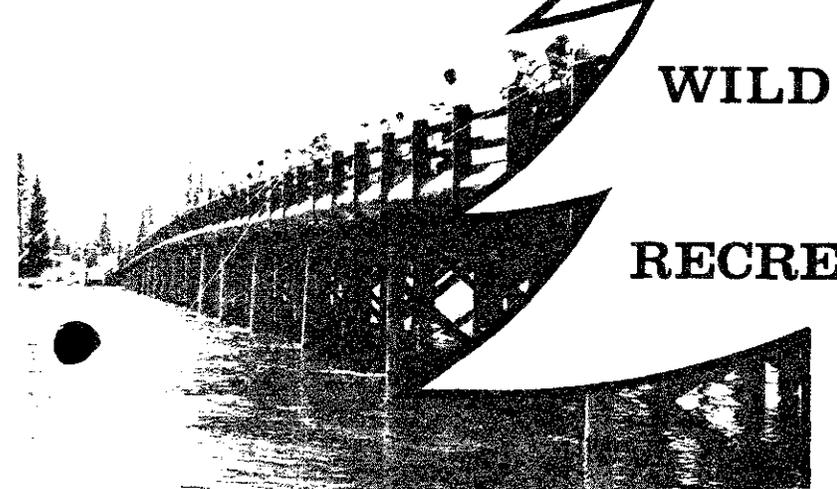
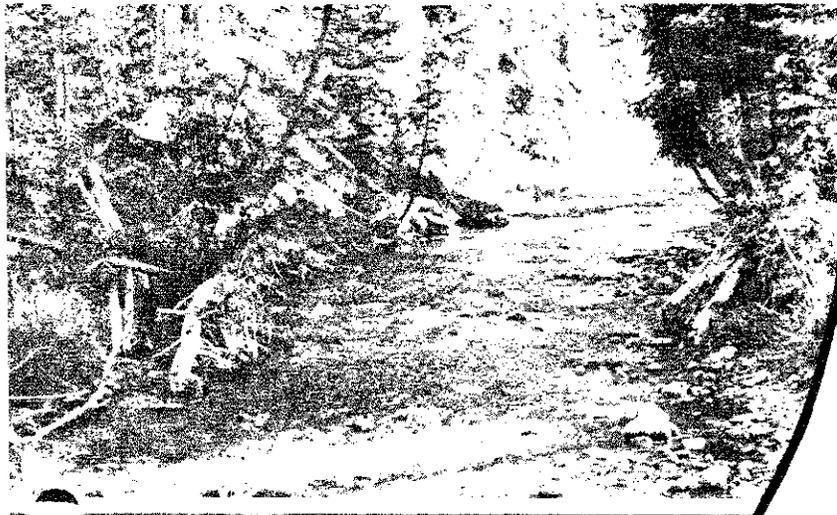
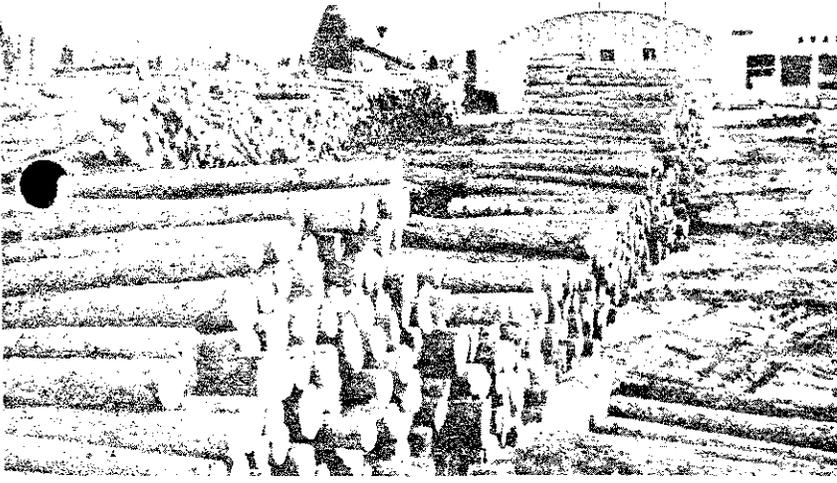


U. S. Forest Service
Resource Bulletin INT-2
1963

The Forests of Wyoming



WOOD

WATER

FORAGE

WILD LIFE

RECREATION

THE AUTHOR

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THE FORESTS OF WYOMING

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FOREST SERVICE — U. S. DEPARTMENT OF AGRICULTURE

FOREWORD

This report is based on the first comprehensive survey of Wyoming's forest resources. The survey was conducted as part of the continuing nationwide Forest Survey. Fieldwork started in 1957 and was completed in 1960.

Wyoming includes parts of two Regions of the U.S. Forest Service. The area to the east of the Continental Divide is in the Rocky Mountain Region with headquarters at Denver, Colorado; the area to the west is in the Intermountain Region with headquarters at Ogden, Utah. The two Regions cooperated with the Intermountain Forest and Range Experiment Station and the Rocky Mountain Forest and Range Experiment Station in field sampling, mapping, and compilation.

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SIGNIFICANT FINDINGS¹

FOREST AREA

- The forest area is 9.8 million acres or 15.7 percent of the area of all land in the State.
- The commercial forest area is 4.9 million acres or 50 percent of the total forest land.
- Lodgepole pine is the principal type and covers 37 percent of the commercial forest.
- Sawtimber stands occupy 60 percent of the commercial forest.
- The public owns 82 percent of the commercial forest area, and the National Forests administer 69 percent.

TIMBER VOLUME

- There are 22.6 billion board feet² of sawtimber of which more than one-third is spruce and one-fourth is lodgepole pine.
- Eighty-four percent of the sawtimber volume is on National Forest lands.

STAND CONDITIONS

- Most sawtimber stands and many pole-timber stands are overmature and are adding little net growth.
- Insects and diseases account for two-thirds of the annual mortality.

¹This survey indicates that Wyoming has 1.4 times more commercial forest area and 1.9 times more live sawtimber volume than was reported for 1952 by "Timber Resources for America's Future." Actual changes in forest stand conditions in that period were probably minor. The most recent figures are based on a complete survey, whereas the previous estimates were not. Also, because of changed

TIMBER USE

- The output of timber products in 1962 was 7 percent greater than 1957.
- Ninety-four percent of the primary timber products cut in 1962 was saw logs for lumber. Wyoming lumber output for that year was 116.5 million board feet.³
- About 80 percent of the 1962 saw log output was east of the Continental Divide.
- In 1962 Wyoming's timber cut amounted to only 0.29 percent of the State's inventory of sound live trees. This cutting rate is less than one-half the rate for the entire Mountain State area.

WATER, RECREATION, AND GRAZING

- Competition is increasing rapidly for Wyoming water, both inside and outside the State. Only one-sixth of the runoff is used in Wyoming.
- Outdoor recreation has increased much more than any other forest use since 1946. On Wyoming National Forests, the increase was almost tenfold or a much more rapid rate than for the Nation or for the Mountain States as a whole.
- Since World War II, cattle grazing on National Forests has remained stable, but sheep grazing has declined by almost one-third.

utilization standards, a large area formerly classed as unproductive is now considered to be productive and is classified as commercial forest.

²International 1/4-inch log rule board-foot volumes are used throughout this report unless otherwise stated.

³Preliminary estimate.

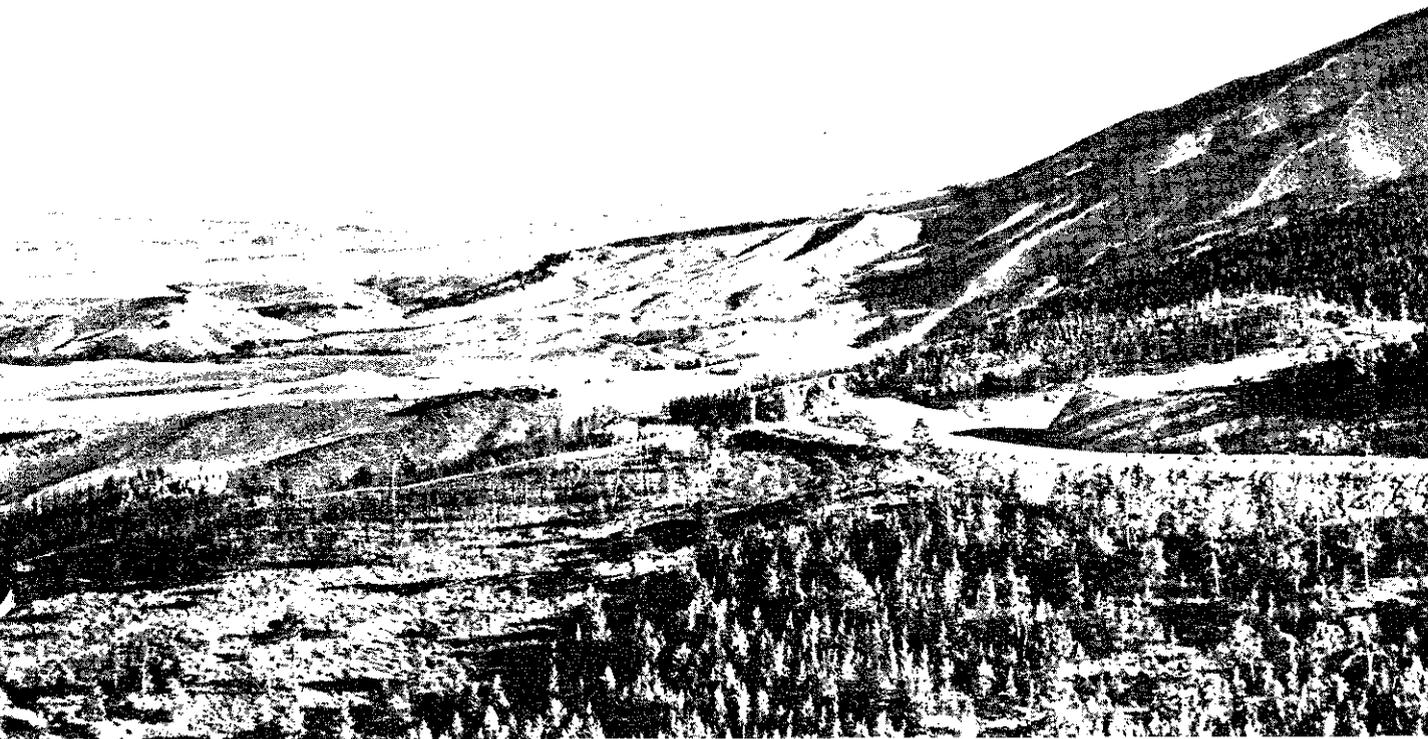
FORESTS WITH MANY VALUES

Only about 16 percent of the State of Wyoming is forest land. Nevertheless, this forest area of 9.8 million acres produces timber, water, recreation, and grazing that are very important to the State and the Nation. Some of these products or uses have been important for a long time. However, recreation is only beginning to come into its own. The grazing load is about all the forests can support at the present time, but there is a great opportunity to expand the other uses. In considering the timber resource under present and future conditions of forest management, timber use cannot be considered apart from the demands on the forest for water, recreation, and grazing. Few acres, if any, can be managed for one use alone. For this reason the demands of water, recreation, and grazing uses are discussed in addition to the timber resource — the principal topic of this report.

Timber use developed early but has been erratic

Wyoming, although not a stopping point in the original westward trek of the American lumber industry, did provide vast numbers of the railroad ties that facilitated the movement of the lumber industry from the Lake States to the Pacific Northwest. Extensive areas of lodgepole pine suitable for ties were a boon

Forested slopes of the Big Horn National Forest rising from the treeless plains west of Sheridan. Wyoming's commercial forests are largely on mountain slopes and lie between 7,000 and 10,000 feet in elevation, but in the Black Hills they come down to about 4,000 feet. Forest land below or above these elevations is of little commercial value for timber production, but most of it is very important for watershed protection, wildlife, and grazing.



to the Union Pacific Railway in its construction of the first transcontinental railroad through Wyoming in 1867-69. During the next several decades as railroads fanned out through the West, "tie hacks" hewed millions of ties from Wyoming trees. During this period timber cut in Wyoming reached a peak that was not exceeded until the late 1950's. The tie hack with his broadax finally gave way to the greater efficiency of sawmills. This did not occur rapidly. Even as late as 1927, most of the ties were hand hewed at Fox Park and other big tie operations.

Many sawmills were built in Wyoming shortly after 1900. However, lumbering has never been a stable enterprise and the number of plants has fluctuated widely over the years. For example, saws were singing in 88 Wyoming mills in 1909, but the number of active plants declined to 41 by 1920. There were 194 active sawmills in 1948, but once again difficult times for many mills whittled the total to about 76 in 1962. During this period, boards and dimension lumber gradually assumed more importance as sawmill products. In some areas, however, ties remained the principal sawmill product until the early 1950's.

