FOREST RESOURCES of NORTHEAST WASHINGTON

by

Paul D. Kemp & H. J. Pissot

Northern
Rocky Mountain
Forest & Range
Experiment Station
Missoula Montana

Chas. L. Tebbe, Director

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

STATION PAPER NO. 21

MAY 1949

Prepared by the Division of Forest Economics

M. B. Dickerman, Division Chief

Field inventory work reported in this publication was done under the supervision of L. L. Folsom and C. W. Brown. Assisting them were G. A. Hutton, R. L. Conn, and M. E. Metcalf. In addition the Kaniksu National Forest detailed V. L. Erickson and D. W. Lynch to assist in the field work during the spring of 1947.

Office computation of the field data was under the direction of H. J. Pissot. J. R. Castles, P. E. Neff, and the men listed above assisted.

Statistical and inventory procedures were the responsibility of Paul D. Kemp.

FOREST RESOURCES OF NORTHEAST WASHINGTON

By

Paul D. Kemp and H. J. Pissot

May 1949

C O N T E N T S

THE FOREST SURVEY IN NORTHEAST WASHINGTON 1/

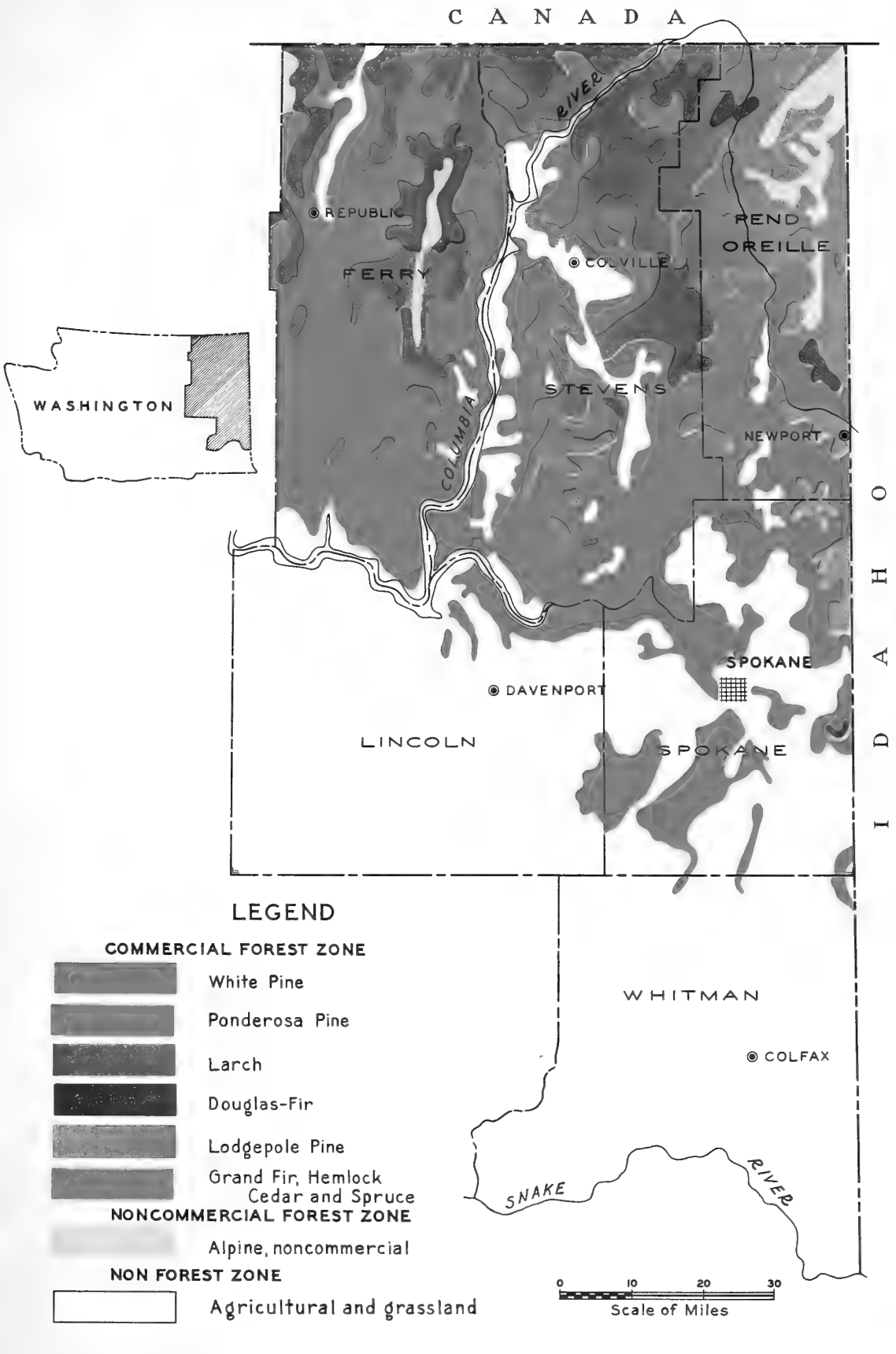
As part of a Nation-wide project, authorized by Congress in 1928, a survey 2/ of the forests of the six counties comprising Northeast Washington was made in 1934 and 1935. The same area was resurveyed during the period from 1946 to 1948 under authorization by Congress in 1944 to maintain current information on forest resources throughout the Nation.

This report summarizes the findings of the resurvey and indicates forest conditions as of January 1, 1948. Also the report contrasts some of the findings of the resurvey and initial survey. Owing to variations in techniques and other factors which are discussed under survey methods, differences in the estimates of the two surveys should be considered indicative of the 13-year trend rather than of the amount of actual change.

