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Forest Statistics for the Upper Koyukuk River, Alaska, 1971

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Foreword

This Resource Bulletin is a summation of the findings of the first intensive inventory of that part of the Koyukuk River drainage lying north of the Arctic Circle. Included within the 741,710-acre inventory are areas being considered for inclusion in one of the four national conservation systems—National Forest, Park, Wildlife, and Wild and Scenic Rivers. The North Slope oil pipeline corridor also passes through the inventory area.

The work on this project began in 1969 with acquisition of aerial photography by the Bureau of Land Management (BLM), U.S. Department of Interior. A cooperative effort by the Bureau of Land Management and the Forestry Sciences Laboratory of the Pacific Northwest Forest and Range Experiment Station completed the photo interpretation and field work in 1971.

Participants in the field and office work included: Keith Hutchison, Karl Hegg, and Ronald Dippold, from the U.S. Forest Service; Carl Jeglum, John Stephanson, Jim Murray, Mel Mehl, and Dan Baird from the BLM; and Craig Lindh from the Alaska Division of Economic Development. Data processing was handled by John Berger and assistants at Portland.

Forest Survey, authorized by the McSweeney-McNary Act in 1928 and extended to Alaska in 1954, is a nationwide effort conducted at various locations to obtain information on forest lands—their extent, condition, volume, growth, and depletion. The first inventory of interior Alaska was begun in 1956 and completed in 1962. This was an extremely extensive inventory, and Forest Survey has subsequently defined areas having commercial forest concentrations for which more intensive inventories are desirable. In addition to the Koyukuk River unit, other areas that have been more intensively inventoried and for which reports are available or pending are: Susitna Valley,¹ Kuskokwim River, Copper River, Tanana/Fairbanks, Tuxedni Bay, and the Norton Bay Indian Reservation.

¹Karl M. Hegg. Forest resources of the Susitna Valley, Alaska. USDA Forest Service Resource Bulletin PNW-32, 42 p. Pacific Northwest Forest and Range Experiment Station, Portland, Oreg., 1970.

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Abstract

Area and volume statistics from the first intensive forest inventory of the upper Koyukuk River drainage, in north-central Alaska, are given. Observations are made on forest location, description, defect, regeneration, growth, and mortality. Commercial forests, although generally restricted to a narrow band along drainages, were found as far as 70 miles (113 kilometers) north of the Arctic Circle. Commercial forests occupy less than 5 percent of the 742,000-acre inventory area but, despite the northerly latitudes, support an average volume in excess of 1,100 cubic feet per acre (80 cubic meters per hectare).

KEYWORDS: Forest Surveys (Upper Koyukuk River - Alaska).

Highlights

	Acres	Hectares
Total unit area is	741,710	300,170
with forests on	486,828	197,019
with nonforest on	202,316	81,877
with water on	52,566	21,274
Forested areas consist of:		
commercial forest land	34,839	14,099
noncommercial forest land		
- more than 800 cubic feet per acre	7,828	3,168
- less than 800 cubic feet per acre	444,161	179,752
Commercial forest composition is:		
Sawtimber	8,209	3,322
Poletimber	16,686	6,753
Seedling/sapling	9,944	4,024
Nonstocked	0	0
Volumes on commercial forest land are:		
	Cubic feet Thousands	Cubic meters Thousands
Total net volume	37,922.5	1,073.2
Total gross volume	39,869.0	1,128.3
Annual gross growth	907.6	25.7
Annual net mortality	721.0	20.4
	Board feet	Cubic meters ²
	Thousands	Thousands
	87,795.6	557.5
	92,104.6	574.4
	3,190.7	8.1
	2,134.9	13.3

¹ By Bureau of Census definition 17,615 acres would be classified as water.

² Volume of roundwood in softwood trees 9.0-inch d.b.h. and larger and hardwood trees 11.0-inch d.b.h. and larger.

Observations

AREA AND LOCATION

The Koyukuk unit lies north of the Arctic Circle and about 225 miles northwest of Fairbanks (fig. 1). It is an area where a fan-shaped series of tributaries rising deep in the Brooks Range join to make up the mainstream of the Koyukuk River. Several of these rivers are of such a wild and primitive nature as to be considered for National Wild River status. The entire area is under study for possible inclusion in the National Forest or Park system. The unit area of 741,710 acres consisting of narrow strips straddling the Koyukuk and its tributaries is but a small part of the area drained by this river system (fig. 2).

FOREST DESCRIPTION

The Koyukuk unit is extensively forested, although forests with commercial potential are

restricted to a narrow strip adjacent to drainages (fig. 3). Most of the acreage in these strips is occupied by white spruce with primary balsam poplar stands on newly built-up river bars (fig. 4). Paper birch stands, sometimes in mixture with balsam poplar and white spruce, are found on some of the south-facing slopes and occasionally on other sites after a burn. Aspen was seen in the area, usually as a minor species associated with birch. However, aspen was not found at any of our field locations. The aspen we did see seemed to occur mostly on noncommercial hillside sites and appeared to be of fire origin.

Fire patterns are a fairly prominent feature on the hillsides of Koyukuk drainage with most of the old burns now occupied by noncommercial site hardwoods which we suspect, barring more fire, will be replaced by black spruce. Evidence of fire was not seen on river bottom commercial sites. These sites apparently maintain a humidity level that discourages fire occurrence.