Roundwood products — mine timbers, poles, and posts — have been cut in vast numbers from Wyoming's straight pole-size trees. Now, however, they make up only a little more than 5 percent of the total timber output as shown by the following estimate for 1962:

Output of Timber Products

Thousand cubic feet

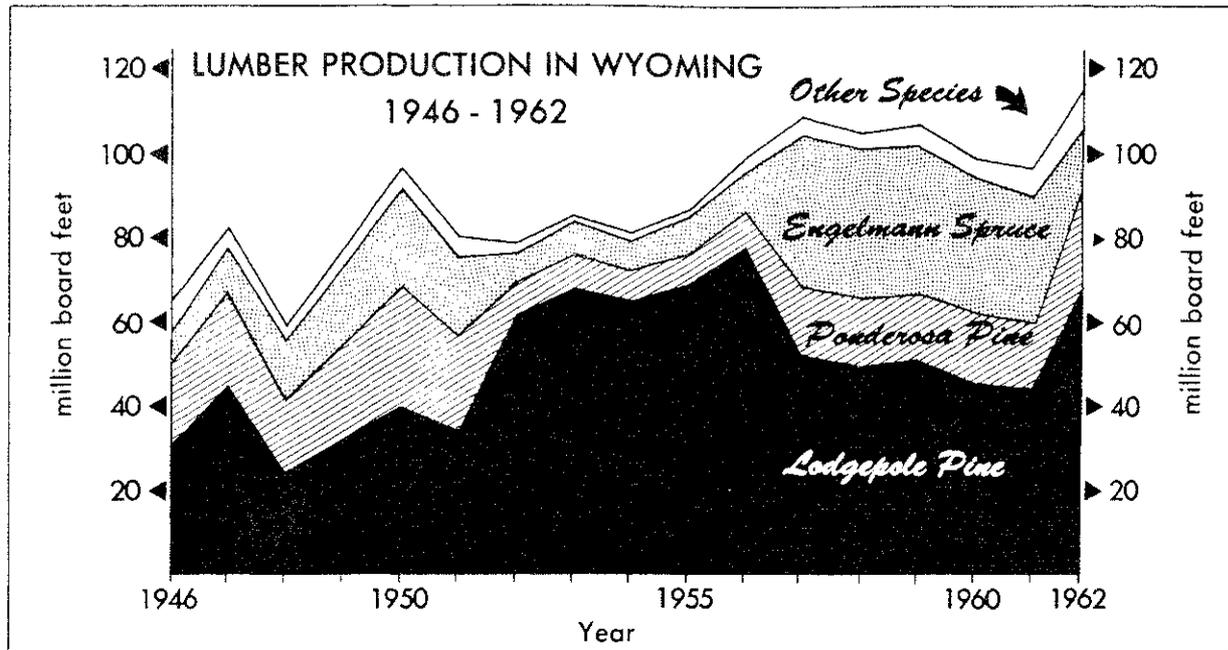
Saw logs	19,617
Posts and poles	79
Mine timbers ¹	54
Pulpwood (round)	464
Miscellaneous farm timbers	409
Fuelwood ¹	109
Miscellaneous industrial wood	32

Total **20,764**

¹Mostly from dead timber.



A "tie hack" hewing a railroad tie from lodgepole pine on the Medicine Bow National Forest, in about 1927. This was near the end of a romantic era during which millions of ties were carved from the timber by the broadaxes of husky snoose-chewing tie hacks—2.3 million were hewed in 1899 alone. In the early days great numbers of ties were floated down the Green River, North Platte River, Wind River, and other waterways. Treating plants have operated for many years at Riverton and Laramie.



The output of timber products has been rising as is shown by data available for three postwar years:

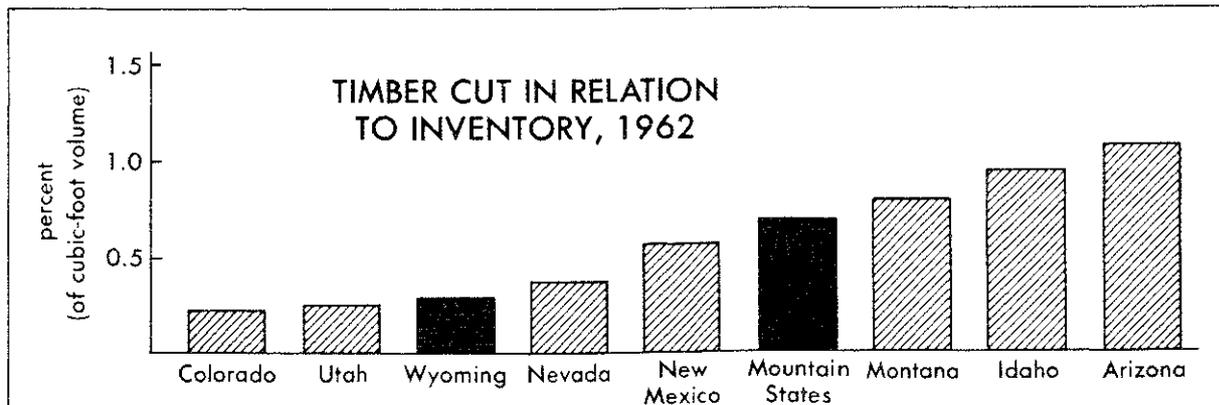
Year	Thousand cubic feet
1952	17,966
1957	19,388
1962	20,764

Preliminary estimates for 1962 show a lumber production of 116.5 million board feet, or an increase of about 7 percent over 1957.

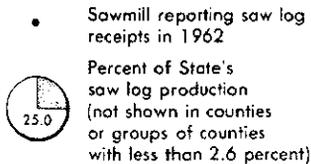
About one-half of the lumber that has been sawed from Wyoming's forests has come from

lodgepole pine. Prior to 1912, ponderosa pine was the principal species used by sawmills. However, lodgepole pine moved into the lead about that time and has subsequently been the leading species for lumber. Trends in lumber production among species since 1946 are shown graphically above. The distribution by species in 1962 is as follows:

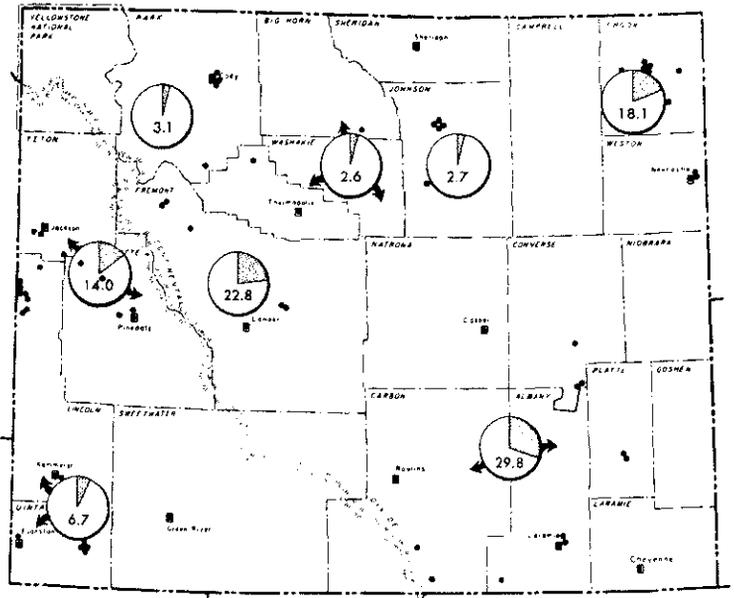
	Percent
Lodgepole pine	58.4
Ponderosa pine	19.0
Engelmann spruce	15.2
Douglas-fir	4.7
Other species	2.7



WYOMING SAWMILLS AND PERCENTAGE OF SAW LOG PRODUCTION BY COUNTY — 1962



In addition to the 56 mills shown on the map, there was an estimated 20 active mills for which saw log receipts were not reported in the 1962 timber products survey.

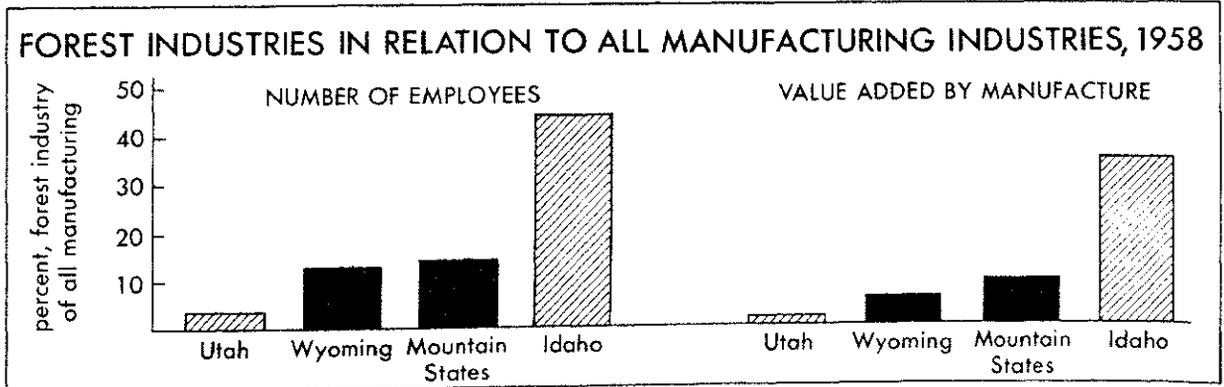


The percent of the inventory harvested annually serves as a rough measure for comparing the development of timber use in Wyoming with that in other Mountain States. Wyoming ranks among the lowest of the eight states (see the chart on page 3). In 1962 only 0.29 percent of the cubic volume of timber in Wyoming was logged. This is less than half the rate of cutting in the Mountain States as a whole. Utilization has been uneven, however. Although most of the forest is being logged at considerably below the sustained yield rate, parts of the eastern end of the State, particularly the forests of the Black Hills, are as intensively managed and utilized as any other areas of comparable size in the West. Advantages in accessibility and transportation costs to midwest markets are re-

flected in the fact that with only about 57 percent of the State's inventory, the area east of the Continental Divide accounts for about four-fifths of the saw log cut.

Although Wyoming's forest industry is not large, it is nevertheless very significant in the State's manufacturing economy. Data for 1958 show that about 27 percent of Wyoming's manufacturing establishments, and one out of eight manufacturing workers are engaged in harvesting timber, or processing it in primary or selected secondary industries (12).¹ About 7.4 percent of the value added to materials by manufacturers is attributable to forest industries.

¹*Italicized numbers in parentheses indicate numbered references on page 24.*



Source: U. S. Bureau of the Census

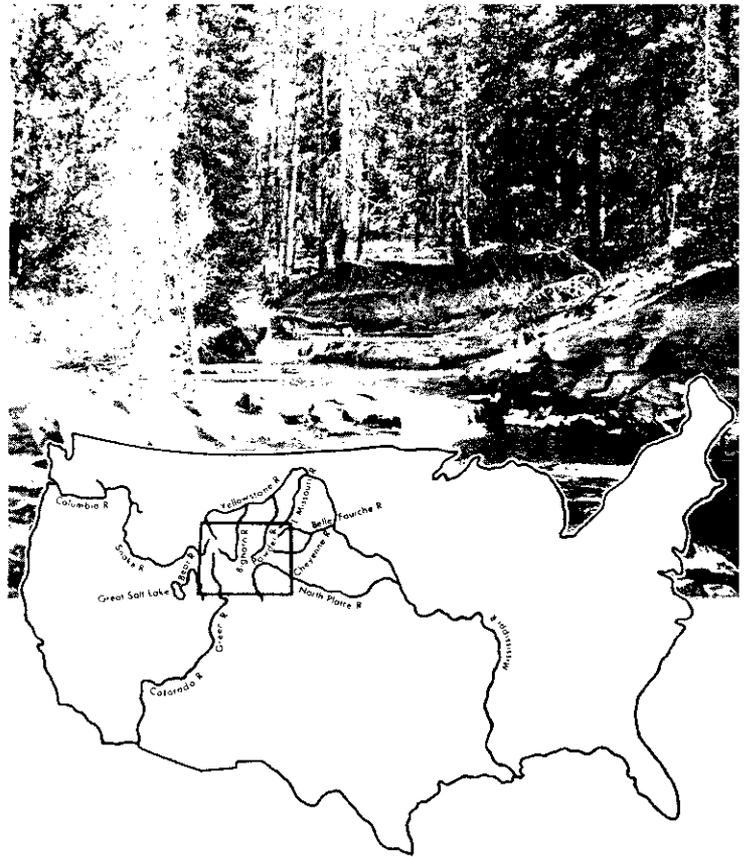
Although the present development of Wyoming's timber industry is not outstanding either in relation to that of other states or in comparison with other forest uses within Wyoming, it can be greatly enlarged. There is a potential not only for immediate expansion of the cut, but a more important potential for long-term, sustained production and consequent continuing economic benefit to the State. First, however, a number of important problems must be solved. These will be discussed later in this report.

Wyoming water is widely distributed

The statement by a member of the Wyoming Natural Resources Board (17), "Water is the key to the present and future development of our State," supports the opinion held by many that water is the most important product of Wyoming's forests. This follows from the fact that lands classified as predominantly forest produce substantially more than one-half the State's annual water runoff. Forests and other lands within the National Forests comprise less than 15 percent of the area of the State but produce about 54 percent of the runoff (8).

The importance of Wyoming's forests for water production has been recognized since early settlement. Watershed protection was a principal reason for creating the Yellowstone Park Timberland Reserve (later the Shoshone National Forest) in 1891, thus marking the start of the National Forest system. The other eight National Forests, lying wholly or partly within Wyoming, were established by 1908. For the most part, they are on the mountains and therefore in the area of greatest precipitation.

