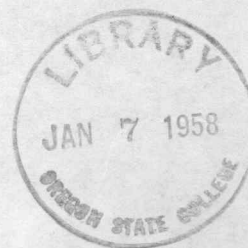


1.321
5.22

A Study of Our Alaskan Forests
and
Their Future Development As a
Pulp and Timber Reserve
by
Kem Blacker

A Thesis
Presented to the Faculty
of the
School of Forestry
Oregon State College



In Partial Fulfillment
of the Requirements for the Degree
Bachelor of Science
June 1938.

Approved: _____

Professor of Forestry

INDEX OF CONTENTS

General description, area and population -----	Page 6
Land administration -----	Page 7
Transportation -----	Page 8
Geographic regions -----	Page 8
Volume and location of forested regions -----	Page 11
Non forest regions -----	Page 11
Chugach region -----	Page 13
Tongass region -----	Page 13
Species of the coast forest -----	
Western hemlock -----	Page 14
Sitka spruce -----	Page 16
Western red cedar -----	Page 18
Alaska cedar -----	Page 19
Species of the Interior forest -----	
White spruce -----	Page 21
Northern black cottonwood -----	Page 21
Mountain hemlock -----	Page 22
Firs -----	Page 22
Pines and others -----	Page 22
Wood exports to the United States -----	Page 23
Management of the National Forests -----	
Pulp timber allotments -----	Page 24
Local use allotments -----	Page 25
General use allotments -----	Page 25
Timber sales and conditions applying to such -----	Page 26
Water-power resources and pulp markets -----	Page 29
Logging methods and costs -----	Page 30
Future possibilities -----	Page 32
Conclusions -----	Page 35

PICTURES AND TABLES

A. Pictures

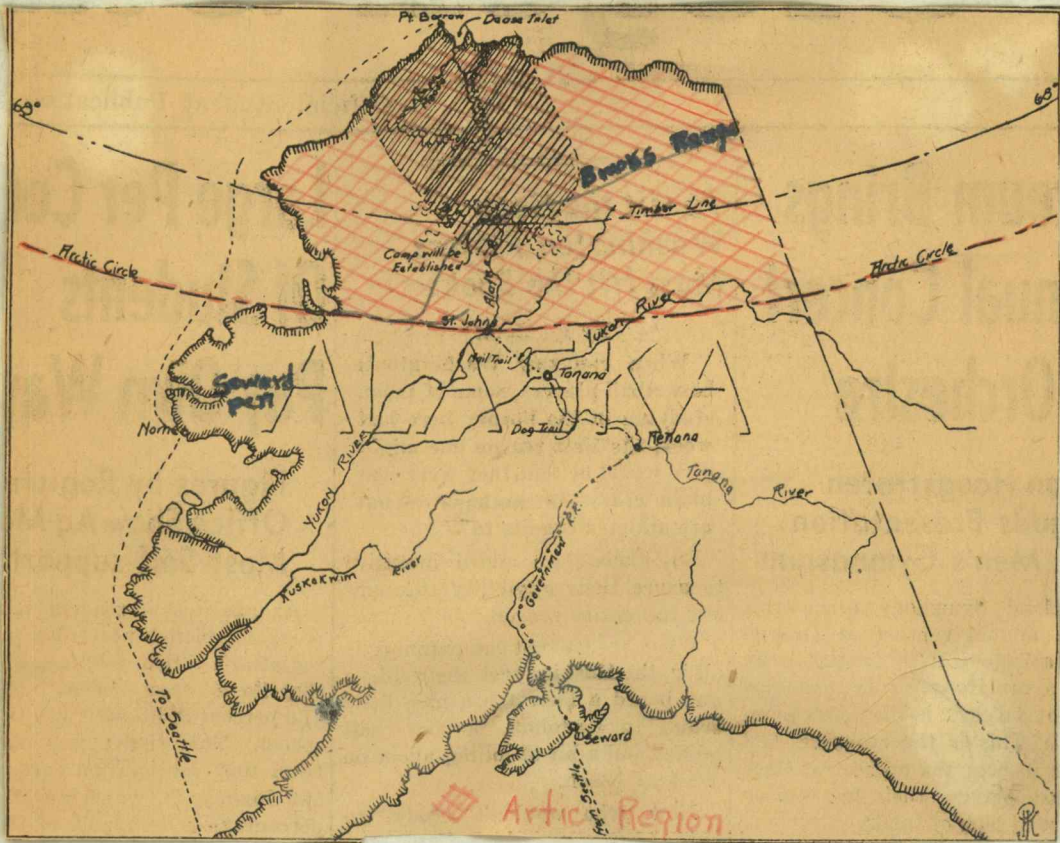
- a. Alaska showing the principle drainage ----- Page 1
streams and the portion within the
Arctic circle.
- b. Alaska showing the four geographic ----- Page 8
regions.
- c. The location and extent of the pre- ----- Page 10
vailing forest regions.
- d. Example of an Alaskan coast forest. ----- Page 11

B. Tables

- a. Areas of the principle cover types ----- Page 11
in Alaska.
- b. Consumption of Hemlock by pulp mills. ----- Page 16
- c. Location and amount of Sitka Spruce ----- Page 18
on the Pacific coast.
- d. Imports and exports of Alaska to U.S. ----- Page 23
- e. Approximate distances to important points -- Page 30
from Ketchikan.

INTRODUCTION

For the past few years I have heard about the timber of Alaska and what an asset it could be to the States but yet no actual facts were ever presented. Not much research or facts is known about Alaska but from my findings I wish to present a study of our Alaskan Forests and their probable development as a pulp and timber reserve.



Alaska, though it forms the Northwest extremity of the North American Continent, only one-fourth of its area is north of the Arctic circle. Its position with regard to latitude is about the same as that of the Scandinavian Peninsula and the town of Seward on the south coast is located on about the same parallel as Oslo, Norway. The Panhandle of Alaska is only 500 miles north of Seattle and at the Bering Strait is only 54 miles from Asia.

The area is 586,000 square miles and is one-fifth the size of the continental United States.* It nearly equals in extent the Rocky Mountain states of Montana, Wyoming, New Mexico and Arizona.

