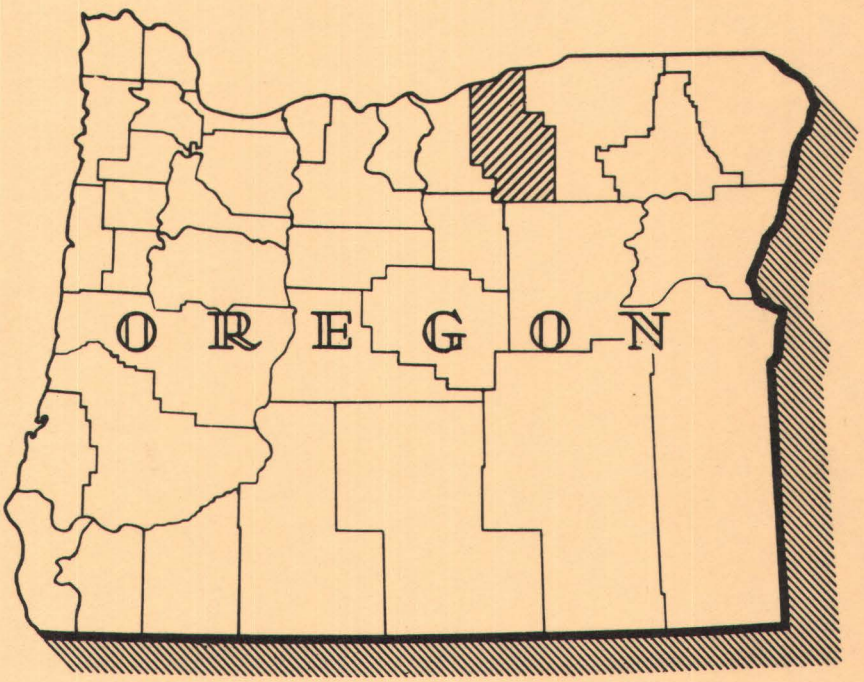
FOREST STATISTICS FOR MORROW COUNTY, OREGON

FOREST SURVEY REPORT NO. 120



U. S. DEPARTMENT OF AGRICULTURE · FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
R. W. COWLIN, DIRECTOR

PORTLAND, OREGON JUNE 1955

PREPARED BY THE DIVISION OF FOREST ECONOMICS RESEARCH

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1/ Acknowledgment is made of cooperation from public and private agencies in furnishing cutting and ownership records.

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and
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U. S. Department of Agriculture Forest Service
Pacific Northwest Forest and Range Experiment Station

R. W. Cowlin, Director
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FOREWORD

This publication summarizes in statistical form the results of a reinventory of the forests of Morrow County, Oregon, conducted in 1954[1/]. This reinventory is a part of the maintenance phase of the Forest Survey, a nationwide project of the Forest Service authorized by the McSweeney-McNary Forest Research Act of 1928 and amended June 25, 1949. The purpose of the Forest Survey is to periodically inventory the extent and condition of forest lands and the timber and other products on them, to ascertain rates of forest growth and depletion, to estimate present consumption of timber products and to analyze and make available in reports survey information needed in the formulation of forest policies and programs.

The Forest Survey is conducted in the various forest regions of the Nation by the regional forest experiment stations of the Forest Service. In the Pacific Northwest region of Oregon and Washington it is an activity of the Pacific Northwest Forest and Range Experiment Station at Portland, Oregon.

Under the initial phase of the Forest Survey the forests of Morrow County were inventoried in 1936. A statistical report, "Forest Statistics for Morrow County, Oregon" and a detailed forest type map--scale 1 inch to the mile--were released. The reinventory was conducted during the months of August and September, 1954. Another result of the reinventory is a revised forest type map of the county, on a scale of either 1 or 2 inches to the mile[2/].

1/ Adjacent to Morrow County on the west is a small area of contiguous forest land in Gilliam County; this area was reinventoried at the time of the work in Morrow County. Of Gilliam County's 775,040 acres of land, a total of only 770 acres is occupied by commercial forests. This forest-land acreage is privately owned and currently stocked with selectively cut stands of ponderosa pine sawtimber; the trees in the stands are of small sawtimber size.

2/ A print of the forest type map is available at cost of blueprinting. For information write Director, Pacific Northwest Forest and Range Experiment Station, P.O. Box 4059, Portland 8, Oregon.