1/ The forest survey program in the remainder of the state of Washington is under the direction of the Pacific Northwest Station, Portland, Oregon.

2/ Reports of this survey are listed on page 29.

GENERALIZED FOREST TYPES
NORTHEAST WASHINGTON-1948



W.E.D. 6-49

FOREST AREA

The land area in Northeast Washington totals almost 7.9 million acres of which approximately 50 percent is forest land. The proportion of forest land, however, ranges from 95 percent in Pend Oreille County to less than 1 percent in Whitman County. Forest land predominates in the three northernmost counties as shown graphically on page 4.

Forest land, according to the resurvey, is estimated to occupy 3,930 thousand acres in contrast with an estimate of 4,021 thousand acres by the 1935 survey — a decrease of 91 thousand acres. Some 25 thousand acres of this decrease is accounted for by backwater from the Grand Coulee Dam. Land clearing and the error limitations of the survey estimates may well account for the remainder.

Commercial forest land occupies 3,708 thousand acres and constitutes 94 percent of the forest land total. Table 4 contrasts the commercial forest land area estimates of the resurvey and initial surveys by stand-size class. The overall estimate, according to the resurvey, is 36 thousand acres less than the 1935 estimate. Although this difference is within the error limitations of the estimates, the trend has been downward since most of the 25 thousand acres of forest land inundated by Grand Coulee Lake was of commercial character. More notable, however, is the trend in deforested areas — an increase of 68 thousand acres, or 24 percent over the 1935 estimates. Since there have been no extensive fires in the past 13-year period, it appears that restocking is not keeping pace with cutting. This trend is borne out by observation. The lag in restocking and the fact that appreciable areas classified as seedling-sapling in 1935 have since developed into pole stands account for a reduction of 116 thousand acres, or 12 percent in the seedling-sapling category. The comparison indicates a slight increase in the area occupied by pole stands.

The trend of saw-timber stands is downward. Although a comparison of the 1935 and 1948 data shows a reduction of only 33 thousand acres, or 3 percent in this category, differences in classification intensity of the two surveys may tend to minimize this trend. For example, in the initial survey areas were classified in blocks of generally 40 acres or larger and thus only the larger blocks that were operable under prevailing extensive management practices were considered saw-timber stands; smaller patches of saw timber were included with other predominating stand-class conditions. In the resurvey stands were classified by 0.4-acre units — 2x2 chain blocks along transect lines. Resurvey saw-timber estimates consequently include much smaller parcels than the 1935 estimates. On the other hand the 1935 estimates of saw timber included small parcels of nonsaw timber which were factored out in the 1948 survey.

TIMBER VOLUME

The estimate of timber volume in trees 11.0 inches d.b.h. and larger of all species is 14.9 billion board feet by International 1/4" rule. Approximately 80 percent of this volume is in saw-timber stands, 16 percent in pole stands, and 2 percent each in seedling-sapling and deforested areas. Although the estimate is approximately 3 percent greater than the 1935 estimate the difference is well within the sampling error limits. Disregarding the volume on deforested areas for which no volume was estimated in the 1935 survey the difference is less than 1 percent. In spite of the fact that the all-species volume remained practically unchanged, there was a notable decrease in the volume of white pine, the most highly prized species. The resurvey also shows less larch and ponderosa pine. The decreases were more than offset by increases in marginal species, chiefly Douglas-fir, balsam firs, spruce and lodgepole pine.

The volume per acre of saw-timber stands according to the 1948 survey averages 9.1 thousand board feet in contrast with 7.7 thousand by the 1935 survey. However, variations in survey methods may account for this difference. For, as classified by the 1935 survey in units of 40 acres or more, saw-timber stands included areas of other stand conditions of relatively low volume. Most of these extraneous elements were factored out in the 1948 survey by the use of 0.4-acre sampling units. If, for example, the woodland area (98 thousand acres with 168 million feet of volume) is included with saw-timber stands as in 1935, the average per-acre volume of saw-timber areas is lowered to 8.6 thousand board feet.

Average pole stand volumes decreased from 3.3 to 2.0 thousand board feet per acre. The higher volume pole stands of 1935 were reclassified as saw timber in 1948 which tended to lower the average. This trend was accentuated by a shift of seedling-sapling areas to pole stands of relatively low volume.

Average volume of seedling-sapling stands remained approximately the same — 379 and 396 board feet per acre, respectively by the 1948 and 1935 surveys. No volumes were estimated for deforested areas in the 1935 survey. According to the 1948 survey poorly stocked and deforested areas average 1066 board feet per acre. Excluding the woodland area the average is 749 board feet per acre. The woodland area of 68 thousand acres, averaging 1714 board feet per acre, is classified as poorly stocked and deforested because the volume is less than the minimum of 2000 board feet per acre set up for saw-timber stands and for lack of sufficient pole and seedling-sapling trees to qualify for either of these stand categories.

A notable difference between the estimates of the two surveys which is not apparent from a comparison of the statistics, is the observed change in volume distribution. Except for Ferry County, which still has extensive stands of saw timber, the board-foot volume in 1948 is much less concentrated in large blocks than in 1935.

GROWTH AND DRAIN

Gross and net growth - During the period 1937 - 1946 gross growth is estimated to have averaged 313 million board feet annually. During the same period drain averaged 312 million board feet — 200 million feet of cutting drain and 112 million feet of unsalvaged mortality. Net growth, that is, gross growth minus mortality averaged 201 million board feet annually. This is the maximum annual cut of green timber that could have been sustained without reducing the growing stock. The unsalvaged mortality estimated at 112 million board feet annually represents additional volume that might have been utilized under more intensive management. Although growth virtually balanced drain, considering all species, drain greatly exceeded growth of white pine, the most highly prized species. The growing stock of this species was approximately halved. Cedar, larch and ponderosa pine were also overcut. This trend was offset by increases in the growing stock of the less valuable species, chiefly Douglas-fir, balsam firs and lodgepole pine.

