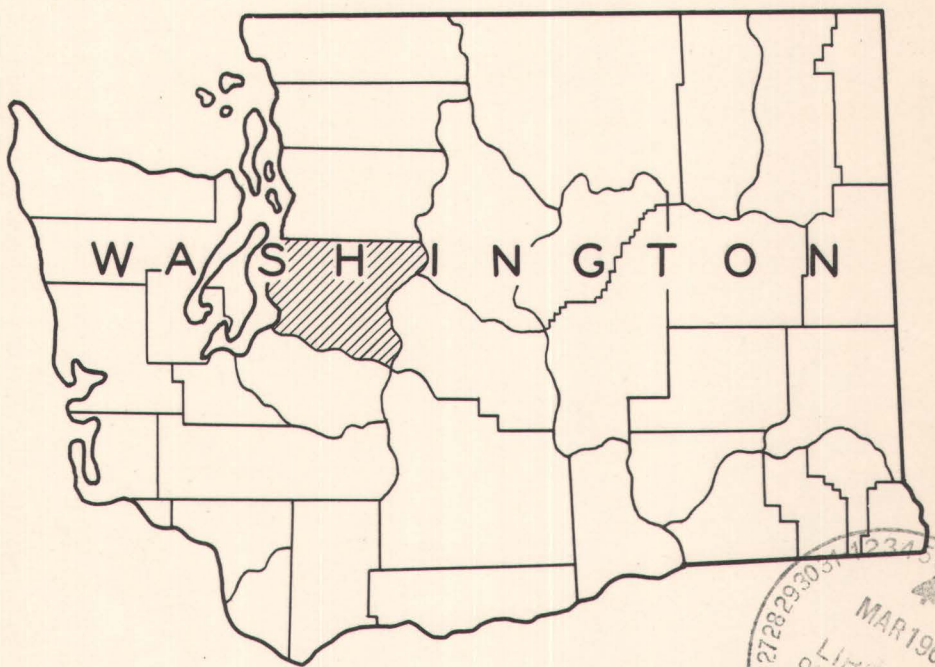
FOREST STATISTICS
FOR
KING COUNTY, WASHINGTON

FROM THE FOREST SURVEY INVENTORY REVISED IN 1941

FOREST SURVEY REPORT NO. 87



U.S. DEPARTMENT OF AGRICULTURE — FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
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R.W. COWLIN, IN CHARGE OF FOREST SURVEY — F.L. MORAVETS, ASSISTANT

