PULPWOOD

A STUDY OF THE WOOD FIBER RESOURCES OF THE BLACK HILLS AND WYOMING TRIBUTARY TO THE CHICAGO AND NORTH WESTERN RAILWAY

RESOURCE DEVELOPMENT DEPARTMENT
CHICAGO and NORTH WESTERN
RAILWAY COMPANY

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R. C. STUBBS
ACTING VICE PRESIDENT — TRAFFIC

To the Pulp and Paper Industry:

Wood is the basic raw material used by the nation's pulp and paper industry, an industry which ranks second among manufacturers in rate of growth, and which makes a vital contribution toward the highest standards of living the world has ever known. As a transportation company we proudly serve this great industry in Chicago and North Western territory.

As the pulp and paper industry expands there is a continuing search for new sources of wood fiber suitable for pulp production. This prospectus describes proven sources of pulpwood and woodchips where current harvests represent only a fraction of the potential yield.

Timber supplies located tributary to the Chicago and North Western Railway in South Dakota, Wyoming and Nebraska are large enough to supply the annual requirements of a moderate sized pulpmill.

Wood Fiber Resources of the Black Hills and Wyoming Tributary to The Chicago and North Western Railway describes this important resource. Our Resource Development Department is well acquainted with these areas. Please call or write us for any further information you may desire.

Sincerely,

R C Stubbs

WOOD FIBER RESOURCES OF THE BLACK HILLS AND WYOMING TRIBUTARY TO THE CHICAGO AND NORTH WESTERN RAILWAY

Chicago and North Western Railway Company
Chicago, Illinois

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INTRODUCTION

Ponderosa pine has long been regarded as one of the most important lumber trees in the West. Within the past decade this species has also become an important source of wood fiber.

The Black Hills form the easternmost part of the commercial range of ponderosa pine. The area represents a vast reservoir of wood fiber with about 1.75 million acres of commercial timberland. Tributary areas in Wyoming and Nebraska bring the total forest area to two million acres. This region has a potential yield of over 250,000 cords annually. In addition, there is a potential of up to 50,000 units of woodchips produced from sawmill residues. Current annual cut represents about one-fifth of the available supply.

Economical multiple-carload rates on pulpwood from the Black Hills to points in Wisconsin were pioneered by the Chicago and North Western Railway Company in 1958. Since that time there has been a steady increase in the volume of pulpwood and woodchips produced in this region.

This prospectus describes the present wood-using industry of the Black Hills and other nearby areas, and the raw materials which support these industries. Special emphasis is given to the potential for the development of these areas as a source of wood fiber. This use has shown rapid growth in recent years and offers the best opportunity for further expansion.

THE BLACK HILLS REGION

The Black Hills are located on the west central border of South Dakota with about one-third of the area overlapping into northeastern Wyoming. The area, an isolated extension of the Rocky Mountains, covers approximately two and one-half million acres and extends 100 miles from north to south and 50 miles in width through the central portion.

The Black Hills are surrounded by the northern Great Plains. The nearest mountain ranges are the Big Horns, located about 150 miles to the west, and the Laramie Peak range, located about the same distance to the southwest. Fifty miles to the south lies a narrow extension of the Black Hills known as the Pine Ridge of Nebraska, containing at least 100,000 acres of commercial timberland.

The Black Hills are the center of a major trade area serving western South Dakota, eastern Wyoming, southeastern Montana and northwestern Nebraska. Livestock and agriculture are the major sources of income for the region.

Physiographic Features

The Black Hills are an elliptically-shaped uplift of timber covered mountains. The granite peaks rise some 3,000 to 4,000 feet above the surrounding prairies, reaching their greatest elevation of 7,242 feet at Harney Peak. The mean elevation is slightly over 5,000 feet. Sloping away at relatively gentle angles is a succession of hogbacks and intervening valleys composed of limestone, sandstone and shales. During the long period of geologic development the erosion process has levelled all but the most resistant hogbacks, highest ridges and divides, thus modifying the rugged terrain.

Since the area was originally a part of the vast ocean bottom that now makes up the northern Great Plains, the uplift was initially covered with various layers of sedimentary rocks. The central portion of these formations have eroded away, leaving the hard crystalline rocks exposed. Large portions of the area, particularly in the northwest, still retain the limestone cap. This is a plateau of relatively gentle rolling terrain, except for the occasional deeply cut canyons. Elsewhere the underlying strata has been tilted upwards by the force of the uplift, exposing porous formations which are the source of artesian water found in the surrounding prairies. The well-known Badlands, to the east of the Black Hills, were formed by the silts which were washed down from the central area.

A similar but smaller uplift occurs in Wyoming, a short distance to the northwest. Because of the close proximity and similar forest cover this area, known as the Bear Lodge Mountains, is considered a part of the Black Hills

Fig. 1. Aerial view of the Black Hills showing gently rolling terrain of the timber covered limestone plateau.

Logging conditions, due to variations in topography, range from fair to good. Only rarely are extremely difficult logging conditions encountered. This is due to the fact that the timber reaches its best development on more favorable sites where there is a good accumulation of soil.

A large number of minerals have been mined commercially in the Black Hills. The largest operating gold mine on the North American continent, the Homestake Mine, is located in the northern Black Hills. This company also operates the largest sawmill in the area with a large share of their production going into mine timbers.

Climate

The average annual precipitation for the Black Hills ranges from 15 to 28 inches, with 57 to 68 percent falling during the growing season. The greatest precipitation occurs at the higher elevations in the northern portion of the area. There is seldom a continuous snow cover throughout the winter, with the exception of the higher elevations to the north.

Because of the favorable climate the Black Hills are considered to have a twelve months logging season.

The average annual growing season is from four to five months. The mean annual temperature ranges from 44 to 49 degrees. The mean July temperature is 70 degrees. Wide diurnal temperatures are common and summer nights are cool, even though the day may be quite hot. However, the relative humidity is low and the comfort index generally high. Maximum temperatures seldom exceed 100 degrees. Protracted sub-zero temperatures are infrequent and cold winter weather is often interrupted by warm chinook winds lasting for several days at a stretch.

Early History and Its Effect on Present Timber Supplies

The Black Hills, as one of the last frontiers, are rich in history. Certain phases of the history have played an important part in shaping the forest as we see it today.

In 1874 General George Custer was sent on an expedition to explore the Black Hills. Gold was discovered by his men in gravel beds of a stream near the present town of Custer. In less than a year the gold rush was on as prospectors flocked into the Black Hills. Up to this time few white men had ventured into the area since it was Sioux Indian territory by treaty and was guarded by them as sacred hunting grounds and home of their great god "Paha Sapa."

The placers of gold in streams near Custer played out in a short time and by 1876 all of the mining activity was centered around Deadwood and Lead in the northern 'hills.' Richer placers, as well as gold bearing ores, were found in this area.

Vast quantities of lumber and timber were necessary to support the booming population and the newly founded mining industry. Large amounts of fire wood were also required to heat the homes and feed the boilers for the mines and smelters. The surrounding hills were able to supply the much needed forest products and an industry centered around logging and sawmilling developed rapidly.

There was little regard for perpetuation of the forests among the early loggers. To them it possibly appeared that there was an inexhaustable supply of timber. The timber slaughter seemed senseless to many of the local residents and in 1897 the Federal government was petitioned to make a forest reserve of the area. The Black Hills were placed under the administration of the General Land Office in 1898. The first recorded timber sale in the history of this agency, which later became the U.S. Forest Service, was made to the Homestake Mining Company in 1899. This sale paved the way for the sale of government timber

from Forest Reserves, however there was little scientific knowledge of timber management at that time.

Improved harvesting practices and principals of sustained yield forestry were adopted by the Forest Service in 1921. In view of past practices it was not surprising that harvesting practices became over-conservative. Industry was faced with uneconomic harvests and much timber growth was lost to decay and supression. In comparatively recent years there has been a trend toward heavier cutting in order to salvage as much timber as possible which would otherwise be lost to mortality. This has made logging more economical as well as contributing toward greater timber yields.

The first phase of logging history, when the land was virtually cleared of all timber, covered a span of about 45 years. Regeneration of the areas cut during this period has resulted in large even-aged stands of timber ranging from 40 to 85 years of age. Consequently, most of the stands resulting from these early harvests are merchantable or near-merchantable for pulpwood, posts and poles. Selective cutting began approximately 40 years ago and these stands contain most of the present sawtimber inventory. The younger timber in these stands is often sub-merchantable because of age. There are exceptions to this general description, but it partially explains the occurrence of the vast pole stands as well as the two-storied stands which are typical of the area.

Second growth stands thinned for post, poles and pulpwood, may be cut two or more times before the crop trees reach sawtimber size. With merchantability for smaller products beginning at about 60 years of age, the thinning for these products from a stand may span a period of 20 to 60 years. During this period many stands now too small in size for commercial thinning will come into production. Under current management sawtimber is to be removed over a sufficiently short period so that the second growth timber develops into even-aged stands.