Drain on commercial forest land from saw-timber trees for commodity use averaged 182 million board feet annually for the period 1937 - 1946. In addition waste resulting from logging accounted for 18 million board feet of drain. Lumber was the principal item of production, making up 80 percent of the drain for commodity use. Fuelwood was second. Other products included poles and piling, pulpwood, fence posts, mine timbers, and hewn ties.

Table 1. Gross area by major use, 1948

County	Total area 1/	Water	Total land area 2/	Forest land	Nonforest land
			Thousand acres		
Ferry	1,446	43	1,403	1,203	200
Lincoln	1,494	30	1,464	74	1,390
Pend Oreille	914	17	897	850	47
Spokane	1,138	16	1,122	480	642
Stevens	1,632	44	1,588	1,315	273
Whitman	1,394	11	1,383	8	1,375
Total	8,018	161	7,857	3,930	3,927

1/ From 1940 U. S. Census.

2/ Total land area according to the 1940 U. S. Census is 7,946 thousand acres, or 89 thousand acres more than the total area given in the table. The difference is accounted for by the area of Grand Coulee Lake and other water areas that are included in the Census "land area" which by definition includes water in lakes less than 40 acres and in streams less than one-eighth mile wide.

Table 2. Forest land area, 1948

County	Forest land				
				Reserved	
	Total	Commercial	Non-commercial	Commercial	Non-commercial
	Thousand acres				
Ferry	1,203	1,085	117	1	1/
Lincoln	74	70	4	1/	1/
Pend Oreille	850	787	63	-	-
Spokane	480	474	1/	5	1
Stevens	1,315	1,284	30	1	1/
Whitman	8	8	--	-	-
Total	3,930	3,708	214	7	1

1/ Less than 500 acres.

Table 3. Area of commercial forest land by county, stand-size and ownership classes, 1948

County	Stand-size class	Total	Federally owned or managed				State	Private 1/
			Total	National forest	Indian	Other		
		Thousand acres						
All counties	Saw timber	1,288	780	343	409	28	66	442
	Pole timber	1,227	481	330	113	38	57	689
	Seed.-sapling	547	234	188	37	9	22	291
	Poorly stocked & deforested 2/	646	181	133	26	22	37	428
	All areas	3,708	1,676	994	585	97	182	1,850
Ferry	Saw timber	619	542	180	355	7	9	68
	Pole timber	258	205	99	102	4	3	50
	Seed.-sapling	128	107	77	29	1	1	20
	Poorly stocked & deforested 3/	80	58	34	22	2	3	19
	All areas	1,085	912	390	508	14	16	157
Lincoln	Saw timber	42	--	--	--	--	3	39
	Pole timber	16	1	--	--	1	2	13
	Seed.-sapling	11	--	--	--	--	--	11
	Poorly stocked & deforested	1	--	--	--	--	--	1
	All areas	70	1	--	--	1	5	64

1/ Includes a neglible area of county-owned forest land.
2/ Includes 98 M acres classified as woodland, and 202 M as poorly stocked, seedling-sapling.
3/ Includes 1 M acres classified as woodland, and 31 M as poorly stocked, seedling-sapling.

Table 3. Area of commercial forest land by county, stand-size and ownership classes, 1948 (Cont.)

County	Stand-size class	Total	Federally owned or managed				State	Private 1/
			Total	National forest	Indian	Other		
		Thousand acres						
Pend Oreille	Saw timber	152	111	108	2	1	6	35
	Pole timber	293	154	150	2	2	7	132
	Seed.-sapling	164	93	93	4/	4/	6	65
	Poorly stocked & deforested 5/	178	69	69	4/	4/	13	96
	All areas	787	427	420	4	3	32	328
Spokane	Saw timber	122	--	--	--	--	12	110
	Pole timber	151	1	--	--	1	4	146
	Seed.-sapling	94	--	--	--	--	2	92
	Poorly stocked & deforested 6/	107	--	--	--	--	1	106
	All areas	474	1	--	--	1	19	454
Stevens	Saw timber	348	127	55	52	20	36	185
	Pole timber	506	120	81	9	30	40	346
	Seed.-sapling	150	34	18	8	8	13	103
	Poorly stocked & deforested 7/	280	54	30	4	20	20	206
	All areas	1,284	335	184	73	78	109	840
Whitman	Saw timber	5	--	--	--	--	--	5
	Pole timber	3	--	--	--	--	1	2
	Seed.-sapling	--	--	--	--	--	--	--
	Poorly stocked & deforested	--	--	--	--	--	--	--
	All areas	8	--	--	--	--	1	7

4/ Less than 500 acres.
5/ Includes 20 M acres classified as woodland, and 33 M as poorly stocked, seedling-sapling.
6/ Includes 69 M acres classified as woodland, and 11 M as poorly stocked, seedling-sapling.
7/ Includes 8 M acres classified as woodland, and 127 M as poorly stocked, seedling-sapling.

Table 4. Comparison of commercial forest land by stand-size class, 1935 and 1948

All counties	Saw-timber stands	Pole stands	Seedling-sapling stands 1/	Deforested	Total
			Thousand acres		
1935	1,321	1,182	963	278	3,744
1948	1,288	1,227	847	346	3,708
Difference	- 33	+ 45	- 116	+ 68	- 36
Percent difference	- 3	+ 4	- 12	+ 24	- 1

1/ Includes poorly stocked seedling-sapling stands to conform with the 1935 survey.

