FOREST RESOURCES *of the* Ponderosa Pine Region

Cowlin, R ; Briegleb, P A ; and Moravets, F L 2 Forest resources of the ponderosa pine region of ashington and Oregon Misc Publication No

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ACKNOWLEDGMENT

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UNITED STATES DEPARTMENT OF AGRICULTURE

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Forest Resources

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The Forest Survey

DEPENDABLE information on the supply of forest products, as of all raw materials, is vital to the conduct of the war and to any plans for our postwar welfare. Intelligent land-use planning must be based upon reliable facts as to location, area, and condition of existing and prospective forest land, supply of timber and other forest products, forest depletion and forest growth, and production and consumption of forest products. This necessity for dependable and comprehensive data is now being met through the Nation-wide forest survey authorized by the McSweeney-McNary Forest Research Act of 1928. The Forest Service was directed by the Secretary of Agriculture to conduct the survey. The rapidly changing conditions of our economic and social life since the second world war began have accentuated the need for publishing the facts already gathered and the conclusions to be drawn from them.

The fivefold purpose of the Forest Survey is: (1) To make an inventory of forest land and timber supplies; (2) to ascertain the current and potential growth on forest areas; (3) to determine the drain upon the forests through cutting and through loss from fire, insects, disease, wind throw, and other causes; (4) to determine the present and prospective

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Survey Findings in Brief

THE amount, character, geographic distribution, and ownership of the forest resources of the ponderosa pine region of Washington and Oregon are of vital concern, not only to local residents, but also to the entire Nation. These forests supply the principal local industries—the sawmills and woodworking plants—with raw material. They contribute to the prosperity of farming and stock raising, the other major economic pursuits. Upon this foundation, towns, schools, banks, shops, transportation systems, and other institutions necessary to modern life have been created. Preservation of the regional economy on the present level rests upon a continuous flow of material and services from the forests at the current annual rate. This can be accomplished only through sustained-yield forest management, which in turn depends upon forest owners accepting the responsibilities that must inevitably accompany ownership of natural resources.

It is not enough to know that this region has 22 million acres of forest land and 127 billion board feet of saw timber. To reap the full economic benefits of this resource a detailed understanding of how it can be made to contribute most to the welfare of the people is necessary. Based upon this understanding, plans for adoption of sustained yield must be formulated and effectuated immediately, to avoid wasteful migration of industry and people that follows exhaustion of forest resources.

A brief synopsis of the findings of the Forest Survey, as presented in detail in the following pages, is as follows:[1]

1. The ponderosa pine region of Oregon and Washington produces one-half of the total ponderosa pine lumber cut in the entire United States.

2. In 1939 this region produced 1.9 billion board feet of lumber, nearly nine-tenths of which was ponderosa pine.

3. The major problem in the ponderosa pine region is to bring about a general shift to a light, maturity-selection cutting practice. This will speed up transformation of old-growth stands to a net growth condition and reduce the severity of inevitable curtailment of cut if present practices continue.

4. Locally the timber-supply situation is acute. The Klamath Plateau and Deschutes River units

[1] Forest Survey progress releases on the ponderosa pine region issued by the Pacific Northwest Forest and Range Experiment Station previous to the publication of this major report are: (1) Forest statistics in separate form for Asotin, Chelan, Columbia, Ferry, Garfield, Kittitas, Klickitat, Okanogan, Walla Walla, and Yakima Counties, Wash., and Baker, Crook, Deschutes, Grant, Harney, Jefferson, Klamath, Lake, Morrow, Umatilla, Union, Wallowa, Wasco, and Wheeler Counties, Oreg. [Mimeographed.] No report was issued for Malheur County, Oreg., or Lincoln, Douglas, and Whitman Counties, Wash., because of the small acreage of forest land involved and its relative unimportance in the counties' economy. (2) Timber Volume and Type Acreage on the National Forests of the North Pacific Region. Forest Res. Notes No. 22. 1937. [Mimeographed.] (3) Forest Statistics for Eastern Oregon and Eastern Washington, Forest Res. Notes No. 25. 1938. [Mimeographed.] A summary of detailed and generalized forest-type areas, site quality, and timber volume. (4) Volume Distribution in Saw-Timber Types of the Ponderosa Pine Region. Forest Res. Notes No. 28. 1939. [Mimeographed.] (5) Forest Growth in the Ponderosa Pine Region of Oregon and Washington. Forest Surv. Rpt. 78. 1940. [Mimeographed.] (6) Detailed forest type maps of each of the above-listed 24 counties and for Douglas, Lincoln, and Whitman Counties, Wash., for which no reports were issued. Scale 1 inch equals 1 mile. Blue line print form. 1936. (7) State type maps—ponderosa pine region covered by eight sheets, NW Washington, SW Washington, NE Washington, SE Washington, NW Oregon, SW Oregon, NE Oregon, and SE Oregon. Scale ¼ inch=1 mile. 1936–37. [Lithographed.]

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furnish approximately three-fifths of the region's total lumber cut. Production in these two units must be reduced to about one-third of their present levels within three decades, if present trends continue.

5. Immediate adoption of sustained yield would mean drastic reductions in the cut of principal lumber-manufacturing centers. In spite of present sacrifice involved in reducing the cut now, the longer such reduction is postponed the greater will be the shock of eventual curtailment enforced by lack of merchantable raw material.

6. The forest industries are the only manufacturing industries of any importance in this region.

7. Forest lands of this region are valuable for many purposes other than timber production. These include furnishing summer range for the important livestock industry and the protection of watersheds which furnish water for irrigation of the most intensively farmed land in the region.

8. This region has 22.1 million acres of forest land, which is one-third of its total land area. Nearly three-fourths of the forest land is commercial conifer land.

9. A total of 13.4 million acres is occupied by stands of saw-timber size, of which 10.4 million acres or 78 percent supports ponderosa pine forests.

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Definitions and Specifications

General

THE forest inventory included determination (1) of areas of the several types, by ownership class; (2) of areas of the even-aged immature conifer types, by age class and degrees of stocking, and uneven-aged immature conifer types, by degrees of stocking of poles and reproduction combined; (3) a classification of forest areas according to site quality; and (4) computation of the volume of the present timber stands, including residual stands on cut-over lands, by species and ownership class.