Water from Wyoming's forest land is very widely distributed within the United States — probably more widely than the water runoff from any other state. Of the annual runoff of about 15 million acre feet, only about 2.5 million is currently being consumed within the State (16). As shown in the map on this page, the five-sixths of the runoff that



Wyoming water flows to many parts of the United States. Streams, such as Brooks Lake Creek (above) on the Shoshone National Forest, supply water to rivers serving such widely separated places as Portland, Los Angeles, New Orleans, and northern Utah.

leaves Wyoming flows into four major river basins. About 75 percent of the State is in the Missouri River system, 18 percent in Colorado River drainage, 5 percent in the headwaters of the Columbia River, and about 2 percent of the area feeds the Bear River and ultimately Great Salt Lake.

The 12.5 million acre feet of water that annually flow across Wyoming's borders are important to many downstream localities. This water will become even more valuable as the years go by as indicated by the forecast that national water use will increase about 47 percent in the 15-year period 1960-75 (10). The North Platte River, which drains much of southeastern Wyoming, is one of the most completely regulated streams in the United States. This river is highly important for irrigation and other uses, not only in Wyoming but in Nebraska and other downstream states. And there is already a particularly hot scramble among downstream states for water of the Colorado River.

Within Wyoming, the principal consumptive use of water is for irrigation. About 1.5 million acres of farmland is irrigated, and of the cropland harvested in 1959, about two-thirds was irrigated (11). Within recent years demands for water have been increasing significantly for domestic, livestock, and industrial uses. Greater demands are also being made for water for outdoor recreation. These include the creation or maintenance of waterways for fish, wildlife, and boating, and the dilution of polluted streams (7).

To satisfy these varied and increasing demands, many water storage and distribution developments are planned or underway. It is anticipated that these developments will increase the State's consumption of water from 2.5 to about 4 million acre feet a year (16).

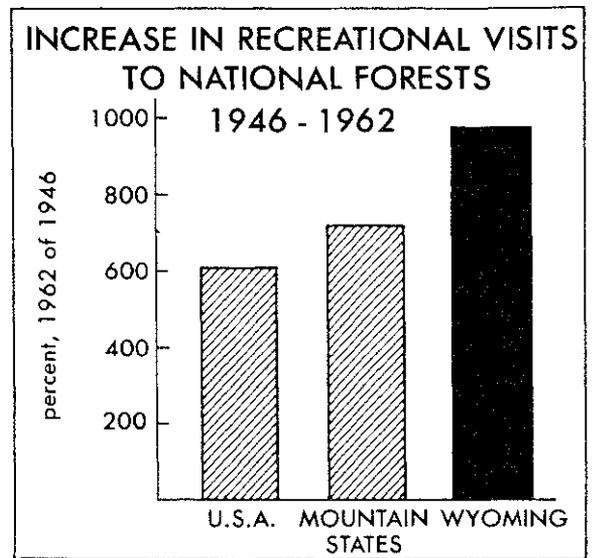
Recreation is booming

No state offers a bigger package of attractions for forest recreation than Wyoming. In addition to some of the most magnificent

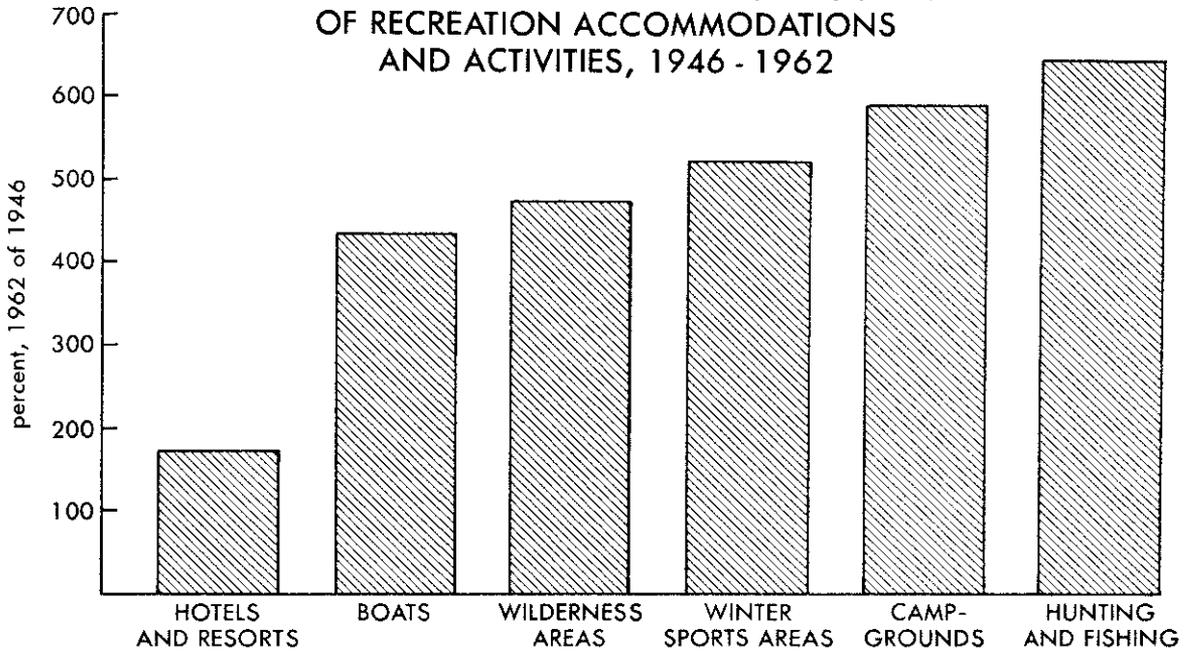
Dude pack train crossing the Thorofare Creek in the Thorofare country of the Teton National Forest. This is in the heart of big game hunting country. Wyoming's forests and water have long provided many opportunities for private enterprise based on recreation.

scenery in the country, opportunities for camping, trail riding, hiking, boating, hunting, and fishing have all contributed to recreation's surging development in recent years.

Interest in Wyoming's recreation potential, however, is by no means entirely recent. Yellowstone National Park was established in 1872 as the first major area in the country set aside for the preservation of natural resources. It is an interesting sidelight that recreation and scenery rather than more utilitarian values, inspired this first reservation. For



INCREASED USE OF SELECTED CATEGORIES OF RECREATION ACCOMMODATIONS AND ACTIVITIES, 1946 - 1962



much the same reason, Devil's Tower became the country's first national monument in 1906.

Wyoming's forests are rapidly becoming more accessible for recreation. Before World War II, remoteness from the big centers of population was a major factor limiting recreational use. Now with the country's rapidly expanding population and the average citizen's greater mobility, more leisure time, and larger disposable income, Wyoming's forests have in effect become the backyard of Americans from coast to coast. In fact, there are indications of an even greater increase in recreation uses of the forests in Wyoming than in the Nation and in the Mountain States as a whole. The preceding chart shows the extent of change on National Forests between 1946 and 1962.

The postwar increase in the popularity of forest recreation has been felt by all public agencies and private enterprises concerned with furnishing facilities and services. These include various agencies of the State of Wyoming, the National Park Service, the Forest

Service, the Bureau of Land Management, and private enterprises such as dude ranches, hotels, resorts, and others. The general increase in various types of use is indicated in the chart shown above, which is based largely on National Forest statistics.

Remoteness, which once delayed development, is now an important attraction in its own right. Wyoming's National Parks and wilderness areas of the National Forests provide assurance that there will be some relatively uncrowded areas in the future. Wyoming has 2.6 million acres of wilderness-type areas, or more than any other state except Idaho. In addition to this, Yellowstone and Grand Teton National Parks include 2.3 million acres that, except for a small strip along the highways, is wilderness too.

The National Parks and the National Forests are heavily used for a variety of forms of recreation. In 1962, for example, Yellowstone Park had 1.9 million visitors and Grand Teton Park 1.8 million. National Forests measure their recreation use in visits rather than visitors. The nine National Forests,

wholly or partly in Wyoming, had 3.9 million recreation visits in 1962, classified as shown below:

Campgrounds	432,200
Picnic areas	406,400
Winter sports	94,200
Organization camps	19,100
Hotels or resorts	221,900
Recreation residences	40,300
Wilderness areas	45,800
Other forest areas	2,650,200
Total	3,910,100

Of the visits to "other forest areas" listed above, 715,000 were by hunters and fishermen. Between 1946 and 1962 the estimated kill of big game on the National Forests of Wyoming increased from 17,000 to 53,000.

Bull moose in the Yellowstone River. Moose, as well as other species of big game, attract many hunters to Wyoming's forests. In 1961, hunters harvested 776 moose—a big take in comparison with other states. Hunter harvest of other big game was: elk, 11,422; black and grizzly bear, 437; deer, 84,677; antelope, 34,873; bighorn sheep, 88.

Big game is one of the major attractions for sightseeing as well as hunting. Deer, elk, moose, black and grizzly bear, bighorn sheep, and other important game species provide annual sport for many hunters. The country's largest elk herd winters at Jackson Hole. Maintaining forage production and soil stability on the ranges used by these elk and coordinating their use with other uses of the forest lands are important problems.

Wyoming provides some of the country's most diversified and high quality inland sport fishing. The State has a number of species of trout; cutthroat is native, and eastern brook, rainbow, brown, mackinaw, and California golden have been introduced. The National Forests alone have about 4,300 miles of fishing streams and about 46,400 acres of fishing lakes. Big areas of water impoundment outside the National Forest, such as Flaming Gorge Reservoir, add substantially to the State's fishing resource.

Since World War II the expanding recreation activity has become an increasingly important competitor for public land. This competition has required development of guides covering priority of use for most of the public forest outside the National Parks. For example, on the lower slopes, grazing allotments must be coordinated with the winter forage requirements of wildlife. And on the



middle slopes, timber management must consider scenic values, campgrounds, and other recreation uses, particularly along roads and waterways.

Grazing reached an early peak

Wyoming's extensive areas of wild-land forage are a highly important factor in the State's big production of sheep and cattle. In 1959, about 9 percent of the cattle and 15 percent of the sheep grazed on National Forest lands. Much additional range was provided by woodland areas outside the National Forests.

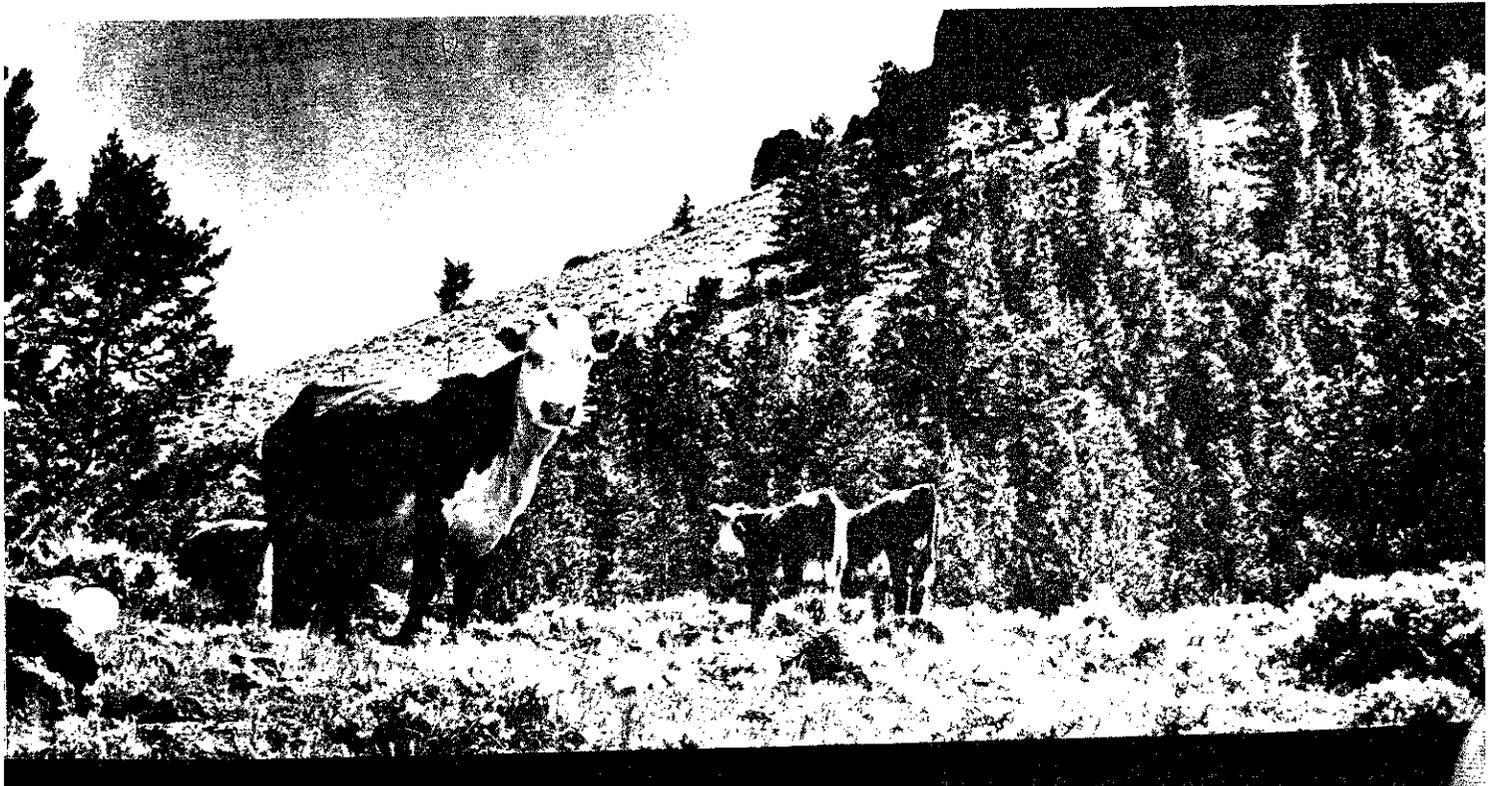
Sheep and cattle have ranged Wyoming's mountain slopes for many decades. The forage on these wild lands has made a substantial contribution to the economy of the State. In fact, grass and other forage have been most heavily used of all the wild land resources. National Forest statistics, which probably reflect the trend in use of the entire range, show

White-faced Hereford cattle on summer range at about 7,500 feet in elevation on Shoshone National Forest west of Cody. In 1961, the National Forests were grazed by about 114,000 head of cattle and horses and 334,000 sheep.

that a peak for cattle was reached in 1921. After a sharp drop between 1921 and 1924, the number of cattle has subsequently remained fairly stable. Sheep, on the other hand, have now dropped in number to about 44 percent of the level during World War I. Since World War II the decline has been about one-third.