The population totals 55,036. Of this number 27,883 are whites and the remainder are Indians and Eskimos.* (The 1930 census showed the population for only the main area to be 39,974).**

The title to lands of Alaska is controlled almost entirely by the Federal Government. Perhaps not to exceed one per cent of the area has passed to private ownership. Portions of the Federal lands have been withdrawn from private entry under the public-land laws and are administered for specialized purposes but the greater part of the territory remains on the status of open public domain. Some of the principal withdrawn areas are:***

* Alfred Brooks --- Geography of Alaska. Vol. 45, page 3.

** B.F. Henintzleman --- Resources of S.E. Alaska. Page 5.

*** Governor of Alaska --- Glimpses of Alaska from 1728 to the present date. From Juneau, Gov't office.

7

Chugach National Forest --- for timber production on a continuous yield. --- Area 7,535 square miles.
McKinley National Park --- for birds and wildlife production Area -3,030 square miles.
Katmai National Monument --- for its unique physical feature Area is 4,275 square miles.
Aleutian Islands --- for a bird and wildlife refuge.

The actual administration of the land in this territory is a hit and miss proposition. True, we have a forest reserve which is very efficient but vast areas of forest reserve is untimbered but are held under restrictions of the Forest Service while timbered lands in some sections are unprotected. Some timbered islands off the coast are included in the forest service reserve but others, equally as timbered, are not. Homesteaders within the forest reserves are surveyed by the forest service officers without charge to the entryman while surveys outside the reserve are paid for by the entryman or homesteader. Roads and trails within the forest reserve are built by the forest service; those outside are built by a commission of Army officers. The appalling confusion that must necessarily follow from such overlapping authority on some questions and no authority at all on some others leads to all sorts of complications.

The territory of Alaska is now divided into a bunch of independent operators with little or no governmental supervision. We cannot expect a undeveloped country to pay for itself at once but if properly handled a profit could be made for the United States in a few years. We need and must have reformation in the laws and government of that territory before efficient administration can be undertaken.

Water furnishes the only means of transportation with the outside world and two steamship companies, operating from Seattle and Vancouver, run all year. Within the territory there are more than 10,000 miles of road and trails with 1,200 miles of gravel roads suitable for light auto traffic.* The territory also has 800 miles of railroad. Other transportation may be the navigable rivers which are numerous and open for the four summer months.

The territory is geographically classified into four regions. They are as follows:**

1. The Artic Region

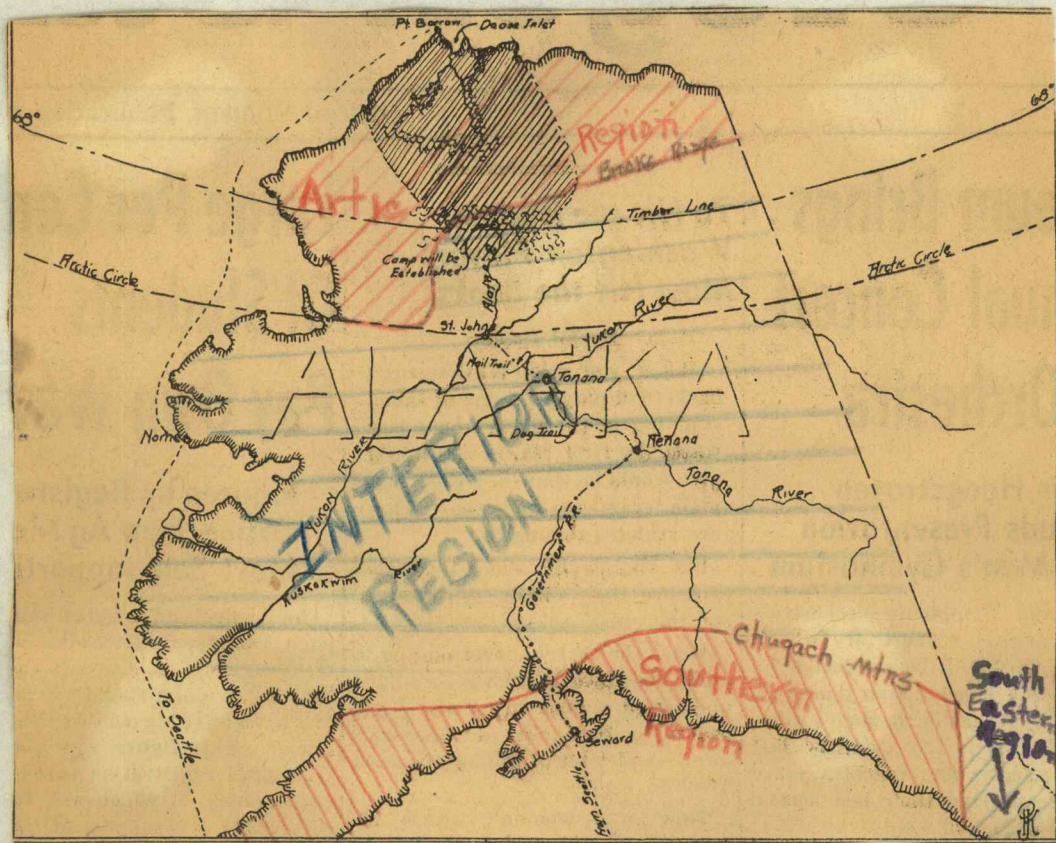
Includes all lands draining into the artic ocean north of the Seward Peninsula. Its Southern limit is the high Brooks range and some lower mountains to the West which together form the divide between the Yukon and Artic drainage areas. The topography of the artic slope consists of a broad low lying area along the shores of the Artic ocean which is gradually succeeded by rolling ridges and steep slopes as the crest of the Brooks range is approached. The size of this division is 114,460 square miles.

2. The Interior Region

It extends from the Artic divide on the north to the crest of the Chugach mountains on the southern coast. It includes the large drainage areas of the Yukon river, Kuskokwin river, and the region between the Alaska range and the Chugach mountains, which drain south through breaks in the Chugach divide to the Pacific ocean. Aside from the steep slopes of the three mountain ranges mentioned, this region is one of high plateaus, ridges of moderate slope and height and broad valley floors. In the Yukon and Kuskokwin drainages the plateau section gives way in the western or lower river stations to the Yukon-Kuskokwin Delta, a very wide strip of marshland across which two rivers flow to reach the Bering Sea. Its area is 373,465 square miles.