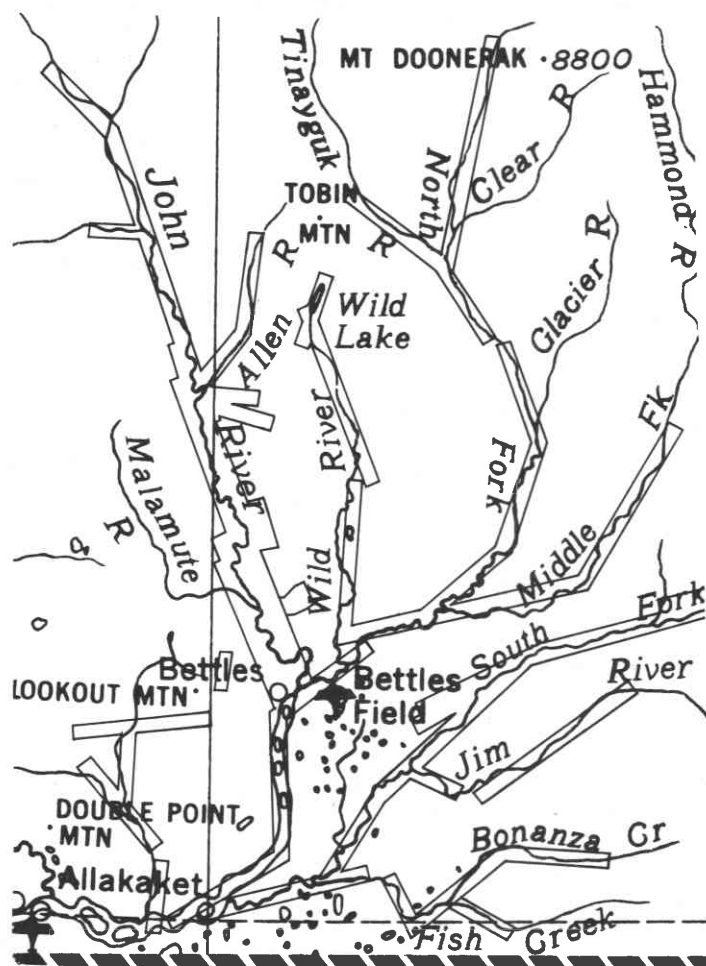


Figure 2.—The Koyukuk Inventory Unit—essentially strips straddling the river network. Actual area included in the unit is outlined.



Figure 3.—Permafrost and restricted drainage confine development of commercial sized trees to narrow bands on the smaller tributaries of the Koyukuk.

Figure 4.—A thrifty balsam poplar stand on the banks of the Koyukuk River.



FOREST USES

The use of the timber in this area appears to be mostly for house logs, firewood, and fish drying racks. With a total sawtimber volume of 87.8 million board feet, the maximum allowable cut could not support more than one medium-sized sawmill. This is assuming a mill could draw from a resource scattered within a 50- by 75-mile area. Railroads are nonexistent and roads nearly so, with rivers the main means of surface transport. Physical problems alone make widespread harvesting not feasible; add this to the probable accompanying scenic disruption, and the situation becomes unacceptable to many people.

The inaccessibility of this supply to the State or world markets is evidenced in one recent commercial sale. This sale was made to supply pilings to the North Slope oilfields. But problems of delivering and competition from sources as far distant as Washington State discouraged continuation.

For recreation, esthetics, and the "wilderness experience," inaccessibility may be more an asset than a problem. Bettles and Wiseman have the only scheduled air service in the area and that by small plane. Charter aircraft are available for flights into bush fields and lakes for canoeing, backpacking, hunting, and fishing.

The area has considerable wildlife and several good fishing streams. Part of our forest inventory procedures involved sampling to determine animal use of the forest. At nearly all sample locations, we noted signs of animal use and occupancy. Evidence indicated that moose, caribou, and bear made extensive use of the Koyukuk forests.

DEFECT

Increment borings to obtain age for site determination and our practice of falling sample trees for volume table checks give the field man a chance to see what, if any, defect is found. By extrapolating this knowledge, we estimated the amount of defect in all trees tallied.

On the Koyukuk we found very little decay in white spruce or paper birch but a high decay incidence in balsam poplar. Tables 14 and 14b show a 4-percent loss from gross volume for white spruce and a 24-percent loss for balsam

poplar. White spruce is by far the most important species in this area, and fortunately the decay found is a butt rot that seldom extends more than 3 feet up the bole. This butt rot is a brown cubical variety probably caused by the fungus, *Coniophora poteana* Schum. ex Fr. In contrast, nearly all the balsam poplar showed signs of injury and decay if they were approaching or of sawtimber size.

REGENERATION

The possible problem of regeneration in northern and western Alaska has long been recognized. For the Koyukuk at least, there appears to be little cause for concern. The old community of Bettles, abandoned about 10-15 years ago, is fast disappearing under the advance of balsam poplar and birch (fig. 5). These two species also have been successfully regenerating on old burns although these tend to be noncommercial sites. White spruce also appears to be regenerating successfully, although the low ratio of seedlings and saplings shown in table 8 does not bear this out. Only 1,400 acres are shown as being in seedling-sapling stands. However, we noted abundant white spruce regeneration at or near almost every plot location.



Figure 5.—Remnants of old Bettles. Birch and balsam poplar reproduction are rapidly concealing any signs of past human occupancy.

Equally indicative of more than adequate regeneration is that no nonstocked areas were noted on either our photo interpretation or field plot locations.

GROWTH AND MORTALITY

Tables 18 and 19 report gross annual growth (annual mortality volume loss has not been deducted) instead of net annual growth. Our field sample of the commercial forest lands of the Koyukuk measured such large amounts of catastrophic loss as to make any net annual growth tables nearly meaningless. This trend, if continued, would eliminate the Koyukuk stands in a short time. At one plot location, volume loss in the past 5 years is equal to one-third of the present plot volume. Three plots out of a total of 62 established in the commercial forest land stratum fell in a severe riverbank erosion area and accounted for 70 percent of the total mortality volume reported (fig. 6). The present per-acre loss rate is 21 cubic feet; but when the mortality volumes of the 3 plots mentioned are reduced and an average based on the other 59 sample plots is assigned, the average volume loss per acre is reduced to 8.5 cubic feet. We feel that a larger sample would confirm this reduction.



Figure 6.—Stream bank erosion is a major contributor to tree mortality in this area.

