (2) Plantings to accomodate needs of local residents, especially near population centers.

Plantings to accomodate the traveling public are receiving ever-increasing attention. The stimulus arises from at least three sources: (1) safety and convenience of travelers, (2) a growing conviction that our roads and roadsides should be beautiful, and (3) the profits to be obtained from tourists. Virtually every Plains State is pushing a program of recreation planting.

Landscaping is used along new interstate and other highways to break monotony and keep travelers alert. Frequent, attractively landscaped rest stops and wayside parks add to both comfort and safety. Demand is growing for overnight camping parks and picnicking spots along highways. Camping has increased 1100 percent since World War II.

Most of the influence of windbreaks start with reduction of windspeed. Wind is reduced for a distance of 5 to 10 "H's" (heights of the windbreak) upwind and up to 30 "H's" downwind from the windbreak.

The effectiveness of a windbreak depends in large measure upon its height, density, width, and shape. Height is a key characteristic. A windbreak that reduces wind acceptably for 25 times its height will bring an additional 25 feet of ground under protection for each added foot of height.

As a result of their fundamental influences on weather factors, field crops have been found to be benefited by windbreak shelter in many parts of the world. All the reasons for the benefits are not apparent. But the amount of benefit depends in part on the crop, the amount of windbreak protection, the latitude, and seasonal moisture. The benefits are greater during dry, hot, and windy seasons; less during wet, cool seasons. The best density of windbreaks for sheltering crops is not known.

Although much has been written on the effect of shelterbelts upon wind, soil moisture and crop yields, most of the research that has been done has been accomplished in areas other than Montana.

A crop yield study in the Great Plains of North Dakota, South Dakota, Nebraska, Kansas, Oklahoma and Texas was completed during the years 1935 to 1951. Results of that study showed that yields of small grains were favored by the presence of shelterbelts upon field crops. Montana shelterbelts are located in areas where shelterbelt research has been conducted.

Since the time of initiating shelterbelt establishment programs, improved farming methods have been enacted by many landowners enabling them to better protect their soil from wind erosion than was possible in the later 1920's and early 1930's. Studies have shown that depending upon the structure of the soil, adequate protection against wind erosion can be provided by farming methods such as: ridging, strip cropping and stubble mulching.

The Rural Area Development Forestry Committee feels that technicians should have a basis upon which to recommend certain species of windbreak trees and certain spacings of trees within and between rows in order to accomplish a specific purpose whether the job to be accomplished is to provide wildlife habitat, to increase crop yield, to protect homes, feed lots or other. In order to gather data on which to formulate the proper recommendations, field studies of existing windbreaks coupled with research projects to evaluate the effectiveness of various species of trees and shrubs at various spacings, applied to various shelterbelt uses, need to be undertaken.

The RAD Forestry Committee realizes the need for more study into the effects of field windbreaks and wishes to encourage the undertaking of such studies.

Shelterbelts or field windbreaks are economically sound investments if they increase the net returns from a farming or ranching enterprise, prevent deterioration of farm soils from wind erosion, or improve the outlook and wellbeing of people.

Many farmers and ranchers in Montana desire to plant trees more for the aesthetic effects than any other reason. Such plantings will most likely accomplish their intended purpose. However, when such landowners wish to also increase production of field crops and to accomplish this with little or no maintenance cost, technicians must have adequate knowledge to advise these landowners of the merit of the proposal.

The following are Agricultural Conservation Program practices available in Montana for establishment of shelterbelts and wildlife plants.

H-2. Renovation of existing shelterbelts, windbreaks, or stands of trees on farmland visible to the public. The purpose of this practice is to clean out dead trees and shrubs, or remove rows that are interfering with the development of more desirable species. Cost-sharing is also authorized for reinforcement plantings where these measures are needed to make the stand effectively serve its beautification-conservation purpose.

Elimination of sod competition by mechanical means will be approved where competition is seriously affecting tree vigor.

A-8. Establishment of a stand of trees or shrubs on farmland to prevent wind or water erosion. Prevention of wind or water erosion, on farmland is defined as the use of (a) windbreaks, (b) shelterbelts, (c) gully stabilization, and (d) stabilization of streambanks. The use of this practice should include considerations of enhancement to wildlife habitat.

G-1. Establishment of vegetative cover providing wildlife food plots and habitat. This practice is applicable only to farmland which is to be established in trees, shrubs, grasses, legumes, or other vegetative cover to provide food or habitat for wildlife.