3. The Southeastern Region

Comprised of a narrow strip of mainland and adjacent chain of islands lying east of meridian 141 and extending southeast from the main body of the territory for 400



SCHOOL OF FORESTRY
OREGON STATE COLLEGE
CORVALLIS, OREGON

miles along this west side of British Columbia. A region of strictly rough rugged country and topography. The area is 35,560 square miles. This section includes the Tongass National Forest, the resources of which are now under adequate administration. The forested area is 25,900 square miles.

4. The Southern Region

Consists of the coastal strip south of the crest of the Chugach mountains and west of meridian 141 degrees. It includes the Alaska Peninsula, Aleutian Islands and Kodiak Island group. Mountains extend to the shores of tidewater and the topography is very rough. The area is 62,915 square miles.

The territory has a wide range of climate. Arctic conditions prevail in the extreme north. The interior compares with the prairie provinces of Canada and bears a striking resemblance to the coast of British Columbia, Washington and Oregon. It also is similar to the whole Pacific coastal strip with its moderate winter temperatures and heavy precipitation. The high range of mountains, lying parallel and adjacent to the southern coast, blocks progress inland of the warm moisture-laden winds from the Pacific and consequently interior Alaska has a light precipitation and the low winter temperatures typical of lands of its high altitude.

The Arctic region has a mean temperature of 38 to 45 degrees F in the summer and -16 to -10 in winter. The annual precipitation is approximately 6 to 8 inches. Interior Alaska areas have a short warm summer with the mean temperature between 50 and 58 degrees F and long winters with the mean temperature between 0 and -20 degrees. The annual precipitation is between 7 and 20 inches.

In the Southern region the mean temperature for summer

is 50 to 55 degrees F and in winter from 20 to 35 degrees. The rainfall is from 50 to 190 inches. Much of the ground in the interior and arctic regions is permanently frozen to bedrock. In the interior region the surface ordinarily thaws to a depth of 8 to 24 inches during the summer months, but with the removal of the usual dense ground cover of moss the soil gradually becomes free of permanent frost to much greater depths. No permanently frozen ground is found in the Pacific coastal strips.

Permanent icefields and glaciers, though prominent features of Alaska cover only a small percentage of the land area and are largely limited to the mountainous system along the south coast and to the slopes of the high Alaska range.

Forests, characterized by the type which is called the coastal forest and occupying the narrow strip of country south of the crest of the mountains on the southern coast and west to Cook Inlet, occurs as a narrow coastal belt from southern Alaska to Oregon. With this exception the vegetative cover types of the territory are those which commonly prevail throughout the sub-arctic and arctic sections of the north american continent.

The non-forest regions of Alaska are:

1. The Tundra

This area lies north and west of the forest region and includes the Kuskokwin and Yukon Delta. The tundra is composed of sedges, dwarf shrubs, lichens, mosses, weeds and grasses. Wet and dry tundra are recognized as separate vegetative types based on a difference in the composition of the species but both form a full cover and have a high forage value.

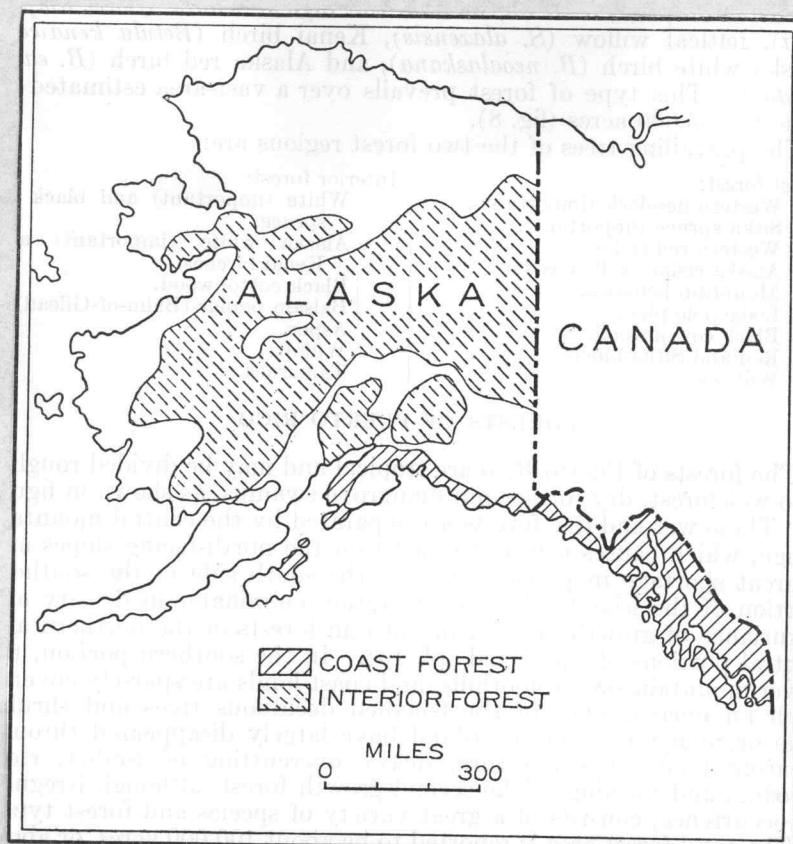


FIGURE 8.—Location and extent of the prevailing forest regions in Alaska.

2. The Grasslands

This area includes the Alaska Peninsula, Aleutian Islands, Kodiak Island and some nearby small island groups. This land is beyond the western limits of western hemlock and the sitka spruce forest. The lower slopes of the prevailing mountains are clothed with a dense waist high growth of grass and herbs from tidewater to high elevations.

3. Estimates of the Principal Cover Types:*

These figures do not exclude the barren areas within the outside boundaries of the zones.

Western hemlock-sitka spruce forest zone or that land west of meridian 141 degrees. -----	7,550
White spruce-birch forest zone -----	337,925
Tundra zone -----	150,000
Grassland area -----	55,415

total of main land area (sq. mi.) ---550, 840

The forests are the asset of value commercially speaking. The total area of the forests and woodlands is estimated at 100,000,000 acres.** Of this 20 million acres contain lumber suitable for manufacturing purposes which is in size about the same as the timber in Maine of Indiana. Of the remainder, one-half is classified as woodland carrying some saw timber but on which the trees are small in size, scattered, and valuable chiefly as fuel. The other tree growth throughout the territory is mostly stunted in character, scrubby and of little value. Originally almost half the surface of Alaska was covered with timber of some kind but in some sections much of this has been cut away

* Walley, J.M. --- Extracts from tables in a report on yield studies on hemlock and spruce types in Alaska.