The data in table 18 yield a gross annual growth figure of 26.1 cubic feet per acre. By extrapolating from the calculations in the preceding paragraph, this growth would be reduced to 17.6 cubic feet per acre net—about what would be expected of the area.

The annual gross growth of 31 cubic feet per acre (27 cubic feet net) in the operable non-commercial strata (see "Terminology") is also unusually high. Apparently, ingrowth, at a rate of 11 cubic feet per acre, has inflated the growth of this strata. Ingrowth is the movement of the total cubic- or board-foot volume of a tree as it grows into the poletimber or sawtimber size. This may occur periodically in quite large amounts as a result of stands recovering from fire.

Survey Methods

The estimates of area and timber volumes are based on a double sampling procedure.³ Enough points to satisfy specific levels of statistical precision were uniformly distributed on aerial photographs. These points (1 acre in size) were classified on photos by land type, forest type, and volume strata. A subsample was then drawn from all land types and reexamined on the photos. All subsample points originally classified as commercial forest land as well as any other subsample points questionably classified were visited on the ground.

For the Koyukuk, we interpreted 3,122 photo points and reexamined 528 noncommercial and nonforest points. This reexamination was used as the equivalent of a ground check and yielded 16 questionable points. These with the 62 commercial forest subsamples totaled 78 locations actually checked on the ground. The ground plot was located at the exact same point as was established on the photo. At each ground location a 10-point cluster of plots was measured. A 40-factor, basal-area gage was used to select sample trees at each point for detailed measurements of size and vigor. Through data processing procedures, the total sample and the individual tree volumes were expanded to obtain the various area and volume data needed or specified. However, the tables herein depart from the standard Forest Survey tables in that

³C. A. Bickford. The sampling design used in the forest survey of the Northeast. *Journal of Forestry* 50: 290-293, 1952.

we added a noncommercial forest category called "operable"—areas with more than 800 gross cubic feet per acre in poletimber and sawtimber trees. During the initial inventory of interior Alaska we found that much noncommercial forest land had a relatively high per-acre volume. When more intensive inventories were begun in the mid-1960's, we and our cooperators agreed that some of this noncommercial strata had potential value as a commercial wood supply. By extrapolation from cutting minimums of 3 cords per acre used in the Lake States and Canada, we established 9 cords or 800 cubic feet per acre as a prudent level for Alaska. This threefold increase in the minimum economic

operating level should help compensate for the higher production and shipping costs in Alaska.

The area and volume in this classification, although considered adequate for some cutting operations, should not be included in allowable cut computations. Future studies may show, through logging or other silvicultural practices, whether these marginal sites can be managed as commercial forest land. None of the reported areas and volumes (whether classed as commercial or other) should be used to calculate an allowable cut without first considering all possible management and forest land use alternatives.

Sampling Error

The reliability of the inventory is expressed in terms of relative sampling errors.

Area		Design sampling error	Sampling error achieved	Sampling error of total area or volume reported
		----- Percent -----		
Area	Commercial forest land, per million acres	3.0	3.0	±16.0
	Noncommercial forest land, per million acres	10.0	4.5	± 6.6
Volume	Commercial forest land, per billion cubic feet	5.0	3.7	±19.0
	Commercial forest land, growth per billion cubic feet—gross	5.0	.6	±20.0 ⁴

⁴ A gross growth sampling error is used in place of the net growth error. Our mortality sampling error has a high bias, which we attribute to an unusual catastrophic loss, and its effect is to make our net growth sampling error nearly meaningless.

For the Koyukuk River unit, we are reporting 37.9 million cubic feet of growing-stock-volume ± 19 percent. This means that unless a 1 in 3 chance has occurred, the true total cubic-foot

volume lies between 30.7 and 45.1 million cubic feet.

In all instances we more than achieved our design sampling error.

Principal Alaska Tree Species

Softwoods:

White spruce

Black spruce

Tamarack

Hardwoods:

Paper birch

Balsam poplar

Quaking aspen

Black cottonwood

Picea glauca (Moench) Voss

Picea mariana (Mill.) B.S.P.

Larix laricina (Du Roi) K. Koch

Betula papyrifera Marsh.

Populus balsamifera L.

Populus tremuloides Michx.

Populus trichocarpa Torr. & Gray

Terminology

Allowable cut.—The volume of timber that would be cut on commercial forest land during a given period under specified management plans for sustained production such as those in effect on National Forests.

Area condition class.—A classification of commercial forest land based upon stocking of desirable trees and other conditions affecting current and prospective timber growth.

Code Area Condition Classification

10 Areas 100 percent or more stocked with desirable trees and not overstocked. Stands in this category generally do not require any treatment at present to maintain high level of growth.

20 Areas 100 percent or more stocked with desirable trees and overstocked. Stands in this category need a treatment such as thinning to produce maximum levels of growth of desirable trees.

30

Areas 60 to 100 percent stocked with desirable trees, with less than 30 percent of the area controlled by acceptable growing-stock trees, cull trees, inhibiting vegetation, slash, or non-stockable conditions. Stands in this category generally have conditions favorable for natural improvement of stocking without special treatment.

40

Areas 60 to 100 percent stocked with desirable trees, with 30 percent or more of the area controlled by other trees (or overstocked areas) and/or conditions that ordinarily prevent occupancy by desirable trees. Stands in this category generally have little prospect for improvement in desirable tree stocking without special treatment such as thinning, cull tree removal, etc.

50

Areas less than 60 percent stocked with desirable trees, but with 100 percent or more stocking with growing-stock trees. Stands in this category generally have little prospect for improved desirable tree stocking without special treatment. Stands almost to rotation age would usually not be treated.

60 Areas less than 60 percent stocked with desirable trees, but with 60 to 100 percent stocking with growing-stock trees. Stands in this category generally have little prospect for improved desirable tree stocking without special treatment such as timber stand improvement or planting.