FOREST RESOURCES OF THE BLACK HILLS

Major Timber Types

Ponderosa pine is the major commercial timber species in the Black Hills, making up over 95 percent of the total volume. About four percent of the commercial timber is Black Hills spruce (Picea glauca var.albertiana.) Either species may occur in pure or mixed stands.

Associated species such as aspen and bur oak may occur in either pure or mixed stands with ponderosa pine. Other species are of minor importance since they represent only about one percent of the total volume in aggregate. Hardwoods in the Black Hills are generally of poor form and quality and utilization is limited to local firewood markets.

As the dominant species, ponderosa pine occurs primarily in pure stands. Virgin, or cut-over mature stands usually have an understory of seedlings, saplings or small pole timber. The understory as well as the overstory are usually even-aged, giving the appearance of a two-storied forest in many areas.

Second growth stands, covering vast areas of the Black Hills, are basically even-aged. This timber is less than rotation age and provides much of the timber that is harvested for post, poles and pulpwood.

Fig. 2. Typical stand of second growth pine in the Black Hills.

Area and Ownership

There are about 1.75 million acres of commercial forest land in the Black Hills. Sixty-five percent of this area is under the administration of the U.S. Forest Service as the Black Hills National Forest, with headquarters located at Custer, South Dakota. Private woodlands are primarily in small scattered tracts as farmsteads or mineral claims averaging 100 acres or less. There are a few private tracts of timber containing up to one thousand acres and a limited number of industrial holdings containing several thousand acres of commercial timberland.

Although state and local governments control only a small amount of timberland, primarily in scattered tracts, the largest single block of commercial timber, other than the National Forest, is located in Custer State Park. This area, containing about 60,000 acres of timber, is managed for timber production as well as for recreational purposes.

Table I. Timber Resources of the Black Hills Commercial Forest Land Area and Allowable Cut for Roundwood Purposes

	Ownership		Roundwood Products	
Source	M Acres	Percent	M Cords	Percent
Federal Lands	1145	65.4	169.5	74.0
State & County	103	5.9	10.0*	4.2
Private	502	28.7	50.0*	21.8
Total	1750	100.0	229.5	100.0

* Estimated

Roundwood products are defined as products produced from timber less than sawlog size. That is, trees ranging from 5.0 to 9.0 inches in diameter, breast high. These products are primarily pulpwood, posts and poles. In addition an unknown quantity of pulpwood and class poles are produced from trees of sawlog size.

There has been no survey of state and private lands which provides a sufficient accuracy to establish allowable cuts. However, allowable cuts have been conservatively calculated on the basis of known acreages.

Many private woodlands are situated outside of the administrative boundaries of the National Forest. Much of the private land within the Forest boundary is highly accessible. Consequently, a large percentage of the current harvest of pulpwood, posts and poles comes from these lands. Farm woodlots, because of accessibility and available part time labor are an especially important source of these products.

Growth of the Forest

During the late 1800's when logging first started in the Black Hills, the total volume of timber was estimated to be about 1.5 billion board feet. Since that time about 3 billion board feet of timber has been harvested. The present timber volume is estimated to be in excess of three billion board feet. While some of the increase in timber volume may be attributed to better inventory methods, these figures indicate the large growth potential.

Climatic conditions are favorable for the establishment of natural reproduction Non-stocked lands represent only about 1.5 percent of the total commercial forest land within the Forest.

Fig. 3. Properly thinned stand of pine will continue to yield a large volume of forest products in future harvests.

Long-range management plans for the Forest call for increasing the annual harvest by two or three times. This can be accomplished by increasing the stocking on low and non-productive areas through planting, precommercial and commercial thinning of the better stocked stands. In the past ten years the Forest Service has put some 212,000 acres into good growing condition by various management practices. Several hundred acres of private forest land is similarly placed in good growing condition each year.

The Black Hills have a variety of timber sites of varying productivity. Second growth stands on average sites will produce about one-quarter cord per acre per year in an unmanaged condition. Productivity may be increased to one-half to three-quarters cord per acre per year under management. Even greater production is possible with good management on the best sites.

The present allowable cut on ponderosa pine sawtimber in the Black Hills is based on a 120 year rotation. Stands below rotation age are to be given intermediate cuts at no more than 20 year periods. The rotation age for spruce is 100 years, with a seed cutting to be made at 80 years of age.

The Black Hills have the longest history of timber management of any forest region in the United States. The area has not been "cut out" as with other regions, notably the Lake States. Productivity of the forest land has kept pace with timber harvesting. Perhaps the key to this condition is the fact that the pine in the Black Hills succeeds itself generation after generation. Many other regions have problems, either with poor restocking of cut-over areas or in restocking with trees of the undesired species.

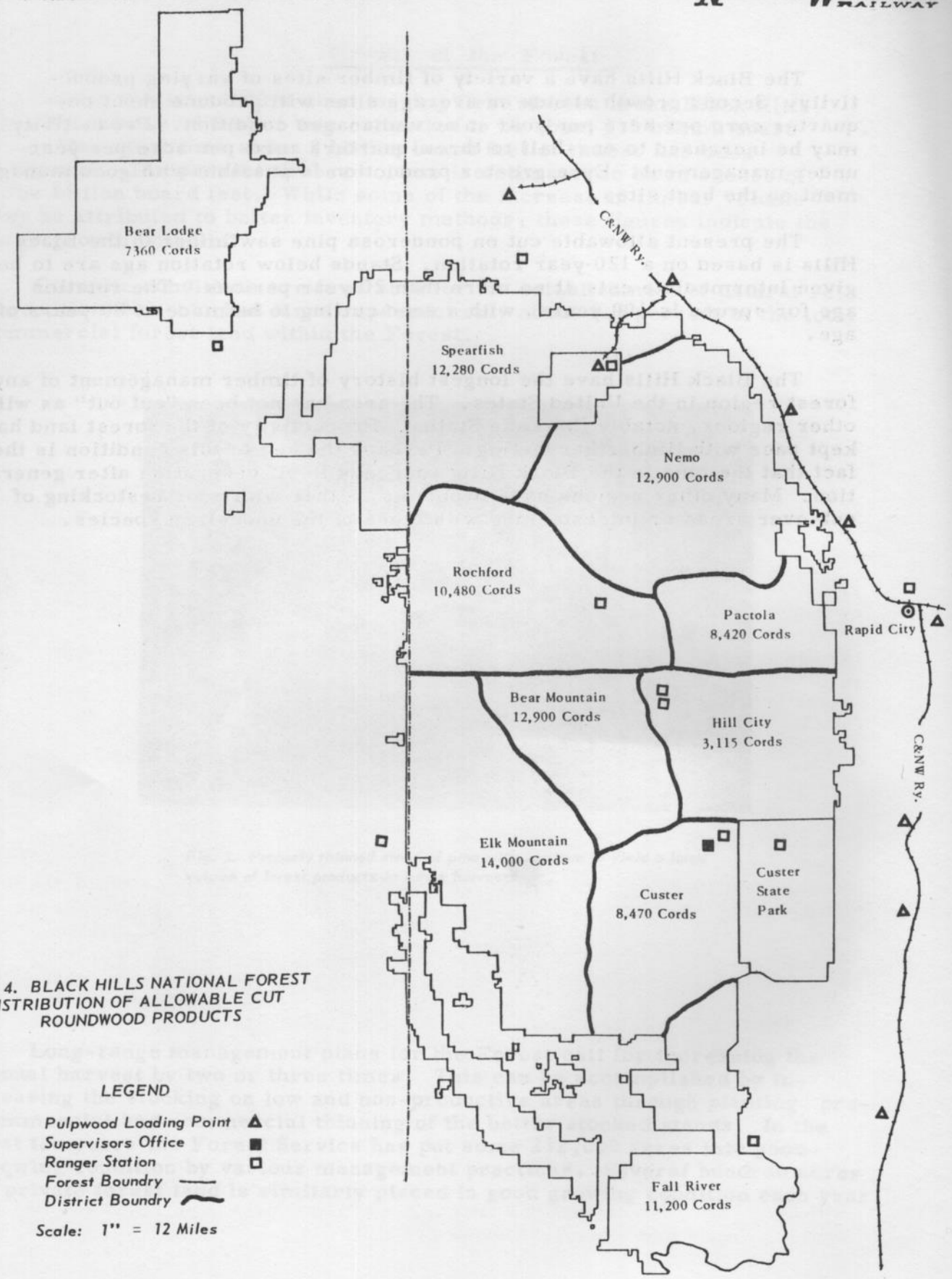

Fig. 4. BLACK HILLS NATIONAL FOREST DISTRIBUTION OF ALLOWABLE CUT ROUNDWOOD PRODUCTS

LEGEND

Pulpwood Loading Point △
Supervisors Office ■
Ranger Station □
Forest Boundry ——
District Boundry ~~~

Scale: 1" = 12 Miles

FOREST INDUSTRIES OF THE BLACK HILLS

The coniferous forests of the Black Hills are in a relatively concentrated area representing about three percent of the total land area of the state of South Dakota. Consequently, the forest industries exert little economic influence outside of the local communities involved in the production and manufacture of forest products. South Dakota is primarily an agricultural state and the forest industries rank third among manufacturing industries.