Most livestock grazing is on parks and grassland and brush openings found intermingled with the commercial forests, rather than in the commercial forests themselves. However, some commercial forests are grazed. The principal grazed areas are grasslands, sagebrush, aspen, and noncommercial ponderosa pine stands found typically in valley bottoms, lower slopes, and at the forest fringes. Alpine and subalpine ranges found at or above the upper timberline are grazed in some areas by cattle but most extensively by sheep.

As demands for forage have increased in recent years, range management has intensified. Sagebrush control with herbicides has become a widespread practice and has resulted in large increases in forage production. Improved management practices, such as rotation and deferred grazing, are now being used in some sections to improve range conditions and increase forage and livestock production.

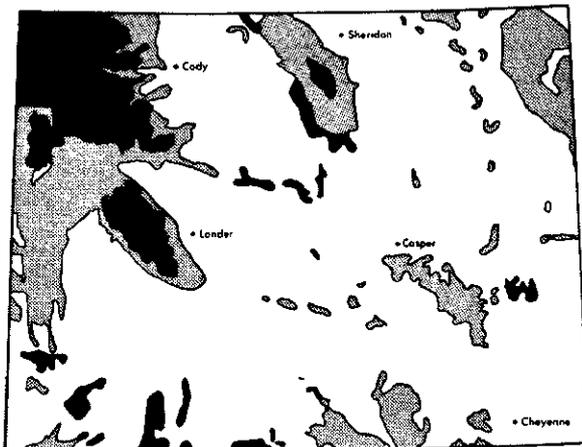


FOREST CONDITIONS

The forest area is dispersed

Wyoming has four principal timbered areas, all lying on well-defined mountain formations. The largest straddles the Continental Divide in the northwestern part of the State. The others are in the Big Horn Mountains, the Bear Lodge Mountains of the Black Hills, and the Laramie, Medicine Bow, and Park Ranges near the southeastern corner of the State. Scattered among these four blocks are a number of islands of forest on isolated ridges and peaks within the Wyoming Basin and the Great Plains.

The ponderosa pine forests of the Black Hills occur above 4,000 feet in elevation. However, the lower limit of most of the rest of Wyoming's forest is considerably higher than that. More than 90 percent of the commercial forest grows in a band between 7,000 and 10,000 feet above sea level.



	million acres
commercial forest	4.9
noncommercial forest	4.9
total forest	9.8

About one-half of the forest area is classed as commercial. This is land capable of producing usable timber and not reserved from industrial use because it is in National Parks, National Forest wilderness areas, or other public recreation areas. There is a degree of optimism in the commercial classification as it includes many areas on steep slopes and unstable soils that cannot be logged at present without causing erosion and impairment of the productive and hydrologic functions of watersheds. National Forests are generally withholding these areas from timber harvest pending the development of suitable logging equipment and techniques.

Almost two-thirds of the noncommercial forest is so classified because it is reserved, although, as the following tabulation shows, part of the reserved area is also nonproductive:

	<i>Million acres</i>
Reserved-productive	2.6
Reserved-unproductive	.5
Unreserved-unproductive	1.8
	4.9
Total	4.9

The productive area of about 2.6 million acres occurs mainly at midelevations and includes about 1.5 million acres of lodgepole pine stands in the National Parks.

Unproductive forest occurs at all elevations. About half the 1.8 million acres of unreserved-unproductive area is either just below timberline or in patches on steep, thin-soil slopes within the commercial forest; the other half is below the commercial forest.

The commercial forest is mostly overmature but there are few large trees

Present timber stands in Wyoming contain many old-growth trees. Three out of every five acres support a sawtimber stand and a high proportion of the timber is overmature. Of the 2.9 million acres of sawtimber, however, only 15,000 acres is classed as large sawtimber — 21 inches and larger. Furthermore, a great many stands become mature before ever reaching sawtimber size.



Noncommercial forests. Stands of juniper, chaparral, and scrubby aspen occur under the dry conditions below the commercial forest. These lands comprise about 43 percent of the unproductive forest area. The photo above shows a stand of juniper south of Kemmerer. At high elevations the noncommercial forest consists mostly of poorly developed fir, spruce and limber, whitebark, and lodgepole pines. Despite adequate rainfall, growing conditions

are poor because of other adverse climatic and physiographic conditions. The photo below shows this type of forest as seen from the Skyline Drive near Fremont Lake on the Bridger National Forest. In addition to the noncommercial forest at low and high elevations, such as shown here, there are many islands within the commercial forest at mid-elevations.





Lodgepole pine small sawtimber on the Medicine Bow National Forest. Lodgepole pine grows on more acres than any other species in Wyoming. As a timber type it occupies 1.8 million acres or more than one-third of the commercial forest. It is also an important component of several other timber types. Over extensive areas the species has come in following fires and as a result occupies land that could be growing other species. Many stands are far too dense and competition results in small trees throughout the life of the stand. Almost one-half the area of the type is in sawtimber stands. Most of these stands and many of the poletimber stands are overmature. Over the years, lodgepole pine has almost always provided the major portion of the timber cut for all products in the State. Since 1909 an estimated 1½ billion board feet of lumber products have been sawed from lodgepole pine in Wyoming.

In general, Wyoming sawtimber trees are not greatly different in present average diameter and volume from those found further north or further south. However, as shown in the tabulations below, there are differences when an individual species is compared from one area to another. These differences result from the effect of a number of factors — soil, climate, stand age, density of stocking, diseases, and so forth.

Average diameter of sawtimber trees

	<i>Western Montana</i>	<i>Wyo- ming</i>	<i>Colo- rado</i>
Lodgepole pine	13.1	13.8	13.5
Engelmann spruce	18.1	16.7	15.7
Douglas-fir	16.2	16.7	15.7
Ponderosa pine	17.8	14.5	15.4

Average net volume per sawtimber tree

	<i>Western Montana</i>	<i>Wyo- ming</i>	<i>Colo- rado</i>
	<i>Board feet</i>		
Lodgepole pine	129	139	128
Engelmann spruce	368	240	209
Douglas-fir	165	169	131
Ponderosa pine	223	83	103

More than one-half the cubic volume in the commercial forest is in sawtimber trees. These trees have a volume of 22.6 billion board feet, three-quarters of which is in trees between 11 and 21 inches d.b.h.; the remainder is larger timber. The sawtimber volume by species is as follows:

	<i>Billion board feet</i>
Engelmann spruce	8.0
Lodgepole pine	5.8
Douglas-fir	3.5
Ponderosa pine	2.1
Other	3.2
Total	22.6

The average net volume in sawtimber stands is 7,258 board feet per acre. While this is low compared to many other areas, it is about average for the Mountain States.

About 82 percent of the commercial forest area and 90 percent of the sawtimber volume is in public ownership — principally in the National Forests.



Dense stand of ponderosa pine about 60 years old on a medium site. Trees are 6 to 12 inches in diameter. This is representative of stands covering much of the Black Hills area. This type of stand after thinning is illustrated on page 19. The ponderosa pine type occurs on almost 1 million acres or one-fifth of the commercial forest area. More than 70 percent of the type is classed as sawtimber but stands are largely less than 100 years old. Ponderosa pine lands are generally low in productivity compared with those occupied by other major types in the State. Furthermore, the sites in Wyoming are among the lowest for ponderosa pine in the western United States. Despite environmental handicaps this species has a long history of heavy and sustained use. Since 1869 about one-

fourth of the lumber cut in the State has been ponderosa pine, and until about 1912 it was the leading lumber species. The high rate of use results from desirable qualities of the wood, accessibility for logging, and the occurrence of the type in the eastern half of the State which has good rail and road networks and is close to midwestern markets. Also, on much of the area there is no problem in obtaining natural regeneration, and therefore this is not a factor that inhibits harvesting. In the Black Hills less than 2 percent of the area of the type, and practically none of the sawtimber area, is classed by Survey as poorly stocked. This compares with statewide figures for ponderosa pine of 24 and 28 percent respectively.



Engelmann spruce sawtimber on the Medicine Bow National Forest. This stand is more than 300 years old and has many trees over 24 inches in diameter. Dominant trees are about 100 feet high. Engelmann spruce and subalpine fir are the principal species that make up the fir-spruce type, which covers about 847,000 acres. More than 80 percent of the type is classed as sawtimber, and the majority of sawtimber trees are overmature and of high risk for epidemic losses from Engelmann spruce beetle. The fir-spruce type generally occurs at higher elevations than any other type. It is the most common type immediately below timberline, but it also

grows at lower elevations as stringers along stream bottoms and on moist benches. Subalpine firs are considerably more numerous than spruce but are much smaller and have a total volume of only about 1.5 billion board feet as compared with 8.0 billion of spruce. If the timber cut were accelerated to liquidate the old-growth forest at a rate more nearly comparable to the theoretically sustainable cutting rate, protection problems in the spruce forest should gradually diminish. However, difficulties in regenerating spruce following logging discourage forest managers from greatly increasing the cut.

Douglas-fir small sawtimber, Teton National Forest. From the standpoint of timber production, Douglas-fir is the most important of a number of "minor" species. Since 1900 less than 5 percent of all lumber cut in the State has been Douglas-fir and there has been no increase in the annual cut since World War II. The Douglas-fir type grows on about 701,000 acres and is largely old-growth sawtimber. About 40 percent of the 3.5 billion board feet of sawtimber is in trees 21 inches and larger. Although diameters of Douglas-fir sawtimber trees are comparable to those of Engelmann spruce, volume of Douglas-fir is considerably less because trees are shorter and more defective. They are also very limby and consequently the lumber has many knots. Still another deterrent to greater use is that

Douglas-fir frequently grows on very steep slopes with unstable soils.

The other minor species for timber production are whitebark and limber pines, aspen, and cottonwood. The two pines occur as a type covering 166,000 acres of rocky and exposed land along the upper range of the forest. The short, limby nature of these pines results in low-grade logs which are uneconomical to harvest. The aspen type covers about 320,000 acres, of which about two-thirds is in pole-timber stands. On the whole Wyoming aspen is not of good quality. Cottonwood is widely distributed but grows mainly along streams at low elevations. A small amount has been cut for lumber but the principal value of the species is for shade, scenery, and riverbank protection.



Diseases and insects greatly limit timber yields

Timber volumes would be considerably greater in Wyoming were it not for the inroads by diseases and insects. These destructive agencies limit timber productivity in two ways — through outright mortality and growth loss. Two-thirds of the annual mortality is caused by diseases and insects. The toll of 33 million cubic feet a year by these agencies is more than 50 percent greater than the harvest by wood-using industries. Data are not available on the effect of diseases and insects on tree growth, but in Wyoming's predominantly old-growth forest the loss of increment may be substantially greater than the volume lost through mortality.

Dwarfmistletoe is a heavy drag on the com-

Dwarfmistletoe is a principal cause of low productivity in many lodgepole pine stands. In the stand shown below (Yellowstone Park), the sparse overstory is decadent and heavily infested with dwarfmistletoe. Clear cutting followed by slash burning is generally the only feasible means of eliminating this parasite in heavily infested stands.



mercial forests from the standpoint of retarding growth as well as causing mortality. This was brought out by a 1953-55 survey of the Bighorn and Medicine Bow National Forests (2), where mistletoe problems are fairly representative of those throughout the State. The survey showed that in virgin stands, those free of mistletoe had nearly 1.5 times the per acre volume found in infested stands. Levels of infestation are much higher in cutover than in virgin stands. Other findings also support the general conclusion that this parasite is causing an enormous loss of growth.

Dwarfmistletoe is particularly damaging to lodgepole pine, and about 45 percent of the sound live trees in Wyoming's commercial forest are lodgepole pine. The survey indicated that 59 percent of the lodgepole pine area was infested in the Medicine Bow National Forest and 31 percent in the Bighorn. Mistletoe is very prevalent in areas logged for railroad ties in years past. Trees that were unsuitable for ties were not logged. Thus, the operations of the tie hacks (and later of the tie mills) more often than not left partially stocked stands in which the mistletoe already there could thrive. This condition is exemplified on considerable areas of the Wind River District on the Shoshone National Forest. The extent of the condition throughout the State is not known but undoubtedly it includes almost all of the 165,000 acres of poorly stocked lodgepole pine, poletimber and sawtimber plus much of the nearly 1 million acres classed as medium stocked. These lands will not become productive of timber unless new stands are started.