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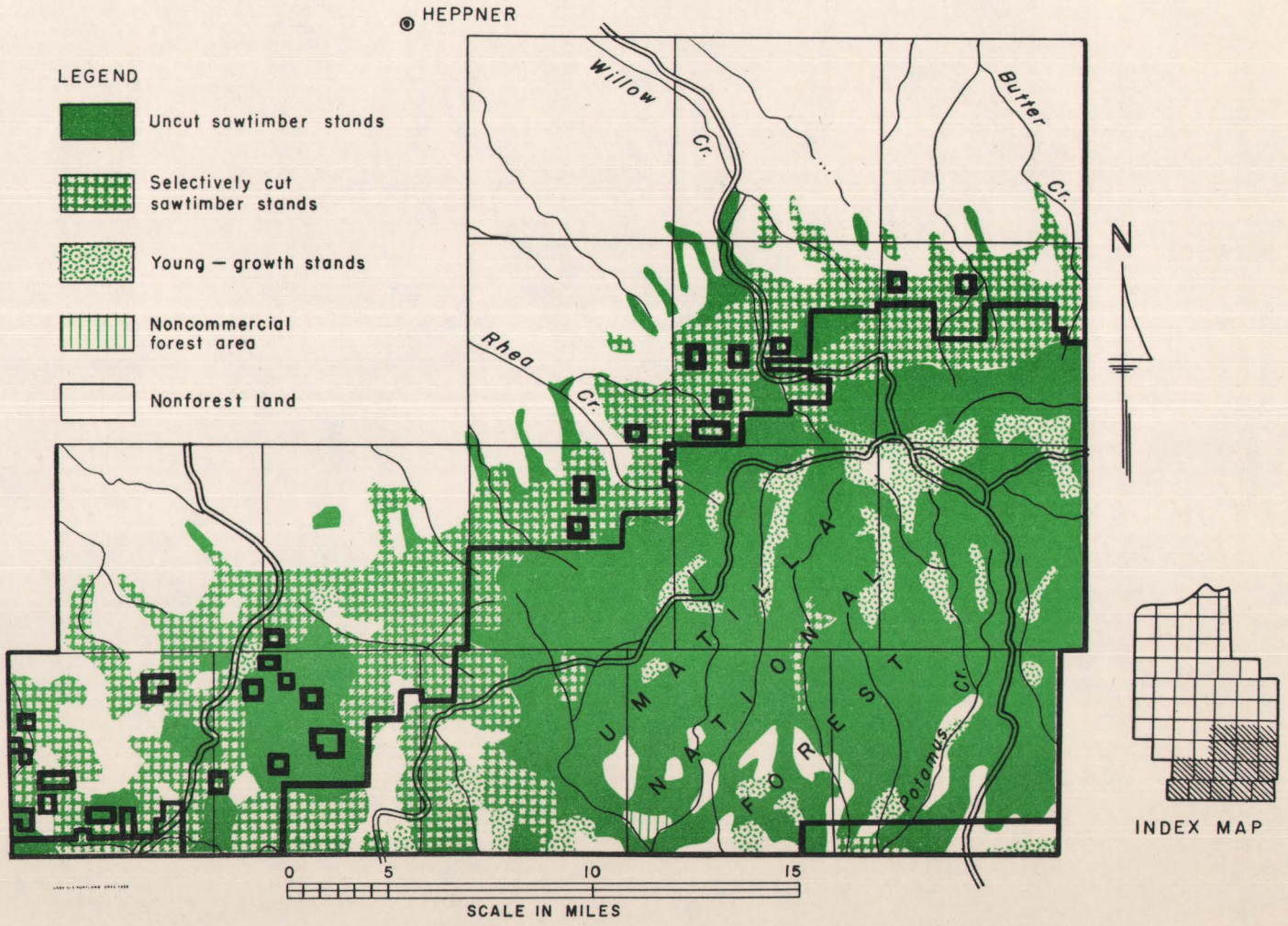
MORROW COUNTY, OREGON
1954



SIGNIFICANT FINDINGS IN THE FOREST INVENTORY

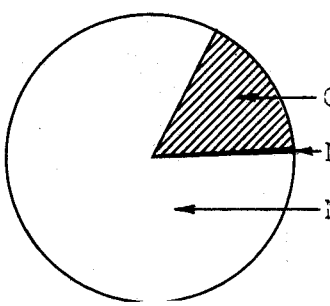
LAND CLASSIFICATION

Located in the north-central portion of Oregon, Morrow County extends southward from the Columbia River some 60 miles to the northern boundary of Grant County. East and west it is approximately 40 miles in width. The total land area is 1,318 thousand acres.

In topography the county's surface varies from a gently rolling plain near the Columbia River to broad plateaus and rounded hills in the central portion, and to the more rugged terrain of a western-reaching spur of the Blue Mountains in the southern one-third. The mountain spur is broken throughout much of its length in the county. Long, narrow ridges and precipituous slopes lead southward from the crest; rounded ridges and moderately deep canyons lead northward. Elevations climb gradually from a few hundred feet along the Columbia River to approximately 4,500 feet on the summits of ridges and buttes in the southern portion.

The county lies in a semi-arid area. Over its low-lying northern two-thirds, precipitation is too scanty for tree growth. Over its higher southern one-third there is sufficient annual moisture to support conifer forests of merchantable character. Here, precipitation is chiefly in the form of snow during the winter season. Some 220 thousand acres of conifer stands form an almost solid cover over the ridges and slopes of the mountain spur. All but a thousand acres of this forested area was classed in the reinventory as commercial forest land. The 1 thousand acres, classed as noncommercial forest land, has either a low, bushy growth of western juniper or a sparse stand of poor-quality timber on rocky sterile sites.