70 Areas less than 60 percent stocked with desirable trees and with less than 60 percent stocking with growing-stock trees. Stands in this category generally have little prospect for improved desirable tree or growing-stock stocking without treatment such as site preparation and regeneration, etc.

Commercial species.—Trees presently or prospectively suitable for industrial wood products.

Cull.—Portions of a tree that are unusable for industrial wood products, because of rot, form, or other defect.

Cull trees.—Live trees of sawtimber or poletimber size that are unmerchantable for saw logs now or prospectively because of defect, rot, or species.

Rough trees: Live trees of commercial species 5.0-inch and larger d.b.h. that do not contain a saw log now or prospectively primarily because of roughness or poor form.

Rotten trees: Live trees of commercial species 5.0-inch and larger d.b.h. that do not contain a saw log now or prospectively primarily because of rot.

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having such tree cover, and not currently developed for nonforest use.

Commercial forest land: Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Note: Areas qualifying as commercial forest land have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood under management.)

Noncommercial forest land: Unproductive forest land incapable of yielding crops of industrial wood because of adverse site

conditions (producing less than 20 cubic feet per acre per year), and productive forest land withdrawn from commercial timber use through statute or administrative regulation.

Noncommercial operable—noncommercial forest land presently carrying a gross volume in excess of 800 cubic feet per acre.

Noncommercial inoperable—noncommercial forest land presently carrying a gross volume of less than 800 cubic feet per acre.

Growing-stock trees.—Sawtimber trees, pole-timber trees, saplings, and seedlings; that is, all live commercial trees except cull trees.

Desirable trees: Growing-stock trees having no serious defects in quality limiting present or prospective use, relatively high vigor, and containing no pathogens that may result in death or serious deterioration before rotation age. They include the type of trees forest managers aim to grow; that is, the trees left in silvicultural cutting or favored in cultural operations.

Acceptable trees: Trees meeting the specifications for growing stock but not qualifying as desirable trees.

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous. Alaska hardwood tree species are paper birch, quaking aspen, black cottonwood, and balsam poplar.

Inhibiting vegetation.—Cover sufficiently dense to prevent establishment of tree seedlings.

International ¼-inch rule.—A formula rule used to determine the log and tree volume in board feet.⁵ The ¼-inch kerf is a modified form and one of the official rules of the U.S. Forest Service.

Land area.—The area of dry land and land temporarily or partly covered by water such as marshes, swamps, and river flood plains (omitting tidal flats below mean high tide); streams, sloughs, estuaries, and canals less than 120 feet in width; and lakes, reservoirs, and ponds less than 1 acre in area.

⁵Donald Bruce and Francis X. Schumacher. *Forest mensuration*. 483 p. New York: McGraw-Hill Book Co., 1950.

Local forest types.—A classification of forest land based upon the species forming a plurality of the live tree stocking.

White spruce: Forests in which a plurality of the stand is white spruce. Common associates include birch, aspen, and cottonwood.

Black spruce: Forests in which a plurality of the stand is black spruce. Common associates are paper birch and occasionally white spruce.

Cottonwood/balsam poplar: Forests in which a plurality of the stand is black cottonwood and/or balsam poplar. Common associates include white spruce and birch.

Aspen or paper birch: Forests in which a plurality of the stand is aspen and paper birch, singly or in combination. Common associates include black cottonwood and white spruce.

Log grades.—A classification of logs based on external characteristics as indicators of quality or value.

Mean annual increment (MAI).—A measure of the volume of wood produced on 1 acre during 1 year. Forest Survey minimum standard for commercial forest land is the ability to produce 20 cubic feet per acre per year.

Mortality.—Number or sound-wood volume of live trees dying from natural causes during a specified period.

Net annual growth of growing stock.—The annual change in volume of sound wood in live sawtimber and poletimber trees during a specified period.

Net annual growth of sawtimber.—The annual change in net board-foot volume of live sawtimber trees during a specified period.

Net volume.—The gross volume of a tree less deductions for rot, sweep, or other defect affecting product use.

Growing-stock volume: The net volume of sound wood in the bole of growing-stock trees 5.0 inches and larger in diameter at breast height, from stump to a minimum 4.0-inch top outside bark or to the point where the central stem breaks into limbs.

Noncommercial species.—Tree species of typically small size, poor form, or inferior quality which normally do not develop into trees suitable for industrial wood products.

Nonforest land.—Land that does not qualify as forest land. Includes land that has never supported forests and lands formerly forested where forest use is precluded by development for nonforest uses, such as crops, improved pasture, residential areas, and city parks. Also includes improved roads and certain areas of water classified by the Bureau of the Census as land. Unimproved roads, streams, canals, and nonforest strips in forest areas must be more than 120 feet wide, and clearings in forest areas must be more than 1 acre in size, to qualify as nonforest land.

Nonstockable.—Areas of forest land not capable of supporting forest growth, because of the presence of rock, water, etc.

Salvable dead trees.—Standing dead trees that are considered currently or potentially merchantable by regional standards. A poletimber tree must be more than one-half sound (cubic measure); a sawtimber tree more than one-third sound (board measure).

Saw log.—A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight, and with a minimum diameter inside bark for softwoods of 6 inches (8 inches for hardwoods).

Saw-log portion.—That part of the bole of sawtimber trees between the stump and the saw-log top.

Saw-log top.—The point on the bole of sawtimber trees above which a saw log cannot be produced. The minimum saw-log top is 7.0-inch d.o.b. for softwoods and 9.0-inch d.o.b. for hardwoods.

Site classes.—A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Softwoods.—Coniferous trees, usually evergreen, having needles or scalelike leaves.

Stocking.—The degree of occupancy of land by trees, measured by basal area and/or the number of trees in a stand by size or age and spacing, compared to the basal area and/or number of trees required to fully utilize the growth potential of the land; that is, the stocking standard.

Overstocked areas: Areas where growth of trees is significantly reduced by excessive numbers of trees.