For convenience and facility of analysis and discussion, the region was arbitrarily divided into 6 units. So far as was practical the units were delimited so as to be homogeneous in economic influence and industrial condition. Maps and timber-volume information were obtained by com-

[redacted]

Standards of Measurement

Timber volume estimates made according to fixed, recorded specifications can be correlated with estimates for other regions, can be adjusted to meet changed economic conditions if desired, and are stable. Standards were adopted that conformed, as far as was practical, with current utilization practice.

Estimates of timber volume were made in board feet, log scale, according to the Scribner rule, and in cubic feet. The board-foot estimates included only the stems of living trees that would make at least one log conforming to these specifications:

Conifers 16 feet long, 8 inches in diameter inside bark at small end.

Hardwoods 8 feet long, 10 inches in diameter inside bark at small end.

Practically, this means making the 12-inch diameter class (11.1 to 13.0 inches d. b. h.[2]) the mini-

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Cubic-foot volume was computed for the sound-wood content of stems only, from stump to 4-inch tip inside bark, limbwood and bark excluded, of all trees of or above the 6-inch (5.1 to 7.0 inches) diameter class.

The estimates cover all timber areas, including

Pacific silver fir (*A. amabilis*)
Alpine fir (*A. lasiocarpa*)
Western larch (*Larix occidentalis*)
Alpine larch (*L. lyalli*)
Engelmann spruce (*Picea engelmanni*)
Sierra juniper (*Juniperus occidentalis*)

BROADLEAF TREES

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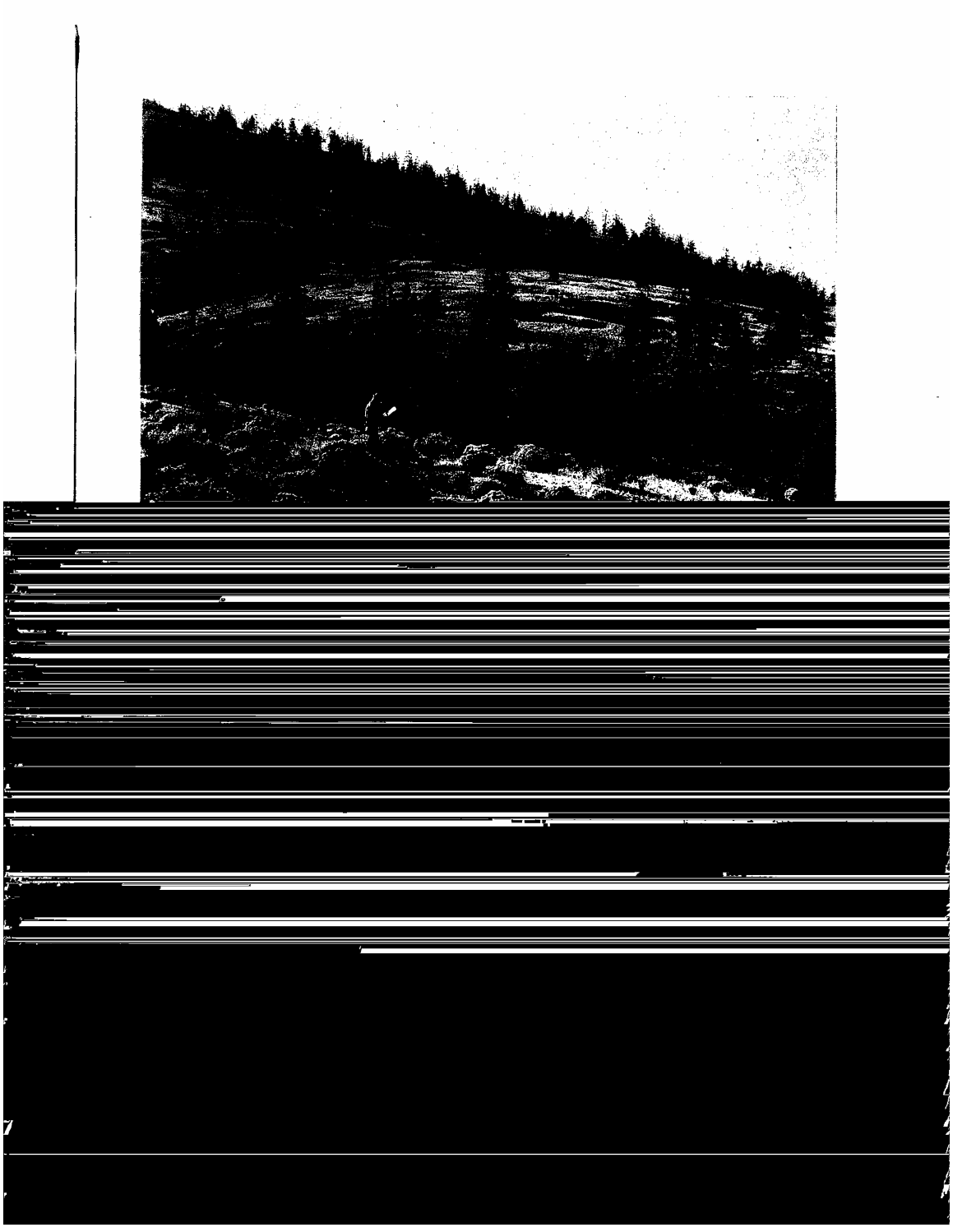