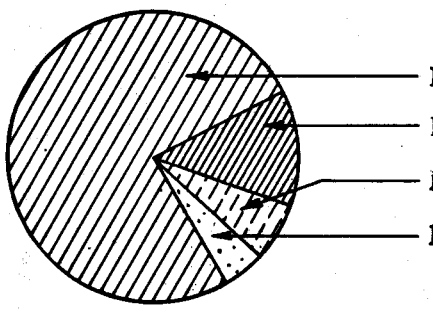
A very large portion of the more than a million acres of nonforest land is in ranches and used seasonally for grazing of sheep and cattle. The U. S. Census of Agriculture found a total of 147 thousand acres of cropland harvested in 1949, most of which was irrigated and cropped for wheat and hay. The forest land is also grazed in season.



CLASS	THOUSAND ACRES	PERCENT
COMMERCIAL FOREST LAND	219	16.6
NONCOMMERCIAL FOREST LAND	1	0.1
NONFOREST LAND	1,098	83.3
TOTAL	1,318	100.0

Commercial Forest Land by Major Types

Ponderosa pine comprises the principal forest type in the county. This species predominates in stands throughout all of the commercial forest area except along the crest of the higher ridges and on moist, cool sites on the northern slopes and in the canyons. Over much of its predominance, it forms pure stands; in mixed stands its associates are usually Douglas-fir and white fir.

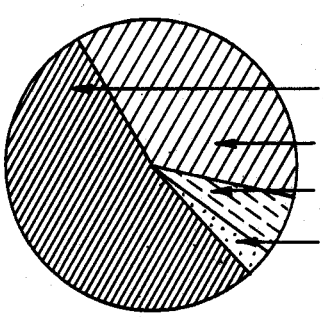


MAJOR TYPE	THOUSAND ACRES	PERCENT
PONDEROSA PINE	166	76
DOUGLAS-FIR	28	13
LODGEPOLE PINE	14	6
LARCH, FIR-SPRUCE	11	5
TOTAL	219	100

Douglas-fir type covers most of the commercial forest area not stocked with ponderosa pine. Douglas-fir usually has western larch and white fir as its associates. Lodgepole pine type occurs on limited tracts of a few hundred acres each. This is also true of the types in which either western larch or white fir is the key species.

Commercial Forest Land by Stand-Size Class

Timber-harvesting operations, nearly all on a selective-cutting basis, have materially influenced the stands on 83 thousand acres, or 38 percent of the total commercial forest area of 219 thousand acres. On 81 thousand acres of this logged area the residual stands are of sufficient volume--1,500 board feet or more per acre--to be classed as selectively cut sawtimber. On 2 thousand acres the residual stands are of young trees less than sawtimber size, mostly from 5 to 11 inches d.b.h.



STAND SIZE	THOUSAND ACRES	PERCENT
UNCUT SAWTIMBER	116	53
SELECTIVELY CUT SAWTIMBER	81	37
POLETIMBER	16	7
SEEDLING AND SAPLING	6	3
TOTAL	219	100

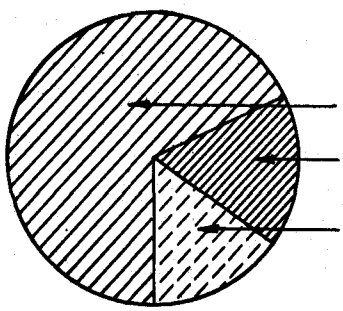
Of the 116 thousand acres of uncut sawtimber, the stands on 110 thousand were classed as "large sawtimber," i.e., most of the volume is in trees more than 22 inches d.b.h.; stands on 6 thousand were classed as "small sawtimber," i.e., trees from 12 to 20 inches d.b.h.

TIMBER VOLUME

Net volume of live sawtimber on commercial forest land is estimated to total 1,766 million board feet, log scale, Scribner rule, or 1,940 million board feet, International ¼-inch rule. Seventy percent of the volume is in uncut sawtimber stands, and practically all of the remaining volume is in selectively cut stands. Less than one percent of the sawtimber volume is in poletimber and seedling and sapling stands.

Volume of Sawtimber by Species

Ponderosa pine is the county's most abundant and valuable commercial species. It makes up two-thirds of the total sawtimber volume. In the uncut sawtimber stands ponderosa pine comprises two-thirds of the volume; in the selectively cut stands it comprises three-fourths of the volume. Douglas-fir is second in abundance; white fir, western larch, Engelmann spruce, subalpine fir, and lodgepole pine make up the remainder.

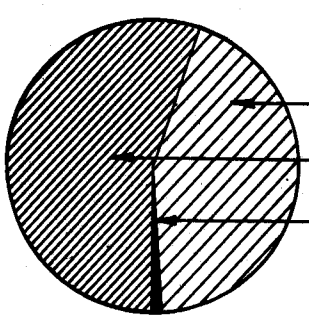


SPECIES	MILLION BOARD FEET	PERCENT
PONDEROSA PINE	1,195	68
DOUGLAS-FIR	269	15
WESTERN LARCH, WHITE FIR AND OTHERS	302	17
TOTAL	1,766	100

FOREST OWNERSHIP

Commercial Forest Land

Ownership of the commercial forest land in Morrow County is divided between the Federal Government and private companies and individuals. All but 1 thousand acres of the total Federal area of 122 thousand acres is national-forest land in the Umatilla National Forest; the 1 thousand acres is public domain land administered by the Bureau of Land Management. The private land lies chiefly in the northern half of the forest zone (fig. 1); only a few small private tracts are inside the national forest boundaries.