Nonstocked areas: Commercial forest

lands less than 16.7 percent stocked with growing-stock trees.

Stand-size classes.—A classification of forest land based on the size class of the growing stock present; that is, sawtimber, poletimber, or saplings and seedlings.

Sawtimber stands: Stands at least 16.7 percent stocked with growing-stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands: Stands at least 16.7 percent stocked with growing-stock trees, of which half or more of this stocking is in poletimber and sawtimber trees, with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands: Stands at least 16.7 percent stocked with growing-stock trees of which more than half of the stocking is sapling and seedlings.

Tree-size classes.—A classification based on the diameter of the tree at breast height (4½ feet above the ground on the uphill side of the tree):

Sawtimber-size tree:

Softwood tree of 9.0-inch d.b.h. and larger.

Hardwood tree of 11.0-inch d.b.h. and larger.

Poletimber-size tree:

Softwood tree of 5.0- to 8.9-inch d.b.h.

Hardwood tree of 5.0- to 10.9-inch d.b.h.

Sapling-size tree: A tree of 1.0- to 4.9-inch d.b.h.

Seedling-size tree: A tree of less than 1.0-inch d.b.h.

Upper-stem portion.—That part of the main stem or fork of sawtimber trees above the saw-log top to a minimum top diameter of 4.0 inches outside bark or to the point where the main stem or fork breaks into limbs.

Water.—*Bureau of the Census:* Streams, sloughs, estuaries, and canals more than ¼ of a statute mile in width; and lakes, reservoirs, and ponds more than 40 acres in area.

Forest Survey: The same as the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

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Metric Conversions

The Forest Survey Handbook requires that the data in the following tables be in the form in common usage in the United States, that is, acres and cubic and board feet. However, to ease the use of these tables internationally and because the United States appears to be shifting to the metric system, the following conversion factors are given:

1 acre	= 0.4047 hectare
1 hectare	= 2.47 acres
1 cubic foot	= 0.0283 cubic meter
1 cubic meter	= 35.3145 cubic feet
1 cubic foot per acre	= 0.06997 cubic meter per hectare
1 cubic meter per hectare	= 14.29 cubic feet per acre
20 cubic feet per acre	= 1.3994 cubic meters per hectare
1 square foot basal area per acre	= 0.2296 square meter per hectare
1 square meter basal area per hectare	= 4.356 square feet per acre

Table 1.—Area by productivity and land class, Koyukuk River, Alaska, 1971

Land class	Thousand acres
Forest land:	
Commercial	34.8
Noncommercial:	
Operable	7.8
Inoperable	444.2
Total noncommercial	452.0
Total forest land	486.8
Non forest land	1254.9
Total area	741.7

¹ Includes 17,615 acres classified as water by Bureau of Census and 34,951 acres defined as water by Forest Survey.

Table 2.—Area of commercial and operable noncommercial forest land, by stand-size class, Koyukuk River, Alaska, 1971

(Thousand acres)			
Stand-size class	Total	Commercial	Operable noncommercial
Sawtimber stands	12.1	8.2	3.9
Poletimber stands	20.6	16.7	3.9
Seedling and sapling stands	9.9	9.9	0
Nonstocked areas	0	0	0
Total	42.6	34.8	7.8

Table 3.—Area of commercial and operable noncommercial forest land, by stand-volume class, Koyukuk River, Alaska, 1971

(Thousand acres)			
Stand volume (board feet per acre) ¹	Total	Commercial	Operable noncommercial
0-1,499	21.8	19.3	2.5
1,500-2,999	6.7	5.5	1.2
3,000-4,999	9.8	5.7	4.1
5,000-6,999	.2	.2	0
More than 7,000	4.1	4.1	0
Total	42.6	34.8	7.8

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

Table 4.—Area of commercial and operable noncommercial forest land, by stand-size and stand-volume classes, Koyukuk River, Alaska, 1971

(Thousand acres)					
Stand volume (net cubic feet per acre)	Stand-size class				
	Total	Non- stocked	Sapling- seedling	Poletimber	Sawtimber
0-299	7.1	0	7.1	0	0
300-799	8.2	0	2.8	4.1	1.3
800-1,499	16.5	0	0	11.0	5.5
1,500-2,199	7.7	0	0	5.3	2.4
More than 2,200	3.1	0	0	.2	2.9
Total	42.6	0	9.9	20.6	12.1

Table 5.—Area of commercial forest land by area condition class, Koyukuk River, Alaska, 1971

Area condition class		Thousand acres
10	Areas 100 percent or more stocked with desirable trees and not overstocked.	0
20	Areas 100 percent or more stocked with desirable trees and overstocked.	1.4
30	Areas 60 to 100 percent stocked with desirable trees, and with less than 50 percent of the area controlled by acceptable growing stock trees, cull trees, inhibiting vegetation, slash, or nonstockable conditions.	2.9
40	Areas 60 to 100 percent stocked with desirable trees and with 30 percent or more of the area controlled by other trees (or overstocked areas) and/or conditions that ordinarily prevent occupancy by desirable trees.	2.8
50	Areas less than 60 percent stocked with desirable trees, but with 100 percent or more stocking with growing-stock trees.	7.0
60	Areas less than 60 percent stocked with desirable trees, but with 60 to 100 percent stocking with growing-stock trees.	15.0
70	Areas poorly stocked with desirable trees, and poorly stocked with growing-stock trees.	5.7
All classes		34.8

Table 6.—Area of commercial forest land, by site class, Koyukuk River, Alaska, 1971

Site class (cubic feet)	Thousand acres
165 or more ¹	0
120 to 165	0
85 to 120	0
50 to 120	0
Less than 50	34.8
Total	34.8

¹ Potential yield, mean annual increment.

Table 7.—Area of noncommercial forest land, by forest type, Koyukuk River, Alaska, 1971
(Thousand acres)

Forest type	Total	Operable ¹	Inoperable ²
Black spruce	444.2	0	444.2
White spruce	7.8	7.8	0
Cottonwood	0	0	0
Paper birch	0	0	0
Total	452.0	7.8	444.2

¹ Operable noncommercial forest land is defined as areas presently supporting more than 800 cubic feet of volume (gross).