** Agnes Burr --- Alaska, our beautiful land of opportunity. Pages 117-119



F-227490

COAST FOREST OF ALASKA.

Coast forests are a continuation of the Oregon-Washington forest belt in which some of the species have dropped out. The forest belt is confined between the sea and an elevation of about 1,500 feet, with an average width of 2 to 3 miles.

owing to the needs of fuel.

Practically all of the merchantable timber of the territory is within the exterior or coast forest limits, namely within the two national forest reserves. They are: The Tongass, covering the entire southeastern Archipelago and the Chugach National Forest extending along the coast from the Malaspina Glacier to Cook Inlet. The timbered areas in both these forests are chiefly found on the thousands of large and small islands along the coast.

These two forest reserves contain 20 million acres of forest land with two million acres of similar character lying between. They include 77 billion feet of timber suitable for timber and pulp. It is estimated that this area can produce a million and one-half cords of pulpwood or a million tons of newsprint each year for an indefinite period.*

The timber here is inferior when compared with that of the Puget Sound area, but compared with the timber of Maine, Pennsylvania or Georgia or with that of France, Germany or Switzerland its value jumps. The distribution of this timber mostly evergreen and of the spruce family, is very great but the quality is poor. The timber is not grown in proportion to its age as fast as it would have done if it had been growing in a more congenial latitude to the south, hence when run through the sawmill the frequent and close proximity of the knots mar the quality and depress the sale of the lumber.

* Gifford Pinchot --- Who Shall Own Alaska - A Short Book of Facts. Page 6.

The three active sawmills in Alaska, one at Prince of Wales Island, one at Sitka and one at Wood Island off Kodiak, are cutting an annual cut of 40 million feet of lumber from the National Forests. These mills are not sawing lumber for exportation. There is a very large supply of timber in Alaska, yet it is apparent that as long as the immense forests of Oregon and Washington remain as they stand today, as long as this be so, the market for Alaskan lumber will be practically null and void. Accessibility is one beneficial factor as seventy-five percent (75%) of the timber is estimated to be within two and one-half (2 1/2) miles of tidewater. *

As most of the commercial timber is within the two forest reserves it may be well to have a general picture of these woodlands. The Chugach forest is deceptive looking, for the timber along the shore is often scrubby, with dead trees much in evidence. But in the forest spruce 2 to 5 feet in diameter and 100 feet tall are found. A single tree will cut 1000 board feet and from 10 to 20 M/bd. ft per acre has been calculated as an output in some places. On both these forests the topography is so steep and rugged breaking away from the shoreline that beyond the five and one-half (5 1/2) mile mark most of the trees are dwarfed and stunted.

The Tongass National Forest occupies all southeastern Alaska and contains almost all of the commercial standing

timber in that region. The total amount of standing timber outside the national forest in this region does not exceed 1,500,000,000 board feet.* The total amount within the national forest is 78,500,000,000 with western hemlock having 58 billion, sitka spruce 16 billion, western red cedar 2 1/3 billion and alaska cedar 2 1/3 billion board feet. The stand is thick and the average stand is estimated at 26,000 board feet per acre.

The species found in the exterior or coast forest region are as follows:

Western Hemlock (Tsuga heterophylla)

This species is the most common tree and constitutes the great bulk of commercial timber. In association with other species, it forms dense forests from tidewater to elevations of 1,500 to 2,000 feet.

In the characterized even-aged stand, the mature trees average in size from 3 to 4 feet in diameter and 100 to 140 feet tall. A long slender bole and a narrow short crown is very common. As the under branches are shed readily, the trunk is free of large knots; below the lower branches the trunk has a very gradual taper.

The trees are commonly sound, when young, but when they reach a diameter of 3 to 3 1/2 feet, they are largely overmature and are affected by disease and rapidly develop spike top and a serious heart rot. Many of these old, over-

mature trees are so defective as to be classes unmerchantable. The greater part of the log output in stands where this defective timber occurs, comes from the intermixed younger timber, which carries little defect. Hemlocks on the poorest sites and occurring as scattered trees in pure stands frequently have deeply "fluted" lower trunks but in the commercial forests as a whole, fluting is not an important factor.

Hemlock is one of the predominating species of the poorly drained scrub and muskeg areas, which are extensive in this region. Here the trees occur as isolated individuals or in very open stands, and are short heavily limbed and otherwise of poor quality. Such timber is classes as non-commercial.

Western Hemlock is an excellent wood for a great variety of uses. It is moderately strong, light in weight when dry, fine-grained, light in color and almost tasteless and colorless. It is hard enough to stand up well under heavy wear, although sufficiently soft to be worked easily. It is especially good for flooring for which it is widely used and is satisfactory for many other kinds of construction from heavy timbers to inside finish. It is superior to eastern hemlock as a pulping wood and is in good demand for boxes and crates.

Hemlock is used extensively as piling for the construction of fish traps, which are operated in the coastal waters of Alaska by the salmon-canning industry. Hemlock

ties are now sawn in quantity by the local mills for use on the Alaskan railroad. Very little hemlock lumber is being cut in Alaska because it cannot profitably be shipped to the general market in competition with Puget Sound hemlock. Western Hemlock makes excellent mechanical and sulphite pulp and enters into various classes of paper, newsprint being the principal product. Forest products Laboratory, U.S.F.S. Madison, Wisconsin gives the average output of pulp per cord of 100 cubic feet of solid wood as being 2,160 pounds bone dry by the mechanical process and 1,050 pounds bone-dry by the sulphite process.

From the United States Bureau of the Census on the pulpwood consumption of the three pacific coast states in 1926 we see the outstanding proportion of hemlocks used by the pulp mills.

Western hemlock -----	300,505 cords
Sitka spruce -----	77,555
Balsam firs -----	76,421
Others -----	29,552
Mill waste -----	54,743
<hr/>	
total	538,776 cords

Sitka Spruce (*Picea sitchensis*)

Sitka spruce occurs from tidewater to an elevation of 1,500 feet. The average mature tree is about 5 feet in diameter and 160 feet tall. The largest known tree in Alaska is 14 1/2 feet in diameter at a point 6 feet from the ground. The boles are well formed above the pronounced butt characteristic of this species and are clear of branches well

toward the tops. It is commonly sound and straight-grained but on exposed sites is much subject to wind-shake and spiral-grain. The most common defect of the overmature tree is butt rot.