The forest industries of the Black Hills employ over 1,000 full time workers with an annual payroll in excess of $3.5 million. The value of the products manufactured is over $12 million annually.

The Sawmill Industry

The sawmill industry is most important in terms of the number of workers, the amount of timber harvested and the value added by manufacture. In the record year of 1959 about 80 million board feet of lumber was manufactured. The number of producing sawmills and the amount of lumber manufactured since that year have declined steadily due to diminishing markets.

The sawmill industry is characterized by a relatively large number of small sawmills. Most of the small mills operate only intermittently, except during favorable market periods. There are only six sawmills capable of producing over five million board feet per year. These six mills are currently responsible for over 90 percent of the total production. Only one mill has a capacity to produce over 50,000 board feet per shift.

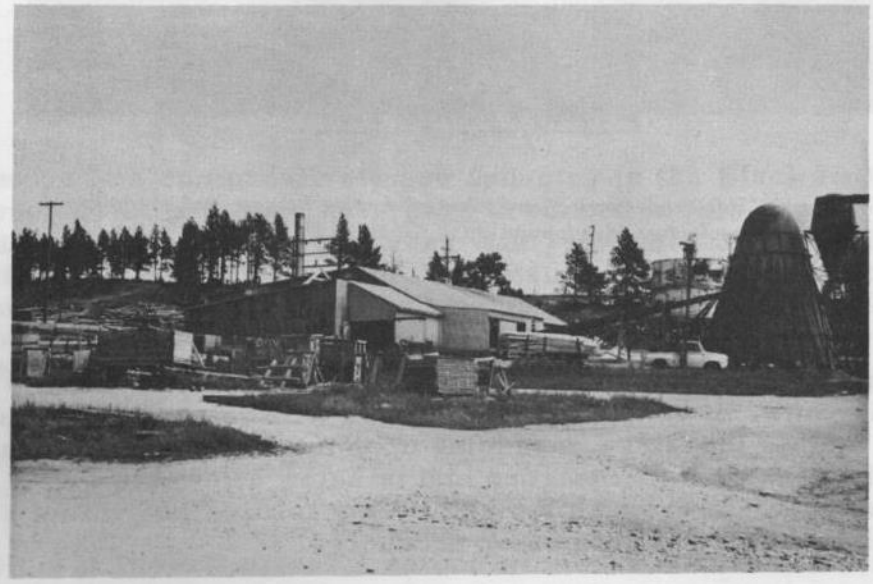

Fig. 5. Typical medium sized sawmill in the Black Hills.

There has been little or no competition for stumpage between sawmills and the pulpwood industry. These industries generally seek a different class of timber. A small percentage of the timber harvested for pulpwood is actually larger than the average size material that many sawmills are making into lumber, however such material is usually removed in an improvement cutting and is immature second-growth timber, not suitable for producing lumber.

The sawmill industry produces about 30,000 tons dry weight of chippable residues on an annual basis. This is equivalent to about 25,000 cords of pulpwood. With the many small scattered sawmills, there are problems in accumulating all of the chippable residue produced. Residues from the three largest mills are now being converted into chips, accounting for two-thirds of the potential production.

Fig. 6. Slab concentration yard takes production from several sawmills for the manufacture of pulpwood chip. Custer, S.D.

The sawmill industry is using about 75 percent of the available allowable cut at this time. It is expected that there will be some variation in timber usage by this industry, depending upon market conditions, however long term trends indicate that the demand is below allowable levels. The surplus of sawtimber is between ten and twenty million board feet annually. Some of the surplus may go into other products.

Sawmills are faced with a general decline in markets. This trend is expected to continue. Unless a major change is made in manufacturing methods and utilization, the number of active sawmills will decrease. The production of pulpwood chips, where feasible, is an important factor in enabling a sawmill to maintain a competitive position .

The Post and Pole Industry

There are eight treating plants in the Black Hills which produce nearly one million pieces of post, poles, and piling annually. Three of these plants use a pressure-treating process, while the remainder use non-pressure preservative methods. There are also three plants which produce peeled and dried posts and poles for treatment at other locations within the area, as well as for treatment at plants located outside the state.

The volume of live green timber used by the post and pole industry is estimated to be equivalent to approximately 15,000 cords annually. This volume represents less than 6.5 percent of the available pole timber supply.

The market for treated post and pole material is fixed within certain limits and competition from other regions has a strong bearing on production in this area. It is not anticipated that there will be any substantial increase in the production of these products in the Black Hills.

There is some competition for stumpage between the post and pole and the pulpwood operator. In many cases they are seeking the same class of material, however different types of stands are often more suitable for one product or the other, depending upon the age, class and stocking. Integration of operations is becoming more prevalent, making the harvesting of all stands more economical. The greatest demand for posts is in diameters of less than five inches, representing a size which is more costly to handle as pulpwood. Therefore, the competition is more apparent than real.

The Pulpwood Industry

Pulpwood is a comparatively new industry in the Black Hills. While limited amounts of pulpwood have been produced in this area over the past two decades, the first important year was 1959 when about 27,000 cords of wood were shipped to pulpmills in Wisconsin. Economical multiple-carload rates, pioneered by the Chicago and North Western Railway late in 1958 were responsible for establishing pulpwood as a major forest industry in the Black Hills. There has been a moderate but steady growth in the movement of pulpwood since the first multiple-carload rates were established.

Production of pulpwood is primarily under the "broker-producer" system. Much of the production comes from numerous small operators, however the brokers in this area are also responsible for a large part of the production. Production of pulpwood covers a rather wide area and the small producer is the key to moving large volumes of wood, just as it is in the Lake States and the South. In other parts of the Rocky Mountain region all of the volume from any one area will usually move into one rail landing and the shipper is usually the sole producer.

Although there are several strategically located rail landings in the Black

Hills capable of handling large volumes of pulpwood the number of individual producers dictate that they be used in a manner similar to a concentration yard. This system also permits economies in loading equipment not normally available to the small producer.

The present annual harvest of pulpwood is approximately 30,000 cords. The annual drain, including posts and poles, represents about 17.5 percent of the allowable cut.

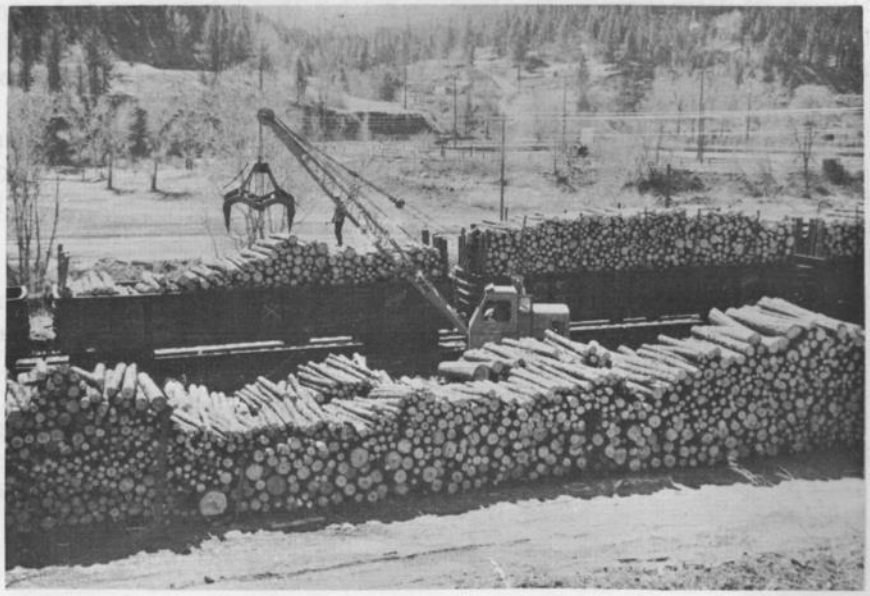

Fig. 7. Mechanized pulpwood loading.

PONDEROSA PINE AS A PULPWOOD SPECIES

The important characteristics of ponderosa pine relating to its suitability for pulpwood have been determined through actual experience as well as research. A groundwood and sulfate pulpmill in the southwest has based its entire pulp production on ponderosa pine. Three sulfate mills in the Lake States have had several years of experience using ponderosa pine in combination with local pulpwood species. The suitability of ponderosa pine for the Kraft process is therefore well established.

Ponderosa pine has been pulped experimentally by the sulfite process, however certain extractives in the wood react unfavorably. There are several modified sulfite pulping processes which have overcome similar problems with other softwood species. According to Sanyer, Keller and Chidester (Multistage Sulfite Pulping of Jack Pine, Balsam Fir, Spruce, Oak and Sweetgum - Tappi, Vol. 45 No. 2): "Multistage sulfite pulping with sodium base offers interesting possibilities for producing pulps that have widely varying properties from any coniferous wood species. By using an appropriate combination of acid sulfite, bisulfite, neutral sulfite or mildly alkaline stages, pulps can be prepared that have properties ranging from those of high yield Mitscherlich fiber to relatively low yield pulps approaching kraft pulp in strength but much brighter in color."