OWNERSHIP CLASS	THOUSAND ACRES	PERCENT
PRIVATE	97	44
NATIONAL FOREST	121	55
BUREAU OF LAND MANAGEMENT	1	1
TOTAL	219	100

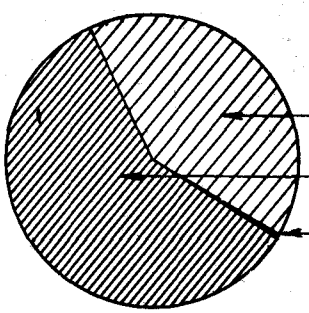
Thirty percent of the private commercial forest area is stocked with uncut sawtimber; 70 percent, or 68 thousand acres, has been logged. Residual stands on 63 thousand acres of the logged area qualify as selectively cut sawtimber; those on 5 thousand acres are composed of trees of poletimber or seedling and sapling size.

Uncut sawtimber stands in national forest ownership occupy 87 thousand acres, or 72 percent of the total national forest area. Selectively cut stands cover 18 thousand acres. Poletimber and seedling and sapling stands stock the remaining 16 thousand acres.

Nearly all of the acreage of Bureau of Land Management land is stocked with sawtimber stands; there is a small area of poletimber.

Sawtimber Volume

Approximately two-fifths of the privately owned sawtimber volume is in uncut sawtimber stands; three-fifths of the volume is in residual stands on selectively cut areas.



OWNERSHIP CLASS	MILLION BD. FT.	PERCENT
PRIVATE	710	40.2
NATIONAL FOREST	1,049	59.4
BUREAU OF LAND MGT.	7	0.4
TOTAL	1,766	100.0

Eighty-eight percent of the sawtimber volume on national forest land is in uncut sawtimber stands, 11 percent is in residual stands on selectively cut areas, and 1 percent is in occasional sawtimber trees in young-growth stands.

FOREST UTILIZATION

During the five-year period 1949-53, the volume of live sawtimber cut annually on the county's commercial forest land has averaged 23 million board feet, log scale, Scribner rule. Approximately 95 percent of the volume has been removed from the forests in the form of timber products (consisting almost entirely of logs), and 5 percent has been left on the ground as logging residue (table 12).

Log production since 1940 has varied from a low of 10 million board feet to a high of almost 40 million board feet in 1946. During this time the cut has averaged 23 million board feet. In recent years the production of logs has been generally decreasing, going from a high of 34 million in 1948 to a low of 11 million in 1953.

Table 1.—Land area by major classes of land, 1954

Class of land	Area
	Acres
Forest:	
Commercial	218,770
Noncommercial:	
Unproductive	1,010
Total	219,780
Nonforest	1,097,980
Total, all classes	1,317,760

Table 2.—Area of commercial forest land by ownership and stand-size classes, 1954

Ownership class	Total	Saw-timber stands	Pole-timber stands	Seedling and sapling stands	Nonstocked areas
	Acres	Acres	Acres	Acres	Acres
Private	96,870	91,340	4,970	560	
Federal:					
Bur. of Land Mgt.	740	700	40		
National forest	121,160	105,280	10,440	5,440	
Total Federal	121,900	105,980	10,480	5,440	
All ownerships	218,770	197,320	15,450	6,000	

Table 3.—Area of commercial forest land by major forest type and stand-size class, 1954

Forest type	Total	Sawtimber stands		Pole-timber stands	Seedling and sapling stands	Non-stocked areas
		Large 1/	Small 2/			
	Acres	Acres	Acres	Acres	Acres	Acres
Ponderosa pine	166,310	143,020	15,380	7,630	280	
Lodgepole pine	14,150		1,410	7,020	5,720	
Douglas-fir	27,520	24,040	3,480			
Larch	7,990	4,940	2,250	800		
Fir-spruce	2,800	1,000	1,800			
Total	218,770	173,000	24,320	15,450	6,000	

1/ 21 inches d.b.h. and larger.

2/ 11 to 21 inches d.b.h.

Table 4.--Land area by cover type, ownership class, and land-use class, 1954

(Acres)

Cover type	Unreserved			
	Total	Private	Federal	
			Bureau of Land Management	National forest
COMMERCIAL FOREST LAND 2/				
Ponderosa pine large sawtimber	143,020	67,610	540	74,870
Ponderosa pine small sawtimber	15,380	11,780	120	3,480
Ponderosa pine poletimber	7,630	2,990	40	4,600
Ponderosa pine seedlings and saplings	280	80		200
Lodgepole pine small sawtimber	1,410	360		1,050
Lodgepole pine poletimber	7,020	1,700		5,320
Lodgepole pine seedlings and saplings	5,720	480		5,240
Douglas-fir small old-growth and large young-growth sawtimber (red fir)	24,040	6,750	40	17,250
Douglas-fir small sawtimber	3,480	2,720		760
Western larch large sawtimber	4,940	510		4,430
Western larch small sawtimber	2,250	490		1,760
Western larch poletimber	800	280		520
White fir large sawtimber	800	200		600
White fir small sawtimber	1,600	920		680
Engelmann spruce large sawtimber	200			200
Engelmann spruce small sawtimber	200			200
Total	218,770	96,870	740	121,160
NONCOMMERCIAL (UNPRODUCTIVE) FOREST LAND				
Juniper	840	80		760
Noncommercial rocky	170			170
Total	1,010	80		930
NONFOREST LAND				
Agriculture, grass and brush, and open--nonvegetative	1,097,980	1,083,690 acres unclassified as to ownership or type		14,290
Total	1,097,980	1,083,690		14,290
ALL LAND				
Forest land:				
Commercial	218,770	96,870	740	121,160
Noncommercial (unproductive)	1,010	80		930
Total forest land	219,780	96,950	740	122,090
Nonforest land	1,097,980	1,083,690 acres unclassified as to ownership		14,290
Total all land	1,317,760	1,181,380		136,380