Spruce is the principal saw-timber tree of the region and is manufactured into all forms of lumber and into airplane stock. It is an excellent box material and much of the low-grade lumber is remanufactured into packing cases for the Alaskan salmon industry. The export of high-grade spruce lumber from Alaska started during the World War, when much airplane stock was furnished and since then a constantly increasing amount of clear spruce for airplanes and other special purposes has been sent out by local mills and trans shipped through Seattle to other North American and foreign markets.

Sitka spruce is conceded to be the best pulping wood on the Pacific Coast and compares very favorably with white spruce, the standard pulpwood of Eastern North America. The average yield of pulp per cord of 100 cubic feet of solid wood is 2,100 pounds bone-dry by the mechanical process and 1,080 pounds bone-dry by the sulphite process. It is used less than hemlock for pulp in the Pacific Coast States because of the keen competition of the sawmills for spruce logs and the suitability of the less expensive hemlock for the grades of pulp and paper manufactured there. It is unlikely that much competition for spruce will develop in Alaska between pulp mills and sawmills as the mixed hemlock-spruce forests are preponderately hemlock and will never be

attractive for an extensive spruce sawmill development.

From the Forest Service records we see the total supply of Sitka Spruce on the Pacific Coast:

Alaska (south coast)	----18 billion board feet
British Columbia	-----15
Washington	----- 7
Oregon	----- 4.5

total 44.5 billion board feet

Western Red Cedar (Thuja plicata)

Western Red Cedar is limited in its range to the territory of the southern half of Southeastern Alaska, Frederick Sound marking its northern limit of the Pacific Coast. The best development occurs at 500 feet elevation. The mature trees are 5 to 6 feet in diameter and 100 to 125 feet tall. They are limby, heavily tapered and subject to severe heart-rot. Trees of pole size are well formed and sound.

The best trees are scattered individuals or those found in small groups in stands of hemlock and spruce. In pure forests the trees are somewhat poorer in quality but are classed as merchantable. The open stands of cedar and other species on swampy soils are poor in quality and are unmerchantable, the trees being short limby and defective.

Western Red Cedar is excellent for shingle material. It is close-grained, fine-textured and is used primarily for this purpose. There is also some specialized boards and strips but knots, seams and heartrot preclude the manufacture of any appreciable percentage of the logs into siding and other high grade lumber. Many younger trees are

suited for telephone poles. This cedar will probably be utilized in fairly large quantities after depletion of the cedar in Washington and British Columbia.

Alaska Cedar (*Chamaecyparis nootkatensis*)

Alaska Cedar occurs along the coast from tidewater to the altitudinal limits of tree growth but the best development is at elevations between 300 and 1,200 feet.

The best trees are found in small groups scattered through the hemlock and spruce forests. The trees of extensive areas on which cedar predominates are in the main of small pole size and produce a very light volume per acre, but occasionally small patches of excellent cedar timber is found within these areas. Such good stands are usually less than 10 acres in extent and have trees from 18 to 36 inches in diameter and from 75 to 90 feet tall.

Trees over 3 feet in diameter usually carry much heart rot in the first 16 foot log. The extensive bark-peeling operations of the Indians in earlier days have produced many "cat faces" and much vertical check, rendering 1/3 to 1/2 of the first log useless. Spiral grain and small knots are common. The best trees average in diameter size to twenty-four inches.

Alaska cedar is not cut in quantity and is not well known on the markets. Its qualities and fields of usefulness have not been studied carefully but results obtained in local use indicate a high value for specialized purposes and there should eventually be a good demand for it. It is of fine

texture, easy to work, has a bright yellow color, takes a beautiful satin finish and is extremely durable. It is considered valuable for pattern making, furniture, toys, turned articles and for cabinet work. Its odor-repelling characteristic makes it valuable for chests. It is used locally for building and for telephone poles. Battery boxes and battery separators are now being made of it in British Columbia. This wood is costly to log and mill because it is scattered in quantity but its specialty uses should give the output a high value.

The interior forests of Alaska cover much territory and is found especially along the streams. Trees in this region cannot send tap roots into the frozen gravels so the tendency is for the roots to branch out in a mat of fine roots which are covered and binded together with moss. High winds and burning off the moss will cause the trees to topple over. The timber here is small and used mainly for fuel purposes and for building log houses of the traders and settlers. These forests played a great part in the early development of Alaska as their wood was used for all purposes. At the present time the forests are being rapidly decimated as they are the chief source of fuel for mining and steamboat needs (one river boat will take on as much as 25 cords at one loading). When Alaska's coal supply is opened up and transportation makes it available these forests will have an opportunity to recuperate.

Interior Alaska timber will not likely furnish export material outside the territory as it is needed for home

consumption on the Yukon and Kuskokwin basins. There are 150 million acres of interior forests,* about one-half of which bears timber of sufficient size to be valuable for cordwood, saw logs, boat building, mine timbers and farm use. The interior forests are all in the public domain and although at the present day are of little commercial value they should not be overlooked in any consideration of a future forest policy for the territory. The inland species are similar to the species grown in Maine and Eastern Canada though inferior when compared to quality. The interior species are as follows:

White Spruce (*Picea alba*)

Grows in vast regions drained by the Yukon River. Many of the trees are 125 feet tall, slender, erect and closely clad with short leafy sprays forming the sharpest and most arrow-like spire of any tree. The wood may be valuable for spars if floated down to tidewater.

Northern Black Cottonwood (*Populus trichocarpa hastata*)

Cottonwood occurs in quantity only on the valley floors of the large mainland streams. The mature trees have an average diameter of 3 feet and are 90 to 90 feet tall. The black heart and black knots are common on mature trees. Extensive area of immature trees of excellent quality may

* General Land Office Circulars Nos. 1092 and 1199 --- Regulations permitting the exportation of timber, from Alaska. Page 15.

be found.

Mountain Hemlock (*Tsuga mertensiana*)

This species is largely confined to the higher altitudes but occasionally it is found near sea level on the rocky sites. This tree is largely inaccessible and not important commercially. In appearance the tree is quite similar to western hemlock but is smaller and the trunk is less clear of branches and knots but has more taper. The quality of the wood is about the same as that of western hemlock.