Some sulfite pulpmills are converting to other processes in order to recover soda base spent liquors as a means of reducing the polution problem. The ability of these processes to use softwoods other than spruce offers the added opportunity of producing a variety of pulps of desirable yields and strength.

It is possible that such pulpmills in the Lake States who have made the conversion have been reluctant to consider the use of pine due to the delicate supply situation which exists for this species in their wood purchasing areas. Another factor is that they do have an abundant source of hardwoods and aspen, but this is ignoring the versatility that softwoods could add to their process. The fact remains that there are surpluses of softwood timber in the Black Hills and other parts of the Rocky Mountain region which could develop into reliable sources of wood for several pulpmills should they find it desirable to use pine even on a limited basis.

Stand Characteristics

Stands of ponderosa pine in the Black Hills fall into two principal groups, based upon age class. Immature stands of pole timber ranging in age from fifty to 100 years provide the bulk of the harvest. Small log and mature sawtimber stands, often referred to as "yellowbark" range in age from 101 years and up. Although there are some minor differences in the wood from these two groups, they are mostly academic since there is no segregation in actual

practice. Although there are some exceptions, stands of less than 50 years in age contain only a small volume of merchantable pulpwood or post and pole material.

Young pole stands of "blackjacks" cover extensive areas in the Black Hills. These stands will average nine cords per acre, but may contain over thirty cords per acre in exceptional cases. The average diameter, breast high, is 8.2 inches, with a merchantable height of three bolts. Trees will average about 15 to the cord.

Mature pole stands are rather limited in area, averaging about 11 cords per acre. In exceptional cases the "yellowbark" pole stand may have volumes over 40 cords per acre, and volume as high as 65 cords per acre have been recorded. The average diameter, breast high, is 8.4 inches with a merchantable height of four bolts. Such stands will average 11 trees to the cord.

Average stand characteristics may be somewhat misleading since they do not necessarily describe the type of stands which are currently being harvested. Most pulpwood cuttings in the Black Hills are from thinning operations and the yield depends upon the marking policies as well as the characteristics of the stand. These thinnings remove from 40 to 60 percent of the stand and the volume of pulpwood harvested will vary from five to fifteen cords per acre. Within this range of production there is little variation in harvesting costs.

Stacking Characteristics

The unit of measure for pulpwood in the Black Hills is the standard cord (4'x 4') based upon 100" bolts. This volume of 133 cubic feet is composed of 59 percent solid wood, 19 percent bark and 22 percent air space. These figures assume that the wood is carefully hand piled. The majority of the pulpwood harvested from the Black Hills comes from trees ranging in diameter from 6.0 to 10.0 inches. An average rough stacked cord will contain 42 bolts. The volume of solid wood in a rough stacked cord is about 78.9 cubic feet for 100 inch bolts. A peeled cord will contain about 99.9 cubic feet of solid wood.

Wood Characteristics

The wood from stands in the 50 to 100 year age group has a specific gravity of 0.398 and a density of 24.8 pounds per cubic foot on a moisture free basis. Green cut wood will have an average moisture content of 133 percent and a weight of 5300 pounds per cord for rough wood. This weight is due to the fact that the wood contains a high percentage of sapwood . The grain of the wood is variable and may contain many wide rings, depending upon growth conditions of the tree.

The wood from "yellowbark" stands has a specific gravity of 0.417 and a density of 26.0 pounds per cubic foot on a moisture free basis. Green cut wood will have a moisture content of 111 percent and a weight of 4900 pounds per cord. The grain of this wood is rather fine and uniform.

It appears that the "yellowbarks" should produce higher yields of pulp due to the greater density as well as better stacking characteristics, however, there is apparently little difference in pulp yield. It may be assumed that this is due to the differences in the sapwood content of the two different types of wood.

Fig. 8. Section of pondeosa pine pulpwood showing uniform growth and wide sapwood.

BLACK HILLS SPRUCE

Although ponderosa pine is the dominant species in the Black Hills, there is also a large volume of spruce (picea glauca var. albertiana) having commercial possibilities for pulpwood. Present utilization of this species is negligible.

This species occurs chiefly at the higher elevations in the northern sections of the Black Hills, but is also found in small stands or as individual specimen on most sites in other portions of the area.

There are about 22,000 acres of spruce in commercial stands in the Black Hills. Forest lands include 20,600 acres of the species while the balance is primarily on private land.

Some of the volume would be available on a year-round basis, however much of it occurs at elevations receiving the heaviest snowfall and logging would be confined primarily to the summer months. This may be considered an advantage since most Minnesota spruce occurs in swamps and can only be logged in the winter.

Spruce stumpage is available at a stumpage price competitive with pine pulpwood. There is no demand for spruce as sawtimber, consequently all of the cut would be available for pulpwood.

Spruce is managed on a 100 year rotation. Stands ten acres and larger on Forest Service land are divided as follows:

18.3 thousand acres of sawtimber size timber.
2.3 thousand acres of poletimber size timber.

The standard size classes for sawtimber are 9.0" d.b.h. and larger.
The standard size classes for poletimber are 5.0" - 8.9" d.b.h.

The Forest Service recognizes there is little or no demand for spruce sawtimber. The entire yield of this species has been calculated for use as pulpwood.

The annual allowable cut for the spruce type for the next ten years is:

Harvest cut - 130 acres @ 25 cords per acre - 3,300 cords.
Seed cut - - - 120 acres @ 10 cords per acre - 1,200 cords.

An additional 500 cords per year would be available from private lands.

HARVESTING PULPWOOD IN THE BLACK HILLS

Favorable climatic conditions permit year-round logging throughout most of the Black Hills. Only a relatively small area at higher elevations of the Limestone Plateau receives a winter snowfall heavy enough to interfere with normal logging operations. Elsewhere there will normally be much bare ground throughout most of the winter. The southern part of the Black Hills are particularly favorable for winter logging.

Since most of the annual precipitation falls between April and September, the period of spring frost breakup is relatively short. Load limits which are placed in effect on major public roads during the thaw are not unduly restrictive and many haulers continue to operate with reduced loads. In a normal year there is little slack-off in production during this period.

Pulpwood Logging

Pulpwood cutters generally operate on a contract basis and are paid at per cord rates. The gasoline chain saw is universally used for felling and bucking. Although there are many variations in logging methods, animal skidding of tree length wood seems to result in the greatest production per man day. Small crawler tractors or wheel tractors apparently are unable to provide sufficient production to justify the investment. Rubber tired FWD tractors with an integral arch show some promise as a means of increasing skidding production and reducing costs.

Fig. 9. Mechanical pulpwood loading at woods landing.

With tree length logging the timber must be bucked into pulpwood lengths at the landing where it is loaded on trucks for hauling to the rail landing. In many cases a tractor loader is used. In this case the wood is not ordinarily stacked, and a relatively large landing is required. Truck mounted loaders are becoming increasingly popular in this area and their use demands that the wood be stacked neatly along the side of the truck road. Although these loaders reduce the payload of the truck they do facilitate unloading and in some cases permit moving wood directly to the cars, thereby eliminating extra handling.

Logging costs in the Black Hills are subject to the same variables as other regions. The terrain varies from flat to moderately steep. The road system is possibly more extensive than any similar forested area in the United States. There is an ample supply of good labor available at reasonable rates. Most pulpwood operations are at least partially mechanized. Therefore, production costs may be expected to be in line with other pulpwood producing regions.

Trucking of Pulpwood

While there are many types of trucks in use for hauling pulpwood, the most commonly used vehicle is a tandem axle truck carrying a load of from four to five cords. The rear axle may be driven or may be of the dummy type. Within the present range of hauling this appears to be the most efficient equipment.

Hauling distances substantially greater than those commonly encountered will possibly require heavier equipment capable of handling greater payloads. In such cases logging shows will have to become larger in order to justify the type of equipment necessary for a balanced operation.

Present hauling distances vary from a few miles up to a maximum of 25 or 30 miles. At least 50 percent of the present allowable cut lies within this range. Nearly all of the timber would be accessible within a radius of less than 50 miles from the nearest rail point on the Chicago and North Western Railway. Greater efficiencies in hauling and harvesting have rapidly extended the economic haul distance, just as has been done in other pulpwood producing regions.

Fig. 10. Selfloading trucks are widely used in Black Hills.

In anticipation of the development of the pulpwood industry, the 1953 Session of the South Dakota Legislature legalized hauling of 100 inch pulpwood crossways to the truck bed.

Since all pulpwood is transported to the rail sidings by truck this is an important part of the overall production cost. Unlike most mountain areas the Black Hills are well traversed with a network of all-weather roads. Major county roads and hard surfaced highways converge on one of the several convenient rail loading stations on the North Western Railway.