H-1. Establishment of a stand of trees or shrubs for beautification-conservation purposes on farmland--the purpose of this practice is to prevent wind or water erosion and provide beautification and wildlife benefits on farmland area visible to the public. This practice includes plantings for windbreaks, shelterbelts, gully stabilization, stabilization of streambanks, to enhance wildlife habitat, elimination of unsightly areas, beautification of the countryside.

H-4. Establishment of trees and shrubs for prevention of erosion, wildlife cover, and beautification on old gravel pits, narrow pits, gold dredgings, or other odd rough unvegetated areas on farmland. The purpose of this practice is to prevent erosion, provide wildlife benefits and to beautify otherwise unsightly areas

on farmland.

The State Forester under the Clarke-McNary Act furnishes the landowner forest tree seedlings at moderate cost. Much of the expense of raising the trees is borne by the Federal and State Governments.

The trees can be used by the landowner to grow forest products and for windbreak plantings. They cannot be used for ornamental plantings.

Application forms and guidance can be secured through the State Forester, the local county extension agent, the county Agricultural Stabilization and Conservation (ASC) office, the Soil Conservation District, or the local publicly employed forester.

RESEARCH

Much research into forestry and forestry-related problems has been accomplished throughout the United States. Much is going on at the present time.

Montana has within its borders many forestry research organizations. Among these are:

The Forestry and Conservation Research Station
School of Forestry, University of Montana, Missoula.

The Intermountain Forest and Range Experiment
Station, U. S. Department of Agriculture, Ogden, Utah
with branches in Missoula.

University of Montana, Missoula, and Montana State
University, Bozeman.

The people representing the federal wildlife management agencies, the Soil Conservation Service, the Extension Service, the Fish and Game Department and the Office of Montana State Forester can easily and quickly assist the local RAD Committee to determine whether or not their particular problem has been researched in Montana, or anywhere else, and will be glad to help them secure the latest information.

EDUCATION

The School of Forestry, University of Montana, Missoula, is fully accredited by the Society of American Foresters and offers work leading to the bachelor, and master degree in forest management, forest engineering, wildlife management, and range management. Full information may be secured by writing the Dean of the School.

PROPOSED AGENCY AND LOCAL GROUP FORESTRY PROJECTS

It is suggested that local RAD committees set up sub-committees to study the extent of local project possibilities. These same committees can also determine tentative priorities for needed projects. The committees should determine, too, the ownership or agency responsible for each proposed project area. This information will influence the method of financing to be proposed.

The same, or another more specific, committee of local individuals should be given the responsibility for preparing the necessary detailed plans. Specific assignments should then be made to coordinate the actual work of carrying the project through to conclusion.

Representatives of agencies making up the local RAD committee should keep people in every committee. To these groups, representatives of other agencies, where appropriate, should be added, such as the State highway department, the county road department, the City streets and park department.

The third group to be considered for membership on the committee might be representatives of those more or less civic organizations, such as high school 4-H clubs, Future Farmers, Boy Scouts, local civic clubs (Lions, Kiwanis, Rotary, Jaycees), women's garden clubs--and there are many more.

It is suggested too, that each forestry project committee, in addition to others, should always include representatives of the County Agent, the Soil Conservation Service, the government land management agencies, the State Forestry Department, the State Fish and Game Department, and other agencies which can provide direct assistance. These people are also aware of many sources of additional outside help and advice.

PROPOSED PROJECTS

Before considering specific forestry projects for a given area we should briefly review all aspects of "forestry" to alert us to the many combinations which will become apparent. For example, a logging operation may be carried out with the thought in mind of providing big game cover for a number of years, of producing forage for domestic livestock for awhile, or providing winter trails for snowmobiles. Plantings might be used as windbreaks, as future sources of posts or poles, as screening and beautification.

Forestry of course is based on trees, and in our management of the forests, multiple-use will be our concern, and water, forage, wildlife, and recreation will be considered along with the direct benefits derived from trees. Such a review includes the following points.:

Trees: Hold soil, prevent soil erosion; slow surface

water runoff, assist ground storage of water;
produce wood and other forest products.

Water: Good watersheds provide pure water.

Irrigation--farms, ranches, orchards, gardens

Domestic water--drinking, cooking, laundry,
heating, lawns, swimming pools,
air conditioners

Stockwater--ponds, wells, springs, streams

Power--industry, farms, homes, hospitals, schools

Industrial water--manufacturing, air conditioning,
pollution control

Recreation--fishing, swimming, boating, canoeing

Forage: Plants hold soil, slow surface water runoff,
provide food for animals.