Firs

A fir like *Picea grandis* and is common on the mountains of the mainland. The tree is usually seldom above the height of 60 or 70 feet and the timber is of inferior quality.

Pines

Pinus contorta is the only species and grows 50 to 60 feet tall. It forms quite extensive forests along the ridges near lakes or bogs.

Other Species

There are no hardwoods of value; only a few small birch, alder and crabapple trees. Other trees which occur in this region are larch, aspen, poplar, balsam and black spruce. None of these trees are of commercial importance.

In 1927 the exports from Alaska to the United States was \$11,700,000 and the imports were \$10,770,000. All the imports were from the United States. In 1926 the timber exports of Alaska valued \$373,170 or .5% of the total value

of exports for that year. In 1927 the United States exported to Alaska the following timber products:*

<u>Material</u>	<u>1913</u>	<u>1927</u>	<u>value</u>	<u>%</u>
Boards, planks	19,800	20,097,000	\$544,500	1.5
Bos shooks	-----	15,559,740	553,100	1.5
Woods-mfg	-----	-----	524,200	1.5
Books, maps, pictures		-----	433,400	1.2

In 1927 the United States imported the following amounts from Alaska:

Timber and lumber ***	<u>1913</u>	--- \$16,400	---	.1 %
	<u>1927</u>	--- 220,700	---	.4%

From these figures we can see that the timber of Alaska is almost untouched and that it will be possible for it to be a producer and potential supply of pulp and paper wood to the states. Another evidence of the quantity of lumber in Alaska is the amount of drift in the rivers; at least it gives evidence of a large wood supply further up the streams.

In the future, at least for a long time, it will only be timber from the coast forests which will be drawn into commercial trade. On the Chugach Reserve, which has the poorest stand of timber on the coast forest, much criticism has been directed. The charge repeatedly being made that little (Humphrey once said 10%) of the area included is real timber land and that what timber land is there is of poor quality and not worth the cost of protection. The Governor of Alaska insists that the Chugach National Forest is largely waste land which will never be utilized and is not worth

* Commerce and Economic resources of our territory and possessions of the United States of America. Printed by the Commerce Department. Page 11.

the cost of maintenance, while Mr. Graves, after a careful inspection of the regions, reported that there was a large amount of timber which would at least be useful in the industrial development of the region near the reserve. It is true that on both reserves there is much land without growing timber on it while outside the reserve is a well timbered country. In time the Forest Service hopes to be in charge of this country also.

The management of the national forests is to provide for a continuous and adequate supply of timber for wood-using plants that may be installed in the region. The establishment of such plants will in turn foster the permanent development of the territory and will allow a sustained contribution to the nations supply of timber products. The Forest Service has for its objectives: the development and maintenance of a permanent pulp and paper manufacturing industry commensurate with the available water power and timber resources; also to furnish a permanent and convenient supply of timber for local consumption, with such as additional supply to the local sawmills for the general lumber markets as may be needed to justify efficient milling facilities and provide yearlong operations.

The productive forest land, after examination and careful study will be divided into pulp and timber allotments, local-use allotments and general-use areas.

The pulp timber allotments will be laid out as complementary to definite available water power sites available for use in the manufacture of pulp. Each area will include

sufficient timberland to supply a sustained annual yield of timber equal to the mill capacity obtainable through a full economic development of the accompanying water-power site or sites. The pulp mills will be so distributed, as far as the Forest Service is after to control location, that an adequate timber supply under the management plan will always be available within a reasonable log-towing distance of each plant or mill.

Local-use allotments will be laid out on the basis of the suitability of the timber for the common local uses and its accessibility to points of consumption. The size of these areas need not always be large enough to supply the entire estimated future local demands because some material may be obtained from pulpwood allotments. They will be large enough, however, to be managed on the principle of sustained yield, using one or several allotments as the unit of management. On these areas timber unsuitable for local use will be disposed of on the stump for pulpwood or other purposes under small, short-term sales or will be cut along with material included in local-use sales and separated from such material after being logged.

General use areas will include all bodies of timber not especially placed in the two foregoing classifications. They will be available for such sale for any product for the general or local market. Sustained yield management will be practiced as far as possible.

Initial sales within an allotment will ordinarily include those timber units most accessible to tidewater, the

more inaccessible units being left for later exploitation.

Other things being equal, preference will be given to such industries and applicants as contemplate the most complete manufacture in Alaska and of her products.

Aggressive action will be taken to interest prospective investors in the pulp-timber and water-power resources. Data on the location, plant sites, transportation, labor, markets, construction costs, operating costs and other governing factors will be gathered and made available to possible timber buyers and interested parties.

Sawmills established primarily to supply an important local demand which may be insufficient to provide year long operations, which permit efficient milling methods, and justify first-class equipment, will be encouraged on any efforts they may make toward the placing of the excess lumber cut on the general markets of the United States and foreign countries. The establishment of minor wood-using industries, especially those using Western red cedar and Alaska cedar, will also be encouraged.

Sales of timber will not be made when it is anticipated that the wood will be exported from the territory of Alaska in the form of logs, cordwood or other raw product necessitating primary manufacture elsewhere. Export of the raw product will, however, be allowed on individual cases where this will permit of a more complete utilization of material on areas being logged primarily for products for local manufacture; prevent serious deterioration of logs unsaleable locally because of an unforeseen loss of markets; permit the

salvage of timber damaged by wind or insects or disease; or bring into use a minor species of little importance to local industrial development. No sales, except for purely local use, will be made to aliens or alien corporations.

Small sales will be encouraged so far as is consistent with the investment required and the demands of the industries. Every encouragement will be given to the establishment of a competitive log market.

Following are a list of points or Conditions applying to timber sales:

1. Stumpage alone is sold from the national forests, the land being retained by the United States for production of succeeding forest crops. Timber paid for in small installments as cutting proceeds.
2. The timber is offered for sale on applications from interested parties.
3. The timber of the unit applied for is appraised by a Forest officer on the basis of its value after manufacture ~~it~~ into usual timber products of the region minus a cost of logging and manufacture plus a reasonable margin for profit and loss. It is then advertised for sale (timber sales involving less than \$500 in stumpage may be sold by private sale without advertisement. Settlers, miners, residents and prospectors are permitted to take for their own use 10,000 board feet of saw timber and 25 cords of wood annually, free of charge, from the national forests), by sealed bids for a period of 30 days, as required by law. The minimum

rates or bids have been set by the appraised stumpage value. Timber is awarded to the highest bidder who can make a satisfactory showing of his ability, financial and otherwise, to carry the proposed operations through to completion.