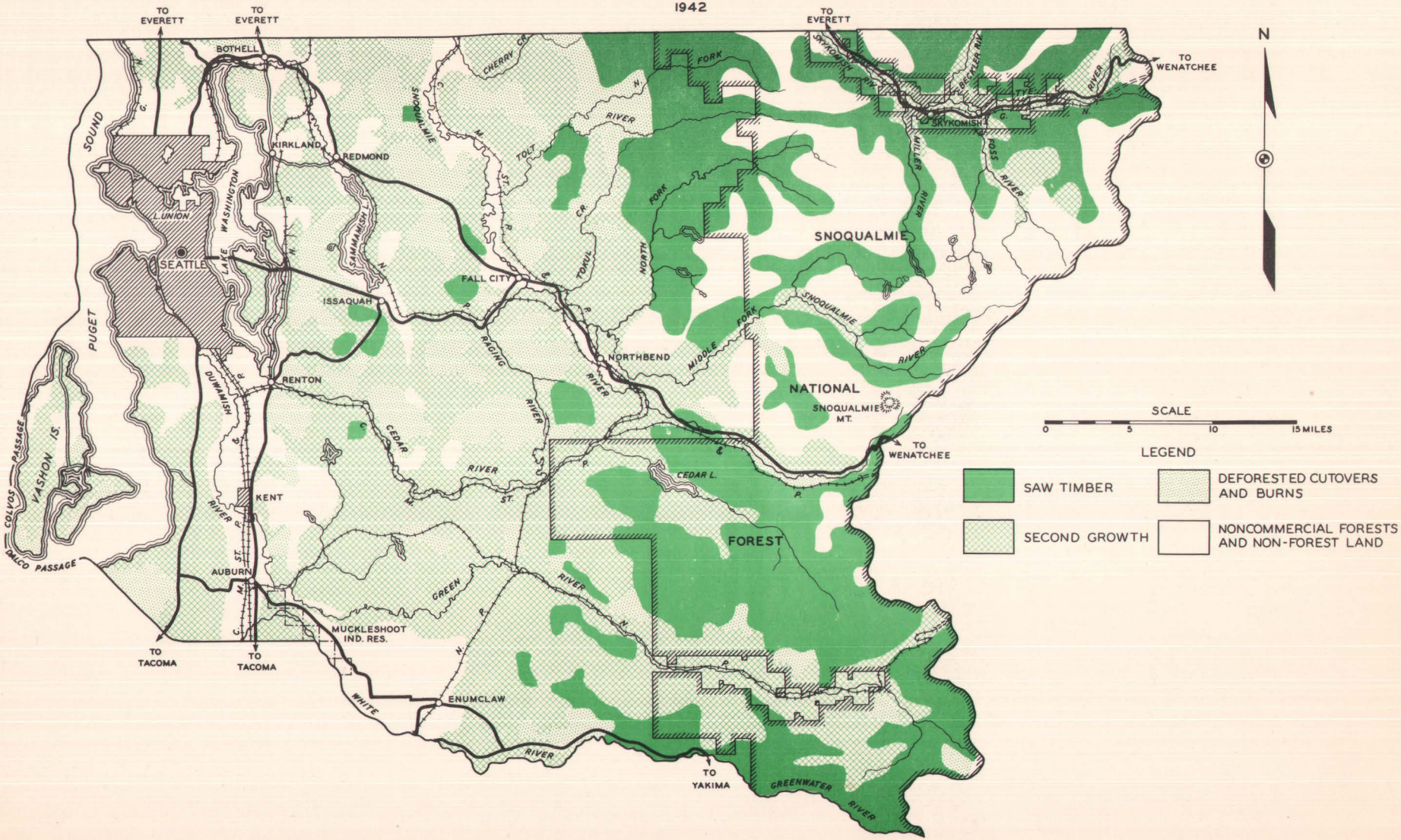
PORTLAND, OREGON

APRIL 25, 1942

FIGURE 1

OUTLINE MAP OF KING COUNTY, WASHINGTON

1942



FOREWORD

The forest survey, a Nation-wide project, consists of a detailed investigation in five major parts of the present and future forest resources: (1) An inventory of the country's existing forest resources in terms of areas occupied by forest-cover types and timber volumes, by species, in board feet and cubic feet, and a study of conditions on cut-over and on burned forest lands; (2) a study of the depletion of the forests through cutting and through loss from fire, insects, disease, and other causes; (3) a determination of the current and potential growth on forest areas; (4) an investigation of present and prospective requirements of the United States for forest products; and (5) an analysis and correlation with other economic data of findings of these studies in order to make available basic facts and guiding principles necessary to plan for sound management and use of forest resources.

The forest survey of Oregon and Washington, an activity of the Pacific Northwest Forest and Range Experiment Station, was conducted in the Douglas-fir region during the period 1930-33, inclusive.* In 1937 work of keeping the survey up to date was commenced in counties in which there had been extensive depletion since the original survey.

The forests of King County, Washington, were first inventoried in 1932 and 1933 and a report summarizing results of the inventory was issued in 1934. The report, Forest Statistics for King County, Washington, gave preliminary statistics on timber volume, forest type area, and productive capacity of the county's forest land. In the summer of 1941 the inventory was made current through field examination covering the entire county and recompilation of the statistical data. In the field the reinventory consisted of examination of all cut-over areas logged prior to 1930 and all burned areas to determine the condition of regeneration, checking of location and extent of lands logged since January 1, 1930, as shown by cut-over reports, and mapping of lands cleared for agricultural use. The ownership status of all lands in the county was also brought up to date.

Results of this reinventory are given in this report which follows the one issued in 1934.

* Oregon and Washington were divided for survey purposes into two regions, (1) Douglas-fir region, consisting of that part of both States west of the Cascade Range summit, and (2) ponderosa pine region, that part of both States east of the Cascade Range summit. A regional report which includes an interpretation of the forest-survey data and analysis of the forest situation in the Douglas-fir region has been published and a similar report for the ponderosa pine region is now in the process of being published. Each region was divided into units--11 in the Douglas-fir region and 7 in the ponderosa pine region--for the purpose of more intensive analysis of data. It is planned to issue reports presenting findings for each unit.

FOREST STATISTICS FOR KING COUNTY, WASHINGTON

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FOREST STATISTICS FOR KING COUNTY, WASHINGTON[1/]

By Edward D. Buell[2/]

King County, strategically located in the central Puget Sound area of western Washington, is the leading county of the State in population, industrial development, and commerce. It also ranks high among the important forest-land counties of the Douglas-fir region. Although years of forest utilization have reduced the county's saw-timber stands to less than one-third their estimated original area and left more than one hundred thousand acres of commercial forest land nonproductive, its forest industries still hold a significant position. One of the major economic problems that the county faces today is how to maintain the continuous supply of raw materials essential to these forest industries. Their uninterrupted operation is an important factor in the prosperity of the county as a whole while some communities are almost entirely dependent upon it. An analysis of the statistical data presented in this report, together with a study of trends indicated by comparing the inventory of 1933 with that of 1941, should aid in the formulation of a forest policy which should have as its objective the perpetuation of the forest resources and the stabilization of the forest industries of the county.

Description of the County

King County is bounded on the west by Puget Sound and on the east by the crest of the Cascade Range. It averages about 55 miles in length, 42 miles in width, and has a land area of 1,356,730 acres (fig. 1).

Topography and climate, the physical factors that exert the greatest influence over forest conditions, vary widely in the county. The west portion consists of level river valleys separated by rolling plateaus and ridges. A considerable part of this area is well suited for agriculture and has been cleared and put under cultivation. The part that still remains forested is accessible with conditions favorable to small-scale logging operations. Equable temperatures throughout the year with no extremes of heat or cold and moderately heavy rainfall

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1/ Assistance in the compilation of the data contained in this report was furnished by the personnel of Work Projects Administration official project 65-2-94-144.

2/ Field work of the revised inventory of the county's forest resources was done by M. J. Lauridsen, B. C. Baker, and R. C. Grant; compilation of data was done by Edward D. Buell, Edna L. Hunt, W. H. Schwindel, and W. W. Hall.

are characteristic of the climate over the low-lying part of the county. These conditions favor the growth of Douglas-fir, which was found abundantly in pure stands. The east portion of the county is a rugged, broken, mountainous terrain, much of which is inaccessible. The elevations of the higher peaks and ridges vary from 6,000 to 8,000 feet. River valleys are deep and narrow with steep sides and some are no more than gorges. Weather conditions are severe in winter. The annual snowfall often amounts to 400 inches and subzero temperatures are common. This section of the county is suitable chiefly for forest use and some of the higher and more rugged areas produce stands which are useful for watershed protection and recreational purposes only. The hemlocks and balsam firs are the principal timber species. Logging is expensive and often cannot be done profitably on a small scale.