Trucking costs are variable, depending primarily on the type of equipment and the length of the haul. Even though the Black Hills are a mountainous area, there is no significant difference in trucking costs for any given distance when compared to other regions, therefore no attempt has been made to analyze these costs. With an average haul of 20 to 25 miles trucking costs are about four dollars per cord. Larger and more efficient equipment is used for longer hauls, thereby keeping costs in line with the average.

Peeled Pulpwood

Experiments in the hand peeling of ponderosa pine began as early as 1956, however sufficient production could not be obtained by this method to be economically justified. This is presumably due to the thickness and difficulty in removal of the bark.

A mechanical pulpwood debarker was brought into the Black Hills following the Deadwood fire of September, 1959. It was hoped that this move would permit the salvage of the large volumes of pulpwood that were killed in this 4,500 acre fire. Complete removal of the charred bark and wood was so difficult that this plan was abandoned. During the year 1960 a few thousand cords of machine peeled fresh cut green wood were produced. The pulpmills then discontinued the purchase of peeled wood. It proved to be quite slippery and dangerous to ship the long distances involved in the rail haul.

In spite of the difficulties which developed in connection with the production of peeled pulpwood there still remain certain advantages in its favor. Some of the danger in shipment could be reduced through air drying of the wood. This would also result in a substantial reduction in shipping weight. The major economic advantage in shipping peeled wood would be a 20 percent increase in the solid wood content in a carload of pulpwood, thus effectively reducing the average freight cost. The solid wood content of a peeled cord is about 100 cubic feet compared to 79 cubic feet for a rough cord. These figures are based on a standard 100 inch cord.

Some work has been done with chemical debarking of pulpwood in the Black Hills. Chemical debarking offers the advantage of a substantial reduction in moisture content by the time the tree is harvested. There would also be no fiber loss which becomes an important factor in machine peeled wood. Although this system offers possible cost savings it has the disadvantage of requiring careful management and presents the possible risk of the loss of treated stumpage by fire or the loss of peelability by not debarking at the proper time.

PULPWOOD TRANSPORTATION

The Black Hills are in a favorable position for the movement of pulpwood, having several local stations on the Chicago and North Western Railway that are conveniently located to timber supplies. In addition, there are a number of pulpmills in Wisconsin served directly by the North Western. With the advantage of a single line haul, in October, 1958 the North Western initiated multiple carload rates on pulpwood. These new rates resulted in substantial savings to the shippers and permitted Wisconsin pulpmills to import pulpwood from the Black Hills. As a result of this historic rate action the Black Hills developed into an important source of softwood pulpwood.

Transportation Costs

The cost of railroad transportation is a key factor in the movement of pulpwood, representing over one-third of the total cost of pulpwood delivered to the pulpmill.

It costs less to ship pulpwood via the North Western from the Black Hills than from any other Western producing area. Rail costs to other long haul shipping points are shown in Figure 11. These are for comparative purposes only. Published tariffs should be consulted for actual freight rates in effect.

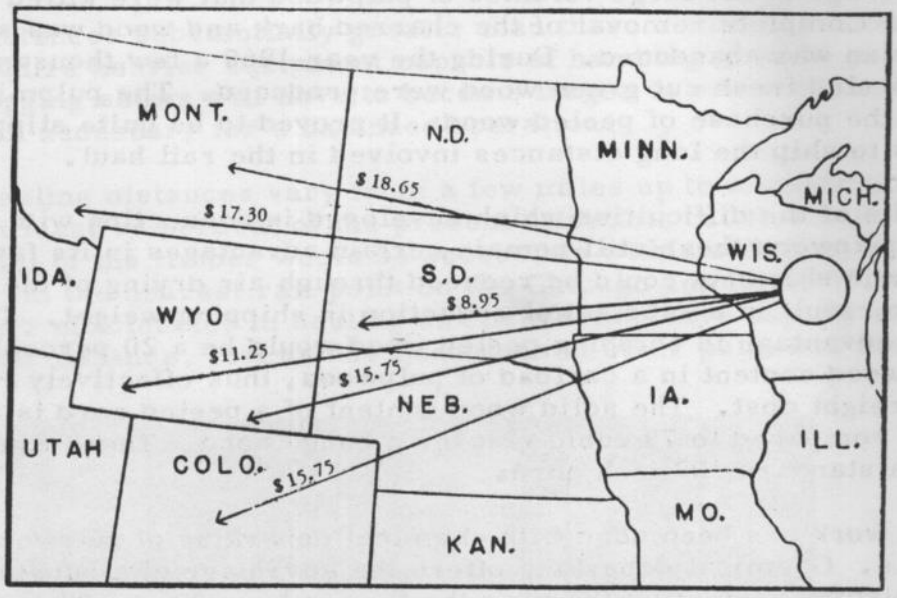

Fig. 11. Comparison of per cord rail rates from the Black Hills and other Western producing points.

Rapid City, S.D. to Green Bay, Wisconsin represents a distance of 892 miles. In order to establish an economical rate for this distance there are certain conditions that should be met. First, the rate should be a "local rate." That is, the transportation should be completely over the line or lines of a single carrier.

The rate should be based on a volume movement. This is presently achieved by the use of multiple car loadings. In the case of the Black Hills and points in Wyoming and Nebraska, the rates are based on a minimum of ten carloads billed from one consignor, to one consignee, on one day, and on one bill of lading. In addition, the rate must be predicated upon a certain minimum annual volume.

A further requirement in establishing an economical rate over this distance is that each car be loaded to the maximum safe capacity. In the case of the Black Hills and other western points on the Chicago and North Western Railway, per cord freight rates are based on a minimum volume of 21 cords. Actual loadings average from 22 to 23 cords in standard 40 ft. gondolas, this being well above the average for the Lake States.

The multiple carload rate on pulpwood from the Black Hills to several specific points in Wisconsin is $8.95 per cord. This rate and the points covered appear in the Appendix on Page 35.

Transportation Equipment

Much of the rolling stock on the Chicago and North Western Railway has been rebuilt recently and brought up to new equipment standards. This includes pulpwood gondolas, as well as other equipment used by the railroad.

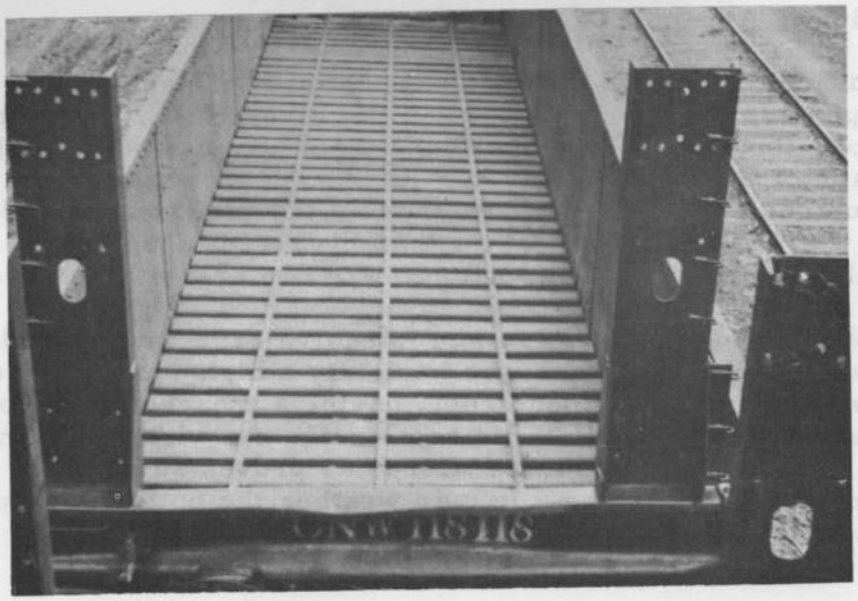

Fig. 12. End-rack pulpwood gondola.

Our pulpwood fleet, consisting of 50-ton and 70-ton gondolas, has been rebuilt and the cars equipped with solid steel floors. In addition, four hundred 50-ton gondolas have been rebuilt specifically for pulpwood service. These cars are equipped with permanent end-racks which also have hooks provided for attaching wire netting as required by loading regulations. The floors of these cars are constructed of steel planking, spaced so as to make the floors self-cleaning. Longitudinal steel straps are welded to the floor to prevent the unloading clam bucket from catching the floor planks.

The end-rack pulpwood gondolas provide added convenience in loading. Normally, a bulkhead must be constructed at each end of the car by standing pulpwood sticks upright to permit loading above the sides of the car. The steel bulkheads provide a more stable load and eliminate this additional labor on the part of the loading crew. They also permit the car to be loaded directly from a truck equipped with self-loader without requiring the operator to dismount.

Transportation of Woodchips

Woodchips are becoming an increasingly important source of wood fiber for pulpmills throughout the country. Sawmills in the Black Hills are currently shipping chips to the pulpmills in the Lake States region. Present movements are handled in standard 50-ft. box cars with an average capacity around 4800 cubic feet. Present unloading systems in use require cars with doors nine feet or over in width.