Table 5. Commercial forest area by forest type and character of growth, 1948

County	Total 1/	Softwood types			Hardwood types		
		Total	Old growth	Second growth	Total	Old growth	Second growth
			Thousand acres				
Ferry	1,005	974	300	674	31	--	31
Lincoln	69	69	2/	69	2/	--	2/
Pend Oreille	609	582	50	532	27	--	27
Spokane	367	356	10	346	11	--	11
Stevens	1,004	972	40	932	32	--	32
Whitman	8	8	--	8	--	--	--
Total	3,062	2,961	400	2,561	101	--	101

1/ Does not include 646 M acres of poorly stocked seedling-sapling stands and deforested areas.

2/ Less than 500 acres.

Table 6. Saw-timber volume on commercial forest land by species, 1948

Species	County						Total
	Ferry	Lincoln	Pend Oreille	Spokane	Stevens	Whitman	
	Million board feet, International 1/4" rule						
Softwoods							
Western white pine	--	--	275	13	130	--	418
Ponderosa pine	2,968	151	283	635	1,541	4	5,582
Western larch	1,009	--	385	48	1,089	2	2,533
Douglas-fir	2,427	9	856	212	1,170	22	4,696
Grand fir	19	--	148	85	77	--	329
Alpine fir	10	--	21	--	30	--	61
Western redcedar	16	--	221	8	128	--	373
Western hemlock	1	--	208	5	47	--	261
Engelmann spruce	102	--	25	1/	29	--	156
Lodgepole pine	44	--	168	24	184	--	420
White bark and limber pine	--	--	--	--	--	--	--
Subtotal	6,596	160	2,590	1,030	4,425	28	14,829
Hardwoods							
Aspen	--	--	1	--	--	--	1
Cottonwood	18	2	17	--	15	--	52
Birch	--	--	--	3	6	--	9
Juniper	--	--	--	--	--	--	--
Subtotal	18	2	18	3	21	--	62
Grand total	6,614	162	2,608	1,033	4,446	28	14,891

1/ Less than 500 M board feet.

Table 7. Saw-timber volume on commercial forest land by stand-size class, 1948

County	All stands	Saw-timber stands 1/			Pole-timber stands 2/	Seedling-sapling stands 2/	Poorly stocked and deforested areas 2/
		Total	Large	Small			
	Million board feet, International 1/4" rule						
Ferry	6,614	6,170	4,377	1,793	353	52	39
Lincoln	162	117	59	58	37	8	--
Pend Oreille	2,608	1,530	786	744	831	77	170
Spokane	1,033	689	251	438	238	23	83
Stevens	4,446	3,245	1,531	1,714	974	129	98
Whitman	28	25	10	15	3	--	--
Total	14,891	11,776	7,014	4,762	2,436	289	390

1/ Large saw-timber volume is the volume of trees 19.0" d.b.h. and larger. Small saw-timber volume is the volume of trees from 11.0 to 18.9" d.b.h.

2/ Includes volume of large and small saw-timber trees.

Table 8. Comparison of board-foot volume by principal species, 1935 and 1948

All counties	Western white pine	Ponderosa pine	Western larch	Douglas-fir	Other species 1/	Total all species
	- - - -Million board feet, International 1/4" rule- - - -					
1935	797	5,607	2,945	3,918	1,143	14,410
1948	418	5,582	2,533	4,696	1,662	14,891
Difference	-379	- 25	-412	+778	+519	+481
Percent difference	- 48	- 1	- 14	+ 20	+ 45	+ 3

1/ Grand fir, alpine fir, western redcedar, western hemlock, Engelmann spruce, lodgepole pine, white bark and limber pine, and hardwoods.

Table 9. Saw-timber volume on commercial forest land by ownership class, 1948

County	Total	Federally owned or managed					Private 1/
		Total	National forest	Indian	Other	State	
	- - -Million board feet, International 1/4" rule- - -						
Ferry	6,614	5,802	2,168	3,565	69	89	723
Lincoln	162	2	--	--	2	15	145
Pend Oreille	2,608	1,701	1,670	24	7	83	824
Spokane	1,033	1	--	--	1	80	952
Stevens	4,446	1,600	755	525	320	383	2,463
Whitman	28	--	--	--	--	1	27
Total	14,891	9,106	4,593	4,114	399	651	5,134

1/ Includes a neglible volume of county-owned forest land.

Table 10. Comparison of board-foot volume (all species) by county and stand-size class, 1935 and 1948

Stand-size class	Ferry	Lincoln	Pend Oreille	Spokane	Stevens	Whitman	Total
	Million board feet, International 1/4" rule						
All stands							
1935	5,640	98	3,177	1,208	4,287	1/	14,410
1948	6,614	162	2,608	1,033	4,446	28	14,891
Difference	+974	+ 64	-569	-175	+ 159	+28	+ 481
Saw timber							
1935	5,245	54	2,434	401	2,095	1/	10,229
1948	6,170	117	1,530	689	3,245	25	11,776
Difference	+925	+ 63	-904	+288	+1,150	+25	+1,547
Pole							
1935	305	42	671	752	2,109	1/	3,879
1948	353	37	831	238	974	3	2,436
Difference	+ 48	- 5	+160	-514	-1,135	+ 3	-1,443
Seedling-sapling							
1935	90	2	72	55	83	1/	302
1948	52	8	89	30	142	-	321
Difference	- 38	+ 6	+ 17	- 25	+ 59	-	+ 19
Deforested							
1935 2/	-	-	-	-	-	-	-
1948	39	-	158	76	85	-	358
Difference	+ 39	-	+158	+ 76	+ 85	-	+ 358

1/ Less than 500 M board feet.