According to the Bureau of the Census, King County had 504,980 inhabitants in 1940, of which 75 percent were urban. Seattle, the county seat and largest city in the Pacific Northwest, is located around Elliott Bay on Puget Sound. As the leading seaport of the region, this city carries on, in normal times, a large shipping business with the Orient, Alaska, and other seaports of the Pacific Coast. In 90 years Seattle has grown from a pioneer settlement to the twenty-second largest city in the United States with a population of 368,302. A considerable number of manufacturing plants are located here. Forest industries figure prominently among these and rafts of logs are towed here from the adjacent territory to supply these plants. The lumber industry is an important factor in the prosperity of Seattle. Many large enterprises with operations in various other parts of the region have their headquarters here.

Transportation facilities are excellent. The county has an extended frontage on Puget Sound and in addition to the good harbor in Elliott Bay fresh water moorage for ships is provided in Lake Union and Lake Washington. Seattle is the terminus of three transcontinental railroads, the Great Northern, the Northern Pacific, and the Chicago, Milwaukee, St. Paul and Pacific. There is also a considerable mileage of logging railroads in the county that tap most of the forest areas. Modern high speed Federal highways cross the county both north and south, and east and west. State, county, and national-forest highways and private truck roads comprise an extensive road system that reaches into all but the inaccessible mountainous areas where travel is confined to horse and foot trails.

Inventory

King County's 1-1/3 million acres was found to be occupied by 23 forest and 2 nonforest cover types. A small-scale generalized type map showing in 4 broad groups the distribution of these types is presented in figure 1. A detailed 1-inch-to-the-mile county type map showing all the type detail mapped in the field is another product of

the survey. This has been revised and is current as of August 1941.[3/] Data concerning the acreage and ownership of the cover types of the county are presented statistically in tables 1 and 2. The acreage of forest land in the county is approximately four times greater than the acreage of nonforest land.

Forest Land

The forest land of King County, which amounts to approximately 1,095 thousand acres, has probably been reduced from its original size by about 200 thousand acres. That its total area will remain over a million acres for a long time to come is indicated by the fact that it has been reduced by less than a thousand acres during the last decade. Of the total area of forest land all but about 117 thousand acres is capable of growing commercial timber, chiefly Douglas-fir (table 4). It is important to keep such a vast area productive.

Saw-timber stands. The area of conifer saw timber totals 342 thousand acres and is located chiefly in the east half of the county. The largest body of saw timber is in the southeastern part between Green River and Cedar Lake (fig. 1). Another block of considerable size is found in the north along the Snoqualmie River and its forks. These areas of saw timber are stocked principally with western hemlock and fir-mountain hemlock types. No large areas of Douglas-fir saw-timber types remain but a number of lesser size especially along the Snoqualmie River and White River are still important.

Stands in which western hemlock is the predominating species occupy 114 thousand acres and those consisting mostly of the upper-slope species--Pacific silver fir, noble fir, alpine fir, and mountain hemlock--cover 99 thousand acres. Together these types occupy 62.4 percent of the county's total saw-timber area. The composition of the stands making up the western hemlock type (type 14) and the fir-mountain hemlock type (type 23) are quite similar in King County. Often a change of not more than 5 percent in the amount of western hemlock or balsam fir-mountain hemlock volume in a stand would change it from type 14 to type 23 or vice versa. Associate species are Douglas-fir, western redcedar, western white pine and Alaska yellow-cedar. Both types occur on the upper slopes and ridges beginning at elevations of about 2,000 feet and extending to about 4,700 feet, above which subalpine conditions prohibit commercial tree growth.

3/ One-inch-to-the-mile county type maps and 1/4-inch-to-the-mile lithographed State type maps have been prepared to show the location and extent of the forest types. For information address Director, Pacific Northwest Forest and Range Experiment Station, 423 U. S. Court House, Portland, Oregon.

Table 1.--Area, in acres, of all forest cover types, by ownership class. Data corrected to August 15, 1941

Type no.	Type	Private	State		County	Municipal	Indian	Federal, available		Total
			Available	Reserved				National forest	Other	
4	Woodland: oak-madrone	385								385
	Douglas-fir									
6	Large old growth	35,045	5,875	90	425	1,130		8,540	125	51,230
7	Small old growth	6,580	780		460	2,525		8,725		19,070
8	Large second growth	27,040	3,240	135	1,205	120		9,745		41,485
9	Small second growth	107,850	7,565	330	6,835	1,850	405	6,415	435	131,685
10	Seedlings and saplings	110,740	14,920	165	8,060	29,830	90	21,690	380	185,875
	Sitka spruce									
11	Large	550	110							660
12	Small	100	10							110
	Western hemlock									
14	Large	48,420	8,795		1,110	6,865		48,895	150	114,235
15	Small	28,380	4,970		1,845	255		3,785	265	39,500
16	Seedlings and saplings	33,985	4,675		590	1,785		4,060	295	45,390
	Western redcedar									
17	Large	9,055	845		255	105		5,820	5	16,085
19	Small	330			20					350
	Fir-mountain hemlock									
23	Large	32,165	1,435		825	8,615		56,335	30	99,405
24	Small	5,075			245			14,175		19,495
	Hardwood									
31.5	Large	11,560	260	45	205	110	20	255	5	12,460
31	Small	24,695	740	25	935	435	480	630	340	28,280
33	Subalpine	17,820	1,925		1,050	325		57,735	725	79,580
	Nonrestocked cutover									
35	Cut prior to 1920	64,430	6,650		4,740	1,840	355	130	15	78,160
35A	Cut from 1920-29, incl.	28,270	3,340		1,050	580		545		33,785
36	Recent cutover, since 1930	36,735	4,870		675	3,105	80	7,210	155	52,830
37	Deforested burn	3,255			105			4,785		8,145
38	Noncommercial rocky area	11,520	865		960	175		22,620	960	37,100
	Total forest types	643,985	71,870	790	31,595	59,650	1,430	282,095	3,885	1,095,300
	Nonforest land									
3	In agricultural use	125,575	760		640	65	40		20	127,100
2	Other	81,030	165		620	1,540	55	50,585	335	134,330
	Total	850,590	72,795	790	32,855	61,255	1,525	332,680	4,240	1,356,730