Unlike dwarfmistletoe, insects increase very rapidly and kill many trees before natural factors control them. Constant vigilance is needed and prompt action must be taken against incipient outbreaks of bark beetles, in particular, to avoid catastrophic losses. The overmature Engelmann spruce stands are highly vulnerable to outbreaks of the Engelmann spruce beetle. Control of this beetle is an especially critical problem because the infested timber is often inaccessible, and spruce is difficult to regenerate following logging.

The stands of ponderosa pine 60 to 100 years old are proving to be highly susceptible to outbreaks of the Black Hills beetle, contrary to expectations that this beetle would not be a serious pest after the harvest of the overmature stands. The mountain pine beetle currently is an important threat to the immature and mature lodgepole stands in many areas. After causing widespread losses in the 1930's and 1940's, mountain pine beetle population subsided until the present outbreak. Thousands of trees have been chemically treated, cut and burned, or salvaged in the past 2 years, and more of this work is being done in 1963.

Other insects and diseases have been important factors in reducing growth and causing high mortality in the past and some may be even more serious in the future. Among these are the Douglas-fir beetle, the pandora moth, pine tip moths, the spruce budworm, lodgepole pine terminal weevil, broom rusts of fir and spruce, stem rusts of lodgepole and ponderosa pines, root rots, and stem decays.

Many acres need thinning; many others need planting

Some stands have far too many trees; others have too few. Both conditions greatly affect the amount, size, and quality of timber available to harvest now or in the future. Here again, the major problem is in the lodgepole pine type. Many of the seedling-sapling and pole stands in this type that are classified as "well-stocked" are actually overstocked. Well-stocked poletimber stands in Wyoming, for example, average more than 1,200 stems per acre; stocking of less than 500 is desirable. Some of these stands are too old to benefit from thinning. Forest Survey data do not indicate the area of overstocked stands by age classes, but probably over half of the 354,000 acres of pole-size and smaller stands of lodgepole pine that are classed as well-stocked are young enough to respond to thinning. Thinnings are also needed in some young stands of Douglas-fir, fir-spruce, and ponderosa pine.

In most areas, commercial thinnings in these types will not be possible until there is a pulpwood market. In the Black Hills and part of the Medicine Bow area, however, thinning is feasible now on a commercial basis. As a matter of fact, the Black Hills area has long been noted for its intensive forestry practices in ponderosa pine stands. Thinnings have been made here for many years. Both the Black Hills National Forest and the Homestake Mining Company, the principal large holdings in this area, have their lands under sustained-yield management.

Many acres that are either not stocked or are understocked with desirable trees pose another big job that must be tackled if Wyoming's forests are to fulfill their potential. Some of the roughly 111,000 acres of non-stocked land may restock naturally. Much of

Overstocked and stagnated stand of lodgepole pine saplings on the Shoshone National Forest. Many stands such as this never reach sawtimber size by maturity. Thinning before trees are too old to take advantage of more growing space can greatly increase sawtimber yields on better sites.



it, however, should be planted, although in some areas planting is not feasible using present methods. Many of the 55,000 acres of poorly stocked aspen could also be made more productive by planting other species. There are similar opportunities for conversion in other types. Another big job involves regeneration in poorly stocked stands of lodgepole pine. As indicated previously, there are many thousands of acres of such lands that are heavily infested with dwarfmistletoe. These stands should be clear cut and burned if they are to be brought into production. Natural regeneration of lodgepole pine following burning may be adequate on many of these areas, but in some instances it will be necessary to plant. It will also be necessary to plant if conversion to other species is desired.

Recently thinned stand of ponderosa pine on the Black Hills National Forest. Trees are all at least 10 inches in diameter and are about 70 years old. About half the basal area was removed in thinning. Thinnings of this type, yielding 5 to 12 cords per acre, are becoming increasingly important commercially. Trees removed in thinning are converted into posts, poles, and pulpwood. The unthinned stand in the background is part of the stand illustrated on page 13.



DEVELOPMENT OPPORTUNITIES AND PROBLEMS

There is a substantial opportunity to increase the timber cut

In 1962, 124 million board feet of sawtimber were cut in Wyoming. The cut could now probably be more than doubled without violating the principles of sound silvicultural and multiple use management. A useful estimate of allowable annual cut⁵ for the State is not possible until more data are available on the management requirements for water production, recreation, wildlife, and grazing — all of which have an impact on timber harvesting. Even if only timber production without regard to other uses is considered, allowable cut estimates can vary by 100 percent or more.

The variation will depend on assumptions that are made, especially with respect to how rapidly the large area of old growth should be cut over. While it is desirable to use this timber before its dies, a very heavy cut now could result in later reduction below sustained yield levels for a number of years.

An increase in timber cutting need not impair water, recreation, and other values; on many areas it could improve them. Opening the coniferous forest by judicious timber cutting can increase water yields (13). On many areas the replacement of old growth, which is subject to devastation by insects and blow-down, would provide better assurance of maintaining long-term scenic and other recreation values. On the National Forests, as well as on some other holdings, multiple use management calls for a gradual harvesting along many roads and waterways, thus minimizing adverse effects on recreation values.

⁵Allowable annual cut is the average volume that may be harvested annually during a planned period of operation, considering the nature of the present stand, the desired degree of utilization, and the management being undertaken.



The portable mill on the left produces railroad ties from the lodgepole pine on Green Mountain. The mill of the Cody Lumber Company, shown in the photo to the right (page 21) is located at the railhead in Cody. Cutting is done in mature timber on the Shoshone National Forest. Most of the lumber goes to the Twin Cities for marketing.

In contrast with the present annual cut of 124 million board feet, the commercial forest of Wyoming has a theoretical capacity for ultimately producing at least 1 billion board feet a year. How close the sustained flow will approach this maximum in years ahead, will depend not only on intensity of management, the degree to which protection and regeneration problems already mentioned are solved, but on demands on the forest for uses other than timber.

A diversified industry is essential for full utilization

Almost 95 percent of the timber utilization in Wyoming is by sawmills — mostly small sawmills. These plants have not been able to make efficient use of the timber because of lack of markets for pulpwood. Without a substantial pulpwood market it is not possible to utilize that large part of the volume in mature stands that is in small trees or the big volumes of plant residues in the form of slabs, edgings, and trim. These generally have to be burned at some cost.

Fiber industry, such as pulpmills or fiber-board plants, would provide outlets for sawmill residues and perhaps much of the logging waste. Such a development would require debarking of the saw logs and chippable logging residue. In addition to providing for recovery of coarse residues, debarking benefits sawmill operations by reducing equipment maintenance and improving lumber recovery.

Timberland management would gain substantially from a market for wood fiber in addition to lumber. Clear cutting and even-aged management are desired in almost all cases. Heretofore, a market based mainly on sawtimber has left much of the cutover area in a highly unsatisfactory condition. Now, the uncut small and defective trees left in a sawtimber operation must often be felled, piled, and burned to make way for a new stand. The land manager would obviously gain if much of this material were removed as part of the logging operation. A market for small trees would be a major encouragement for thinnings.

In addition to sawtimber, Wyoming has more than 35 million cords of wood that could



be harvested for conversion to fiber products. This is a conservative estimate of the volume of all species in salvable dead trees, pole-timber trees in sawtimber stands, the upper stems of sawtimber trees, and trees that are sound but of poor form. It also includes volume in mature but pole-size lodgepole pine. The distribution of wood available for conversion to fiber is shown in a general way as follows:

	<i>Million cords</i>
Medicine Bow National Forest	7.5
Bighorn National Forest	5.1
Black Hills National Forest	.8
Shoshone National Forest	5.9
Bridger, Teton, Targhee, Caribou, and Wasatch National Forests	10.3
Lands outside National Forests	5.5
<hr/>	
Total	35.1

Initially a fiber industry would probably be based on a combination of sawmill residues and roundwood. It is very doubtful that the present sawmill industry, consisting of small and widely dispersed mills, could furnish enough residues within reasonable hauling distance to support a fiber plant.

An established market for fiber products would undoubtedly encourage the establishment of larger sawmills because only these larger mills can justify debarking and chipping equipment. In 1962 only seven mills in Wyoming individually produced 5 million feet or more a year. Sixty-eight percent of the active mills produced less than one-half million board feet. While small mills can continue to play an important role in some localities, they are in general less efficient and the trend in the Mountain States is now toward larger mills.

An economic study of potentials for timber utilization in western Wyoming and part of Idaho discusses possibilities for production of composition board and paper (5). One possibility is a pulpmill at Green River. Here, according to the findings of a Public Health Service survey in 1957 (15), streamflow was

adequate at that time for a 150- to 200-ton-per-day sulphate mill assuming adequate provision for waste recovery. Subsequent to this survey, the Seedskadee Project was undertaken on the Green River. On completion of this project stream conditions may be favorable for a larger mill.

From the standpoint of wood supply, there is enough material in a number of areas to support small groundwood mills.

Another possibility lies in further shipment of pulpwood to out-of-state mills. In 1962 about 17,000 cords were shipped to the Lake States. This outlet, while desirable, can never offer the advantages of a pulp and paper development within the State, or at least much closer to it. The Medicine Bow National Forest has been considered as one source of supply for possible pulpmills in Colorado (3).

Road development should be geared to management

Forest management has been largely limited by and geared to the extent and pattern of road development. Accessible areas have been heavily exploited and some have been under intensive management for a long time. On the other hand, there are many stands of old growth which should have priority for cutting but cannot be reached.

In the past, a lack of markets for the kind and size of timber available has probably been the most important factor limiting the total cut. As markets improve there will be an increasing need for better access to timberlands. More and better roads are needed now, not only to reach utilizable timber, but also to permit cultural work in young or depleted stands.

The biggest problem of access is on the National Forests which have about 70 percent of the commercial forest area. And this area is largely on the most difficult terrain in the State. All the National Forests need more roads — some much more than others. The Bighorn National Forest, for example, estimates that 2,080 miles of road must be built if the allowable cut is to be harvested.

Much of the roadbuilding in the National Forests has been financed by timber sales, an approach which has not led to an adequate road network. In the first place, utilization and development have tended to be concentrated on the more accessible areas first; the roads have crept into the forest in steps and have not reached many remote stands most in need of cutting. On the other hand, many stands already tapped by roads tend to be overcut in relation to the property as a whole. Moreover, with an inadequate road network, National Forest Administrators are handicapped in achieving allowable cut objectives, in dealing with insect, disease, and fire control problems, and in applying cultural work where it is needed.

In addition to access roads into the timber, more and better truck routes are needed for hauling. In many areas of the State not served by railroads, trucks must do the job, but frequently on roads which are entirely inadequate for the heavy loads and long-distance hauls.

A much bigger effort is necessary if anticipated demands are to be met

The forests no less than other resources will feel the eruptive demands of a population that is expected to increase from the present 188 million to 230 million by 1976 and 350 million by 2000 (9). The levels of use already reached by water, recreation, and grazing leave no doubt that they will tax the capacity of Wyoming's forests in the future. Timber use will also increase though probably not so rapidly in relation to potential.

Future demands that will be made on the forests for water, timber, and recreation are indicated by a number of trends and forecasts. Water use in the United States increased from 8 percent of the supply in 1900 to 60 percent in 1960. It has been estimated that 88 percent of the total supply will be used by 1975 (10). By the year 2000, a threefold increase over the 1960 level is anticipated in outdoor recreation (9).

Two nationwide studies indicate a substan-

tial long-range rise in wood needs. The *Timber Resources Review* (11) states that "prompt and very substantial expansion and intensification of forestry in the United States is necessary if timber shortages are to be avoided by 2000." A more recent report forecasts that the demand for forest products will probably increase by two-thirds between now and 1980 and triple by 2000 (6).

If these wood needs develop, Wyoming has the timber-growing potential to supply a larger portion of the cut than in the past. Pulpwood is one of the leading wood products in terms of rate of increase in national consumption — and Wyoming has a lot of pulpwood. Wyoming is favored with a preponderance of soft-textured woods that are suitable for pulp. The probable effects of these factors of supply and demand are discussed more thoroughly in recent studies (1, 4).

If predicted demands are to be met, the most expensive and difficult job facing timber managers is stand improvement. So far very little work has been done on the more than three-fourths of the State's commercial forest that lies outside the Black Hills and Medicine Bow areas. On the National Forests outside these areas, less than 9,000 acres has been given any cultural treatment. This includes 633 acres of successful seeding and planting, almost 3,600 acres of site preparation, and about 4,600 acres of timber stand improvement work. Unless the program is greatly stepped up, a big area of potentially productive timberland will continue indefinitely in an unproductive condition.

There will be many difficult decisions in setting development priorities for Wyoming's forest lands. These decisions become especially difficult in view of the complexities of multiple use management. And, because in the future, very few lands can be managed for timber alone, consideration must generally be given to other uses — water, recreation, grazing, and wildlife.