Wildlife--recreation, nature study, food, skins,
hides

Cattle--meat, hides, by-products

Sheep--meat, skins, wool, by-products

Horses--saddle, pleasure, ranch, packing

Wildlife: Provide pleasure for fishermen, hunters, camerabugs,
sight-seers

Fish--trout, whitefish, bass

Game animals--deer, elk, bear

Furbearers--mink, muskrat

Birds--game birds, waterfowl, songbirds

Recreation: Fun, rest and relaxation

Camping, picnicking, hunting, fishing, canoeing,
hiking, riding, climbing, packing, skiing
Resorts, organizations camps, summer homes
Conservation study, scientific study,
Natural beauty.

Special Products: Food, fuel, medicine, home beautification,
tourist trade, chemicals.

Special products--fruits, nuts, seeds, medicinal
products, chemicals
Christmas trees, Christmas greens and
decorations.

PLANTINGS

Plantings of forest trees are made to establish forest growth where none has ever existed, to re-establish or replace forest growth that has been removed by logging, overgrazing or fire, and to increase the number of stems per acre on a forest area which is under-producing.

Trees for many years have been planted in windbreaks to provide protection from the weather to farm homes and buildings, to stock feeding areas, and to crop producing fields. Planned series of windbreaks make up shelterbelts which actually change the climate--temperature and humidity--of the soil surface areas. Woodlots have been planted on many farms for the production of posts and poles.

Trees and shrubs are used in plantings to produce wildlife sanctuaries, to prevent both wind and water erosion, and for just plain beautification.

To provide the trees and shrubs for plantings of all kinds, seed sources and seed harvesting must be provided. This brings us to the consideration of nurseries for the production of needed planting stock.

County Survey:

A county committee might first survey the needs for

afforestation and reforestation projects. In making such a survey rely on the advice and counsel of trained foresters and botanists. In many areas, the absence of tall growth may indicate that reasons exist which make these areas unsuitable for the forest growth.

Afforestation, Reforestation and Interplanting:

Many areas exist throughout Montana in need of planting. These areas may be in public ownership, the ownership of large companies, or be owned as small parcels by private individuals.

First, a county committee would wish to identify the scope of planting needs by areas and ownership to determine the estimated proportions of a planting project, by ownership. The need for various species of seedling trees should be estimated. Then the source of the planting stock and planting equipment should be determined.

Tree planting offers a wonderful array of opportunities for local, community or county wide projects. Some projects can be developed to provide employment for a number of people for a month to six weeks in the spring of the year. Other projects could be used as sources of financing for the local 4-H, Future Farmer, Boy Scouts and similar groups. Some could simply be public service to permit individuals to

contribute something of themselves to the betterment of their community.

Interplanting is needed on many areas now supporting a stand of trees, but which are capable of supporting more. These areas should not be overlooked. So far as inventory, securing of planting stock and planting equipment, equipment and financing, can be handled in the same manner as reforestation projects.

In preparing planting projects, it is important that the committee planning planting projects contain at least one member acquainted with forestry as a science. Keep in mind that the tree planting season is rather short and that all projects planned should be of a size and nature which will permit completion within safe limits of the planting season to provide the best opportunity possible for the small trees to survive.

Windbreaks:

Windbreaks make good farms better. Many, many farms and ranches throughout Montana, both east and west of the Continental Divide, have need for more and bigger windbreaks.

Windbreak projects over the years have traditionally been encouraged by the County Extension Agents, personnel of the Soil Conservation Service, and Service Foresters of the State

Forestry Department, and the seedling trees have been supplied by the State Forester's Nursery.

A county committee could easily survey the needs for windbreaks in its county, set up a group to help plan suitable windbreaks for local farmsteads, arrange to order and plant the young windbreaks.

In some areas the windbreaks could be planned and layed out in such manner as to be an integral part of a shelterbelt system.

Another possibility exists in servicing windbreaks by pruning, cleaning, and doing the interplanting made necessary by death and damage to trees within the windbreaks.

Wildlife Sanctuaries:

These plantings are rather specialized in that they are made for the purpose of providing food and cover for wildlife. Many areas exist throughout the State which could benefit by these plantings. Interest already exists in the fish and game and wildlife clubs which throughout the State. This type project is a favorite for highschool biology teachers.

A committee made up to include representation from the local wildlife club, the biology teachers, as well as the local forestry and soil conservation people will receive much

encouragement for projects of this kind.

Erosion Control:

It is thought by many that the best form of erosion control is provided by growing plants--such as grass, brush, trees. In all communities areas of erosion exist and these should be corrected. A survey can easily determine the location and seriousness of these areas in order that a priority list might be made up.

Again, programs of planting for erosion control can be developed determined by ownership and the financing that can be arranged.