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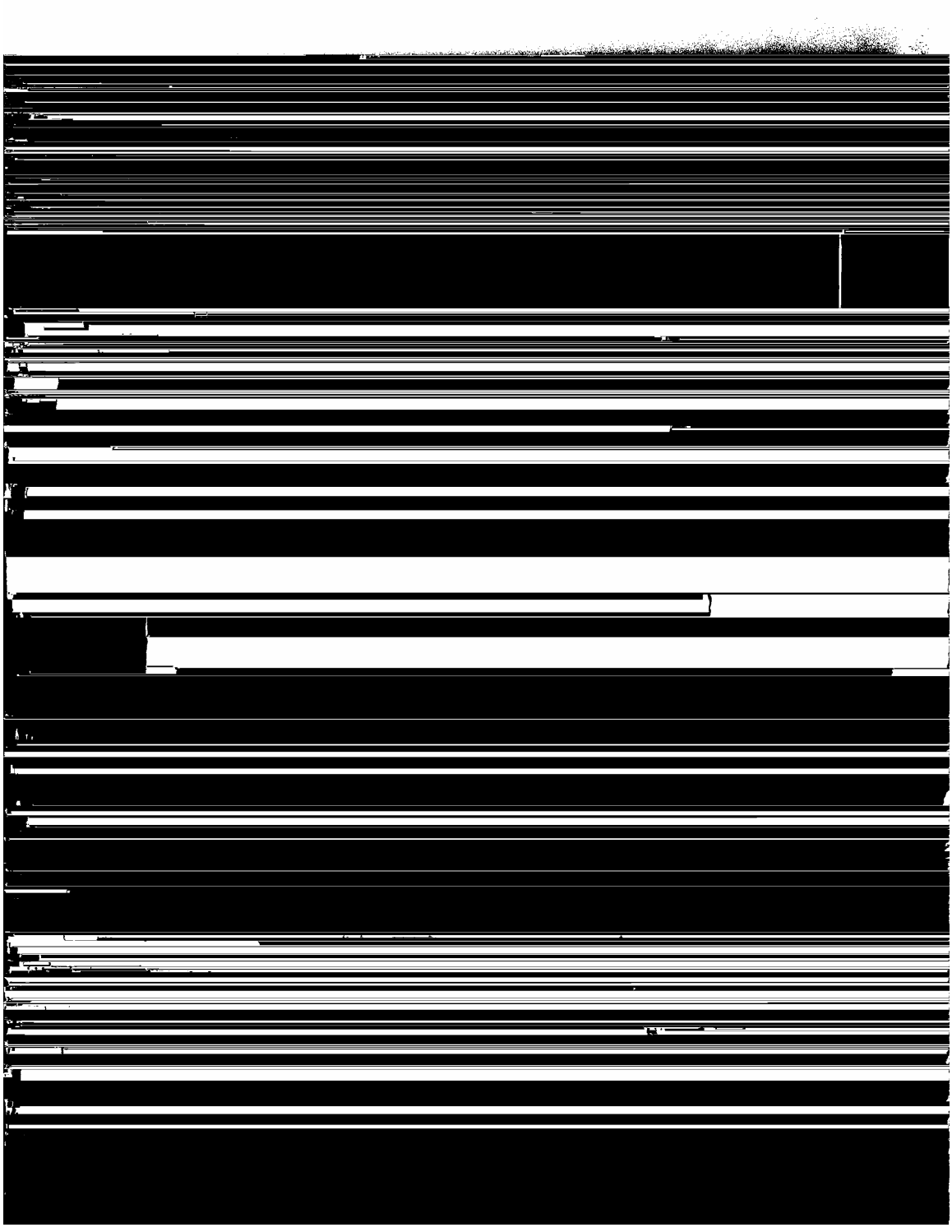

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ordinarily less than 5 M board feet per acre (if ponderosa pine, less than 2 M board feet); no volume recorded; does not include upper portions of valleys or higher slopes now inaccessible but potentially loggable.

All type mapping in the region was done by a form of intensive reconnaissance and the same general procedure was followed on all forest lands. While in theory the mapping was to be limited principally to areas not previously covered by intensive cruises, in actual practice it amounted to an almost complete coverage of all forest land. Areas covered by acceptable cruises were examined extensively to determine type boundaries, to map out small openings such as meadows and glades, to determine site quality of the forest land, and to verify the coverage of the previous cruise. The intensity of examination varied considerably, depending upon character and species of timber and intensity and reliability of preexisting records.

In addition to type mapping according to composition and size, the even-aged immature forest stands, those in which most of the dominant trees are less than 22 inches in diameter, were classified according to age in 10-year classes and according to their density in three degrees of stocking. These data are not shown statistically in this report but were used in making growth estimates. If a forest of seedlings, saplings, or small second growth was dense enough to cover 70 to 100 percent of the area (as measured by the stocked-quadrat method), it was classified as well stocked; if 40 to 69 percent was covered it was called medium stocked; if 10 to 39 percent, it was called poorly stocked. Areas less than 10 percent stocked were termed nonrestocked. If uneven-aged the stands were classified on the basis of poles and reproduction combined.

Other Classifications

The term "site quality" denotes the forest-productive capacity of an area, determined by the composite effect of all climatic and soil conditions. Site-quality classifications based on height of dominant trees were made for the ponderosa pine, Douglas-fir, lodgepole pine, ponderosa pine, sugar pine, pine woodland, pine mixture, and white fir types; the Douglas-fir classification was used for the Douglas fir, upper-slope mixture, fir-mountain hemlock, and "cedar" types. Land occupied by other types was not classified by site quality, unless it was judged likely to support in the future one of the types previously listed. Deforested areas, cut-over land, and burns were classified on the basis of the original type.

Ownership status was determined for all lands surveyed, and all lands not shown as public property were classed as private. It is, of course, recognized that ownership is constantly changing and that the totals given for individual ownership classes probably fail in many cases to agree with statistics from other sources. Nonforest land was not classified as to ownership except on the national forests. The ownership classes considered are:

Private. All privately owned forest property, including farm woods.

State, available for cutting. Includes any State-owned forest property not reserved from cutting.

State, reserved from cutting. Includes State-owned forest property used for parks, National-Guard campgrounds, etc.

County. Forest property deeded to the county. (Tax-delinquent land not deeded to the county is classified as private.)

Municipal. Includes all municipally owned forest property outside the platted limits of municipalities.

Indian. Includes both tribal lands and trust allotments.

Revested land grant. Includes Oregon & California Railroad and other land grants that have reverted to Federal ownership, whether classified as timber, agricultural, or power withdrawals.

Federal, other than national forest and revested land grant, reserved from cutting. Includes national parks, wildlife refuges, military reservations, etc.

National forest available for cutting.

National forest reserved from cutting.

Railroad selection pending. Federal lands designated for selection as railroad grants but not yet deeded.