2/ No volumes were tabulated for this category in 1935.

Table 11. Total timber volume on commercial forest land by species, 1948

Species	County						Total	Usable dead volume All counties
	Ferry	Lincoln	Pend Oreille	Spokane	Stevens	Whitman		
	Million cubic feet, excluding bark 1/							
Softwoods								
Western white pine	--	--	57	2	41	--	100	--
Ponderosa pine	552	51	57	174	394	10	1,238	20
Western larch	215	--	136	11	228	2/	590	34
Douglas-fir	568	6	239	69	308	6	1,196	42
Grand fir	9	--	35	24	43	--	111	8
Alpine fir	8	--	10	--	10	--	28	6
Western redcedar	13	--	119	3	45	--	180	2
Western hemlock	3	--	96	7	18	--	124	8
Engelmann spruce	38	--	22	2/	5	--	65	6
Lodgepole pine	143	--	117	39	123	--	422	3
White bark and limber pine	--	--	--	--	--	--	--	--
Subtotal	1,549	57	888	329	1,215	16	4,054	129
Hardwoods								
Aspen	2	--	1	2	--	--	5	2/
Cottonwood	4	2/	6	2/	3	--	13	--
Birch	2/	--	2/	1	1	--	2	--
Juniper	--	--	--	--	--	--	--	--
Subtotal	6	--	7	3	4	--	20	--
Grand total	1,555	57	895	332	1,219	16	4,074	129

1/ Sound stem volume in trees 5.0" d.b.h. and larger between a 1-foot stump and a 4.0" top diameter, inside bark, plus the sound volume of hardwood limbs larger than 4.0" in diameter.

2/ Less than 500 M cubic feet.

Table 12. Total timber volume (inside bark) on commercial forest land by stand-size class, 1948

County	Total	Saw-timber stands 1/			Pole-timber stands	Seedling-sapling stands 2/	Poorly stocked & deforested stands 2/
		Total	Large	Small			
	Million cubic feet, excluding bark						
Ferry	1,555	1,218	703	515	293	27	17
Lincoln	57	34	12	22	19	4	--
Pend Oreille	895	346	150	196	466	43	40
Spokane	332	147	38	109	91	73	21
Stevens	1,219	683	248	435	465	43	28
Whitman	16	13	2	11	3	--	--
Total	4,074	2,441	1,153	1,288	1,337	190	106

1/ Large saw-timber volume is the volume of trees 19.0" d.b.h. and larger. Small saw-timber volume is the volume of trees from 5.0" to 18.9" d.b.h.

2/ The sound volume of trees larger than 5.0" d.b.h.

Table 13. Total timber volume (inside bark) on commercial forest land by class of material and species group, 1948

County	Total			Saw-timber trees			Pole-timber trees 1/		
	Total	Soft-wood	Hard-wood	Total	Sawlog material	Tops, limbs etc. 1/	Total	Soft-wood	Hard-wood
	Million cubic feet, excluding bark								
Ferry	1,555	1,549	6	1,112	965	147	443	441	2
Lincoln	57	57	2/	31	24	7	26	26	-
Pend Oreille	895	888	7	539	394	145	356	354	2
Spokane	332	329	3	186	156	30	146	144	2
Stevens	1,219	1,215	4	773	665	108	446	446	2/
Whitman	16	16	-	5	4	1	11	11	-
Total	4,074	4,054	20	2,646	2,208	438	1,428	1,422	6

1/ Includes usable volume of cull trees. 2/ Less than 500 M cubic feet.

Table 14. Average annual (1937-1946) timber drain 1/ on commercial forest land by cause

County	Total	Cutting for commodity use	Mortality 2/	
			Fire 3/	Other natural causes
	Thousand cubic feet, excluding bark			
Ferry	15,008	6,158	401	8,449
Lincoln	377	343	32	2
Pend Oreille	12,442	8,646	104	3,692
Spokane	4,781	3,235	241	1,305
Stevens	22,478	12,688	702	9,088
Whitman	32	32	--	--
Total	55,118	31,102	1,480	22,536

1/ Total decrement expressed in terms of inventory standards - includes commodity production extended for waste.
2/ Not salvaged.
3/ Including fire from all causes — wildfire, brush burning, and land clearing.

Table 15. Average annual (1937-1946) saw-timber drain 1/ on commercial forest land by cause

County	Total	Cutting for commodity use	Mortality 2/		
			Total	Fire 3/	Other
	Million board feet, International 1/4" rule				
Ferry	91	40	51	2	49
Lincoln	2	2	4/	4/	4/
Pend Oreille	77	55	22	1	21
Spokane	29	21	8	1	7
Stevens	113	82	31	2	29
Whitman	4/	4/	4/	4/	4/
Total	312	200	112	6	106

1/ Total decrement expressed in inventory standards — includes commodity production extended for waste.
2/ Not salvaged.
3/ Including fire from all causes — wildfire, brush burning, land clearing, etc.
4/ Less than 500 M board feet.