1/ The total area of the county, according to the 1950 Census of Agriculture is 1,317,760 acres. Of this total 234,070 was classified as to ownership in the Forest Survey reinventory; this area includes all of the forest land in the county plus nonforest land in national forest ownership.

2/ There is no reserved-commercial (productive-reserved) forest land in the county.

Table 5.—Area of commercial forest land by forest-condition and ownership classes, 1954

Forest-condition class	Total	Private	Federal	
			Bureau of Land Mgt.	National forest
	Acres	Acres	Acres	Acres
Conifer large sawtimber				
Uncut	110,060	27,390	360	82,310
Selectively cut	62,940	47,680	220	15,040
Total	173,000	75,070	580	97,350
Conifer small sawtimber				
Uncut	5,980	1,010	80	4,890
Selectively cut	18,340	15,260	40	3,040
Total	24,320	16,270	120	7,930
Conifer poletimber				
On cutovers	1,830	1,430		400
On other	13,620	3,540	40	10,040
Total	15,450	4,970	40	10,440
Conifer seedlings and saplings				
On cutovers	80	80		
On other	5,920	480		5,440
Total	6,000	560		5,440
Total	218,770	96,870	740	121,160

Table 6.—Area of young-growth timber stands on commercial forest land by stocking class, species group, and stand-size class, 1954

Stocking class and species group	Total young-growth stands	Sawtimber		Pole-timber	Seedlings and saplings
		Large 1/ young growth	Small young growth		
	Acres	Acres	Acres	Acres	Acres
Well stocked					
Softwoods	50,070	23,640	12,340	8,370	5,720
Medium stocked					
Softwoods	13,700	400	11,460	1,640	200
Poorly stocked					
Softwoods	6,040		520	5,440	80
All classes					
Softwoods	69,810	24,040	24,320	15,450	6,000

1/ Includes only the stands classified and mapped as Douglas-fir large, young-growth, sawtimber type.

Table 7.—Net volume of live sawtimber and growing stock on commercial forest land by ownership class, 1954

Ownership class	Sawtimber		Growing stock
	Million board feet, log scale, Scribner rule	Million board feet, International ¼-inch rule	Million cubic feet
Private	710	786	193
Federal:			
Bur. of Land Mgt.	7	7	2
National forest	1,049	1,147	293
Total Federal	1,056	1,154	295
All ownerships	1,766	1,940	488

Table 8.--Net volume of live sawtimber and growing stock on commercial forest land by stand-size class, 1954

Stand-size class	Sawtimber		Growing stock
	Million board feet, log scale, Scribner rule	Million board feet, International ¼-inch rule	Million cubic feet
Sawtimber stands:			
Uncut	1,235	1,347	320
Selectively cut	525	586	134
Total sawtimber	1,760	1,933	454
Poletimber stands	5	6	33
Seedling and sapling stands	1	1	1
Nonstocked areas	-	-	-
Total	1,766	1,940	488

Table 9.—Net volume of live sawtimber and growing stock on commercial forest land by species, 1954

Species	Sawtimber		Growing stock
	Million board feet, log scale, Scribner rule	Million board feet, International ¼-inch rule	Million cubic feet
Softwoods:			
Ponderosa pine	1,195	1,306	235
Lodgepole pine	12	14	53
Douglas-fir	269	300	88
Western larch	101	113	27
White fir	104	112	54
Subalpine fir	17	19	10
Engelmann spruce	68	76	21
Total	1,766	1,940	488
Hardwoods 1/	-	-	-
All species	1,766	1,940	488

1/ In addition to the species and volumes shown which are based on data from sample plots, black cottonwood and quaking aspen occur in the county but in negligible quantities.

Table 10.--Net volume of ponderosa pine, Douglas-fir, and other softwood live sawtimber species on commercial forest land by diameter-class group and log rule, 1954.