The term "reserved from cutting" as applied to State and national-forest land or other Federal land means that the timber on it is unavailable for cutting because of statute, proclamation, or policy. Land so classed usually had been officially

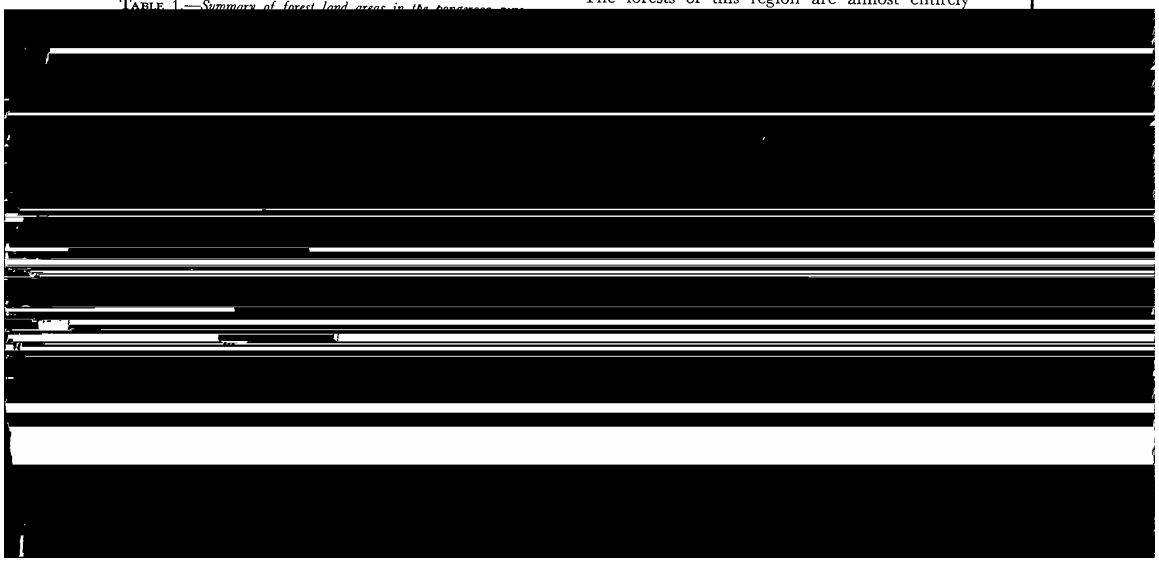
Description of the Region

FOR the purposes of the survey, the ponderosa pine region of Oregon and Washington is defined as that part east of the summit of the Cascade Range (fig. 2), exclusive of Pend Oreille, Stevens, and Spokane Counties in northeastern Washington, which are principally western white pine type. Jackson and Josephine Counties, Oreg., already inventoried as part of the Douglas-fir region (*7*), are also excluded, although containing extensive ponderosa pine forests. The region thus defined extends 480 miles from north to south and varies in width from 200 to 275 miles. It includes 65.5 million acres, of which approximately 22.1 million acres (table 1), or one-third, is forest land and 43.4 million acres is farm, grazing, and nonforested wild land. Because the Cascade Range acts as a barrier to moisture-laden winds from the Pacific Ocean, extensive areas in eastern Oregon and eastern Washington have insufficient precipitation and are treeless. The "dry" timber line, the elevation below which forests cease to grow because of lack of moisture, ranges from about 1,500 feet in northern Washington to about 4,000 to 5,000 feet in southern Oregon. The "cold" timber line, the elevation at which temperature and shortness of growing season limit tree growth, ranges from about 6,000 feet in northern Washington to 8,000 feet in southern Oregon. On the Steens Mountains in southeastern Oregon the lower limit of tree growth is much higher and on a large part of this area the aridity is so intense and growing season so short that the dry and cold timber lines meet.

Generally speaking, the forests are confined to the mountainous districts, of which there are three: (1) The Cascade Range, extending the length of the region from north to south, including the Klamath Plateau as its southern extremity in Oregon; (2) the Blue Mountains, including the Wallowa Mountains in northeastern Oregon and projecting a short distance into southeastern Washington; and (3) the Colville Mountains, an extension of the Rocky Mountains in northeastern Washington.

The forests of this region are almost entirely

TABLE 1.—*Summary of forest land areas in the ponderosa pine*



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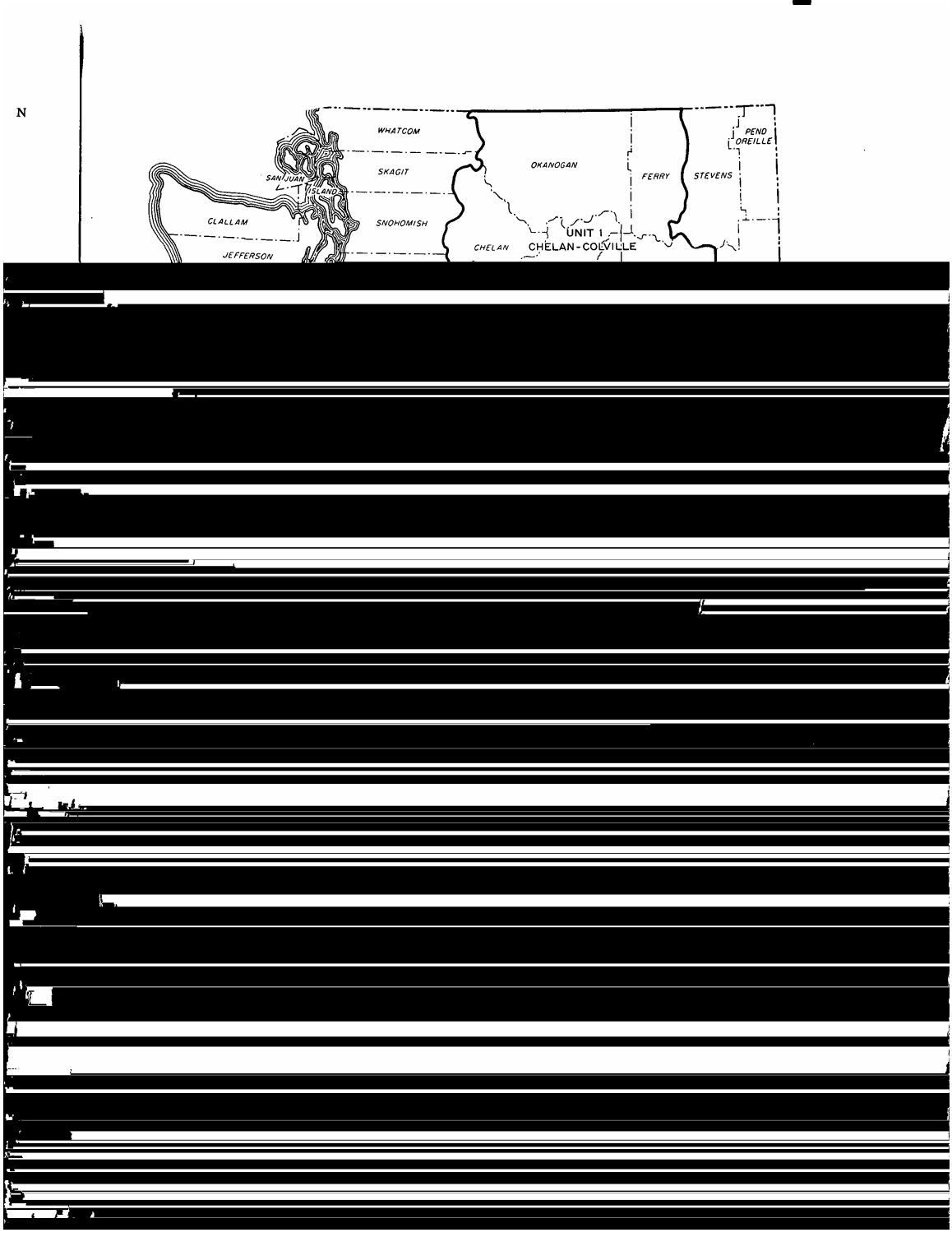