Stumpage prices will vary with the species, quality and accessibility. Sitka spruce, Western red cedar and Alaska cedar for sawmill use sells for \$1.50 per thousand board feet but \$2 is obtained for the better stand of spruce. Hemlock for the same use averages \$1 per thousand board feet. Piling of any species varies in price from one to one-and one-half cents per lineal foot, according to the length of the sticks. Pulp timber price bids in 1927 showed 80 cents per cord of 100 cubic feet for spruce and 40 cents per cord for Hemlock on the Ketchikan project; for the Juneau project 60 cents per cord for spruce and 30 cents for hemlock.

4. National forest timber sold for use and cannot be held for speculation and other purposes. Contracts specify logging dates and the amount of minimum cut.

5. The timber is sold on the basis of the unit customarily used in the industry concerned. Bd. ft. for sawtimber).

6. The contracts call for clear cutting the merchantable timber on the sale area with the exception not to exceed 5% of the volume may be reserved for reseeding purposes. Seed trees are selected by Forest officers and must be protected from injury during the logging operations.

8. The Forest Service reserves the right to require disposal of logging debris to the extent of logging the tops and scattering the brush so it lies close to the ground and

away from the seed trees of clumps of reproduction.

Southeastern Alaska has excellent water-power resources for industrial use and especially for the manufacture of pulp and paper. The outstanding characteristics of the water powers of this region are as follows: high-head developments, short conduits, small drainage basins with heavy runoff, good water storage facilities, accessibility of the projects to navigable streams and the opportunity to locate industrial plants either directly at the power house sites or within a very short power-transmission distance.

Owing to the close relationships in the paper-making projects between water-power developments and the use of timber resources, the Federal Power Commission and the Forest Service coordinated their action on application for such projects and the power site or sites and the appurtenant timber supply are awarded to one concern.

Year round transportation is provided by the Alaska Steamship Company and the Pacific Steamship Company between Seattle and all ports in Southeastern Alaska, operating combined passenger and freight vessels, as well as strictly cargo carriers.

As there is a network of protected sea channels in this region and extending south to Puget Sound, small tugs with barges and float-scows could haul Alaska pulp and paper to Prince Rupert, British Columbia, a western terminus of the Canadian National Railroad and then by this short route to the Middle Western States.

The pulp and paper markets of the Orient and Australia are as readily accessible to Alaska as to the Pacific Coast States and British Columbia. Those of the Gulf States and other sections of the Atlantic seaboard can be reached by water shipments through the Panama Canal.

Approximate distances from Ketchikan, the most southerly Alaska port to some of the most important possible markets are as follows:*

Minneapolis, via Prince Rupert, British Columbia, and Canadian Railroad	--- 2,390
Chicago, via Prince Rupert	----- 2,700
Seattle	----- 600
Sân Francisco	----- 1,300
Colon	----- 4,638
New Orleans, via Panama Canal	---- 6,084
Savannah " " "	---- 6,407
New York " " "	---- 6,663
Honolulu	----- 2,450
Yokohama	----- 3,911
New Zealand	----- 6,550
Sydney, Australia	----- 6,850

Machine logging with the donkey engines and wire rope is the only practical means of moving logs from the woods in this region because of the rough topography, the large quantity of debris on the ground and the large size of many of the trees. Ground skidding and the high-lead systems are now used, but one of the overhead-systems will probably prove most economical for extensive pulpwood operations. The method of logging required in Alaska are similar to those used in Washington and Oregon, and the necessary machinery and supplies are manufactured in those states.

* Drake, G:L. -- Birch-spruce forests of SE Alaska. Tim. vol. 25

A large percentage of the timber can be logged directly into tidewater by the use of two or three donkey-engines working tandem. Log flumes, short railroads or motor truck roads will be required to move the timber from the logging engines to tidewater in the longer valleys, but these more extensive logging areas need not be tapped for pulpwood supplies in the early years of the paper industry in Alaska. Log-driving is not practicable in the short turbulent streams which are found in this region.

Timber is handled in full-tree lengths or as very long logs from the stump to the mill. After being pulled to tidewater by donkey engines it is towed in the form of flat rafts through the protected waterways. The cost of towing saw-logs is about one cent per one thousand board feet per mile. The cost for pulpwood per cord should not exceed this figure and it may be somewhat less. Timber supplies can be drawn from a very extensive region surrounding a plant without incurring an extensive transportation cost.

Floating logging camps, which can be easily towed from one cutting area to another, are in general use. Similarly, donkey engines and all other logline equipment are moved on scows and floats.

The average cost of saw-logs, exclusive of stumpage, delivered at the sawmills in 1927 was about one dollar per thousand board feet. It is estimated that the total cost of unpeeled pulpwood logs delivered at local mills and including an average stumpage charge of 40 cents per cord will not exceed six dollars per cord (equivalent to \$10 per thou-

sand board feet) during the next ten years, on the basis of labor and equipment costs of 1927. *

An extensive sawmill development primarily for entering the general markets is considered inadvisable. The pure stands of high grade spruce saw timber are too limited to support a large industry and it is unlikely that the mill run of lumber from the predominating hemlock-spruce forests can compete with the material of the same species produced in Southern British Columbia, Washington and Oregon. The trees of the hemlock-spruce stands in Alaska are similar and smaller and give less clear stock; the general distance from the market is a very important factor in handling a heavy low-grade product, and there are other drawbacks, such as lack of any local market for by-products. The sawmill capacity in Alaska should be gauged to the local demand, and if this is done the supply of high-grade saw timber is sufficient to maintain a thriving lumber industry. The common lumber can be sold locally, and the class produced from this select timber will stand the shipping charge to the general markets outside the territory.

The hemlock piling industry offers no chance of expansion as the present operators are fully able to meet the local needs ^{and} ~~and~~ piling cannot be shipped out of the territory at a profit.