Fifty foot box cars, in common use on the North Western, vary somewhat in load limit but are usually loaded to capacity at 110,000 to 120,000 pounds. This is equivalent to about 21 units of chips. However, freight charges are based on carload rates. The current rate from on-line points in the Black Hills to on-line destinations in Wisconsin is $224.23 per car, as shown in the Appendix on Page 36.

In addition to the standard box car, the North Western has tested two types of open-top cars from origins in the Black Hills. One type of car was the open-top, high-sided, bottom unloading hopper car. The chief disadvantage of this type of car was that excessive shaker time was required in unloading in sub-zero weather. Chip loss was as high as 3,000 pounds on the 900 mile trip. Other than the direct economic loss, accumulation of chips on the railroad right-of-way can create a serious fire hazard.

The North Western has also run intensive experiments with a chip car of their own design. This car was basically a high-sided, bottom unloading, gondola, with a partially closed roof, having a trough opening of sufficient width to permit top loading. This roof design has virtually eliminated loss of chips. The bottom unloading feature has proven superior to the hopper bottom for ease of unloading. In cold weather the bottom dumping gondola unloads in about half the time required for the hopper car.

Freezing of chips provides few problems in unloading of box cars. On the basis of tests with open-top cars from the Black Hills it has been concluded that they are not satisfactory for long hauls in northern climates during the winter months. Frozen chips in open cars are the cause of unloading and demurrage problems in some areas.

Transportation costs on woodchips may be expected to be somewhat greater than pulpwood because of the higher type of cars required, however this may be offset by other advantages offered by chips.

Fig. 13. North Western's experimental woodchip car.

PULPWOOD PRODUCTION AND FOREST PROTECTION

Like most forest areas the Black Hills have a fire history. The most disastrous fires were the Rockford Fire of 1931, burning 21,640 acres and the McVey Fire of 1930, burning 21,857 acres. Other less serious fires were the Sundance Fire of 1936, which burned 8,361 acres, the Scott Fire of the same year, burning 7,338 acres, the Big Elk Fire of 1939, burning 6,600 acres and the Deadwood Fire of 1959 which burned 4,500 acres.

Major fires are becoming progressively less serious since fire fighting organizations have become more highly trained and large amounts of heavy fire fighting equipment have become available. New techniques in fire fighting have been developed in relatively recent years which have greatly reduced the risk of a major fire. Helicopter fire attack crews are now used regularly in the Black Hills. Drops of bentonite slurry from low flying aircraft have proved to be effective in controlling fire in many high hazard areas, and a suitably equipped bomber is regularly stationed in the Black Hills during the fire season as a backup for the helicopter attack crews or as a prime attack weapon.

During 1960 and 1961 the Black Hills faced a major drought. There were a large number of small fires during this period which had the potential of developing into the type of major fire which had occurred on several occasions during similar drought periods in the 1930's. Rapid detection and attack prevented most of these fires from burning more than a few acres. Fire protection has become so advanced that the risk of losing large acreages of commercial timberland is no longer a major consideration. The Black Hills also have one of the most extensive road systems of any forest area in the United States. This accessibility is also a key factor in effective protection of the area from fire.

Next to fire the Black Hills Beetle (Dendroctonous ponderosae) has been the greatest decimating factor in this area. Control methods for this insect are effective but costly. Maintaining a healthy forest through properly regulated harvests can be an important factor in the control of insects as well as some diseases which attack ponderosa pine. Experience has shown that insect damage is usually smallest in healthy managed stands.

These destructive agencies may have been important ecologically in the past through their action in thinning the forest, but they are not very selective and result in the loss of large volumes of commercial timber. The problems of protection, other than being costly, are not an important factor. Pulpwood cutting can go a long way toward replacing these destructive forest agents, resulting in a controlled thinning process which will provide a financial return instead of a major outlay of cash for protection.

PULPWOOD SUPPLY AND OTHER FOREST USES

Many sheep, cattle and horses graze the summer range of the forest each year. Deer are relatively abundant and elk or even an occasional mountain goat may be seen in certain areas. Dense forests provide much needed cover to protect wildlife but unfortunately do not always provide the forage needed for survival. Wild game thrives in a managed forest where timber harvesting opens up the dense canopy so that forage upon which they feed will flourish. There is no question that properly regulated pulpwood harvests may be classed as a range improvement measure, be it for wildlife or lifestock.

Recreation is another important use of the forest. The Black Hills are very scenic and provide many attractions for the tourist as well as permanent residents of the area. Points of interest include Spearfish Canyon, Harney Peak, Rushmore National Monument, Sylvan Lake, Wind Cave and many others. An attractive ski area at Terry Peak provides for winter sports and many large water reservoirs in and around the Black Hills take care of the fisherman and boating enthusiast.

The organized recreation industry of the Black Hills has expressed the view that there is no conflict between their interests and a sustained pulpwood industry as long as there is no widespread clearcutting of the timber. They affirm that which creates wealth for the local economy will supplement the value of the recreation industry.

Small areas of forest land can accomodate a relatively large number of people. The greatest demand that the traveling public make is for the land upon which the highways are built. Few if any realize that timber harvesting is taking place unless they should happen to encounter a truck loaded with logs.

TIMBER SALES POLICIES OF THE U. S. FOREST SERVICE

About 65 percent of the commercial timberland in the Black Hills is under the administration of the United States Forest Service through the offices of the Black Hills National Forest. Their objective in managing the forest is to provide for a maximum combination of values and services considering all uses. It is their aim to produce good quality crop trees of sawtimber size at a rotation age of 140 to 160 years.

Silvercultural System

The ponderosa pine type will be clearcut at rotation age with evenaged management as the objective. Variations of the clearcut method are: (a) commercial clearcut with removal of disease-infected residual stand, (b) seed tree, (c) shelterwood, (d) group clearcut, sometimes referred to as group selection. A two-cut shelterwood system is normally used in this area.

Non-commercial thinnings will be applied after saplings are above browse height. Intermediate cuts (commercial thinning) will be applied at approximately twenty year intervals to those stands below rotation age. The magnitude of these thinnings depend upon markets for the products.

The Forest Service considers the application of intermediate cuts as a vital factor in reaching their management objective with regard to sawtimber. Often the volume of timber removed in intermediate cuts may exceed the volume of the crop trees. The role which pulpwood markets play in reaching their objectives is fully appreciated by the Forest Service. While the value of posts and poles is not to be minimized, pulpwood is the only market with the potential of expanding to reach the allowable cuts which have been set for intermediate harvests.

Stumpage Costs

The minimum stumpage for products removed by commercial thinning is one dollar per cord. Most of the sales currently being offered are at or near this minimum price. In addition to stumpage the Forest Service recognizes the fire hazard caused by timber harvesting. Timber operators are required to lop and scatter their brush as a normal part of the operation and also to deposit cooperative funds with the Forest Service for partial brush disposal and added fire protection. This cost is a minimum of 30¢ per cord and is added to the stumpage price.

Merchantability Requirements

Any tree which contains two or more 100 inch pulpsticks in the lower two-thirds of the stem may be marked for cutting as a merchantable tree. A pulpstick must have a minimum diameter of four inches inside the bark at the small end. To meet these standards a tree usually must have a minimum diameter of six inches, breast high. Trees of ten inches, breast high, and over are

classed as sawtimber. However, in second growth stands, trees of larger diameters may be marked for cutting as a stand improvement measure. The maximum sized tree marked is seldom over 16 inches in diameter, breast high.

Marking of timber for cutting is generally confined to stands which will permit the harvest of at least five cords per acre. This volume permits an economic cut, while volumes in excess of this amount do not have any marked influence on logging costs. The average cut is from seven to eight cords per acre. Harvests over extensive areas may average up to ten cords per acre, while it may go as high as 20 cords per acre over limited areas.

Timber Contracts

Timber sales contracts are made for periods of from one to five years, depending on the size of the sale. On larger sales provisions are made for re-appraisal after a certain specified volume is cut. Upon re-appraisal the stumpage price cannot be set below the one dollar per cord minimum.

Pulpwood offerings have been made for volumes of less than 100 cords up to in excess of 40,000 cords. The Forest Service prefers to offer sales with larger volumes in order to attract more reliable operators and reduce administrative costs and expenses.

Forest Service officers have cooperated in every way to encourage the harvest of pulpwood as well as posts and poles. Intermediate cuttings are an intrinsic part of the management of ponderosa pine. Only through complete utilization is it possible to achieve maximum production from the forest. The large proportion of Federal ownership presents no obstacle in the development of the pulpwood industry in the Black Hills.

TIMBER SALES ON STATE AND PRIVATE LANDS

Timber sales on state and private lands are quite similar to Forest Service timber sales. The primary difference may be greater leniency with regard to slash disposal and road construction .

Private timberlands have given much impetus to the harvesting of pulpwood. Large acreages of private land surround the National Forest and have been given early attention in the development of pulpwood operations in this area.

Although there has been some abuse in the harvesting of private woodlands, the practices have been surprisingly good. Much of the private woodlands which have been cut for pulpwood have been left in reasonably good productive condition. Farm forestry projects under the South Dakota Department of Game, Fish and Parks have been instrumental in furthering the cause of timber management. There are also many active members of the Tree Farm program in the Black Hills.