**Between 1950 and 1960 the per capita consumption of wood declined about 17 percent, but the per capita use of pulpwood increased 12 percent.*

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APPENDIX

TERMINOLOGY

Forest Land

The term *forest land* includes (a) land which is at least 10 percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting an influence on the climate or on the water regime; (b) land from which the trees described in (a) have been removed to less than 10 percent stocking, and which has not been developed for other use; (c) afforested areas.

At the time the fieldwork for this report was performed, the minimum unit of area for forest land classification was 10 acres with a minimum width of stringer strips of 120 feet.

The principal classes of forest land are:

Commercial forest land. — Forest land which is (a) producing, or is physically capable of producing, usable crops of wood (usually sawtimber); (b) economically available now or prospectively; (c) not withdrawn from timber utilization.

Noncommercial forest land. — Three classes of noncommercial forest land are recognized: *Productive-reserved*, *Unproductive-nonreserved*, and *Unproductive-reserved*.

Productive-reserved is public forest land withdrawn from timber utilization through statute, ordinance, or administrative order, but which otherwise qualifies as commercial forest land.

Unproductive indicates forest land incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions or forest land so physically inaccessible as to be unavailable economically in the foreseeable future.

Forest Types

Forest land is classified into types on the basis of tree species; the type name is that of the predominant species. The predominant species is the one which has a plurality of (a) gross cubic volume in sawtimber and pole-timber stands, or (b) the number of stems in seedling and sapling stands. Both growing stock and cull trees are considered in the classification. Forest types which occur on both commercial and noncommercial forest land are:

Douglas-fir	Fir-spruce
Ponderosa pine	Aspen
Lodgepole pine	Cottonwood
White bark and limber pine	Other western hardwoods

Two additional forest types which occur only on noncommercial forest land are:

Pinyon-juniper
Chaparral

Tree Size Classes

Sawtimber-size tree

A tree 11.0 inches d.b.h. or larger

Pole-size tree

A tree 5.0 to 10.9 inches d.b.h.

Seedling-sapling trees

Trees at least 1 foot high and less than 5.0 inches d.b.h.

Tree-Merchantability Classes

Sawtimber tree

Live tree of commercial species, 11.0 inches d.b.h. or larger, that contains at least one 10-foot log to a merchantable top diameter and having the likelihood of eventually containing at least a 16-foot minimum saw log. Also, at least one-third of the board-foot volume must be free from rot or other defect.

Poletimber tree

Live tree of commercial species, 5.0 to 10.9 inches d.b.h., free of rot and having the likelihood of growing into a sawtimber tree.

Sapling and seedling trees

Live trees of commercial species, less than 5.0 inches d.b.h., with form and quality to qualify as potential poletimber trees.

Growing stock trees

Sawtimber trees, poletimber trees, saplings and seedlings; i.e., all live trees except cull trees.

In discussion and tables on volumes, growth, and mortality, the term *growing stock* refers only to sawtimber trees and poletimber trees; i.e., all live trees 5 inches d.b.h. and larger (except cull trees). Saplings and seedlings are not part of growing stock in this usage of the term.

Cull tree

Live tree of sawtimber or poletimber size that is unmerchantable for saw logs, now or prospectively, because of rot or other defect, or species.

Sound cull trees include:

a. Sawtimber-size trees that have more than two-thirds of their gross board-foot volume in cull with at least one-half of this cull the result of sweep, crook, or other sound defect. Also included are sound trees which do not contain at least one 10-foot saw log.

b. Poletimber-size trees that are unlikely to grow into sawtimber trees because of serious fire and basal scars, broken tops, severe mistletoe, crooks, or girdling by porcupine. No rot may be present.

Rotten cull trees include:

a. Sawtimber-size trees that have more than two-thirds of their gross board-foot volume in cull, with more than half of the cull due to rot.

b. Poletimber-size trees showing any evidence of rot in the main stem.

Mortality tree

A tree 5.0 inches d.b.h. or larger, standing or down, which has died within the past 5 years and was not a cull tree at time of death.

Salvable dead tree

Dead tree 5.0 inches d.b.h. or larger, standing or down (but not lying on the ground) which has 50 percent of more of its cubic-foot volume in sound wood.

Stand-Size Classes

Sawtimber stands

A stand with a minimum net volume per acre of 1,500 board feet (International $\frac{1}{4}$ -inch rule) in sawtimber trees. Two classes of sawtimber stands are recognized:

Large sawtimber.—A stand in which the majority of the net board-foot volume is in sawtimber trees 21.0 inches d.b.h. and larger.

Small sawtimber.—A stand in which the majority of the net board-foot volume is in sawtimber trees from 11.0 to 20.9 inches d.b.h.

Poletimber stand

Stand failing to meet the sawtimber stand specifications, but at least 10 percent stocked with poletimber and larger (5.0 inches d.b.h. and larger) trees and with at least half the stocking in poletimber trees.

Seedling and sapling stand

A stand not qualifying as either a sawtimber or poletimber stand, but having at least 10 percent stocking of trees of commercial species and with at least half the stocking in seedling and sapling trees.

Nonstocked area

An area not qualifying as a sawtimber, poletimber, or a seedling-sapling stand; i.e.,

normally an area less than 10 percent stocked.

Stocking

Stocking is a measure of the degree to which growing space is utilized by trees. In this report it is expressed as the percentage of the available space that is occupied by tree crowns as viewed on aerial photographs.

Well-stocked stand

A stand that is 70 percent or more covered by tree crowns.

Medium-stocked stand

A stand with 40 to 70 percent coverage by tree crowns.

Poorly stocked stand

A stand with 10 to 40 percent coverage by tree crowns.

Nonstocked area

An area with less than 10 percent coverage by tree crowns.

Timber Volume

All-timber volume

Volume in cubic feet of sound wood in the bole of growing stock, cull, and salvable dead trees 5.0 inches and larger in diameter at breast height, from stump to a minimum 4.0-inch top inside bark.

Growing stock volume

Net volume in cubic feet of sawtimber trees and poletimber trees from stump to a minimum 4.0-inch top inside bark.

Live sawtimber volume

Net volume in board feet of the saw log portion of sawtimber trees.

Saw log portion

That portion of the bole of sawtimber trees between the stump and the merchantable top.

Merchantable top

The point at which the upper limit of saw log merchantability is limited either by limbs or by a minimum diameter. The latter varies with diameter class, ranging from 5 inches inside bark for trees 11 inches at breast height to 10 inches for trees 26 inches or larger.

Upper-stem portion

That part of the bole of sawtimber trees above the merchantable top to a minimum top diameter of 4.0 inches inside bark.

Quality class

A classification of sawtimber volume in terms of log grades. Four grades are recognized and distinguished by the occurrence and characteristics of knots. The log grades corresponding to the quality classes are:

Grade 1 (select logs) are essentially smooth and surface clear, except that in logs 16 inches and larger in diameter a few visible knots are permitted, providing there are no more than 1 large knot, or 2 medium or small knots, or 4 pin knots. Knot sizes for all grades are:

Pin knots—0.5 inch or less

Small knots—0.5 to 0.75 inch

Medium knots—0.75 to 1.5 inches

Large knots—over 1.5 inches

Occasional logs having a greater number of knots are admitted provided these knots may be boxed in an area not exceeding one-third the area of one face or an equivalent area of two faces.

Grade 2 (shop logs) display relatively few knots of any size, so spaced that at least 50 percent of the surface of the log is in smooth, clear areas, the size of which must be at least one-fourth the girth of the log in width, by 4 feet or more in length.

A log with no more than 12 medium or smaller knots, or more than 8 large ones, may be immediately classed as grade 2. If this number of knots is exceeded, the clear area basis governs.

Grade 3 (common logs) display either (a) pin, small, or medium knots of which 80 percent are either live or will cut out red (intergrown) beneath the slab, or (b) 16 dead knots (an average of 4 per face) averaging medium in size.

Grade 4 (low common logs) display medium, large, and very large live and/or dead knots in excess of the numbers permitted in grades 2 and 3.

Growth

Net annual growth of sawtimber or growing stock

The average annual change, calculated from the total change over a 10-year period, in net board-foot or cubic-foot volume of live sawtimber or growing stock on commercial forest land.

Mortality

Net annual mortality of sawtimber or growing stock

The average annual net board-foot or cubic-foot volume removed from live sawtimber or growing stock through death, calculated from the total net volume removed by such causes over a 10-year period.

Timber Cut

Timber cut from growing stock

The volume of sound wood in live sawtimber and poletimber trees cut for forest products during a specified period, including both roundwood products and logging residues.

Timber cut from sawtimber

The net board-foot volume of live sawtimber trees cut for forest products during a specified period, including both roundwood products and logging residues.

Logging residues from growing stock

The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by logging on commercial forest land and not converted to timber products.

Ownership Classes

National Forest lands

Federal lands which have been designated by Executive order or statute as National Forests or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Other Federal lands

Federal lands other than National Forests, including lands administered by the Bureau of Land Management, Bureau of Indian Affairs, and miscellaneous Federal agencies.

State lands

Lands owned by the State.

Forest industry lands

Lands owned by companies or individuals operating wood-using plants.

Farmer-owned lands

Lands owned by operators of farms.

Miscellaneous private lands

Privately owned lands other than forest-industry or farmer-owned lands.

Principal Tree Species

Softwoods

Douglas-fir	<i>Pseudotsuga menziesii</i>
Fir, subalpine	<i>Abies lasiocarpa</i>
Fir, white	<i>A. concolor</i>
Juniper	<i>Juniperus</i> spp.
Pine, limber	<i>Pinus flexilis</i>
Pine, lodgepole	<i>P. contorta</i>
Pine, ponderosa	<i>P. ponderosa</i>
Pine, whitebark	<i>P. albicaulis</i>
Spruce, Engelmann	<i>Picea engelmannii</i>
Spruce, white	<i>P. glauca</i>

Hardwoods

Aspen, quaking	<i>Populus tremuloides</i>
Cottonwood, black	<i>Populus trichocarpa</i>

SURVEY METHODS

Area statistics were determined by two methods: (1) On National Forests, forest lands were mapped on aerial photographs according to forest type, stand size, and crown density. Photo delineations were then transferred to base maps. Non-National Forest lands within National Forests were delineated on the maps according to the ownership class. Maps were then dot counted to obtain the estimates of area by the various land and forest classes, and by ownership. (2) For lands outside National Forests a sampling procedure was used. Points were classified on Army Map Service maps and on aerial photos to determine the proportion of area by forest versus nonforest, class of forest, and ownership. A percentage of the points was checked on the ground for correctness of classification. Results of the field check were then used to adjust the map and photo estimates of proportions. Acreages were determined by applying the adjusted proportions to the area outside National Forests.

Volume estimates are based on tree measurements taken on 1,159 sample areas located at random on commercial forest lands. Sample locations were pricked on aerial photos then located on the ground and established on a permanent basis to permit re-measurement on future surveys. Each location consisted of a pair of circular plots, 5 chains apart. Each plot consisted of four circular subplots with a common center. The

area of subplots and kind of trees tallied on them are as follows:

1/500 acre—live seedling-sapling-size trees.

1/50 acre—live pole-size trees.

1/5 acre—live sawtimber-size trees, and all salvable dead trees (pole-size and sawtimber-size).

1/3 acre—mortality trees of pole-size and larger.

In addition to making the customary measurements and classifications of trees for volume and quality, increment borings were taken for growth estimates.

Formulas equating field measurements to volume, growth, and mortality were applied as part of the machine data processing to provide average volumes per acre for the various classifications based on type, size, stocking, etc. These averages, applied to area estimates, provided volumes shown in statistical tables.

Estimates of timber cut are based on periodic surveys of forest industries. The latest surveys are for 1962 and are the basis for data shown in the appendix tables. Utilization trends discussed in the text are based mainly on lumber production data, since complete information on output of all products for years prior to 1957 is not available. Data for estimating the volume of logging residues are obtained by special studies on active woods operations.

RELIABILITY OF ESTIMATES

Data collected by sampling are not entirely reliable; i.e., there is a sampling error. Sufficient samples are taken to insure that the error is not above a specified maximum. Magnitude of the errors associated with area and volume estimates for Wyoming have been determined by statistical analysis of the data.

Estimates of the acreage of the various

classes of forest land were determined by two procedures—mapping (5.7 million acres) and sampling (4.1 million acres). There are no sampling errors for the mapped area. Sampling errors for the sampled portion and for the total estimates of commercial and non-commercial breakdowns are shown in the following tabulation:

	Mapped area		Sampled area			Total forest area		
	<i>Area</i>	<i>SE</i>	<i>Area</i>	<i>SE</i>		<i>Area</i>	<i>SE</i>	
	<i>M acres</i>		<i>M acres</i>	<i>Acres</i>	<i>Percent</i>	<i>M acres</i>	<i>Acres</i>	<i>Percent</i>
Commercial	3,580	0	1,273	33,265	2.61	4,853	33,265	0.69
Noncommercial	2,127	0	2,797	33,284	1.19	4,924	33,284	.68
Total	5,707		4,070			9,777		

The sampling error for the estimated 7,458 million cubic feet of growing stock in Wyoming is ± 2.7 percent.

The sampling error for the total timber cut from growing stock (21,756,000 cubic feet) is

estimated at ± 3.5 percent.

All errors are computed on the basis of odds of two out of three that values which would result from a 100-percent survey would lie within the range indicated by the error.