A market can undoubtedly be developed for Alaska cedar. The wood of this tree is somewhat similar to that of Port

* Alaska Woods by L.D. Markwardt. Page 43

Orford Cedar and is valuable for many of the products for which that valuable species is used. The manufacture of articles such as moth-repellent chests, battery boxes or battery separators from Alaska cedar could probably be made as an important minor industry or one could produce the rough shapes for manufacture and then send them to be finished elsewhere.

The manufacture of shingles is now confined to two small plants cutting solely for the local trade. In the future this could develop into an important industry, as the region has a large amount of Western Red Cedar of shingle grade. The production of cedar telephone poles is also a possibility. Logging primarily for poles will be obtained in connection with the logging operations for the other products. Shingles and poles should be marketed to best advantage in the Prairie Provinces of Canada and the Middle Western States, with shipments through Prince Rupert, British Columbia.

Alaska has no operating pulp or paper mills at the present time. The nearest pulp mill is a sulphite plant at Swanson Bay, British Columbia, 212 miles south of Ketchikan.

The extensive forest resources of Alaska will undoubtedly be exploited chiefly for the manufacture of newsprint paper because of the usually favorable conditions there for the large scale operations that now characterize that industry. Conditions are not favorable for other branches of the paper industry or for the extensive manufacture of lumber in this region.

Studies by the Forest Service indicate that the forest of this region, under a proper system of management, could produce not less than 1,500,000 cords of pulpwood annually in perpetuity. In other words this amount of timber can be logged yearly and will be fully renewed through tree growth. Converted into newsprint this represents a production of 1,000,000 tons, or more than one-fourth of the present yearly consumption of pulp in the United States.

The policy of the Forest Service in limiting the development of wood-using plants dependent on national forest ~~timber~~ timber to the total capacity that can be supplied indefinitely through tree growth, indicates and insures a permanent industry for this region. It prevents that overdevelopment and subsequent collapse through timber exhaustion that has characterized timber industries in many sections of the United States, and is highly important to paper companies with their heavy capital investments that can be justified only by an assuredly long operating life.

The United States has been the world's greatest user of newsprint for some time. The consumption is constantly growing and for 1927 was 3,460,000 tons or about 58 pounds per capita. To meet the increased demand and to offset production losses, due to timber depletion around old plants, the industry has reached farther and farther afield from the great consuming center represented by the Eastern United States. The virgin forests capable of supplying the spruce hemlock and true firs so essential for the mechanical and sulphite pulp used in newsprint have long since been foll-

owed across the border into Eastern Canada and this migration has now reached the stage when the greater part of the newsprint requirements of the United States are supplied by Canadian mills.

This expansion of the industry into the region next to accessibility to the large markets, though on foreign soil, was a logical development. But the projects of outstanding merit in Eastern Canada have now largely been taken up. Those remaining apparently possess no advantages for supplying paper to the Eastern markets that cannot be offset by other advantages enjoyed by plants operating in the Pacific Northwest and Alaska, and shipping on a relative cheaper ton-mile rate by vessel through the Panama Canal.

The outstanding advantages of Alaska as a location for the manufacturing center of newsprint are its water transportation facilities to the markets of the world, abundant water power and timber resources which are available for bona-fide development and use under reasonable agreement with the United States. These advantages are sufficient to assure the establishment of a large and permanent paper making industry in the region.

References:

1. Badiam, Alexander --Wonders of Alaska.
2. Brooks, Alfred -- Geography and Geology of Alaska.
3. Burr, Agnes -- Alaska, our beautiful land of opportunity.
4. Carpenter, Frank C -- Alaska, Our Northern Wonderland.
5. Commerce Department Bulletin -- Commerce and Economic resources of our territory and possessions of the United States of America.
6. Commerce Department and Labor -- Commerce and Industries.
7. Congress, U.S. Report --Alaska.
8. Dalph, J N -- Congress Report - 54th session.
9. Davis, Mary Lee -- The Intimate Story of Alaska.
10. Drake, G.L. -- The Birch-Spruce Forests of Southwestern Alaska. *Timberman* 25 (2): 51-53.
11. General Land Office Circulars Nos. 1092 and 1199 -- Regulations Permitting Exportation of timber from Alaska.
12. Pinchot, Gifford --Who shall own Alaska.
13. Graves -- Alaska Forests.
14. Guthrie J.D. -- Alaska's Interior Forests - *Amer. For.* vol. 28(344), pps. 451-55.
15. Henintzleman, B.F. -- The pulp and Timber Resources of Southeastern Alaska.
16. Henintzleman, B.F. -- Alaska Facts- West Coast *Lumberman* Vol. 44(518), pps. 102-2, 108.
17. Hoffman, B.E. -- Alaska Woods.
18. Hear the Governor-- Glimpses of Alaska from 1728 to the present date from Juneau, Government Office.
19. Interior, Department of -- General Information regarding the Territory of Alaska.
20. Johnson, R.P.A. and Gibbons, W.H. -- Properties of Western Hemlock and their relation to the uses of wood. U.S.D.A. Technical Bulletin No. 139, pps. 1-62.

References Continued--

21. Markwardt, L.D. -- Alaska Woods.
22. Mattoon, Wilbur R -- Forest Trees and Forest Regions of the United States. U.S.D.A. misc. pub. No. 217.
23. Office, General Land Circulars Numbers 1092 and 1199 -- Regulations permitting Exportation Of Timber From Alaska.
24. Stephenson, William B -- Land of Tomorrow.
25. Taylor, R.F. -- Yield of Second growth Western hemlock-Sitka spruce stands in Southeastern Alaska. Forest Quartely vol. 11 - 1913. pps. 185-200.
26. Taylor R.F. -- Indicative vegetation on cut-over lands of Southeastern Alaska. Univ. of Wash. Quart. (9)(1) 1930.
27. Taylor R.F. -- Role of Sitka Spruce in Developing Western hemlock stands in Southeastern Alaska. Journal of Forestry 27 (5). Also Journal of For. vol. 29, pps.532-35.
28. Walley, J.M. -- Extracts from tables in a report on yield studies on Hemlock-Spruce types.
29. Weigle, W.G. -- Production of Alpine Lumber in Alaska. Alaska Pioneer 1(2) 1917.
30. Zon, R and Sparhawk, W.N. -- Forest Resources of the World. 2nd Edition.