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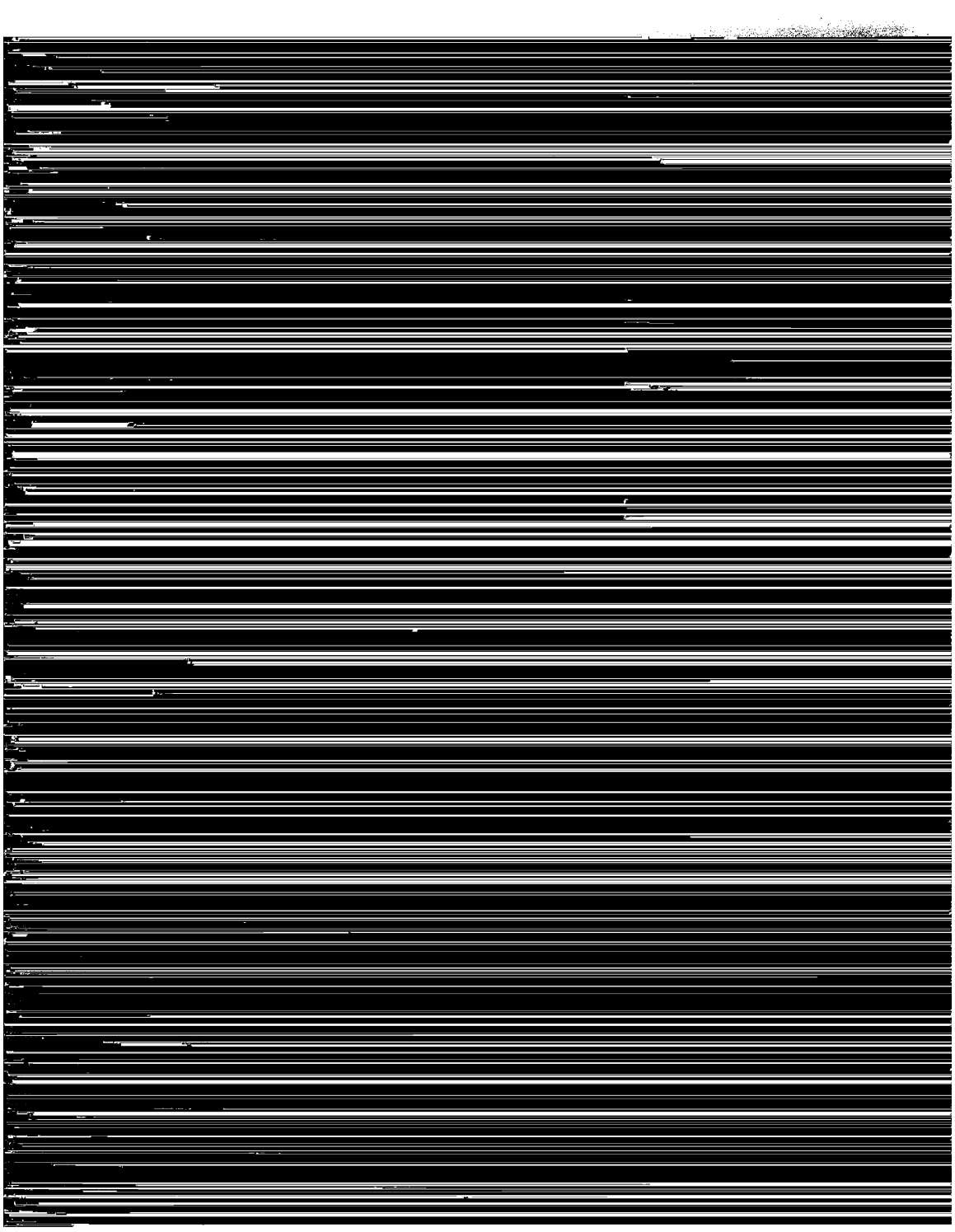

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Forest Inventory

AN important factor immediately apparent from the inventory phase of the forest survey is that the distance from seaports and markets and lack of navigable waterways (figs. 4 and 5), together with the numerous light stands which necessitate extended log transportation systems, have unquestionably retarded utilization of the forest resources. On the other hand, lumbering has been furthered by the intrinsic value of ponderosa pine and the favorable topography for logging. Lumbering has been carried on in parts of this region for half a century or more, but it has been conducted on a large scale only for the past two or three decades. Extensive stands of virgin timber remain, most of them in public ownership, but a large part are not now economically available.