Table 16. Average annual (1937-1946) production 1/ for commodity use on commercial forest land by commodity, class of material, and species group in the subregion

Commodity	Total			Saw-timber trees			Pole-timber trees		
	Total	Softwood	Hard-wood	Total	Softwood	Hard-wood	Total	Soft-wood	Hard-wood
	Thousand cubic feet, excluding bark								
Lumber	21,238	21,233	5	21,238	21,233	5	--	--	--
Pulpwood	519	476	43	519	476	43	--	--	--
Mine timbers	315	315	--	298	298	--	17	17	--
Fuelwood	3,545	3,518	27	2,877	2,850	27	668	668	--
Hewn ties	8	8	--	6	6	--	2	2	--
Fence posts	535	535	--	392	392	--	143	143	--
Poles and piling	1,665	1,665	--	1,590	1,590	--	75	75	--
Total	27,825	27,750	75	26,920	26,845	75	905	905	--

1/ Total volume in cubic feet of solid wood, round wood products, plus the volume of sawlogs required by International 1/4" rule to produce the volume of sawed products reported as lumber production.

Table 17. Average annual (1937-1946) production 1/ from saw-timber trees for commodity use on commercial forest land in the subregion, by commodity and species group

Commodity	Total		
	Total	Softwood	Hardwood
	Thousand board feet, International 1/4" rule		
Lumber	145,347	145,324	23
Pulpwood	3,120	2,928	192
Mine timbers	2,120	2,120	--
Fuelwood	20,394	20,235	159
Hewn ties	36	36	--
Fence posts	2,786	2,786	--
Poles and piling	8,346	8,346	--
Total	182,149	181,775	374

1/ The estimated board-foot volume by International 1/4" rule of round products from trees 11.0" d.b.h. and larger, plus the volume of sawed products reported as lumber production.

Table 18. Average annual (1937-1946) timber on commercial forest land killed 1/ by fire and natural causes

County	Total	Saw-timber trees			Pole-timber trees		
		Total	Fire	Other causes	Total	Fire	Other causes
	Thousand cubic feet, excluding bark						
Ferry	8,850	8,188	358	7,830	662	43	619
Lincoln	34	21	21	--	13	11	2
Pend Oreille	4,196	3,684	104	3,580	512	10	502
Spokane	1,546	1,357	201	1,156	189	40	149
Stevens	9,390	5,339	618	4,721	4,051	74	3,977
Whitman	--	--	--	--	--	--	--
Total	24,016	18,589	1,302	17,287	5,427	178	5,249

1/ Not salvaged.

Table 19. Average current annual (1937-1946) growth on commercial forest land by tree-size class and species group

County	Total			Saw-timber trees			Pole-timber trees		
	Total	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood
	Million cubic feet, excluding bark								
Net growth									
Ferry	24	24	-	8	8	-	16	16	-
Lincoln	2	2	-	1	1	-	1	1	-
Pend Oreille	32	32	-	9	9	-	23	23	-
Spokane	14	14	-	4	4	-	10	10	-
Stevens	33	33	-	12	12	-	21	21	-
Whitman	1	1	-	-	-	-	1	1	-
Total	106	106	-	34	34	-	72	72	-
Gross growth									
Ferry	33	33	-	16	16	-	17	17	-
Lincoln	2	2	-	1	1	-	1	1	-
Pend Oreille	36	36	-	12	12	-	24	24	-
Spokane	16	16	-	5	5	-	11	11	-
Stevens	42	42	-	17	17	-	25	25	-
Whitman	1	1	-	-	-	-	1	1	-
Total	130	130	-	51	51	-	79	79	-

Dash indicates less than 500 M cubic feet.

Table 20. Average annual (1937-1946) growth of saw timber on commercial forest land by species group

County	Total	Softwoods	Hardwoods
	-Million board feet, International 1/4" rule- -		
Net growth			
Ferry	50	49	1
Lincoln	4	4	1/
Pend Oreille	54	53	1
Spokane	27	27	1/
Stevens	56	55	1
Whitman	1	1	-
Total	192	189	3
Gross growth			
Ferry	101	100	1
Lincoln	4	4	1/
Pend Oreille	76	75	1
Spokane	35	35	1/
Stevens	96	95	1
Whitman	1	1	-
Total	313	310	3

1/ Less than 500 M board feet.

DEFINITIONS

Following are definitions of terms used in this report:

Forest land

Land bearing forest growth or land from which the forest has been removed but which shows evidence of past forest occupancy and which is not now in other use.

Commercial - Forest land bearing or capable of bearing timber of commercial character and economically available now or prospectively for commercial use and not withdrawn from such use.

Noncommercial - Forest land incapable of yielding usable wood products because of adverse site conditions, or so physically inaccessible as to be permanently unavailable economically and not withdrawn for other purposes.

Reserved - Forest land that has been withdrawn from timber utilization through statute, ordinance, or administrative order.

Reserved commercial - Forest land that, except for the prohibition against timber cutting, would qualify as commercial forest land.

Reserved noncommercial - Forest land that, except for the prohibition against timber cutting, would qualify as noncommercial forest land.

Forest types

Softwoods - Stands with 25 percent or more of ponderosa pine, 20 percent or more of western white pine, or 50 percent or more of other coniferous species. (Based on cubic-foot volume.)

Hardwoods - Stands with less than 25 percent of ponderosa pine, less than 20 percent of western white pine, and 51 percent or more hardwood species. (Based on cubic-foot volume.)

Stand-size and -condition classes

Saw-timber stands - Stocked areas with a plurality of the total net cubic volume in trees 11.0 inches and larger in diameter and generally with 2,000 board feet per acre or more in saw-timber trees.

Pole stands - Stocked areas in which a plurality of the total cubic-foot volume is in trees from 5.0 inches in diameter to saw-timber size.

Seedling-sapling stands - Stocked areas in which the plurality of the total cubic-foot volume is in trees less than 5.0 inches in diameter.

Poorly stocked and deforested areas - Areas with less than: (a) 2,000 board feet per acre, (b) 10 percent stocking of pole trees, and (c) 40 percent stocking of seedling-sapling trees.