Table 2.-Area, in acres, of generalized forest types, by ownership class
Data corrected to August 15, 1941

Type definition	Private	State		County	Municipal	Indian	Federal, available		Total
		Available	Reserved				National forest	Other	
Woodland: oak-madrone Type 4	385								385
Conifer saw timber Types 6, 7, 8, 11, 14, 17, & 23	158,855	21,080	225	4,280	19,360		138,060	310	342,170
Conifer second growth Types 9, 12, 15, 19, & 24									
On cut-over areas	99,410	5,070	275	5,935	1,495	405	875	500	113,965
On old burns	38,035	7,475	55	2,840	610		12,705	200	61,920
Total	137,445	12,545	330	8,775	2,105	405	13,580	700	175,885
Conifer seedlings and saplings Types 10, 16, 19, & 24									
On cut-over areas	129,835	18,865	165	7,675	31,155	90	12,550	430	200,765
On old burns	19,180	730		1,145	460		23,995	245	45,755
Total	149,015	19,595	165	8,820	31,615	90	36,545	675	246,520
Recent cut-over areas Type 36	36,735	4,870		675	3,105	80	7,210	155	52,830
Nonrestocked cut-over and burned areas Types 35, 35A, and 37	95,955	9,990		5,895	2,420	355	5,460	15	120,090
Hardwoods Types 31 and 31.5	36,255	1,000	70	1,140	545	500	885	345	40,740
Noncommercial areas Types 33 and 38	29,340	2,790		2,010	500		80,355	1,685	116,680
Total forest types	643,985	71,870	790	31,595	59,650	1,430	282,095	3,885	1,095,300
Nonforest land Types 2 and 3	206,605	925		1,260	1,605	95	50,585	355	261,430
Total	850,590	72,795	790	32,855	61,255	1,525	332,680	4,240	1,356,730

Generally, the amount of western hemlock decreases as the elevation increases. Western hemlock and Pacific silver fir are the most numerous and also the most important commercial species found in these types. Trees of these species at lower altitudes range from 16 to 60 inches d.b.h. with 3 to 10 sixteen-foot logs. They are of good quality, have fair clear length, and are generally sound. At the higher altitudes these species and their associates are quite short and limby. Cull because of defect also runs considerably higher. The principal value of the timber in these types is for pulpwood and watershed protection.

Douglas-fir saw-timber types extend over 112 thousand acres; a total of 70 thousand acres is occupied by old-growth timber and 42 thousand acres by second-growth timber of saw-timber size varying from 60 to 160 years in age. Large old-growth Douglas-fir over 40 inches d.b.h. (type 6), once the most extensive and by far the most valuable type in the county, now covers only 51 thousand acres. However, this class of timber is still important in the county because it is the source from which high-value logs are now being obtained and because it is generally accessible.

Second-growth Douglas-fir of saw-timber size is found on benches and lower slopes below 2,500 to 3,000 feet elevation, mostly in the west and south parts of the county. Individual stands are usually pure Douglas-fir in composition, even aged, and of satisfactory density. The majority have originated on old burns but some of the younger-aged stands found near the Sound occupy cut-over land and some are the result of economic selective logging. A large percentage of the stands are very accessible.

In addition, saw-timber stands of western redcedar (type 17) and Sitka spruce (type 11) stock areas of 16 thousand acres and 600 acres, respectively.

Immature stands. A total of 422 thousand acres, or nearly two-fifths of the county's forest land area, is stocked with immature conifer stands composed of trees less than saw-timber size. As might be expected in a county in which a large acreage of the original forest has been harvested, the bulk of the acreage stocked with these immature stands is cut-over land; only 25 percent of the area is restocked burns. Seven immature conifer types are found in King County. Table 3 shows their distribution by age class and degree of stocking.

Douglas-fir was the predominating species in the virgin stands prior to logging and this species continues to predominate in the second-growth stands that have restocked the cut-over land. Western

Table 3.-Area, in acres, of certain immature conifer forest types, by age class and degree of stocking

Data corrected to August 15, 1941

Age class (years)	Degree of stocking	Type number and name: 10 Douglas-fir seedlings and saplings	16 Western hemlock seedlings and saplings	9 Douglas-fir small second growth	15 Western hemlock small second growth	24 Fir-mountain hemlock second growth	Other[1]	Total
10	Good	9,940	2,420					12,360
	Medium	29,660	17,410			155		47,225
	Poor	19,460	9,895					29,355
	Total	59,060	29,725			155		88,940
20	Good	23,970	1,665			110		25,745
	Medium	74,735	7,690	895	5	9,720		93,045
	Poor	27,455	6,310	320	150	5,230	40	39,505
	Total	126,160	15,665	1,215	155	15,060	40	158,295
30	Good			3,290	975	300		4,565
	Medium	50		17,700	1,640	1,435	120	20,945
	Poor	605		4,000	255	1,280	5	6,145
	Total	655		24,990	2,870	3,015	125	31,655
40	Good			4,095	710	145		4,950
	Medium			19,515	1,960	410	70	21,955
	Poor			6,210	1,240		185	7,635
	Total			29,820	3,910	555	255	34,540
50	Good			2,415	70			2,485
	Medium			18,000	1,315			19,315
	Poor			5,780	1,125	10		6,915
	Total			26,195	2,510	10		28,715
60	Good			1,595	165			1,760
	Medium			5,955	750	235		6,940
	Poor			4,770	1,595			6,365
	Total			12,320	2,510	235		15,065
70	Good			2,460	60			2,520
	Medium			4,695	2,025	465		7,185
	Poor			4,950	2,565			7,515
	Total			12,105	4,650	465		17,220
80	Good			12,435	9,490			21,925
	Medium			2,870	7,715			10,585
	Poor			6,580	3,675		40	10,295
	Total			21,885	20,880		40	42,805
90+	Good				595			595
	Medium			1,295	615			1,910
	Poor			1,860	805			2,665
	Total			3,155	2,015			5,170
Total all ages	Good	33,910	4,085	26,290	12,065	555		76,905
	Medium	104,445	25,100	70,925	16,025	12,420	190	229,105
	Poor	47,520	16,205	34,470	11,410	6,520	270	116,395
	Total	185,875	45,390	131,685	39,500	19,495	460	422,405

1/ Includes 110 acres type 12, Sitka spruce second growth, and 350 acres type 19, western redcedar second growth.

hemlock has encroached on some areas. Seventy-five percent of the total area is restocked with Douglas-fir types, 20 percent by western hemlock types, and the remaining 5 percent by western redcedar and fir-mountain hemlock types.