The forests of eastern Washington differ considerably in composition and character from those of eastern Oregon. (See forest type maps of the six survey units of the ponderosa pine region at end of this publication.) That part of the Chelan-Colville

ized by large areas of nonforest land and noncommercial forests. The larger valleys and foothills support commercial timber, chiefly ponderosa pine. Farther south the Cascade Range becomes less rugged and the proportion of ponderosa pine increases and the quality improves. Some of the finest ponderosa pine stands in the region grow in Klickitat County, the most southerly county in eastern Washington.

In Oregon the east slope of the Cascade Range is a high plateau surmounted by an occasional volcanic peak or butte. As a consequence the ponderosa pine zone extends from the dry timber line to within a few miles of the summit. Along the summit is a belt of upper-slope and lodgepole pine types which seldom exceeds 6 miles in width. Surrounding the high peaks are subalpine forests. In Oregon this zone varies in width from 10 to 15 miles on the north to as much as 75 miles on the broad Klamath Plateau on the south. Extensive areas of cut-over land supporting second-growth

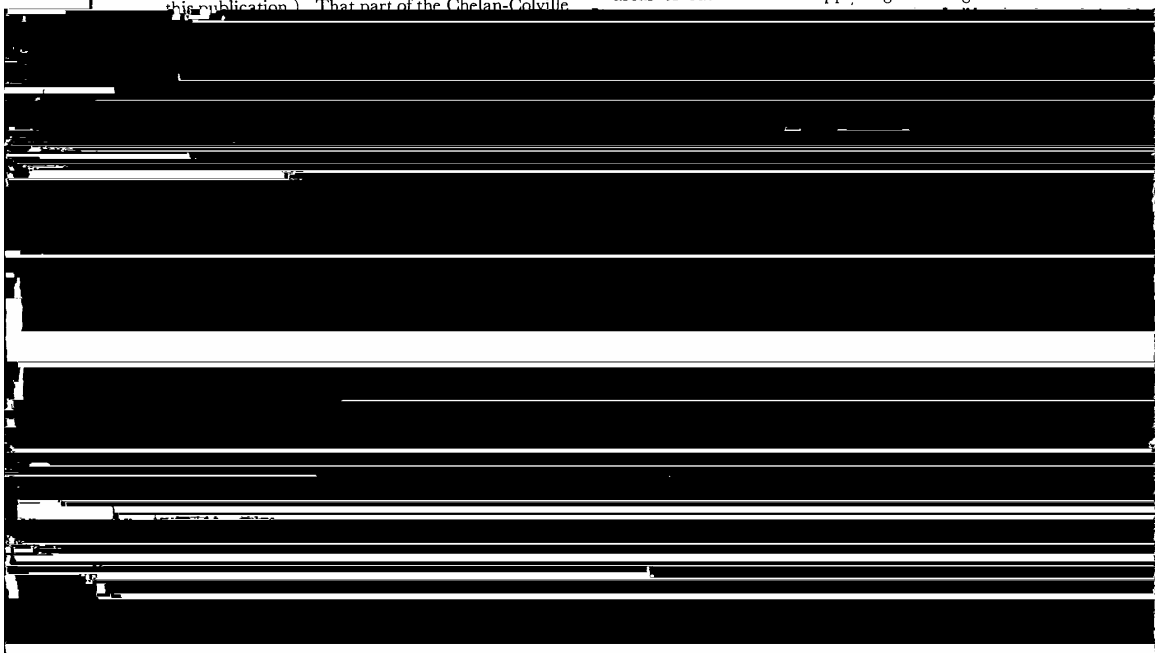

FIGURE 4.—*Principal drainages, national forests, and principal cities of eastern Washington.*

Types and Areas

The area of commercial forest land is characterized by a large proportion of old growth and a small acreage deforested (table 2). The areas of the individual forest-cover types recognized in the survey are given in table 3 by ownership class and summarized. Table 4 presents type areas by forest-survey units. The national forests include the largest area of pine saw timber and also the largest area of noncommercial land (fig. 6).

TABLE 2.—*Summary of commercial forest land areas*

State	Saw-timber areas			All other second growth	Deforested areas [1]	Total
	Old growth	Second growth	Total			
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
Oregon	7,842.6	729.9	8,572.5	1,245.0	213.0	10,030.5
Washington	3,803.5	778.6	4,582.1	1,062.4	174.3	5,818.8
Total	11,646.1	1,508.5	13,154.6	2,307.4	387.3	15,849.3

[1] Includes 131,700 acres temporarily noncommercial.

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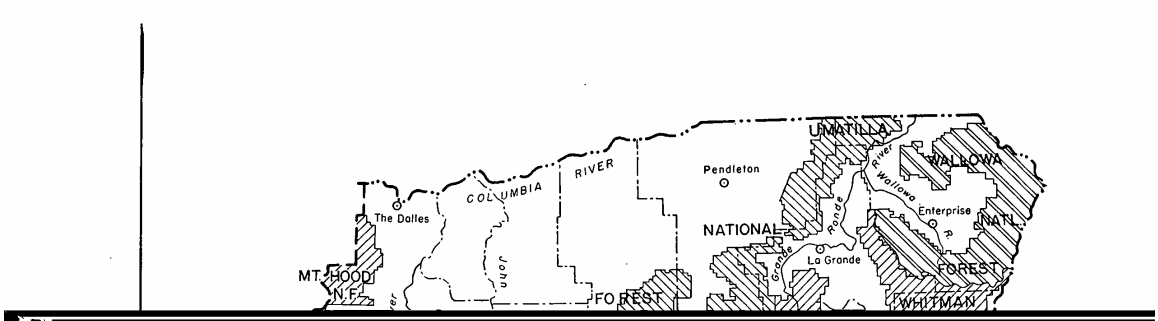

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TABLE 3.—*Area of all forest types in the ponderosa pine region, by ownership class, 1936*