Stumpage prices on private lands are similar to those on Federal lands, generally ranging from $1 to $2 per cord, depending on the location.

Many private woodland owners have become engaged in the production of pulpwood and these lands have become an important source of supply. While the amount of wood from this source is diminishing, it still carries its proportionate share of the harvest load. Some of these lands will be ready for a second cutting in the next decade. Local farms and ranches have become an important source of labor as well as stumpage.

Fig. 14. Farm woodlots are an important source of pulpwood in the Black Hills.

Most of the timber on state lands is confined to Custer State Park. There has been a limited amount of pulpwood harvesting in this area which is favorably situated with respect to two rail landings on the Chicago and North Western Railway. With a limited forestry staff, this area has placed most of its emphasis on the sale of sawtimber, however the administration has indicated they would be placing greater emphasis on roundwood products sales in the future.

Marking practices, contracts and stumpage prices on state lands are similar to the Forest Service lands.

PULPWOOD RESOURCES TRIBUTARY TO THE BLACK HILLS

There are several areas tributary to the Black Hills that have a potential for development of pulpwood production. The combined yield from these areas is estimated to be as high as 75,000 cords per year. This includes woodchip production of 20,000 units per year from sawmills in the Wind River area of Wyoming. The possibility of opening the Wind River Indian Reservation to commercial timber cutting could result in a substantial increase in pulpwood and chippable sawmill residues.

The Pine Ridge of Nebraska

The "Pine Ridge" of Nebraska is composed of pure, evenaged stands of ponderosa pine. The total forest area covers 230,000 acres. Of this 70 percent, or approximately 160,000 acres, is considered to be commercially accessible and operable.

Eighty percent of the area is in farm or other small private ownership. Fourteen percent of the area is administered by the U.S.Forest Service and the balance of the area is in state school land.

The area contains over 1,100,000 cords of merchantable pulpwood timber. The average volume is seven cords per acre, although many stands will contain as high as 20 cords per acre.

The "Pine Ridge" is located in Sheridan, Dawes and Sioux Counties of Nebraska, approximately 60 miles south of the Black Hills. The timber lies in a narrow belt which is parallel to the Chicago and North Western Railway for about 80 miles. Truck haul distances to rail loading points do not exceed thirty miles.

The Chicago and North Western Railway provides convenient single line hauls to pulpwood markets in the Lake States and multiple-carload rates could be established which would compare with those being used in the Black Hills.

Most of the timber is less than 80 years old. Stands between the ages of 50 and 80 years have their greatest potential for the production of pulpwood. Since the land is primarily in farm ownership, short rotations should be favored. Proper management of the timber will result in an abundance of natural regeneration.

There is no established lumber industry in the area so that there is no conflict in land management objectives. The majority of landowners welcome stable markets for their timber and reasonable stumpage prices can be expected.

With an operating volume in excess of one million cords and an adequate growth rate, the allowable annual cut is estimated to be 15,000 cords. Several thousand cords of pulpwood have been harvested in the past few years, indicating an opportunity for further commercial development of the timber for pulpwood.

Central Wyoming

There is an estimated 20,000 cords of pulpwood available for harvesting annually in the central area of Wyoming, including the Laramie Peak Range and smaller tributary areas. Sixty percent of the pulpwood volume is lodgepole pine and the balance is ponderosa pine, both excellent pulpwood species.

There are 480,000 acres of timberland in the area, although the full extent of the commercial timber is not known at the present time. Seventy percent of the timberlands are in private ownership and the balance of the area is in public ownership, primarily in the Laramie Peak division of the Medicine Bow National Forest.

The Laramie Peak Range, and tributary timber areas are located in the east central part of Wyoming, approximately 200 miles southwest of the Black Hills. The area extends up to a few miles south of Casper, 50 miles east to Douglas and approximately 50 miles south of Douglas. Convenient rail loading points are located at Casper, Glenrock and Douglas.

The Chicago and North Western Railway provides convenient single line hauls to pulpwood markets in the Lake States and economical multiple-carload rates have been established for this area.

Timber stands in the area are primarily of pulpwood size. Lodgepole pine stands average 25 cords per acre and may go as high as 50 cords per acre. Prevailing practice is to clearcut in block or strips in this timber type, greatly facilitating logging operations.

Pole sized stands of ponderosa pine, located primarily in an area south of Douglas, average 15 cords per acre, with volumes as high as 30 cords. Logging is on a selective basis but access is good in the ponderosa pine type and profitable operations are possible. The volume of pulpwood in sawtimber stands may be as high as 10 cords per acre, which may be removed in the first cutting.

Elevations range from 6,000 to 9,000 feet. Higher elevations receive heavy snowfall, but there is a sufficient volume of timber at lower elevations, making possible year-round operations, particularly in the ponderosa pine type.

An equivalent volume of over 750 carloads of pulpwood is available annually from the central Wyoming area. This represents an important undeveloped potential. There is a local supply of experienced labor available for the production of pulpwood. Most of the volume is available at hauling distances under 60 miles.

Wind River Range of Wyoming

There are 20,000 cords of lodgepole pine pulpwood available annually from the Wind River Range in Wyoming. It is estimated that there is sufficient timber to sustain cutting for a minimum period of 15 to 20 years. The pulping characteristics and yields of lodgepole pine make it a highly desirable pulpwood species.

Eighty-seven percent of the commercial timber is located in the Shoshone National Forest and the balance is Public Domain administered by the Bureau of Land Management. There is no private land available for timber cutting in this area.

The Wind River Range is located in west central Wyoming on the Continental Divide, approximately 400 miles west of the Black Hills. The rail shipping points for this area are at Riverton and Lander which is the western terminus of the Chicago and North Western Railway.

Timber from the Wind River District is located from 85 to 120 miles from shipping points. This area, representing about 50 percent of the volume is at present considered too remote for commercial pulpwood operations. Pulpwood from the Lander District is located at distances of 15 to 40 miles from Lander. Green Mountain is located approximately 75 miles from Lander.

Freight rates taking advantage of single line hauls have been established for single and multiple carload shipments to pulpwood markets in the Lake States.

Most of the timber lies in an altitude range from 8,000 to 9,000 feet. Although the area receives heavy snowfalls, logging is normally possible for nine months of the year. Major access roads are available into some areas from which this material would be harvested and other areas would become available as new access roads are built.

Several thousand cords of pulpwood have been harvested annually since 1960 in the Lander area, indicating operations are feasible and offering opportunity for expansion.

The usual harvesting practice in this area is to clearcut in blocks or strips, resulting in very favorable operating costs. The volume will run from 10 to 40 cords per acre. The average pole stand will contain 20 cords per acre, while sawtimber stands will contain an average of 10 cords per acre.

Further expansion of pulpwood harvesting is possible on the Wind River Indian Reservation. Although cutting is not now permitted it has been under consideration by the Tribal Council. A timber survey is in process as of this writing and a management plan is expected to follow. It is expected that this area will open up many well stocked, high quality stands of accessable pulpwood timber.

APPENDIX

SUPPLEMENT 113 TO WTL TARIFF 18-U

SECTION 1 - SPECIFIC COMMODITY RATES

Item	COMMODITIES	FROM	TO	RATES in cents per cord
4335-D	**PART A (See Note 2)** Pulpwood. Minimum weight 25 cords per car (See Note 1.) Rate in cents per cord of 128 cubic feet. Note 1. - Minimum weight of 23 cords per car will apply when carrier is unable to furnish cars over 43 feet in length, inside measurement, and for carrier's convenience shorter cars are furnished the min wt will be 23 cords per car. Note 2. - Rate will not apply where rates are provided in Part B.	Buffalo Gap . . . . S.D. Custer . . . . . S.D. Deadwood . . . . . S.D. Fairburn . . . . . S.D. Hermosa . . . . . S.D. Jolly Dump . . . . S.D. Mystic . . . . . S.D. Pluma . . . . . S.D. Rapid City . . . . S.D. St. Onge . . . . . S.D. Sturgis . . . . . S.D. Whitewood . . . . S.D.	Appleton . . . . . Wis. Biron . . . . . Wis. Combined Locks . . Wis. Cornell . . . . . Wis. Eau Claire . . . . . Wis. Green Bay . . . . . Wis. Kaukauna . . . . . Wis. Kimberly . . . . . Wis. Little Rapids . . . . Wis. Marinette . . . . . Wis. Menominee . . . . . Wis. Nekoosa . . . . . Wis. Niagara . . . . . Wis. Oconto Falls . . . . Wis. Park Falls . . . . . Wis. Peshtigo . . . . . Wis. Port Edwards . . . Wis. Rhinelander . . . . Wis. Rothschild . . . . . Wis. Shawano . . . . . Wis. Stevens Point . . . Wis. Tomahawk . . . . . Wis. Wisconsin Dam . . Wis. Wisconsin Rapids . Wis.	1271
	PART B (See Notes 3 and 4) Pulpwood. Minimum weight 23 cords per car (except as noted). Rates in cents per cord of 128 cubic feet. Note 3. - Applies only on shipments in lots of 15 cars or more billed from one consignor at one origin on one bill of lading at one time to one consignee at one destination (except as noted.) Note 4. - When in connection with C&NW, minimum weight will be 21 cords per car and applies only on shipments in lots of ten (10) or more cars, billed from one consignor at one origin on one bill of lading at one time to one consignee at one destination.	Buffalo Gap . . . . S.D. Deadwood . . . . . S.D. Fairburn . . . . . S.D. Hermosa . . . . . S.D. Jolly Dump . . . . S.D. Rapid City . . . . S.D. St. Onge . . . . . S.D. Sturgis . . . . . S.D. Whitewood . . . . . S.D.	Appleton . . . . . Wis. Combined Locks . Wis. Green Bay . . . . . Wis. Kaukauna . . . . . Wis. Kimberly . . . . . Wis. Nekoosa . . . . . Wis. Peshtigo . . . . . Wis. Port Edwards . . . Wis. Wisconsin Rapids Wis.	895