Deforested - Areas with less than 2,000 board feet per acre and less than 10 percent stocking of pole and seedling-sapling trees.

Woodland - Characteristically open stands, chiefly of the ponderosa pine type that average less than 2,000 board-foot volume per acre, are less than 10 percent stocked with pole trees and less than 40 percent stocked with seedling-sapling trees. They are fringe forests between prairie and dense forest in which understocking definitely could not be ascribed to cutting or fire. These areas are included in the "poorly stocked and deforested" category in this report.

Tree-size and -condition classes

Sound trees

Saw-timber - Trees 11.0 inches d.b.h. and larger with at least one 16-foot log and with at least 50 percent (in case of western white pine with at least 40 percent) of the gross cubic-foot tree volume in sound material.

Pole - Trees 5.0 to 10.9 inches d.b.h. without major defect.

Seedling-sapling - Trees up to 4.9 inches d.b.h. that are without major defect.

Cull trees - Trees of any size that do not now, or are not likely to qualify as sound because of major defect - rot, exceptional limbiness, poor form, etc.

Forest growth

Gross growth - The average annual increase in sound volume for the specified period before allowance for any drain.

Cubic-foot - The average annual increase in sound cubic volume of trees larger than 5.0 inches d.b.h. from stump to a 4-inch top plus the average annual sound volume of trees reaching 5.0 inches d.b.h.

Board-foot - The average annual increase in sound wood volume of trees 11.0 inches d.b.h. and larger plus the average annual volume of trees reaching 11.0 inches d.b.h. and larger, from stump to merchantable sawlog top.

Net growth - The average annual gross growth less average annual mortality for the specified period.

Cubic-foot - The gross cubic-foot growth discounted for average annual mortality.

Board-foot - The gross board-foot growth discounted for average annual mortality.

Mortality

The average annual volume drain of timber attributable to death from natural causes - fire, insects, disease, windthrow, etc. - during a specified period.

Cubic-foot - The average annual cubic-foot volume drain of timber attributable to death from natural causes. Standards of measurement are the same as for cubic-foot volume and cubic-foot growth.

Board-foot - The average annual board-foot volume drain attributable to death from natural causes. Standards of measurement are the same as for board-foot volume and board-foot growth.

FOREST SURVEY METHOD

Initial survey - The initial survey of Northeast Washington was made during 1934 and 1935 by the "compilation" method briefly described as follows: The boundaries of nonforest land and forest land classified by type, stand-size, stocking, age and site classes, were delineated on 2-inch-to-the-mile base maps so far as possible from intensive cruises data, county assessment records, fire records, etc. Information for areas not covered by records and for stand characteristics, such as age and site, which could not be determined from available records, was determined by field examination in connection with an overall check of all data. Forest cover classifications were based on prevailing condition on areas of generally forty acres or more.

All delineated areas were planimetered and area computations were sorted and summarized by classification. The possible number of classes for commercial forest only were 10 (types) x 3 (stand-size classes) x 3 (stocking classes) x 6 (age classes) x 5 (site classes) or 2700.

Timber volume was estimated for each commercial forest delineation either from intensive cruises adjusted to a common standard, field samples, ocular estimates, or modified normal yields correlated with type, stand-size, stocking, age, and site classes.

Resurvey - The resurvey of the same area was made from 1946 to 1948. Nonforest, forest and the various subclasses were derived by correlating initial survey area data with forest cover observed along sample transects. The transects were run in a random direction to and from Land Office section corners spaced at 4-mile intervals. Cover conditions were observed, classified, and recorded on a strip two chains wide, a 2x2 chain or 0.4-acre unit being the minimum area considered in the classification. Transect courses, location of section corners, and other information were recorded on available aerial photographs to facilitate relocation and future remeasurement.

The transect courses were plotted on the initial survey cover maps. Transect classifications were sorted and summarized by initial survey cover classifications. The total area of each initial survey classification was reclassified in accordance with the composition indicated by the transect sample for that classification.

Three 1/5-acre sample plots measured for volume at each location (4-mile intervals) provided the basis for mean-acre volumes by classes. Total volume estimates were derived from the mean-volume estimates and revised areas by classes.

The area and volume statistics of the resurvey are based on the initial cover-type area, modified by sample line transects and volume sample plots shown in the following table:

County	Area	Volume
	Number of line transects 1/	Number of plots 2/
Ferry	128	339
Pend Oreille	76	220
Spokane	75	163
Stevens	151	469
Lincoln	19	44
Whitman	2	3
Total	451	1238

1/ Transects for the six counties totaled 15,745 chains, 196.8 miles, or approximately 35 chains per location.

2/ Based on an analysis of variance each plot was considered 0.6 of an independent observation.

ACCURACY OF THE DATA

In determining the extent of various cover types and stand-condition classes, there are two possible sources of error: (1) errors in classifying the cover of the field samples and in compiling the field data, and (2) sampling errors. The former result from mistakes of judgment or technic and the complexity of the cover which not infrequently grades from one class into another with no clearly defined boundaries. These errors were minimized by the exercise of care and skill, but it is seldom possible to evaluate them. An effort was made to maintain a high order of accuracy and uniformity of standards in the classification, collection, and compilation of sample data, by field checks, by a continuing program of training, and by cross checks in the office.

Sampling errors, as measured by the standard error of estimate, on the other hand do not involve human errors but rather are theoretical measures of the reliability of estimates based on the variability exhibited by sample measurements. They generally vary inversely with the square root of the number of observations and directly with the square root of the unsampled proportion of the total population. Hence, they can be controlled by altering either the number of samples, the size of individual samples, or both.