INDIVIDUAL TYPES

Type definition [1] and No.	Private	State		County	Municipal	Federally owned or managed							Total
						Indian	Revested land grants	Public domain		Reserved from cutting [2]	National forest		
		Available for cutting	Reserved from cutting					Available for cutting	Railroad selection pending		Available for cutting	Reserved from cutting	
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
Woodland:													
Oak (4)	50.9	3.3	------	2.1	0.5	4.1	0.4	3.0	------	------	2.1	------	66.4
Dense juniper (or mountain mahogany) (5A)	127.1	8.3	(3)	30.8	.1	1.0	------	247.1	------	------	4.8	------	419.2
Scattered juniper (or mountain mahogany) (5B)	438.4	30.1	0.1	47.4	.2	17.9	.5	521.2	0.2	------	61.3	------	1,117.3
Scattered ponderosa pine (5½)	336.3	26.5	(3)	13.1	.1	136.1	1.5	80.3	1.0	------	224.7	0.1	819.7
Ponderosa pine:													
Large (20)	350.1	41.7	------	10.7	.1	305.8	6.1	14.5	12.6	1.6	731.3	11.6	1,486.1
Pure, large (20½)	2,084.7	133.5	.1	32.3	.4	982.3	4.5	82.9	24.3	5.6	2,610.3	12.3	5,973.2
Ponderosa pine-sugar pine, large (20A)	11.7	------	------	------	------	9.8	.9	------	------	------	7.7	------	30.1

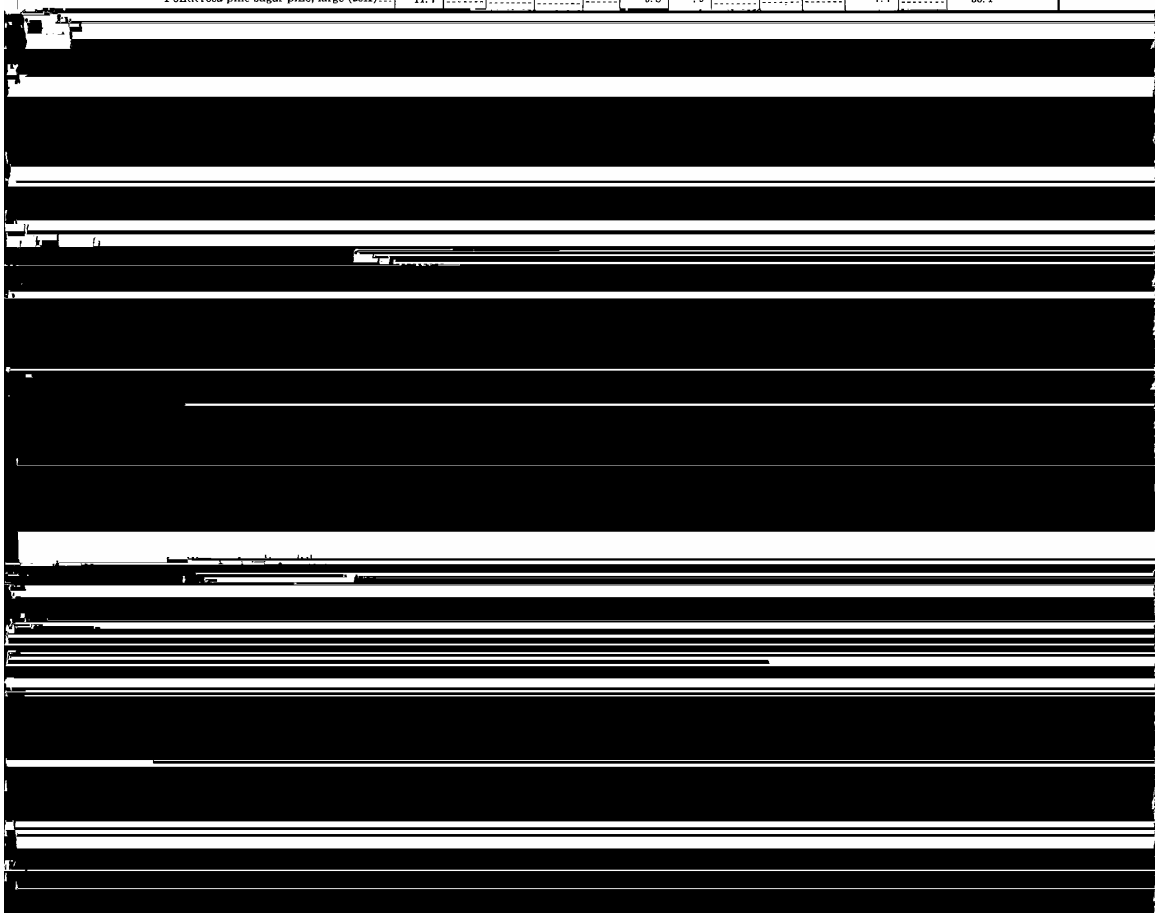

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TABLE 3.—*Area of all forest types in the ponderosa pine region, by ownership class, 1936*—Continued

GENERALIZED TYPES

Type definition and No.	Private	State		County	Municipal	Federally owned or managed							Total
								Public domain			National forest		
		Available for cutting	Reserved from cutting			Indian	Revested land grants	Available for cutting	Railroad selection pending	Reserved from cutting	Available for cutting	Reserved from cutting	
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
Woodland (4, 5A, and 5B)	610.4	41.7	0.1	80.3	0.8	23.0	0.9	771.3	0.2	.....	68.2	.....	1,602.9
Hardwood (31 and 31½)	25.4	.4	.....	(3)	.....	4.3	.....	3.0	.1	.....	6.7	.....	39.9
Conifer saw timber, ponderosa and sugar pine (5½, 20, 20½, 20A, 20B, 21, and 27)	3,510.7	247.0	.1	83.9	1.3	1,898.0	21.8	199.8	44.3	9.0	4,349.2	34.7	10,399.8
Conifer second-growth, ponderosa pine (22 and 28):													
On cut-over areas	832.0	24.1	(2)	24.7	.8	41.3	4.0	17.2	.3	.....	188.9	.1	1,133.4
On uncut areas [4]	103.2	5.5	.....	3.2	.7	31.9	(2)	11.6	1.1	.1	121.1	1.0	279.4
Total	935.2	29.6	(2)	27.9	1.5	73.2	4.0	28.8	1.4	.1	310.0	1.1	1,412.8
Conifer saw timber (6, 7, 8, 9A, 17, 19A, 23, 27½, and 29)	441.4	85.9	.....	23.7	.6	185.4	11.0	18.8	52.6	44.5	1,981.1	174.6	3,019.6
Conifer second growth (9B, 10, 19B, 24, 28½, and 30):													
On cut-over areas	92.7	3.7	.....	5.5	.....	1.7	.....	2.8	.....	(2)	14.0	.....	120.4
On uncut areas [4]	90.3	15.8	.....	3.2	.2	85.2	.9	5.6	19.3	1.0	556.6	40.8	818.9
Total	183.0	19.5	.....	8.7	.2	86.9	.9	8.4	19.3	1.0	570.6	40.8	939.3
Lodgepole pine, large (25)	7.3	1.7	.....	.2	.....	4.1	.....	.2	.7	4.8	61.5	4.1	84.6
Lodgepole pine, medium and small (26 and 26A)	239.1	46.8	.....	8.2	.1	234.6	1.9	58.3	3.3	48.0	1,328.3	91.9	2,060.5
Noncommercial (33 and 38)	156.3	43.8	.....	6.3	.2	88.6	2.6	67.8	77.7	25.6	1,411.4	382.0	2,262.3
Nonrestocked cut-overs and deforested areas (35A, 35B, 37, and 37B)	107.3	10.3	.....	6.4	.....	26.0	4.4	10.8	4.2	1.1	86.2	7.7	264.4
All types	6,222.1	526.7	.2	245.6	4.7	2,624.1	47.5	1,167.2	203.8	134.1	10,173.2	736.9	22,086.1