SUPPLEMENT 31 TO C.& N.W. TARIFF 4407-0

SECTION 1

Item	COMMODITIES	FROM	TO	RATES in cents per cord
938-B	Pulpwood. Minimum weight 21 cords per car. Rates in dollars and cents per cord of 128 cubic feet. NOT SUBJECT TO ITEMS X-206, X-212 NOR X-223.	Andrews . . . . . Neb. Chadron . . . . . Neb. Crawford . . . . . Neb. Ft. Robinson . . . Neb. Harrison . . . . . Neb. Hay Springs . . . . Neb. Rushville . . . . . Neb. Whitney . . . . . Neb.	Kaukauna . . . . . Wis. Nekoosa . . . . . Wis. Port Edwards . . Wis.	895
	Applies only on shipments in lots of ten cars or more billed from one consignor, at one origin, on one bill of lading, at one time, to one consignee, at one destination.	Casper . . . . . Wyo. Douglas . . . . . Wyo. Glen Rock . . . . . Wyo.	Kaukauna . . . . . Wis.	1010

APPENDIX

SUPPLEMENT 116 TO WTL TARIFF 18-U

Item	COMMODITIES	FROM	TO	RATES In cents per cord	
				Col. A	Col. B
4330-B	PART C Pulpwood. Col. A. -- Minimum weight 25 cords per car except minimum weight 23 cords per car applies when carrier is unable to furnish cars over 43 feet in length, inside measurement, and for carriers convenience shorter cars are furnished and loaded to less than 25 cords. Col. B. --Minimum weight 21 cords per car and applies only on shipments in lots of ten (10) or more cars, and only when shipped from one loading track located on the outbound roadhaul carrier, on one bill of lading, from one consignor to one consignee, at one time to one destination.	Lander . . . . . Wyo. Riverton . . . . . Wyo.	Kaukauna . . . . Wis.	1271	1125

SUPPLEMENT 62 TO C.& N.W. G.F.D. 5950-L

SECTION 1				
Item	COMMODITIES (Carloads)	FROM	TO	RATE
617-H	BOUGHS. CLIPPINGS. CORES. EDGINGS. SAWMILL WASTE. SLABS. WOOD CHIPS (Pulpwood Chips). *** Switching charges of connecting lines at destination will not be absorbed. NOT SUBJECT TO ITEMS X-175, X-196, X-206, X-212 NOR X-223. (634-12-91)	Buffalo Gap . . . . . S.D. Deadwood . . . . S.D. Fairburn . . . . . S.D. Hermosa . . . . . S.D. Jolly Dump . . . S.D. Rapid City . . . S.D. St. Onge . . . . . S.D. Sturgis . . . . . S.D. Whitewood . . . S.D.	Green Bay . . . . Wis. Kaukauna . . . . Wis. Nekoosa . . . . . Wis. Port Edwards . . . . Wis. Wisconsin Rapids . . . . Wis.	$224.23 per car.
624	WOOD CHIPS. NOT SUBJECT TO ITEMS X-175, X-196, X-206, X-212 NOR X-223. (624-93-91)	Riverton . . . . . Wyo.	Kaukauna . . . . Wis.	$290.00 per car.

The rates and tariff references shown on Pages 35 and 36 are for reference only. This is not a tariff and rates shown herein are subject to change without notice. Published tariffs should be consulted for actual rates in effect.

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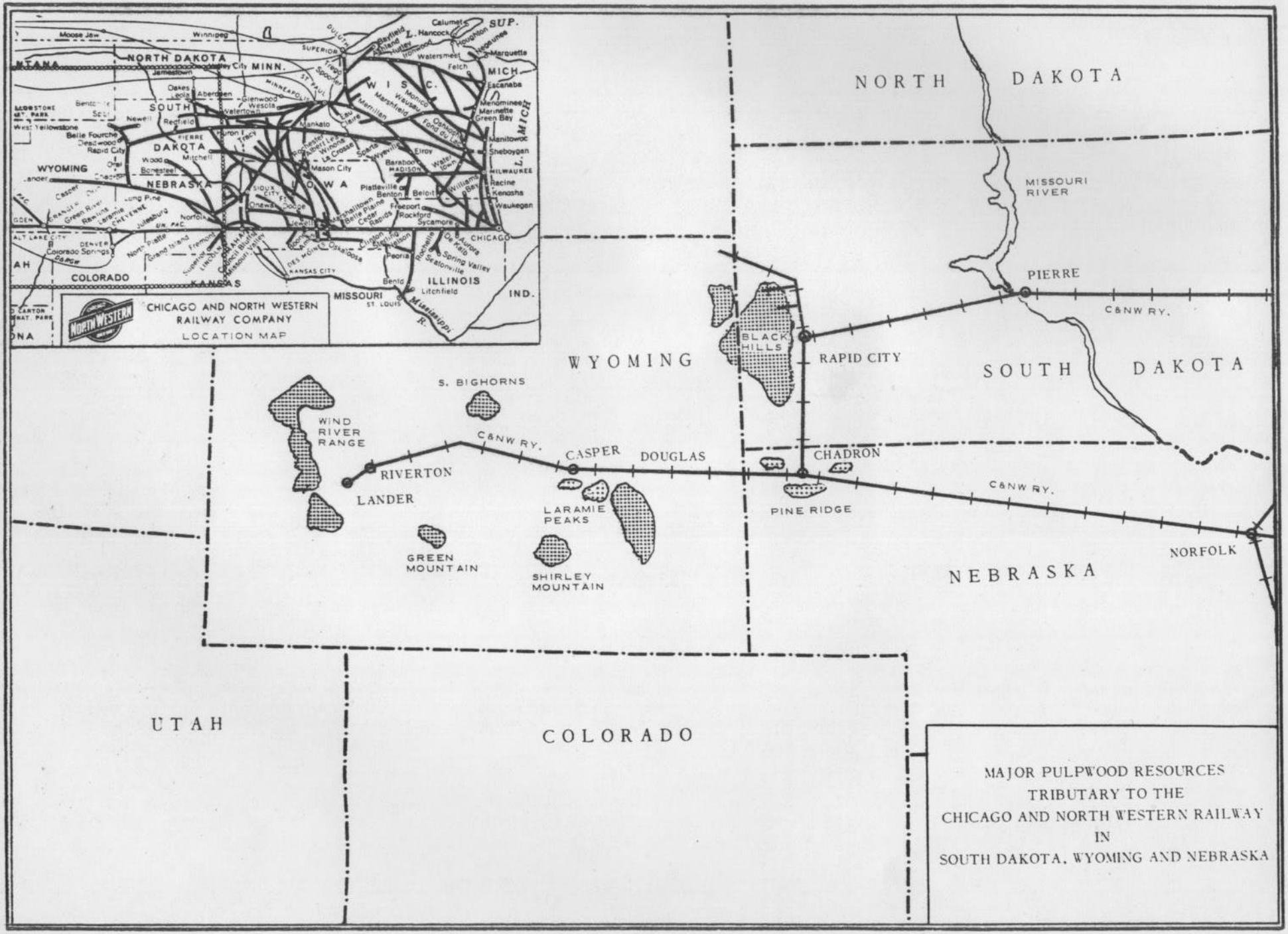
CHICAGO AND NORTH WESTERN RAILWAY COMPANY
LOCATION MAP
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
NEBRASKA
COLORADO
UTAH
MISSOURI RIVER
PIERRE
C&NW RY.
BLACK HILLS
RAPID CITY
S. BIGHORNS
WIND RIVER RANGE
RIVERTON
LANDER
CASPER
DOUGLAS
CHADRON
PINE RIDGE
NORFOLK
LARAMIE PEAKS
GREEN MOUNTAIN
SHIRLEY MOUNTAIN
MAJOR PULPWOOD RESOURCES
TRIBUTARY TO THE
CHICAGO AND NORTH WESTERN RAILWAY
IN
SOUTH DAKOTA, WYOMING AND NEBRASKA