Analysis of sample variations of the 451 line transects indicate that the standard errors of estimate for the six counties combined are ±1.3 percent for total forest land area, ±1.4 percent for commercial forest land area and ±19.5 percent for noncommercial forest land area. Accordingly, the probabilities are 2 out 3 that actual forest land, commercial forest land and noncommercial forest land areas are, respectively, within ±51,000 acres, ±52,000 acres, and ±43,000 acres of the areas given in this report if measurements and computing errors introduced no bias.

In determining timber volumes, the possible sources of error include in addition to those cited above (3) inaccurate measurement of sample plots, tree diameters, tree heights, and cull, and (4) bias resulting from improper construction, selection, and use of tree-volume tables. All reasonable effort was made to eliminate errors from these sources. Analysis of the variation of the 1238 one-fifth-acre volume plots indicate that the standard errors of the volume sample are: saw-timber and pole trees ±4.0 percent, saw-timber trees ±5.4 percent, and pole trees ±5.9 percent. The standard errors of total cubic volume are:

	Percent	Million cubic feet
Saw-timber and pole trees	±4.2	±177
Saw-timber trees	±5.6	±151
Pole trees	±6.0	± 88

Stand volume was originally computed in cubic feet and converted to board feet by use of board-foot/cubic-foot ratios correlated with tree size. These ratios should have small errors. Therefore, standard error of board-foot volume is judged to be the same as the error of cubic-foot volume for saw-timber trees only, or ±5.6 percent. In terms of board-foot volume of all species for the block as a whole this is equivalent to a sampling error of ±834 million feet.

The statistics on cutting drain are based in part on a 100-percent canvass of producers and in part on sampling data. Only 20 percent of the cubic-foot and 15 percent of the board-foot cutting drain are based on samples. An indeterminable error, however, is introduced in translating production into drain. The statistics for the sum of all drain items for the block as a whole are judged to be within ±10 percent, i.e. within ±2,800 M cubic feet and ±15,000 M board feet.

The reliability of one statistic as compared with another presented in the same or a related table can be judged roughly by its relative magnitude. In general, the large quantities warrant greater confidence; the smaller quantities indicate only relative magnitude.

In determining gross growth the possible sources of error include all of the limitations enumerated under area and volume. Net growth includes in addition the extremely variable factor of mortality. Standard errors of gross and net growth for all species for the block are:

	Percent	Million cubic feet	Million board feet
Saw-timber and pole trees			
Gross	± 5.8	± 8	
Net	±11.2	±12	
Saw-timber trees			
Gross	± 7.7	± 4	±24
Net	±17.6	± 6	±35
Pole trees			
Gross	± 8.4	± 7	
Net	±10.7	± 8	

LIST OF FOREST SURVEY REPORTS FOR NORTHEAST WASHINGTON

Forest Statistics, Pend Oreille County, Washington, March 1937. Forest survey release No. 2.

Forest Statistics, Spokane County, Washington, May 1937. Forest survey release No. 4.

Forest Statistics, Stevens County, Washington, June 1937. Forest survey release No. 5.

Forest Statistics for Ferry County, Washington, April 1937. Published by Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Forest Statistics for Douglas, Lincoln, and Whitman Counties, Washington, January 1936. Typewritten report by Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

LIST OF PREVIOUS PUBLICATIONS IN THIS SERIES

Station Paper No.	
1	* A preliminary study of root diseases in western white pine, by John Ehrlich. Oct. 1939.
2	* Possibilities of partial cutting in young western white pine, by E. F. Rapraeger. Jan. 1940.
3	Blister rust control in the management of western white pine, by Kenneth P. Davis and Virgil D. Moss. June 1940.
4	Possibilities of wood-pulp production in the northern Rocky Mountain region, by E. F. Rapraeger. Mar. 1941.
5	Results to date of studies of the durability of native woods treated and untreated, by C. N. Whitney. Rev. Jan. 1946.
6	Changes in Benewah County forest statistics, by Paul D. Kemp. July 1947.
7	A guide for range reseeding on and near the national forests of Montana, by C. Allan Friedrich. Oct. 1947.
8	Pole blight - a new disease of western white pine, by C. A. Wellner. Nov. 1947.
9	Management practices for Christmas tree production, by C. A. Wellner and A. L. Roe. Nov. 1947.
10	The merits of lodgepole pine poles, by I. V. Anderson. Nov. 1947.
11	Tables for approximating volume growth of individual trees, by P. D. Kemp and M. E. Metcalf. Mar. 1948.
12	Forest resource statistics, Cascade County, Montana, by H. J. Pissot and E. F. Peffer. Apr. 1948.
13	Forest resources of northern Montana, by C. W. Brown and W. C. Hodge. June 1948.
14	List of publications available for distribution or loan, 1910 through 1947. NRM station. June 1948
15	Review of published information on the larch-Douglas fir forest type, by Russell K. LeBarron. Nov. 1948.
16	Development of a blister rust control policy for the national forests in the Inland Empire, by Donald N. Matthews and S. Blair Hutchison. Dec. 1948.

* Out of print. Loan copies may be obtained upon request.

Station Paper No.	
17	Disintegration of girdled western hemlock and grand fir, by Austin E. Helmers. Dec. 1948.
18	Suggested Montana Douglas-fir Christmas tree standards, by S. Blair Hutchison and Ben M. Huey. Jan. 1949.
19	The possibilities of modifying lightning storms in the Northern Rockies, by Vincent J. Schaefer. Jan. 1949.
20	Forest Resources of Southern Montana, by W. C. Hodge, C. W. Brown, and T. L. Finch. May 1949.