APPENDIX TABLES

Table 1.—Area by land classes, Wyoming, 1960

Land class	Thousand acres
Commercial forest land	4,853
Unproductive forest land	2,344
Productive-reserved forest land	2,580
Total forest land	9,777
Nonforest land	52,566
All land	162,343

¹From U.S. Bureau of the Census, *Land and Water Areas of the United States, 1960*.

Table 2.—Area of commercial forest land by ownership classes, Wyoming, 1960

Ownership class	Thousand acres
National Forest	3,364
Other Federal:	
Bureau of Land Management	395
Indian	124
Miscellaneous Federal	—
Total other Federal	519
State	111
County and municipal	—
Farmer-owned	622
Miscellaneous private ¹	237
All ownerships	4,853

¹Forest industry has been combined with miscellaneous private to avoid disclosure of holdings of an individual owner.

Table 3.—Area of commercial forest land by stand-size and ownership classes, Wyoming, 1960

Stand-size class	All ownerships	National Forest	Other public	Farmer ¹ and misc. private
	<i>Thousand acres</i>			
Sawtimber stands:				
Large sawtimber	15	15	—	(2)
Small sawtimber	2,904	1,915	411	578
Total	2,919	1,930	411	578
Poletimber stands	1,588	1,206	143	239
Sapling and seedling stands	235	176	31	28
Nonstocked areas	111	52	45	14
All classes	4,853	3,364	630	859

¹Forest industry has been combined with farmer and miscellaneous private to avoid disclosure of holdings of an individual owner.

²Less than 0.5 thousand acres.

Table 4.—Area of commercial forest land, by stand-volume classes for sawtimber and other stand-size classes, Wyoming, 1960

Stand volumes per acre ¹	Area by stand-size classes		
	All stands	Sawtimber stands	Other stands
	<i>Thousand acres</i>		
Less than 1,500 board feet	1,881	11	1,870
1,500 to 5,000 board feet	1,502	1,438	64
5,000 to 10,000 board feet	843	843	—
10,000 to 20,000 board feet	507	507	—
More than 20,000 board feet	120	120	—
All classes	4,853	2,919	1,934

¹Net volume, International 1/4-inch rule.

Table 5.—Area of commercial forest land, by stocking classes of all live trees and by stand-size classes, Wyoming, 1960

Stocking class	All stands	Sawtimber stands	Poletimber stands	Sapling and seedling stands	Nonstocked stands
	<i>Thousand acres</i>				
70 percent or more	1,184	565	488	131	—
40 to 70 percent	2,730	1,805	851	74	—
10 to 40 percent	828	549	249	30	—
Less than 10 percent	111	—	—	—	111
All classes	4,853	2,919	1,588	235	111

Table 6.—Area of commercial forest land, by forest types and ownership classes, Wyoming, 1960

Forest type	All ownerships	Public ownerships	Private ownerships
	<i>Thousand acres</i>		
Douglas-fir	701	635	66
Ponderosa pine	992	449	543
Lodgepole pine	1,802	1,700	102
Whitebark and limber pine	166	148	18
Fir-spruce	847	816	31
Other hardwoods	20	8	12
Aspen	320	236	84
Cottonwood	5	2	3
All types	4,853	3,994	859

Table 7.—Area of commercial forest land by forest types and by stand-size classes, Wyoming, 1960

Forest type	All stands	Sawtimber stands	Poletimber stands	Sapling and seedling stands	Nonstocked stands
<i>Thousand acres</i>					
Douglas-fir	701	505	155	18	23
Ponderosa pine	992	727	203	27	35
Lodgepole pine	1,802	855	805	117	25
Whitebark and limber pine	166	76	73	10	7
Fir-spruce	847	696	117	13	21
Other hardwoods	20	—	17	3	—
Aspen	320	57	216	47	—
Cottonwood	5	3	2	(1)	—
All types	4,853	2,919	1,588	235	111

¹Less than 0.5 thousand acres.

Table 8.—Area of noncommercial forest land, by forest types, Wyoming, 1960

Forest type	All areas	Productive reserved areas	Unproductive areas
<i>Thousand acres</i>			
Douglas-fir	318	191	127
Ponderosa pine	(1)	(1)	—
Lodgepole pine	1,951	1,756	195
Whitebark and limber pine	405	104	301
Fir-spruce	1,216	513	703
Aspen	239	16	223
Cottonwood	(1)	(1)	—
Chaparral	214	—	214
Pinyon-juniper	581	—	581
Other	—	—	—
All types	4,924	2,580	2,344

¹Less than 0.5 thousand acres.

Table 9.—Number of growing-stock trees on commercial forest land, by diameter classes and by softwoods, and hardwoods, Wyoming, 1960

D.B.H. class (inches)	All species	Softwood	Hardwood
<i>Thousand trees</i>			
1.0- 2.9	1,018,579	883,553	135,026
3.0- 4.9	619,657	552,226	67,431
5.0- 6.9	371,864	335,243	36,621
7.0- 8.9	220,652	202,676	17,976
9.0-10.9	111,856	107,838	4,018
11.0-12.9	62,548	59,391	3,157
13.0-14.9	36,389	35,831	558
15.0-16.9	21,137	21,006	131
17.0-18.9	12,381	12,351	30
19.0-28.9	14,312	14,312	—
29.0-38.9	1,015	1,006	9
39.0 and larger	41	41	—
All classes	2,490,431	2,225,474	264,957

Table 10.—Number of cull and salvable dead trees on commercial forest land, by diameter groups and by softwoods and hardwoods, Wyoming, 1960

D.B.H. class (inches)	Cull trees	Salvable dead trees
<i>Thousand trees</i>		
Softwoods:		
5.0- 8.9	22,967	97,421
9.0-18.9	9,043	50,792
19.0 and larger	1,303	2,095
Total	33,313	150,308
Hardwoods:		
5.0-10.9	14,720	18,631
11.0-18.9	966	870
19.0 and larger	5	—
Total	15,691	19,501
All species	49,004	169,809

Table 11.—Volume of timber on commercial forest land, by class of timber and by softwoods and hardwoods, Wyoming, 1960

Class of timber	All species	Softwoods	Hardwoods
	<i>Thousand cubic feet</i>		
Sawtimber trees:			
Saw-log portion	3,833,163	3,761,441	71,722
Upper-stem portion	322,906	300,511	22,395
Total	4,156,069	4,061,952	94,117
Poletimber trees	3,301,557	3,071,536	230,021
All growing-stock trees	7,457,626	7,133,488	324,138
Sound cull trees:			
Sawtimber-size trees	41,269	40,358	911
Poletimber-size trees	61,831	59,040	2,791
Total	103,100	99,398	3,702
Rotten cull trees:			
Sawtimber-size trees	49,655	44,237	5,418
Poletimber-size trees	35,492	15,627	19,865
Total	85,147	59,864	25,283
Salvable dead trees:			
Sawtimber-size trees	658,968	650,387	8,581
Poletimber-size trees	471,961	439,048	32,913
Total	1,130,929	1,089,435	41,494
All timber	8,776,802	8,382,185	394,617

Table 12.—Volume of growing stock and sawtimber on commercial forest land, by ownership classes and by softwoods and hardwoods, Wyoming, 1960

Ownership class	All species	Softwoods	Hardwoods
	GROWING STOCK <i>(Million cubic feet)</i>		
National Forest	6,046	5,870	176
Other public	579	525	54
Farmer and misc. private ¹	833	739	94
All ownerships	7,458	7,134	324
	SAWTIMBER <i>(Million board feet)²</i>		
National Forest	18,939	18,829	110
Other public	1,532	1,429	103
Farmer and misc. private ¹	2,161	1,988	173
All ownerships	22,632	22,246	386

¹Forest industry has been combined with farmer and miscellaneous private to avoid disclosure of holdings of an individual owner.

²International 1/4-inch rule.

Table 13.—Volume of growing stock and sawtimber on commercial forest land, by stand-size classes and by softwoods and hardwoods, Wyoming, 1960

Stand-size class	All species	Softwoods	Hardwoods
GROWING STOCK (Million cubic feet)			
Sawtimber stands	5,675	5,567	108
Poletimber stands	1,714	1,510	204
Sapling and seedling stands	64	52	12
Nonstocked areas	5	5	—
All classes	7,458	7,134	324
SAWTIMBER (Million board feet) ¹			
Sawtimber stands	21,186	20,894	292
Poletimber stands	1,426	1,333	93
Sapling and seedling stands	10	9	1
Nonstocked areas	10	10	—
All classes	22,632	22,246	386

¹International 1/4-inch rule.

Table 13a.—Volume of growing stock and sawtimber on commercial forest land, by stand-size classes and by species, Wyoming, 1960

Stand-size class	All species	Douglas-fir	Ponderosa pine	Lodgepole pine	White-bark and limber	True ¹ firs	Spruce ²	Other ³ softwoods	Hardwoods
GROWING STOCK (Million cubic feet)									
Sawtimber stands	5,675	751	600	1,642	360	586	1,627	1	108
Poletimber stands	1,714	148	93	1,080	68	55	66	(⁴)	204
Sapling and seedling stands	64	2	(⁴)	44	2	3	1	—	12
Nonstocked areas	5	(⁴)	3	2	—	—	—	—	—
All classes	7,458	901	696	2,768	430	644	1,694	1	324
SAWTIMBER (Million board feet) ¹									
Sawtimber stands	21,186	3,386	1,876	5,066	1,200	1,480	7,886	—	292
Poletimber stands	1,426	177	187	731	55	54	129	—	93
Sapling and seedling stands	10	2	(⁴)	1	1	3	2	—	1
Nonstocked areas	10	1	9	—	—	—	—	—	—
All classes	22,632	3,566	2,072	5,798	1,256	1,537	8,017	—	386

¹Subalpine and white firs.

²Engelmann and white spruces.

³Pinyon and juniper.

⁴Less than 0.5 million feet.

⁵International 1/4-inch rule.

Table 14.—Volume of growing stock on commercial forest land,
by species and diameter groups, Wyoming, 1960

Species	Diameter group (inches at breast height)					
	All classes	5.0 to 10.9	11.0 to 20.9	21.0 to 30.9	31.0 to 40.9	41.0 and larger
<i>Million cubic feet</i>						
Softwoods:						
Douglas-fir	901	251	416	191	40	3
Ponderosa pine	696	248	409	38	1	—
Lodgepole pine	2,768	1,720	1,004	41	3	—
Whitebark and limber pine	430	190	208	29	2	1
White fir	1	1	(1)	(1)	—	—
Subalpine fir	643	352	267	23	1	—
Engelmann spruce	1,687	306	906	411	60	4
White spruce	7	4	3	—	—	—
Other softwoods	1	—	1	—	—	—
Total	7,134	3,072	3,214	733	107	8
Hardwoods:						
Aspen	252	221	31	(1)	—	—
Cottonwood	72	9	62	—	1	—
Total	324	230	93	(1)	1	—
All species	7,458	3,302	3,307	733	108	8

¹Less than 0.5 million cubic feet.

Table 14a.—Volume of sawtimber on commercial forest land, by International ¼-inch log rule, species, and diameter groups, Wyoming, 1960

Species	Diameter group (inches at breast height)				
	All classes	11.0 to 20.9	21.0 to 30.9	31.0 to 40.9	41.0 and larger
<i>Million board feet</i>					
Softwoods:					
Douglas-fir	3,566	2,150	1,152	249	15
Ponderosa pine	2,072	1,894	175	3	—
Lodgepole pine	5,798	5,551	231	16	—
Whitebark and limber pine	1,256	1,095	146	10	5
White fir	1	1	(1)	—	—
Subalpine fir	1,536	1,398	136	2	—
Engelmann spruce	8,004	5,071	2,517	386	30
White spruce	13	13	—	—	—
Other softwoods	—	—	—	—	—
Total	22,246	17,173	4,357	666	50
Hardwoods:					
Aspen	159	159	(1)	—	—
Cottonwood	227	220	—	7	—
Total	386	379	(1)	7	—
All species	22,632	17,552	4,357	673	50

¹Less than 0.5 million board feet.

Table 14b.—Volume of sawtimber on commercial forest land by Scribner log rule, species, and diameter groups, Wyoming, 1960

Species	Diameter group (inches at breast height)				
	All classes	11.0 to 20.9	21.0 to 30.9	31.0 to 40.9	41.0 and larger
<i>Million board feet</i>					
Softwoods:					
Douglas-fir	3,054	1,798	1,016	225	15
Ponderosa pine	1,641	1,493	145	3	—
Lodgepole pine	4,874	4,652	208	14	—
Whitebark and limber pine	1,052	908	131	9	4
White fir	1	1	(1)	—	—
Subalpine fir	1,292	1,168	122	2	—
Engelmann spruce	7,165	4,529	2,264	346	26
White spruce	11	11	—	—	—
Other softwoods	—	—	—	—	—
Total	19,090	14,560	3,886	599	45
Hardwoods:					
Aspen	132	132	(1)	—	—
Cottonwood	191	185	—	6	—
Total	323	317	(1)	6	—
All species	19,413	14,877	3,886	605	45

¹Less than 0.5 million board feet.

Table 15.—Volume of sawtimber on commercial forest land, by species¹ and quality classes, Wyoming, 1960

Species	All classes	Quality classes			
		1	2	3	4
<i>Million board feet</i> ²					
Softwoods:					
Ponderosa pine ²	2,072	44	164	535	1,329
Total	2,072	44	164	535	1,329

¹Ponderosa pine is the only species graded.