As much of the early logged land in the west part of the county has been either cleared for settlement or burned over by numerous fires, the second-growth stands are found chiefly on the more recently logged areas in the central portion. Approximately 59 percent of the total acreage is occupied by seedling and sapling stands less than 25 years old. Of the acreage stocked with immature Douglas-fir and western hemlock stands, totaling about 402 thousand acres, 57 percent is stocked with trees less than 6 inches d.b.h. and the remainder by trees of pole size--6 to 20 inches d.b.h.

Second-growth stands on old burns are found principally in the east half of the county and are of the older age classes.

In density of stocking the immature stands of the county are about average for the Douglas-fir region; 18 percent were classified as well stocked, 54 percent as medium stocked, and 28 percent as poorly stocked.

Hardwoods. Hardwood types cover a total of 40.7 thousand acres of bottomlands and lower slopes in King County. They are especially prevalent along the Snoqualmie River and near the Sound. Red alder, bigleaf maple, and northern black cottonwood growing pure or in mixture comprise the composition of the stands. Stands on 28.2 thousand acres of the hardwood area are less than saw-timber size; those on 12.5 thousand are merchantable.

Deforested areas. There is a total of 120.1 thousand acres of commercial conifer forest land in King County devoid of conifer forest cover not including areas clear cut since the beginning of 1930. Areas logged prior to 1920 and nonrestocked after more than 20 years amount to 78.2 thousand acres, areas logged during the decade 1920-29 and still nonrestocked total 33.8 thousand acres, and deforested burned-off land sums up to 8.1 thousand acres.

Most of the nonrestocked cut-over areas once supported a fine stand of Douglas-fir and inherently it is the best forest land in the county. Nearly all is accessible and has topography favorable to cheap logging practices, but very little is suitable for agricultural use. A considerable part of the area of nonrestocked cut-over types is the result of unsuccessful endeavors of settlers to convert cut-over land into pasture through repeated burning. Lack of an adequate seed supply prevents many areas from restocking.

Deforested burns are located chiefly at high altitudes close to the subalpine zone. Their failure to restock is due mostly to the unfavorable seed-producing and growing conditions that exist there.

Areas clear cut since January 1, 1930, total 53 thousand acres. Regeneration on these lands has not been completely stabilized and no attempt to type them other than to classify them as recent cutovers (type 36) was made. They have resulted chiefly from the continued extension of long-established logging operations. Only since 1940 have many new logging operations contributed to this type's acreage.

Noncommercial forests. This category includes subalpine forests, areas of inferior tree growth on steep, rocky, or sterile sites below the altitudinal range of the subalpine forests, and woodlands. Subalpine forests cover nearly 80 thousand acres, all of which is located in the high, mountainous east portion of the county. They have very definite recreational value as they add greatly to the scenic beauty in summer and being open and park-like in character are used as ski grounds in winter.

Noncommercial forests on rocky and sterile sites occupy 37 thousand acres and are also principally found in the east part of the county. Their most valuable use is retarding excessive erosion and run-off during periods of heavy precipitation.

Woodland type covers only 385 acres. It is comprised of areas bordering on Puget Sound occupied by Pacific madrone.

Productive capacity of forest land. The relative productive capacity of the forest land, known as site quality, was determined during the forest inventory primarily to compute forest growth and volume of immature stands. All commercial conifer lands in King County were classified and the result is presented in table 4. Based on forest-cover types a total of 605.9 thousand acres was rated according to the Douglas-fir site classification and 331.6 thousand acres by the spruce-hemlock site classification.

As shown in table 4 over half the land in each classification falls in the middle site class III. Site I is lacking and the acreage of site V is insignificant. Growing conditions on spruce-hemlock sites are less favorable than on Douglas-fir sites. The productive capacity of the county is about average for the Douglas-fir region. The west half of the county has a higher productive capacity than the east half.

Nonforest Land

The nonforest land of King County totals 261 thousand acres. In the survey this acreage was classified as land in agricultural use and other nonforest land. Although nonforest land other than agricultural exceeds the farm land by 7 thousand acres, it is for the most part less important economically.

Table 4.-Land areas, forest land areas, and commercial conifer areas, by site quality class[1]

Data corrected to August 15, 1941

Kind of forest land and site quality class	Total area		Area in forest land	Area in commercial conifers
	Acres	Percent	Percent	Percent
Commercial conifer				
Douglas-fir				
Class II	135,905	10.0	12.4	14.5
Class III	339,065	25.0	30.9	36.1
Class IV	129,225	9.6	11.8	13.8
Class V	1,670	.1	.2	.2
Total	605,865	44.7	55.3	64.6
Spruce-hemlock				
Class II	22,820	1.7	2.1	2.4
Class III	168,665	12.4	15.4	17.9
Class IV	136,800	10.1	12.5	14.6
Class V	3,345	.2	.3	.5
Total	331,630	24.4	30.3	35.4
Total commercial conifer	937,495	69.1	85.6	100.0
Woodland	385			
Subalpine	79,580	5.9	7.3	
Noncommercial rocky	37,100	2.7	3.4	
Hardwood	40,740	3.0	3.7	
Total other	157,805	11.6	14.4	
All forest land	1,095,300	80.7	100.0	
Nonforest land	261,430	19.3		
Grand total	1,356,730	100.0		

[1] The "site quality" of a forest area is its relative productive capacity, determined by climatic, soil, topographic, and other factors. The index of site quality is the average height of the dominant stand at the age of 100 years. Five site quality classes are recognized for both Douglas-fir and spruce-hemlock types, Class I being the highest. In the survey, Douglas-fir classifications were used for Douglas-fir and western redcedar types; spruce-hemlock classifications were used for Sitka spruce, western hemlock, and fir-mountain hemlock types.