² All inoperable noncommercial forest land is assumed to be black spruce and paper birch.

Table 8.—Area of commercial forest land, by forest type and stand-size class, Koyukuk River, Alaska, 1971
(Thousand acres)

Local forest type	Stand-size class			
	Total	Sapling-seedling	Poletimber	Sawtimber
White spruce	21.0	1.4	11.4	8.2
Cottonwood	12.4	7.1	5.3	-
Paper birch	1.4	1.4	-	-
Total	34.8	9.9	16.7	8.2

Table 9.—Area of commercial forest land, by stand age and stand-size class, Koyukuk River, Alaska, 1971

(Thousand acres)				
Stand age (years)	Stand-size class			
	Total	Sapling- seedling	Poletimber	Sawtimber
Nonstocked	—	—	—	—
1-10	1.4	1.4	0	0
10-20	1.4	1.4	0	0
20-30	1.4	1.4	0	0
30-40	1.4	0	1.4	0
40-50	2.8	2.8	0	0
50-60	5.5	2.9	2.6	0
60-70	0	0	0	0
70-80	0	0	0	0
80-90	1.4	0	1.4	0
90-100	2.9	0	2.9	0
100-120	5.4	0	2.7	2.7
120-140	1.4	0	1.4	0
140-160	0	0	0	0
160-180	4.1	0	2.9	1.2
180-200	.3	0	0	.3
200-300	2.6	0	0	2.6
300 and over	0	0	0	0
Mixed ages	2.8	0	1.4	1.4
Total	34.8	9.9	16.7	8.2

Table 9a.—Area of operable noncommercial forest land, by stand age and stand-size class, Koyukuk River, Alaska, 1971

(Thousand acres)				
Stand age (years)	Stand-size class			
	Total	Sapling- seedling	Poletimber	Sawtimber
Nonstocked	—	—	—	—
1-10	0	0	0	0
10-20	0	0	0	0
20-30	0	0	0	0
30-40	0	0	0	0
40-50	0	0	0	0
50-60	0	0	0	0
60-70	0	0	0	0
70-80	0	0	0	0
80-90	0	0	0	0
90-100	1.2	0	1.2	0
100-120	0	0	0	0
120-140	1.4	0	1.4	0
140-160	0	0	0	0
160-180	3.8	0	1.3	2.5
180-200	0	0	0	0
200-300	1.4	0	0	1.4
300 and over	0	0	0	0
Mixed ages	0	0	0	0
Total	7.8	0	3.9	3.9

Table 10.—Number of growing-stock trees on commercial forest land, by species and diameter class, Koyukuk River, Alaska, 1971

Species	(Thousand trees)												
	Diameter class (inches at breast height)												
	Total	1.0- 2.9	3.0- 4.9	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 28.9	29.0+
White spruce	5,260	1,159	1,323	955	799	583	275	92	51	14	4	5	0
Paper birch	2,035	426	1,065	375	136	33	0	0	0	0	0	0	0
Balsam poplar	5,916	2,312	1,338	1,158	746	273	84	5	0	0	0	0	0
Total	13,211	3,897	3,726	2,488	1,681	889	359	97	51	14	4	5	0

Table 11.—Number of growing-stock trees 5.0-inch d.b.h. and larger on commercial and operable noncommercial forest land, by species and 5-foot height class, Koyukuk River, Alaska, 1971

5-foot height classes	(Thousand trees)			
	Total	Species		
		White spruce	Paper birch	Balsam poplar
0-30	1,063	558	145	360
31-35	970	506	186	278
36-40	1,014	606	117	291
41-45	1,253	566	109	578
46-50	926	509	61	356
51-55	808	535	46	227
56-60	594	390	12	192
61-65	263	208	0	55
66-70	164	164	0	0
71-75	122	122	0	0
76-80	88	88	0	0
81-85	25	25	0	0
86-90	20	20	0	0
91-95	23	23	0	0
96-100	5	5	0	0
101+	4	4	0	0
Total	7,342	4,329	676	2,337

Table 12.—Net volume of timber on commercial forest land, by class of timber and softwoods and hardwoods, Koyukuk River, Alaska, 1971

(Million cubic feet)			
Class of Timber	Total	Softwoods	Hardwoods
Sawtimber trees:			
Saw-log portion	17.8	17.1	.7
Upper-stem portion	1.9	1.5	.4
Total	19.7	18.6	1.1
Poletimber trees	18.2	7.3	10.9
All growing-stock trees	37.9	25.9	12.0
Rough trees	0	0	0
Rotten trees	.3	.1	.2
Salvable dead trees	3.1	3.0	.1
Total	41.3	29.0	12.3

Table 12a.—Net volume of timber on operable noncommercial forest land, by class of timber and softwoods and hardwoods, Koyukuk River, Alaska, 1971

(Million cubic feet)			
Class of Timber	Total	Softwoods	Hardwoods
Sawtimber trees:			
Saw-log portion	4.6	4.5	0.1
Upper-stem portion	.4	.4	0
Total	5.0	4.9	.1
Poletimber trees	4.7	4.3	.4
All growing-stock trees	9.7	9.2	.5
Rough trees	.1	.1	0
Rotten trees	0.	0	0
Salvable dead trees	.2	.2	0
Total	10.0	9.5	.5

Table 13.—Net volume of growing stock on commercial forest land, by species and diameter class, Koyukuk River, Alaska, 1971