²International 1/4-inch rule.

Table 16.—Volume of salvable dead sawtimber-size trees on commercial forest land, by softwoods and hardwoods, Wyoming, 1960

Species group	Volume
	<i>Thousand board feet</i> ¹
Softwoods	3,554,561
Hardwoods	39,911
All species	3,594,472

¹International 1/4-inch rule.

Table 17.—Net annual growth and annual cut of growing stock on commercial forest land, by species, Wyoming

Species	Net annual growth, 1960	Annual timber cut, 1962
	<i>Thousand cubic feet</i>	
Softwoods:		
Douglas-fir	7,490	1,007
Ponderosa pine	14,463	3,990
Lodgepole pine	33,294	12,954
True firs	4,344	552
Spruce ¹	19,828	3,230
Other softwoods	5,484	8
Total	84,903	21,741
Hardwoods	412	15
All species	85,315	21,756

¹Engelmann and white spruces.

Table 18.—Net annual growth and annual cut of sawtimber on commercial forest land, by species, Wyoming

Species	Net annual growth, 1960	Annual timber cut, 1962
	<i>Thousand board feet</i> ¹	
Softwoods:		
Douglas-fir	16,443	5,706
Ponderosa pine	49,542	22,824
Lodgepole pine	40,436	73,902
True firs	-10,697	3,101
Spruce ²	84,145	18,483
Other softwoods	13,039	31
Total	192,908	124,047
Hardwoods	-7,875	9
All species	185,033	124,056

¹International 1/4-inch rule.

²Engelmann and white spruces.

Table 19.—Net annual growth and annual cut of growing stock on commercial forest land, by ownership classes and by softwoods and hardwoods, Wyoming

Species group	All ownerships	National Forest	Other public	Farmer ¹ and misc. private
NET ANNUAL GROWTH, 1960 (Thousand cubic feet)				
Softwoods	84,903	60,116	7,356	17,431
Hardwoods	412	3,518	-708	-2,398
All species	85,315	63,634	6,648	15,033
ANNUAL TIMBER CUT, 1962 (Thousand cubic feet)				
Softwoods	21,741	19,415	1,304	1,022
Hardwoods	15	13	1	1
All species	21,756	19,428	1,305	1,023

¹Forest industry has been combined with farmer and miscellaneous private to avoid disclosure of holdings of an individual owner.

Table 20.—Net annual growth and annual cut of sawtimber on commercial forest land, by ownership classes and by softwoods and hardwoods, Wyoming

Species group	All ownerships	National Forest	Other public	Farmer ¹ and misc. private
NET ANNUAL GROWTH, 1960 (Thousand board feet) ²				
Softwoods	192,908	120,174	22,286	50,448
Hardwoods	-7,875	-546	-1,691	-5,638
All species	185,033	119,628	20,595	44,810
ANNUAL TIMBER CUT, 1962 (Thousand board feet) ²				
Softwoods	124,047	110,774	7,443	5,830
Hardwoods	9	8	1	—
All species	124,056	110,782	7,444	5,830

¹Forest industry has been combined with farmer and miscellaneous private to avoid disclosure of holdings of an individual owner.

²International 1/4-inch rule.

Table 21.—Annual mortality of growing stock and sawtimber on commercial forest land, by species, Wyoming, 1960

Species	Growing stock	Sawtimber
	<i>Thousand cubic feet</i>	<i>Thousand board feet¹</i>
Softwoods:		
Douglas-fir	5,833	25,405
Ponderosa pine	3,518	11,728
Lodgepole pine	13,444	39,956
True firs	11,406	39,347
Spruce ²	2,587	13,627
Other softwoods	1,577	7,360
Total	38,365	137,423
Hardwoods	10,490	14,884
All species	48,855	152,307

¹International ¼-inch rule.

²Engelmann and white spruces.

Table 22.—Annual mortality of growing stock and sawtimber on commercial forest land by ownership classes, and by softwoods and hardwoods, Wyoming, 1960

Ownership class	Growing stock			Sawtimber		
	All species	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
	<i>Thousand cubic feet</i>			<i>Thousand board feet¹</i>		
National Forest lands	34,730	33,277	1,453	126,582	123,338	3,244
Other public lands	4,320	2,194	2,126	8,220	5,510	2,710
Farmer and miscellaneous private lands ²	9,805	2,894	6,911	17,505	8,575	8,930
All ownerships	48,855	38,365	10,490	152,307	137,423	14,884

¹International ¼-inch rule.

²Forest industry has been combined with farmer and miscellaneous private to avoid disclosure of holdings of an individual owner.

Table 23.—Annual mortality of growing stock and sawtimber on commercial forest land, by causes and by softwoods and hardwoods, Wyoming, 1960

Cause of death	Growing stock			Sawtimber		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
	<i>Thousand cubic feet</i>			<i>Thousand board feet¹</i>		
Fire	1,339	1,339	—	4,675	4,675	—
Insects	12,057	11,813	244	47,818	47,541	277
Disease	20,627	10,580	10,047	50,233	36,244	13,989
Other	6,703	6,614	89	24,944	24,617	327
Unknown	8,129	8,019	110	24,637	24,346	291
All causes	48,855	38,365	10,490	152,307	137,423	14,884

¹International ¼-inch rule.

Table 24.—Total output of timber products, by products, by type of material used, and by softwoods and hardwoods, Wyoming, 1962

Product and species group	Total output in standard units		Output from roundwood from growing stock		Output from roundwood from nongrowing stock sources		Output from plant by-products (standard units)
	Unit	Number	Standard units	M cubic feet	Standard units	M cubic feet	
Saw logs:							
Softwood	M bd. ft. ¹	116,523	114,193	19,225	2,330	392	0
Hardwood	M bd. ft. ¹	0	0	0	0	0	0
Total	M bd. ft. ¹	116,523	114,193	19,225	2,330	392	0
Pulpwood:							
Softwood	M std. cords ²	16	3	334	1	130	12
Hardwood	M std. cords ²	0	0	0	0	0	0
Total	M std. cords ²	16	3	334	1	130	12
Mine timber:							
Softwood	M cu. ft.	54	21	21	33	33	0
Hardwood	M cu. ft.	0	0	0	0	0	0
Total	M cu. ft.	54	21	21	33	33	0
Misc. Industrial wood:³							
Softwood	M cu. ft.	426	335	335	91	91	0
Hardwood	M cu. ft.	15	15	15	0	0	0
Total	M cu. ft.	441	350	350	91	91	0
Posts:							
Softwood	M pieces	79	48	48	31	31	0
Hardwood	M pieces	0	0	0	0	0	0
Total	M pieces	79	48	48	31	31	0
Fuelwood:							
Softwood	M std. cords	3	0	11	1	98	2
Hardwood	M std. cords	0	0	0	0	0	0
Total	M std. cords	3	0	11	1	98	2
All products:							
Softwood	M cu. ft.	—	—	19,974	—	775	—
Hardwood	M cu. ft.	—	—	15	—	0	—
Total	M cu. ft.	—	—	19,989	—	775	—

¹International 1/4-inch rule.

²Rough wood basis (for example, chips converted to equivalent standard cords).

³Includes mainly house logs and turnery bolts.

Table 25.—Total output of roundwood products, by source and by softwoods and hardwoods, Wyoming, 1962

Source	All species	Softwoods	Hardwoods
	<i>Thousand cubic feet</i>		
Growing-stock trees: ¹			
Sawtimber trees	16,598	16,598	0
Poletimber trees	3,391	3,376	15
Total	19,989	19,974	15
Cull trees	84	84	0
Salvable dead trees ¹	691	691	0
Other sources ²	0	0	0
All sources	20,764	20,749	15

¹On commercial forest land.

²Includes noncommercial forest land, nonforest land such as fence rows, trees less than 5.0 inches in diameter, and treetops and limbs.

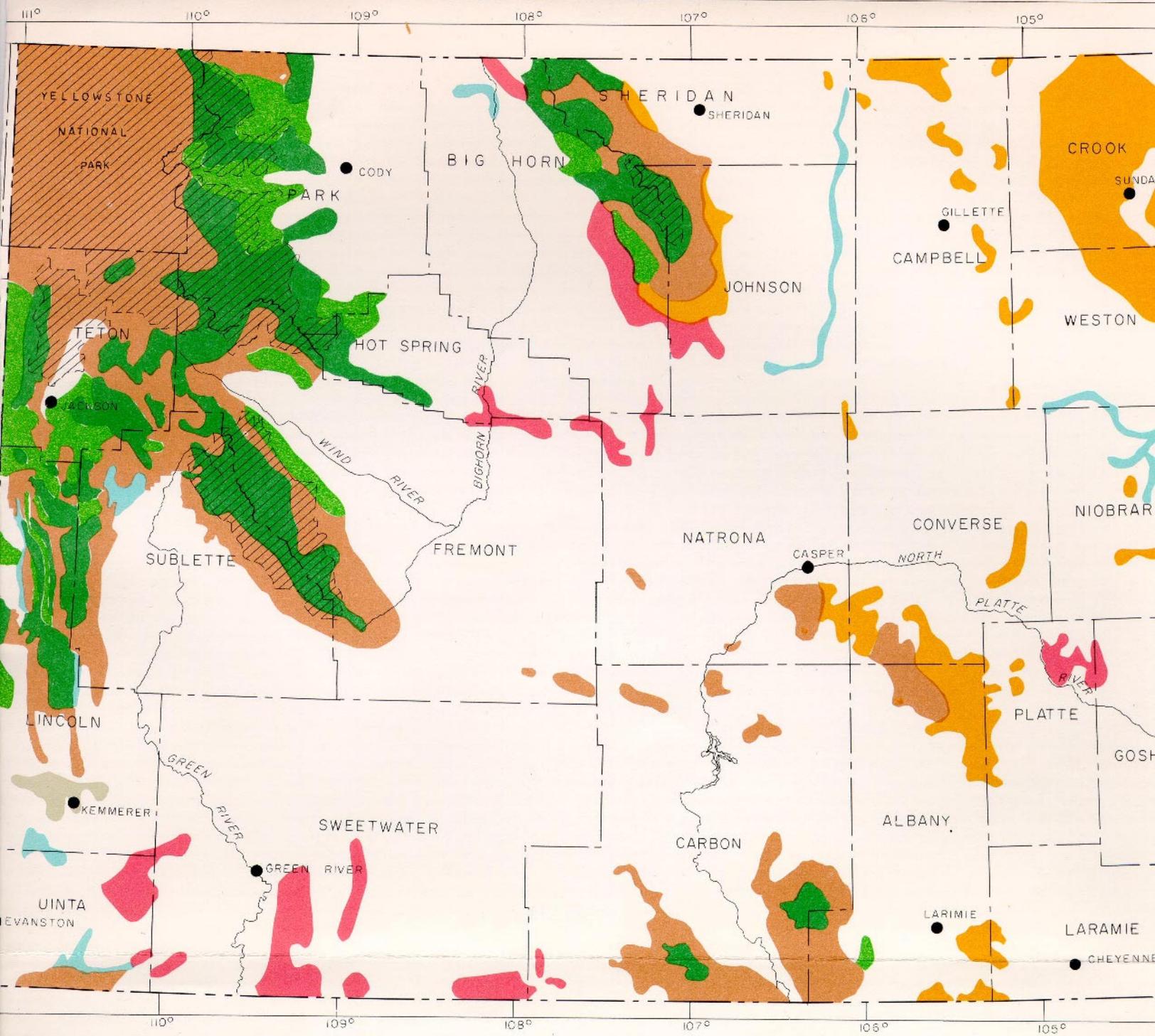
Table 26.—Annual timber cut from growing stock on commercial forest lands, by products and logging residues, and by softwoods and hardwoods, Wyoming, 1962

Products and residues	All species	Softwoods	Hardwoods
	<i>Thousand cubic feet</i>		
Roundwoods products:			
Saw logs	19,225	19,225	0
Pulpwood	334	334	0
Mine timbers	21	21	0
Misc. industrial wood	350	335	15
Posts	48	48	0
Fuelwood	11	11	0
All products	19,989	19,974	15
Logging residues	1,767	1,767	0
Timber cut	21,756	21,741	15

Table 27.—Annual timber cut from live sawtimber on commercial forest lands, by products and logging residues, and by softwoods and hardwoods, Wyoming, 1962

Products and residues	All species	Softwoods	Hardwoods
	<i>Thousand board feet¹</i>		
Roundwood products:			
Saw logs	114,193	114,193	0
Pulpwood	1,739	1,739	0
Mine timbers	33	33	0
Misc. industrial wood	199	190	9
Posts	143	143	0
Fuelwood	4	4	0
All products	116,311	116,302	9
Logging residues	7,745	7,745	0
Timber cut	124,056	124,047	9

¹International 1/4-inch rule.



MAJOR FOREST TYPES WYOMING

1963

FOREST SURVEY - INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE



LEGEND

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| <ul style="list-style-type: none"> LODGEPOLE PINE FIR-SPRUCE DOUGLAS - FIR | <ul style="list-style-type: none"> HARDWOODS PONDEROSA PINE PINYON - JUNIPER | <ul style="list-style-type: none"> CHAPARRAL NON FOREST AREAS RESERVED FROM
TIMBER CUTTING |
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