Beautification:

Unlimited possibilities for beautification plantings exist. Parks, recreation areas, rural picnic areas, highway interchanges, local schools, historic sites. Here, again, is an opportunity to involve representatives of almost all professions in local projects.

Seed Gathering:

The basis of all shrub and tree planting, with the exception of those made by using cuttings, is, of course seed. A satisfactory source of seed is a very important item to all nurseries producing planting stock to be used over wide areas. A survey of the local areas might reveal a

potential source of several varieties of seed in demand by nurseries. A second portion of the survey could reveal whether or not a demand exists which can be filled from local communities. If this should be true, the possibility exists for limited industry in the form of seed gathering.

Nurseries:

Having reviewed the above list of possible projects, all of which require nursery planting stock, it might be time for the county committee to investigate the need for a local nursery to produce the planting stock needed.

A nursery is a "long-time" and expensive investment. It must be able to produce stock that can be used in the area intended at the time of year it will be needed.

INTERMEDIATE CULTURE

Much of the most productive forest land is in small privately owned parcels. This type land has suffered most over the years from mistreatment. Nevertheless, it is expected that in the future our society will need all the wood these areas will be able to produce.

A given area is capable of producing only a given amount of cellulose over a given period of time. In order to have as much as possible of this cellulose produced in the usable portion of the tree--the trunk--thinnings of overstocked stands are carried out in order to place the same amount of wood on fewer stems. Prunings, or removing the limbs from trees, permits the stem to produce knot-free wood.

Many areas of over-stocked, stagnated, forest stands exist in Montana. A county-wide survey should be made to determine the location, the amount, and the ownerships of these forest stands.

The committee formed to study and determine the possibilities for intermediate culture treatments should also determine the methods by which such projects could be financed.

Although the supply of round wood from thinning operations far exceeds the demand for such material, forestry committees should be alert to the possibility of developing markets for

this material.

The ideal situation will exist when the material removed in thinning operations can be sold to finance the cost of thinning and pruning. For this reason, we will discuss the requirements of round wood projects at this point.

Round Wood Projects:

First, a study should be made to determine whether or not a market exists for "round wood" that might come from a thinning operation. Possibilities are: sawlogs, fuelwood, fence posts, fence rails, sign posts, telephone and power poles, flag poles, guard rails, bumper logs, bridge and building timbers, and possibly Christmas trees and greens. Each of these projects will require a certain amount of treatment between forest and market, and may be the basis for a small, or large, industrial undertaking. For example, fence posts will require peeling, seasoning, and treating to make them decay resistant.

If the area in need of intermediate cultural treatment is federally owned, any projects carried on will be federally financed.

For projects proposed on privately owned lands, at least partial financing is available through the Agricultural Stabilization Service. Soil Conservation Service, County

Extension Agents, and State Forestry Service Foresters are knowledgeable of these financial aid programs and should be members of any committee set up to study intermediate forest culture activities.

FOREST PRODUCTS MANUFACTURE

Granted, forest industries have searched the state over and over for sources of logs for their mills. As demands have grown, and sources of high quality timber has diminished, methods and equipment are constantly being developed to utilize the presently available forest material.

The establishment of facilities to produce primary lumber should be encouraged only after consultation with experts in markets, raw material procurement, logging procedures, manufacturing methods, transportation methods, and economics. A relatively large amount of capital will be required. Those in the County Committee with forestry and business backgrounds should be consulted to learn the sources of this expert information.

To serve as a beginning check list for possible items of primary manufacture, the following list is given:

Rough lumber: Railroad ties, mine ties and props, bridge timbers, stringer.

Construction lumber: Beams, boards, decking, dimension stock, forms, framing, joists, planks, sheathing, studs, sills.

Finished lumber: Casing, ceiling, flooring, lath, paneling, pickets, plywood, scaffolding, siding.

Remanufactured lumber: Boxes, crates, butcher blocks, cabinets, displays, door frames, door jambs, doors, flooring, furniture, millwork, mouldings, pallets, panels, painted signs, sporting goods, toy stock, trim, window frames.

Miscellaneous items: Fence pickets, planks, work benches, shingles, shakes, wood chips for pulp.

WHO MUST DO WHAT

Natural resources can rarely be dealt with as separate entities. The forest resource is no exception. Everything done within the forest influences the environment. In some cases the influence is detrimental; in other cases, beneficial.

The quality of our basic natural resources--air, water, soil--as well as the quantity and quality of our secondary, or renewable natural resources--forests, ranges, fish, wildlife--are profoundly affected by forest management practices.