Diameter class and log rule	Total	Ponderosa pine	Douglas-fir	Other softwoods
	Million bd. ft.	Million bd. ft.	Million bd. ft.	Million bd. ft.
11.0" to 20.9" d.b.h.				
Scribner rule	589	280	122	187
International ¼-inch rule	676	324	142	210
21.0" to 30.9" d.b.h.				
Scribner rule	914	696	120	98
International ¼-inch rule	988	752	130	106
31.0" to 40.9" d.b.h.				
Scribner rule	183	139	27	17
International ¼-inch rule	194	148	28	18
41.0" d.b.h. and larger				
Scribner rule	80	80		
International ¼-inch rule	82	82		
All diameter classes				
Scribner rule	1,766	1,195	269	302
International ¼-inch rule	1,940	1,306	300	334

Table 11.--Net volume of all timber on commercial forest land by class of material and species group, 1954

Class of material	Total	Softwoods	Hardwoods
	Million cubic feet	Million cubic feet	Million cubic feet
Growing stock:			
Sawtimber trees:			
Sawlog portion	339	339	-
Upper stem portion	26	26	-
Total	365	365	-
Poletimber trees	123	123	-
Total growing stock	488	488	-
Other material:			
Sound cull trees	-	-	-
Rotten cull trees	2	2	-
Salvable dead trees	18	18	-
Total other material	20	20	-
Total, all timber	508	508	-

Table 12.--Average annual cut of live sawtimber and growing stock on commercial forest land by species group for the period 1949-53 incl.

Species group	Sawtimber						Growing stock		
	Timber products	Logging residual	Annual cut 1/	Timber products	Logging residual	Annual cut 1/	Timber products	Logging residual	Annual cut 1/
	Thousand board feet log scale, Scribner rule			Thousand board feet, International ¼-inch rule			Thousand cubic feet		
Softwoods	22,089	1,221	23,310	24,265	1,341	25,606	3,842	462	4,304
Hardwoods 2/									
Total	22,089	1,221	23,310	24,265	1,341	25,606	3,842	462	4,304

1/ Annual cut is the sum of timber products and logging residues.

2/ Hardwood cut insignificant.

FOREST SURVEY PROCEDURE

The procedures used in the reinventory of Morrow County were materially different from the procedures used in the initial inventory. This change in procedures accounts for some differences in both the forest-area and timber-volume statistics obtained. Therefore, a brief description of the procedures used in each inventory seems desirable.

Initial Inventory

The initial inventory of the county was conducted in 1936 by what is known as the "compilation method." In this method existing information on forest types, timber cruises and logging records, and other pertinent data, were collected from private timber owners and various public agencies. These data were checked in the field for reliability, and were adjusted to the then existing specifications and standards of Forest Survey. Forest-type and timber-volume data for areas not covered by reliable existing information were obtained through field reconnaissance.

All land in the county was classified as either forest or nonforest. Forest land was further classified as commercial or noncommercial; the commercial was still further classified by forest type, stand-size or condition class, and in case of young growth, by stocking class. All such types and classes were mapped in place on 1-inch-to-the-mile base maps of each forested township. These township type maps were then superimposed over current ownership-status plats and dot counted to obtain forest-type-area statistics by ownership class. Type delineations on the township maps were traced to a base map of the county to form a county forest type map. The commercial forest land was also classified as to site quality, or forest-productive capacity.

In-place, timber-volume estimates were based on existing cruises collected and adjusted to the Forest Survey standard, on field samples, and on ocular appraisals. Cruises made by commercial cruisers were obtained for most of the privately owned timber and Forest Service cruises were available for a large portion of the national-forest lands. Separate volume estimates were computed for each of the commercial tree species and for each ownership class. Methods used in this initial inventory did not permit a statistical computation of accuracy of the estimate.

Reinventory

In the reinventory in 1954 the forest type map of the county was completely revised. This revision was accomplished through interpretation, classification, and field mapping on aerial photos which covered all of the commercial-forest and the noncommercial-forest land in the county. In the delineation of types and conditions on

aerial photos similar types were examined on the ground to ensure accuracy in interpretation. The presence of old and new roads through much of the forested area greatly facilitated these examinations. Types, stand-size classes, and stocking classes were similar to those recognized in the initial inventory. However, field mapping on aerial photos resulted in much greater accuracy and detail than was possible in the earlier inventory through ground reconnaissance alone. Type delineations on the aerial photos were transferred to a 2-inch scale county planimetric base map through use of a photo projector. The new type map was then superimposed over a current ownership-status map and a dot count made of forest type areas by ownership class.

Estimates of net volumes of live sawtimber, growing stock, rotten cull, and salvable-dead material were developed by applying average-per-acre volumes to the appropriate forest-type acreages. The per-acre volumes for stands of sawtimber and poletimber were obtained through a sampling procedure in which the stands were measured on randomly selected plots. Comparable sawtimber and poletimber per-acre volumes contained in scattered trees in the overstory of seedling and sapling stands were based on empirical estimates. In the random selection of samples each individual sawtimber or poletimber plot in the county had an equal chance to be chosen. A sample consisted of a series of three one-fifth-acre circular plots spaced at 6-chain intervals. Intensity of the sampling was designed to produce a total estimate of volume within a specified sampling accuracy.

ACCURACY OF REINVENTORY DATA

Forest Area

In the reinventory of the county, in-place mapping of the forests and their classification by forest type, stand-size class, or condition class, were on the basis of 100-percent coverage. Thus no error due to sampling was involved. Errors due to techniques or judgment in the field and in office computation of data were possible, but difficult to evaluate. Throughout all phases of the work close supervision and frequent checks assured a high level of accuracy and uniformity of standards.