Land in agricultural use. Farm land, all located in the west half of the county, amounts to 127 thousand acres. This represents land originally forested, cleared, and now under cultivation or in pasture. Thousands of acres of very fertile level bottomlands, though heavily forested, attracted pioneer homesteaders and as markets increased agricultural development expanded. The largest area of bottomland and the first to be developed lies in the valley formed by the Duwamish and White Rivers. This area, varying in width from one to three miles, extends from the city limits of Seattle south to the county line. Most of the acreage in this district is devoted to truck farming, berry growing, dairying and poultry raising. Other important agricultural districts are located along the White River from Auburn to Enumclaw, along the Snoqualmie River south of North Bend, and in the vicinity north of Lake Sammamish and Lake Washington.

An agricultural development that has taken place during the last two decades and that is especially important in the forest situation is the rapid increase in the number of small farms. According to the Bureau of the Census, there were 3,801 farms in King County in 1920, 4,656 in 1930, and 5,760 in 1940. The average size of the farm unit in 1920 was 39.9 acres; in 1930, 29.6 acres; and in 1940, 26.5 acres. This change is not so much the result of more intensive occupation of established farm land as it is the creation of hundreds of new small units, many of which are located on land thought to be marginal or submarginal for agriculture within the forest zone where they greatly increase fire risk and give rise to other land-use problems.

Probably the area of farm land will not be materially increased in the immediate future. Except for small areas of hardwoods along river bottoms and a limited acreage of fertile upland, the county's unimproved land is not suited to agricultural use under current economic conditions.

Other nonforest land. This category includes city and industrial sites, barren and glacier country above timber line, open grassland, brush, tide flats, and unmeandered water. It totals 134 thousand acres.

Saw-Timber Volume

The volume of saw timber remaining in the county after nearly a century of logging amounts to 16.4 billion board feet. As shown in table 5 practically all is coniferous and over two-thirds is comprised of two species: Douglas-fir and western hemlock. The other major species are Pacific silver fir and western redcedar. Minor conifer species include noble fir, mountain hemlock, western white pine, Alaska yellow-cedar, Sitka spruce, alpine fir, and grand fir. Hardwood species are red alder, bigleaf maple, and northern black cottonwood.

Table 5.-Volume of timber by species and ownership class
Data corrected to August 15, 1941

Trees 16" and more d.b.h.[1/]
Thousands of board feet, log scale, Scribner rule

Species	Private	State		County	Municipal	Indian	Federal, available		Total
		Available	Reserved				National forest	Other	
Douglas-fir									
Large old growth	1,691,939	201,107	3,434	21,642	66,618		543,552	5,477	2,533,769
Small old growth	482,031	42,477	661	10,698	151,880		443,015	1,053	1,131,815
Large second growth	781,819	137,489	4,559	28,010	878		338,472		1,291,227
Small second growth	298,452	53,874	506	16,070	3,586	934	22,341	2,864	398,627
Sitka spruce									
Large	55,820	6,011	74	8	1,527		549	178	64,167
Small	522								522
Western hemlock									
Large	2,530,908	389,822	217	56,878	276,323		1,754,428	7,019	5,015,595
Small	434,674	103,296	24	20,731	5,446		208,583	3,841	776,595
Mountain hemlock	54,076	2,800		375	210		185,506		242,967
Western redcedar									
Live	638,954	81,667	279	22,674	37,930		390,488	733	1,172,725
Dead	5,065	434		2	1,049		1,438		7,988
Alaska yellow-cedar	6,138	720		200	126		106,599		113,783
Western white pine	43,213	3,143		161	13,347		65,557		125,421
Pacific silver fir	1,238,845	124,595		41,863	258,089		1,445,720	1,203	3,110,315
Grand fir	849	13		8					870
Noble fir	112,387	385		2,670	52,052		176,972		344,466
Alpine fir							10,551		10,551
Red alder	15,536	940	48	347	146	71	2,210	21	19,319
Bigleaf maple	10,571	1,441	8	190	149	60	1,160	26	13,605
Black cottonwood	8,357	223		100	70	20	210		8,980
Total	8,410,156	1,150,437	9,810	222,627	869,426	1,085	5,697,351	22,415	16,383,307

1/ Trees of hardwood species taken from 12" and more d.b.h.

Conifer saw-timber volume. Although Douglas-fir is slightly less in total volume than western hemlock, more of it is economically available. Currently it also commands a higher market price. Because of its importance the volume, totaling 5.3 billion board feet, has been segregated by size classes which are indicative of quality. Nearly half the Douglas-fir saw timber is in large old-growth trees. This is timber of excellent quality commonly known as "yellow fir" and suitable for veneer and high grade lumber. Volume in small old-growth trees, which are usually found at higher elevations or on poorer sites, is generally inferior in quality and less accessible. It amounts to 1.1 billion board feet. Large second-growth trees ordinarily less than 200 years of age and often referred to as "red fir" contribute a volume of 1.3 billion feet suitable only for the common grades of lumber, piling, ties, and other low grade products. Volume in the smallest size class, trees 16 to 20 inches d.b.h., amounts to approximately 400 million board feet and is suitable chiefly for piling or ties.