Although the forestry profession was an early, and sometimes only, advocate of natural beauty, soil erosion prevention, proper grazing practices, abundant wildlife habitat, clear streams, and vigorous forests, much attention presently is being paid the other side of the coin. Some forestry practices have had adverse affects on soil stability and stream purity. Burning forest slash to reduce fire hazards and prepare proper seed beds for forest regeneration has brought on storms protesting air pollution. Modern forest harvest practices, new forms of forest pest control, have not always produced their good results by methods altogether acceptable by a watchful public.

Quality of life in the future will depend on how well and how soon we learn to manage our natural resource-use not only wisely, but in conformity with environmental demands. It will depend upon how well our educational systems can probe the relationships of natural resources to environmental management, and how clearly this knowledge can be imparted to the public.

So, emphasis on single resource management must give way to the ecological approach. In order not to destroy his environment, man must decide to save it. Decisions pertaining to natural resource use and management should be made carefully in a democratic way with full exploration of the alternatives. Integrated planning is vital.

Members of the whole community will become involved in the decision making and the planning necessary to reduce air, land, and water pollution and landscape destruction, while at the same time making full use of the natural resources. Therefore, natural resource education will deal with entire communities.

National studies have shown that, nationally, competencies needed for an effective natural resource development program vary from "little to none" to "little to sufficient."

The areas in which competencies are "little to sufficient"

are: Agronomy, Public Affairs, Recreation, Biology, Entomology, Ornamental Horticulture, Sociology, Forest Management, Planning, Soil Management, Plant Pathology, Educational Methodology, Institutional Management, Engineering (Agriculture), Wildlife Management.

The areas in which competencies are "little to none" are: Engineering (Civil), Law, Air Management, Meteorology, Fisheries, Geology, Urban Conservation, Economics, Transportation, Political Science, Water Management, Landscape Planning, and Public Administration.

Areas in need of immediate strengthening are: Engineering (Environmental), Marketing, Regional Resource Planning, Business Management, Ecology, Hydrology, Waste Utilization and Disposal, Pollution--air, land and water.

As more educational and action programs in natural resource management are made available to communities, fewer resource allocation mistakes should be added to those made in the past.

In part, the need for such educational and action programs is based on the assumptions:

1. That an informed public should assist in the development of policies and action programs which relate to natural resource use and development.

2. That the wants and values of individuals and groups at the local level should combine across the state to form a composite which reflects the will of the people.
3. That the basic strength and wisdom of any democratic process depends on informed individuals and groups dedicated to goals consistent with the best interests of the state.
4. That the essence of democratic philosophy is to keep the decision-making initiative dispersed throughout the state's communities.
5. That the public wants to understand and participate in natural resource policy decisions.
6. That many people and groups of people who are now involved in making decisions and implementing action programs would like to be better informed. All natural resource management agencies are operating scientifically based programs with which people should be acquainted.

This job of providing educational and action programs stressing the ecological relationship of natural resources and the environmental consequences when alternative uses are made of them is one which will involve all agencies with responsibilities in natural and human resource management.

In such programs, specified areas of the educational and action portions need relate to:

1. Natural resources and their importance and their relationship to man's environment. (University of Montana System--geographers, botanists, foresters)
2. Needs for natural resources and their products--situation and outlook. (University of Montana System--economists, manufacturers, producers, natural resource management agencies)
3. Public natural resource programs--policies and regulations. (State and Federal Natural Resource Management Agencies--State Forester, State Fish and Game Department, State Land Commission, U. S. Forest Service, Bureau of Land Management, State and Federal Natural Resource Management Assistance Agencies--Soil and Water Conservation Districts, U. S. Soil Conservation Service, Agricultural Conservation Program, Federal Land Bank)
4. Maintenance and development of natural resources. Research divisions of State and Federal Natural Resource Management Agencies, University.
5. Prevention and control of pollution. (State and County Health Departments; producers; manufacturers)
6. Protection against natural and man-made hazards, such as fire and flood. (State and Federal Forestry

- agencies, Rural Fire departments, National Guard)
7. Development and management of natural resources for economic growth and aesthetic values. (State and Federal Natural Resource Management Agencies; State Highway Department; Park Division of the Fish and Game Department; State Planning Board)
 8. Tools available for resource development--programs, funds, technical assistance. (Extension Service; University Systems; State and Federal Natural Resource Management Agencies; State and Federal Natural Resource Management Assistance Agencies)
 9. Planning and action process--community resource development, including analysis of situation, establishment of goals, selection of alternatives, implementation of a program. (RAD and TAP Committees)