Timber Volume

The chances are 19 out of 20 that the board-foot volume of live sawtimber, if measured by a 100-percent cruise, would be within plus or minus 16.6 percent of the estimated total of 1,766 million board feet. On this basis the actual volume would be somewhere between 1,473 and 2,059 million board feet. On the same basis cubic-foot volume from a 100-percent cruise would be within a range of plus or minus 13.8 percent of the estimated 488 million cubic feet. Volume estimates by species, stand-size class, or other subdivision, probably have greater sampling errors.

DIFFERENCE IN RESULTS OF INVENTORIES

Some of the differences in forest-type and timber-volume statistics resulting from the 1936 and 1954 inventories are due to actual physical change. Other differences are due to variations in procedures used, in interpretation and classification of forest conditions, and in standards of utilization. Because of these differences direct comparison of the statistics is not meaningful.

Forest Area

Forest-area statistics resulting from the two inventories are shown in the following table:

Inventory	Total forest land	Commercial forest land				Noncommercial forest land
		Total	Sawtimber		Poletimber and seedlings and saplings	
			Uncut	Selectively cut		
	Thousands of acres					
1936	211	210	182	8	20	1
1954	220	219	116	81	22	1

The difference in the 1936 and the 1954 commercial forest land areas, an apparent increase of 9 thousand acres during the intervening 18 years, was probably not due to any appreciable change in the forest cover. Instead, the change appears mainly because of the application of modern survey techniques utilizing aerial photographs, as has been pointed out in the preceding section on Procedure, in application of survey procedures, and by minor changes in definitions.

Differences within the commercial forest land area of stand-size and condition class reflect in part real changes, such as those brought about by logging or growth, as well as differences brought about by changes in the survey procedure and specifications.

Timber Volume

The respective estimates of total sawtimber volume, by species group, obtained in the two inventories are shown in the tabulation below:

Inventory	Live sawtimber volume					
	All species	Ponderosa pine	Douglas-fir	White fir	Western larch	Other species
	Million board feet, log scale, Scribner rule					
Initial, 1936	1,504	1,179	175	44	95	10
Reinventory, 1954	1,766	1,195	269	104	101	97

The 1936 estimate was based on national-forest cruises, on adjusted existing private cruises, and on ocular appraisals of uncruised stands. The cruises covered the major portion of both the private and national-forest sawtimber acreages. The 1954 estimate was based on a sampling procedure, as described on page 16 under "Forest Survey Procedure - Reinventory."

A considerable portion of the change in volume may be due to differences in the survey techniques and methods used for the two inventories. The exact extent of the differences in volume between the two inventories which is attributable to the two different survey techniques is not measurable.

A part of the change in volume during the 18 years was undoubtedly due to forest growth, i.e., increment in sawtimber trees and the ingrowth of poletimber trees into the sawtimber class. Conversely, the timber inventory was decreased during the interval through timber cutting operations and the activities of such natural depleting agencies as forest insects, diseases, and wind.

Another cause of the difference in volumes may have been the variation in standards of utilization between inventories, particularly as they apply to the species other than pine. The respective standards for pine were quite similar. The standards for Douglas-fir, white fir and western larch were changed between surveys to take cognizance of the increased degree of industrial use of these species. In 1954 volume tables were used that gave a materially greater volume for a tree of a given size than did the tables used in the 1936 inventory. Other changes included lowering the minimum merchantable top diameter of a sawtimber tree, and reduction of the minimum requirement of net sound volume in a sawtimber tree from 33-1/3 to 25 percent of gross volume.

Because of these conditions and factors, the estimates do not reflect significant trends in the county's timber resource.

DEFINITION OF TERMS USED

Land Area

Total Land Area

Includes dry land and unmeandered water surfaces.

Forest Land Area

Includes (a) land which is at least 10-percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting an influence on the climate or on the water regime; and (b) land from which the trees described in "(a)" have been removed to less

than 10-percent stocking and which has not been developed for other use. Minimum area of forest land recognized in reinventory of the county is 10 acres.

Nonforest Land Area

Land that does not qualify as forest land. Minimum area recognized in the reinventory of the county is 10 acres.

Forest Land Classes

Commercial Forest Land Area

Forest land which is producing, or is physically capable of producing, usable crops of wood, economically available now or prospectively, and not withdrawn from timber utilization.

Noncommercial Forest Land Area

Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualifies as commercial forest land, and (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

Cover Types

Forest Land Types

Forest land is typed on the basis of the predominant species as indicated by cubic volume for sawtimber and poletimber stands, and number of trees for seedling and sapling stands, or as a forest condition such as nonstocked cutover, or burned-over land. Where none of the indicated species comprise 50 percent or more of a given stand, the stand is classified on the basis of plurality of cubic volume or number of trees. In classifying forest land by type the minimum area recognized is 40 acres.

Commercial forest land

Major forest types. Local forest types are grouped into generalized types. The major forest types in Morrow County are as follows:

Ponderosa pine. Forests in which 50 percent or more of the stand is ponderosa pine.

Lodgepole pine. Forests in which 50 percent or more of the stand is lodgepole pine.

Douglas-fir. Forests in which 50 percent or more of the stand is Douglas-fir.

Larch. Forests in which 50 percent or more of the stand is western larch.