(Million cubic feet)											
Species	Diameter class (inches at breast height)										
	Total	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-26.9	27.0+
Softwoods:											
White spruce	25.9	2.4	4.9	6.8	5.4	2.9	1.9	0.8	0.3	0.5	0
Total	25.9	2.4	4.9	6.8	5.4	2.9	1.9	.8	.3	.5	0
Hardwoods:											
Paper birch	1.7	.9	.5	.3	0	0	0	0	0	0	0
Balsam poplar	10.3	2.9	3.9	2.4	1.0	.1	0	0	0	0	0
Total	12.0	3.8	4.4	2.7	1.0	.1	0	0	0	0	0
Total, all species	37.9	6.2	9.3	9.5	6.4	3.0	1.9	.8	.3	.5	0

Table 13a.—Net volume of growing stock on commercial and operable noncommercial forest land, by species and diameter class, Koyukuk River, Alaska, 1971

(Million cubic feet)											
Species	Diameter class (inches at breast height)										
	Total	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-26.9	27.0+
Softwoods:											
White spruce	35.1	3.9	7.7	9.3	6.8	3.7	2.1	0.8	0.3	0.5	0
Total	35.1	3.9	7.7	9.3	6.8	3.7	2.1	.8	.3	.5	0
Hardwoods:											
Paper birch	2.0	1.1	.5	.3	.1	0	0	0	0	0	0
Balsam poplar	10.5	3.0	4.0	2.4	1.0	.1	0	0	0	0	0
Total	12.5	4.1	4.5	2.7	1.1	.1	0	0	0	0	0
Total, all species	47.6	8.0	12.2	12.0	7.9	3.8	2.1	.8	.3	.5	0

Table 14.—Net volume of sawtimber on commercial forest land, by species and diameter class, Koyukuk River, Alaska, 1971

(Million board feet, International ¼-inch rule)

Species	Diameter class (inches at breast height)								
	Total	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods:									
White spruce	85.6	26.6	25.3	14.8	10.3	4.2	1.6	2.8	0
Total	85.6	26.6	25.3	14.8	10.3	4.2	1.6	2.8	0
Hardwoods:									
Paper birch	0	0	0	0	0	0	0	0	0
Balsam poplar	2.2	0	1.9	.3	0	0	0	0	0
Total	2.2	0	1.9	.3	0	0	0	0	0
Total, all species	87.8	26.6	27.2	15.1	10.3	4.2	1.6	2.8	0

Table 14a.—Net volume of sawtimber on commercial and operable noncommercial forest land, by species and diameter class, Koyukuk River, Alaska 1971

(Million board feet, International ¼-inch rule)

Species	Diameter class (inches at breast height)								
	Total	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods:									
White spruce	106.3	36.0	32.2	18.6	10.9	4.2	1.6	2.8	0
Total	106.3	36.0	32.2	18.6	10.9	4.2	1.6	2.8	0
Hardwoods:									
Paper birch	.3	0	.3	0	0	0	0	0	0
Balsam poplar	2.2	0	1.9	.3	0	0	0	0	0
Total	2.5	0	2.2	.3	0	0	0	0	0
Total, all species	108.8	36.0	34.4	18.9	10.9	4.2	1.6	2.8	0

Table 14b.—Gross volume of sawtimber on commercial forest land, by species and diameter class, Koyukuk River, Alaska, 1971

(Million board feet, International ¼-inch rule)									
Species	Diameter class (inches at breast height)								
	Total	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods:									
White spruce	89.2	27.2	26.2	15.5	11.1	4.6	1.7	2.9	0
Total	89.2	27.2	26.2	15.5	11.1	4.6	1.7	2.9	0
Hardwoods:									
Paper birch	0	0	0	0	0	0	0	0	0
Balsam poplar	2.9	0	2.6	.3	0	0	0	0	0
Total	2.9	0	2.6	.3	0	0	0	0	0
Total, all species	92.1	27.2	28.8	15.8	11.1	4.6	1.7	2.9	0

Table 14c.—Gross volume of sawtimber on commercial and operable noncommercial forest land, by species and diameter class, Koyukuk River, Alaska, 1971

(Million board feet, International ¼-inch rule)									
Species	Diameter class (inches at breast height)								
	Total	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods:									
White spruce	111.3	37.3	33.2	19.9	11.8	4.6	1.6	2.9	0
Total	111.3	37.3	33.2	19.9	11.8	4.6	1.6	2.9	0
Hardwoods:									
Paper birch	.3	0	.3	0	0	0	0	0	0
Balsam poplar	2.8	0	2.5	.3	0	0	0	0	0
Total	3.1	0	2.8	.3	0	0	0	0	0
Total, all species	114.4	37.3	36.0	20.2	11.8	4.6	1.6	2.9	0

Table 15.—Net volume of sawtimber on commercial forest land, by species and log grade, Koyukuk River, Alaska, 1971

(Million board feet, International 1/4-inch rule)

Species	Log grade				
	Total	1	2	3	4 ¹
Softwoods:					
White spruce ²	85.6	0	1.2	67.9	16.5
Total	85.6	0	1.2	67.9	16.5
Hardwoods:					
Paper birch ³	0	0	0	0	0
Balsam poplar ³	2.2	0	.3	1.8	.1
Total	2.2	0	.3	1.8	.1
Total, all species	87.8	0	1.5	69.7	16.6

¹ Local use logs.

² Graded by "Official Grading Rules for Northern Hardwoods and Softwoods." Northern Hemlock and Hardwood Manufacturers Association, 1959.

³ Graded by "Hardwood Log Grades for Standard Lumber." USDA Forest Service, Forest Products Laboratory, 1961.

Table 15a.—Net volume of sawtimber on commercial and operable noncommercial forest land, by species and log grade, Koyukuk River, Alaska, 1971

(Million board feet, International 1/4-inch rule)

Species	Log grade				
	Total	1	2	3	4 ¹
Softwoods:					
White spruce	106.3	0	1.2	82.7	22.4
Total	106.3	0	1.2	82.7	22.4
Hardwoods:					
Paper birch	.3	0	0	.3	0
Balsam poplar	2.2	0	.3	1.8	.1
Total	2.5	0	.3	2.1	.1
Total, all species	108.8	0	1.5	84.8	22.5

¹ Local use logs.