The pulp species--western hemlock, mountain hemlock, the balsam firs, and Sitka spruce--contain an aggregate saw-timber volume of 9.5 billion board feet, equivalent to 58 percent of the total volume in the county. Stands of these species dominated principally by either western hemlock or Pacific silver fir are concentrated in the eastern part of the county and are largely in a virgin state. Most of the pulp species logged up to the present time have been in mixed stands of Douglas-fir or cedar and were logged concurrently with those species.

Western redcedar volume totals 1.2 billion board feet. It is important because it is a specialty wood used for shingles and in a minor degree for pipes, tanks, boat building, and other uses.

Hardwood saw-timber volume. The entire saw-timber volume of the three commercially important hardwood species is only 42 million board feet. Part of this is found in the merchantable hardwood types and part as an understory in conifer stands. Red alder and bigleaf maple are in demand for furniture stock while northern black cottonwood is used in wood pulp manufacture.

Ownership of Forest Resources

One private and seven public classes of ownership are present in King County and two of these, private and national forest, have approximately 87 percent of the land area and saw-timber volume.

Private. This is the largest and one of the more important classes of ownership in the county. It includes 851 thousand acres of land, 644 thousand acres of which is forest land, and 8.4 billion board feet of saw timber. Moreover, the better quality timber and the more productive forest soils are in this class. The bulk of the cutting has been on private land. The status of cut-over land is very

unstable and large areas are tax delinquent, or have passed into county or State ownership through tax foreclosure and transfer. A total of nearly 93 thousand acres of nonrestocked cut-over land, logged prior to 1930, is in private ownership.

National forest. National-forest land situated in the east half of the county comprises 333 thousand acres occupied by 5.7 billion feet of saw timber. Two species, western hemlock and Pacific silver fir, comprise most of the volume. Conifer types of saw-timber size cover 138 thousand acres; 131 thousand acres is noncommercial or nonforest land, and 50 thousand acres is occupied by immature types. All national-forest resources in the county are statutably available. Logging under government supervision and based on a sustained-yield policy has removed timber from 33 thousand acres, of which only 675 acres is nonrestocked.

Other public. Included in this category are lands in State, county, and municipal ownership; lands in Indian reservations, both tribal and trust allotments, managed by the Federal Government; and federally owned lands in lighthouse reserves and public domain. The State of Washington owns 72 thousand acres of forest land and a total of 1,150 million board feet of timber that is available for cutting; it also owns 790 acres of forest land and 10 million board feet of timber in State parks in which the timber is in a reserved status. A total of 32 thousand acres of forest land and 223 million board feet of timber is in county ownership. Municipalities own a total of 61 thousand acres of forest land and 869 million board feet of lumber, nearly all of which is owned by the City of Seattle and lies principally in the Cedar River Watershed. In addition to city-owned lands this watershed is comprised of federally owned national-forest lands and some in private ownership. The City of Tacoma also owns lands in the county in connection with a watershed on the Green River. Forest lands in the Indian reservations and in Federal ownership on lighthouse reserves and the public domain are of limited extent.

Forest Depletion

Since this area was settled nearly a century ago, the virgin stands of King County have been depleted by probably more than 35 billion board feet of saw timber. Merchantable timber has been removed by various depletion agencies from roughly 700 thousand acres. Cutting is the most important factor in reducing stumpage resources, although fire has contributed materially, while wind, insects, and disease are a small but constant drain upon mature forests. Burning of reproduction and small second-growth stands has depleted numerous areas of growing stock.

Cutting Depletion

Nearly all the timber cut in the county comes out of the woods as sawlogs. Reliable data on annual sawlog production which have been compiled since 1925 show that cutting was greater during 1925 than in

any subsequent year, although for the four years following it was close to this peak. This indicates that the period of greatest cutting may have been in years just prior to 1925 before the effect of diminishing raw material was felt. Log production in 1932 was the lowest of any year during the period 1925-40. The average annual sawlog production for each 5-year period beginning with 1925 is: 1925-29, 634.7 million board feet; 1930-34, 222.6 million board feet; and 1935-39, 309.9 million board feet. The production for 1940 was somewhat above the average for the previous 5-year period. It was still more in 1941. This upswing in sawlog production has been attributed to demands of national defense.

Other drains on the forest are materials cut for fuel wood, poles and piling, pulpwood, mine timbers, veneer block, posts, excelsior blocks, and shingle bolts. The total volume of these products is relatively small.

Cutting depletion is chiefly of Douglas-fir volume and as would be expected most of it is derived from old-growth trees that produce high-quality logs and veneer stock. However, considerable cutting of second growth of merchantable size is taking place and some stands that are at the peak of annual increment are being rapidly liquidated. The area occupied by large second-growth Douglas-fir, a class of timber growing very rapidly, has been reduced more than 12 thousand acres since 1933. The total board-foot volume cut during the period 1933 to 1941 from trees that were thrifty and growing rapidly can be conservatively estimated at 250 million board feet. At present, piling, ties, car decking, cants, lagging and mine props are being taken in great quantities from second-growth stands in the county.

Fire Depletion

In recent years no major fires have burned in merchantable stands but important losses occur annually in seedling, sapling, and small second-growth stands. Repeated fires on cut-over land not only kill the growing stock but also the source of seed supply needed for natural regeneration of the areas. Soil fertility is also impaired.

Forest Growth

Calculations of forest growth are based on the 1933 inventory data when 430 thousand acres of forest land maintained timber stands that were classified as adding net growth. Current annual growth for the year 1933 in board-foot volume computed for trees 15.1 inches or more d.b.h. was 60 million feet. The cubic-foot volume computed for trees 5.1 inches or more d.b.h. amounted to approximately 29 million

cubic feet. It is probable that the current annual growth for 1941 was greater than in 1933 because of an increase in the acreage and age of the growing stands.