Fir-spruce. Forests in which 50 percent or more of the stand is of white fir (Abies concolor and grandis) or Engelmann spruce.

Noncommercial forest land

Unproductive forest land. Forest land incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

The unproductive forest land types in Morrow County are as follows:

Pinion-Juniper. Forests in which 50 percent or more of the stand is western juniper.

Noncommercial-rocky. Area within the range of commercial timber that is too rocky, too steep, or too sterile to produce a merchantable stand.

Nonforest Land Types

Agricultural, grass and brush. Cultivated land, stump pasture, grass or brush on nonforest land.

Open-nonvegetative. Includes barrens, tideflats, towns, and unmeandered water.

Tree Classes

Sawtimber Tree

Tree of commercial species, 11 inches d.b.h. or larger, that contains at least one 16-foot coniferous sawlog or one 8-foot hardwood sawlog to a variable top diameter never less than 8 inches inside the bark. Also, 25 percent or more of the gross board-foot volume must be free from rot or defect.

Poletimber Tree

Softwood or hardwood tree 5.0 to 10.9 inches d.b.h. of commercial species in which 25 percent or more of the gross cubic-foot volume is free from rot and defect.

Seedling and Sapling Trees

Live trees of commercial species less than 5.0 inches d.b.h. and of good form and vigor.

Cull Tree

Live tree of sawtimber or poletimber size that is unmerchantable, now or prospectively, because of defect, rot, or species.

Rotten cull tree. Live tree of sawtimber or poletimber size in which less than 25 percent of the total volume is sound.

Salvable Dead Tree

Standing dead or down tree which contains 25 percent or more of sound volume and at least one merchantable 16-foot coniferous or 8-foot hardwood log.

Stand-Size Classes

Sawtimber Stand

Stand of sawtimber trees having a minimum net volume of 1,500 board feet, per acre, International $\frac{1}{4}$-inch rule.

Large sawtimber stand. Stand in which the majority of the volume is in trees more than 21.0" d.b.h.

Small sawtimber stand. Stand in which the majority of the volume is in trees from 11.0" to 20.9" d.b.h.

Poletimber Stand

Stand failing to meet sawtimber-stand specifications but at least 10-percent stocked with poletimber and larger (5.0" d.b.h. and larger) trees and at least half the minimum stocking in poletimber trees.

Seedling and Sapling Stand

Stand not qualifying as either sawtimber or poletimber stand but having at least 10-percent stocking of trees of commercial species and with at least half the minimum stocking in seedling and sapling trees.

Uncut Sawtimber Stand

Sawtimber stand that is essentially undisturbed by cutting.

Selectively Cut Sawtimber Stand

Sawtimber stand in which a partial harvest has been made, and in which the residual volume amounts to 1,500 board feet or more per acre.

Stocking

Stocking is the extent to which growing space is effectively utilized by present or potential growing stock trees of commercial species. "Degree of stocking" is synonymous with "percent of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Stocking may be measured in terms of number of trees, volume, basal area, cover canopy, or other criterion, or combination of criteria.

Well-stocked stands. Stands that are 70 percent or more stocked with present or potential growing stock trees.

Medium-stocked stands. Stands that are 40 to 69 percent stocked with present or potential growing stock trees.

Poorly stocked stands. Stands that are 10 to 39 percent stocked with present or potential growing stock trees.

Nonstocked area. Areas that are 0 to 10 percent stocked with present or potential growing stock trees.

Timber Volume

Live Sawtimber Volume

Net volume in board feet of live sawtimber trees of commercial species:

Scribner rule. The common board-foot rule used in determining log-scale volume of sawtimber in the Pacific Northwest.

International ¼-inch rule. The standard board-foot rule adopted nationally by the Forest Service in the presentation of Forest Survey volume statistics.

Growing Stock

Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

All-Timber Volume

Net volume in cubic feet of live and salvable dead sawtimber trees and poletimber trees of commercial species, and cull trees of all species from stump to a minimum 4.0-inch top inside bark.

Tree Species

Tree species commonly found in Morrow County include:

Softwoods: Ponderosa pine (Pinus ponderosa)
Lodgepole pine (Pinus contorta)
Douglas-fir (Pseudotsuga menziesii)
White fir (Abies concolor and grandis)
Subalpine fir (Abies lasiocarpa)
Western larch (Larix occidentalis)
Engelmann spruce (Picea engelmannii)
Western juniper (Juniperus occidentalis)

Hardwoods: Black cottonwood (Populus trichocarpa)
Quaking aspen (Populus tremuloides)

Timber Cut

Annual Cut of Live Sawtimber

The net board-foot volume of live sawtimber trees cut or killed by logging on commercial forest land during a specified year.

Timber products from live sawtimber. The volume of timber products cut from live sawtimber.

Logging residues from live sawtimber. The net board-foot volume of live sawtimber trees cut or killed by logging on commercial forest land and not converted to timber products.

Annual Cut of Growing Stock

The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by logging on commercial forest land during a specified year.

Timber products from growing stock. The volume of timber products cut from growing stock.

Logging residues from growing stock. The net cubic-foot volume of growing stock cut or killed by logging on commercial forest land and not converted to timber products.