Table 16.—Net volume of growing stock on commercial forest land, by forest type and stand-size class, Koyukuk River, Alaska, 1971

(Million cubic feet)				
Local forest type	Stand-size class			
	Total	Sapling-seedling	Poletimber	Sawtimber
White spruce	28.4	0	12.9	15.5
Cottonwood	8.8	1.3	7.5	0
Paper birch	.7	.7	0	0
Total	37.9	2.0	20.4	15.5

Table 16a.—Net volume of growing stock on operable noncommercial forest land, by forest type and stand-size class, Koyukuk River, Alaska, 1971

(Million cubic feet)				
Local forest type	Stand-size class			
	Total	Sapling-seedling	Poletimber	Sawtimber
White spruce	9.2	0	4.3	4.9
Cottonwood	.3	0	.2	.1
Paper birch	.2	0	.2	0
Total	9.7	0	4.7	5.0

Table 17.—Net volume of sawtimber on commercial forest land, by forest type and stand-size class, Koyukuk River, Alaska, 1971

(Million board feet, International 1/4-inch rule)				
Local forest type	Stand-size class			
	Total	Sapling-seedling	Poletimber	Sawtimber
White spruce	81.1	0	22.9	58.2
Cottonwood	6.4	.3	6.1	0
Paper birch	.3	.3	0	0
Total	87.8	.6	29.0	58.2

Table 17a.—Net volume of sawtimber on operable noncommercial forest land, by forest type and stand-size class, Koyukuk River, Alaska, 1971

(Million board feet, International ¼-inch rule)

Local forest type	Stand-size class			
	Total	Sapling-seedling	Poletimber	Sawtimber
White spruce	21.0	0	6.9	14.1
Cottonwood	0	0	0	0
Paper birch	0	0	0	0
Total	21.0	0	6.9	14.1

Table 18.—Gross annual growth of growing stock, by forest-land class and species, Koyukuk River, Alaska, 1971¹

(Thousand cubic feet)

Species	Forest-land class		
	Total	Commercial	Operable noncommercial
Softwoods:			
White spruce	787.0	550.7	236.3
Total	787.0	550.7	236.3
Hardwoods:			
Paper birch	106.8	103.7	3.1
Balsam poplar	255.0	253.2	1.8
Total	361.8	356.9	4.9
Total, all species	1,148.8	907.6	241.2

¹ Because of catastrophic losses that occurred on commercial forest land, we have not deducted annual mortality in constructing this table. See text for details.

Table 19.—Net annual growth of sawtimber, by forest-land class and species, Koyukuk River, Alaska, 1971¹

(Thousand board feet, International ¼-inch rule)

Species	Forest-land class		
	Total	Commercial	Operable noncommercial
Softwoods:			
White spruce	3,247.7	2,913.8	333.9
Total	3,247.7	2,913.8	333.9
Hardwoods:			
Paper birch	2.1	0	2.1
Balsam poplar	276.9	276.9	0
Total	279.0	276.9	2.1
Total, all species	3,526.7	3,190.7	336.0

¹ Because of catastrophic losses that occurred on commercial forest land, we have not deducted annual mortality in constructing this table. See text for details.

Table 20.—Annual mortality of growing stock, by species and forest-land class, Koyukuk River, Alaska, 1971

(Thousand cubic feet)			
Species	Forest-land class		
	Total	Commercial	Operable noncommercial
Softwoods:			
White spruce	710.1	686.9	23.2
Total	710.1	686.9	23.2
Hardwoods:			
Paper birch	0	0	0
Balsam poplar	34.2	34.2	0
Total	34.2	34.2	0
Total, all species	744.3	721.1	23.2

Table 21.—Annual mortality of sawtimber, by species and forest-land class, Koyukuk River, Alaska, 1971

(Thousand board feet, International ¼-inch rule)			
Species	Forest-land class		
	Total	Commercial	Operable noncommercial
Softwoods:			
White spruce	2,239.0	2,134.9	104.1
Total	2,239.0	2,134.9	104.1
Hardwoods:			
Paper birch	0	0	0
Balsam poplar	0	0	0
Total	0	0	0
Total, all species	2,239.0	2,134.9	104.1

Table 22.—Annual mortality of growing stock, by forest-land class, cause, and softwoods and hardwoods, Koyukuk River, Alaska, 1971

(Thousand cubic feet)

Cause	Commercial forest land			Operable noncommercial forest land		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
Fire	0	0	0	0	0	0
Insects	31.4	31.4	0	0	0	0
Disease	72.7	57.9	14.8	0	0	0
Windthrow	0	0	0	0	0	0
Other ¹	513.0	493.6	19.4	23.2	23.2	0
Unknown	104.0	104.0	0	0	0	0
Total	721.1	686.9	34.2	23.2	23.2	0

¹ Erosion of stream banks.

Table 23.—Annual mortality of sawtimber by forest-land class, cause, and softwoods and hardwoods, Koyukuk River, Alaska, 1971

(Thousand board feet, International 1/4-inch rule)

Cause	Commercial forest land			Operable noncommercial forest land		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
Fire	0	0	0	0	0	0
Insects	0	0	0	0	0	0
Disease	272.7	272.7	0	0	0	0
Windthrow	0	0	0	0	0	0
Other ¹	1,600.7	1,600.7	0	104.1	104.1	0
Unknown	261.5	261.5	0	0	0	0
Total	2,134.9	2,134.9	0	104.1	104.1	0

¹ Erosion of stream banks.

Hegg, Karl M.

1974. Forest statistics for the upper Koyukuk River, Alaska, 1971. USDA For. Serv. Resour. Bull. PNW-54, 26 p., illus. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

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Keywords: Forest surveys (upper Koyukuk River-Alaska).

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The FOREST SERVICE of the U. S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress — to provide increasingly greater service to a growing Nation.