It was calculated that King County's commercial forest land could produce 270 million board feet annually in trees 15.1 inches or more d.b.h. under intensive forest management. This figure, known as potential annual growth assumes that all commercial forest land would be producing at 75 percent of capacity. The cubic-foot potential annual growth would be 96 million feet.

Forest Industries

In 1852 the first steam sawmill built on Puget Sound was erected on a site that now lies in the heart of Seattle. From this beginning, lumbering in King County continued to expand until the more accessible supplies of raw material were exhausted. At present logging operations in the county produce an annual volume of sawlogs only about one-half that produced 15 or 20 years ago. Manufacturing plants have been less affected by the depleted log supply than woods operations for those located in Seattle or its vicinity can draw from the Puget Sound log market.

Logging operations vary in size from those capable of cutting about 5 thousand board feet a day to those with an installed capacity of 500 thousand feet or more per 8-hour shift. At present two companies, one in the vicinity of Snoqualmie Falls and the other near Enumclaw, produce the bulk of the county's annual volume of sawlogs. Other important logging operations center at Carnation, Falls City, Hobart, North Bend, and Skykomish.

Wood-using plants are concentrated in Seattle where the many advantages of a large seaport and log market are available. Sawmills, remanufacturing plants, shingle mills, furniture factories, and boat building shops are some of the woodworking industries located here. The sawmill with its accompanying planing mill, dry kilns, machine shop, etc. is the only important type of wood-using plant located outside the Seattle area. Large sawmills located at Enumclaw and Snoqualmie Falls have a combined daily capacity of 835 thousand board feet per 8-hour shift. Sawmills of less capacity are found in numerous communities throughout the county where raw material is available and several small portable-type mills are operated at the site of logging.

Comparison of Inventories

Present trends in the forest situation in King County are indicated by a comparison of the results obtained in the original inventory in 1933 and the reinventory in 1940. This comparison is shown in the following tabulation:

	1933	1941	Change
Area Data			
Conifer saw-timber stands	396 M acres	342 M acres	-14%
Conifer second-growth stands 6-20" d.b.h.	147 M acres	176 M acres	+20%
Conifer seedling and sapling stands, less than 6" d.b.h.	176 M acres	274 M acres	+40%
Nonrestocked cutovers and burns	118 M acres	120 M acres	+ 2%
Area cut over 1920-32	107 M acres		
Area cut over 1930-40		53 M acres	
Volume Data			
Saw-timber volume	18,649 million bd. ft.	16,383 million bd. ft.	-12%
Douglas-fir saw-timber volume	6,667 million bd. ft.	5,355 million bd. ft.	-20%
Other saw-timber volume	11,982 million bd. ft.	11,028 million bd. ft.	- 8%
Ownership Data			
Privately owned forest land	793 M acres	644 M acres	-19%
Privately owned saw-timber volume	12,030 million bd. ft.	8,411 million bd. ft.	-30%
National-forest forest land	187 M acres	282 M acres	+51%
National-forest saw-timber volume	4,383 million bd. ft.	5,697 million bd. ft.	+30%
Other publicly owned forest land	116 M acres	169 M acres	+46%
Other publicly owned saw-timber volume	2,236 million bd. ft.	2,275 million bd. ft.	+ 2%

During the period between inventories, which was approximately eight years, the area of the conifer saw-timber stands of the county was reduced at an average rate of nearly 7 thousand acres per year. As would be expected the acreage of small second-growth and seedling-and-sapling stands shows a strong upward trend. The area of nonrestocked

land increased in spite of the fact that 31 thousand acres of land classified as deforested at the time of the first inventory had restocked by 1941, as a total of 33 thousand acres clear cut during the decade 1920-29 was added to this group. There has been about half as much land clear cut in the county in the eleven years since 1930 as there was during the 13-year period 1920-32.

The comparison of volume data shows a trend toward the continued rapid depletion of saw timber, especially Douglas-fir. Net depletion of saw-timber volume between inventories was close to 2.3 billion board feet, 1.3 billion board feet of Douglas-fir and one billion board feet of other species.

An increase of approximately 49 percent in the total area of publicly owned forest land during the 8-year period was due to the transfer of foreclosed tax-delinquent private lands to the county and the State and also to the settlement of the Northern Pacific land-grant case whereby the Federal Government revested a large acreage.

Summary

Certain pertinent facts ascertained by the forest survey indicate the seriousness of the forest situation in King County and point the way toward some possible improvements. Economically available saw timber continues to be liquidated at a rate far in excess of either current or potential growth and, moreover, thrifty, growing stands are being cut prematurely because they are accessible, can be logged cheaply, and a strong market exists at present. Proper care should be taken to assure regeneration on cut-over lands following the harvesting of mature timber. As the old-growth stands are replaced by thrifty growing forests an increase in net growth can be effected. The harm that usually comes from the rapid cutting of old-growth timber is the establishing of large areas of nonrestocked cut-over lands and over-development of communities. Both of these conditions are present in King County. To keep them from becoming more of a problem further increase in the rate of harvesting should be discouraged. No immature stands should be cut.

The problems of idle forest land, land use, and fire protection are closely related in the county. There is little chance of reducing the acreage of nonrestocked cut-over land without adequate protection which has been hampered by attempted settlement of submarginal land in the forest zone. All such settlement should be discouraged. All possible aid should be given fire protection agencies. Planting should be done on nonrestocked land, where the seed supply is insufficient, after fire risk is reasonably reduced.

Ownership of forest land has a direct bearing on the forest situation. The resources on national-forest land will be utilized under sustained-yield forest management. Resources in private ownership have not been so cut in the past and now they are nearing exhaustion. All public and private timber owners should cooperate in the future toward a permanent solution of the forest problem of King County.