[1] For description of types, see p. 4.
[2] Crater Lake National Park and Upper Klamath Wildlife Refuge.
[3] Less than 50 acres.
[4] Original stand removed by agencies other than cutting.

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TABLE 4.—*Area of all forest types in the ponderosa pine region, by State and forest-survey unit, 1936*

Type definition [1] and No.	Eastern Washington [2]				Eastern Oregon					Region total
	Chelan-Colville	Yakima River	North Blue Mountain	Total	North Blue Mountain	Deschutes River	South Blue Mountain	Klamath Plateau	Total	
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
Woodland:										
Oak (4)		30.2		30.2		35.6		0.6	36.2	66.4
Dense juniper (or mountain mahogany) (5A)					0.1	313.6	19.6	85.9	419.2	419.2
Scattered juniper (or mountain mahogany) (5B)		.3		.3	.8	575.7	311.6	228.9	1,117.0	1,117.3
Scattered ponderosa pine (5½)	275.8	49.1	9.2	334.1	50.7	122.5	218.5	93.9	485.6	819.7
Ponderosa pine:										
Large (20)	406.7	204.9	27.9	639.5	280.9	195.9	208.4	161.4	846.6	1,486.1
Pure, large (20½)	661.5	481.8	36.7	1,180.0	469.2	975.0	1,551.8	1,797.2	4,793.2	5,973.2
Ponderosa pine-sugar pine, large (20A)						1.4		28.7	30.1	30.1
Small (21)	323.5	207.7	5.0	536.2	159.6	100.6	156.0	263.8	680.0	1,216.2
Seedlings and saplings (22)	192.1	134.2	27.5	353.8	164.5	230.9	226.0	171.2	792.6	1,146.4
Ponderosa pine mixture:										
Large (27)	233.9	139.6	15.7	389.2	202.7	78.0	109.1	59.8	449.6	838.8
Small (28)	58.0	32.1	29.3	119.4	109.3	19.5	17.2	1.0	147.0	266.4
Sugar pine mixture, large (20B)								35.7	35.7	35.7
Douglas-fir:										
Large old growth (6)		1.0		1.0				5.7	5.7	6.7
Small old growth (7)	153.1	143.1		296.2	1.0	24.9	6.1	28.1	60.1	356.3
Large second growth (8)	65.4	64.1		129.5	14.4	.2	2.3		16.9	146.4
Large poles (9A)	93.5	20.4		113.9	30.2	1.2	2.2	.1	33.7	147.6
Small poles (9B)	53.1	25.5	1.0	79.6	27.4	3.7	4.8	.2	36.1	115.7
Seedlings and saplings (10)	26.6	26.8	.1	53.5	3.6	.7	1.9	.9	7.1	60.6
Western redcedar:										
Large (17)	2.2	1.0		3.2		.2			.2	3.4
Poles (19A)	.1			.1						.1
Seedlings and saplings (19B)	.1			.1						.1
Fir-mountain hemlock:										
Large (23)	69.0	192.2		261.2		128.0		222.2	350.2	611.4
Small (24)	18.8	55.0	1.2	75.0		18.9		11.1	30.0	105.0
Upper-slope mixture:										
Large (27½)	493.0	265.7	62.8	821.5	403.6	51.0	346.7	6.7	808.0	1,629.5
Small (28½)	261.4	87.2	59.2	407.8	203.1	23.0	19.1	.3	245.5	653.3
White fir:										
Large (29)	.6	3.2	10.1	13.9	64.1	7.1	15.4	17.7	104.3	118.2
Small (30)		.2	.9	1.1	1.4		.1	1.9	3.4	4.5
Lodgepole pine:										
Large (25)	9.8	17.2		27.0	.8	6.3	.3	50.2	57.6	84.6
Medium (26)	229.5	36.0	6.2	271.7	135.7	332.7	105.6	750.9	1,324.9	1,596.6
Small (26A)	210.2	10.7	1.9	222.8	86.3	38.6	62.4	53.8	241.1	463.9
Hardwoods:										
Large (31½)	2.9	8.5	.4	11.8	3.1	.7	2.6	.5	6.9	18.7
Small (31)	4.1	2.8	.2	7.1	.1	.2	7.3	6.5	14.1	21.2
Subalpine (33)	679.0	115.4	13.5	807.9	150.1	52.6	121.6	91.1	415.4	1,223.3
Nonrestoked cut-overs:										
Cut 1920 or later (35A)	9.1	14.9		24.0	5.4	10.6	3.3	38.2	57.5	81.5
Cut before 1920 (35B)	.8	2.4		3.2	1.5	1.1	1.5	3.6	7.7	10.9
Deforested area:										
Deforested burn (37)	61.5	24.8	1.7	88.0	5.2	26.5	8.5	42.9	83.1	171.1
Insect-killed (37B)						.3		.7	1.0	1.0
Noncommercial rocky area (38)	509.6	116.0	71.4	697.0	192.3	14.6	97.3	37.8	342.0	1,039.0
All types	5,104.9	2,514.0	381.9	8,000.8	2,767.1	3,391.8	3,627.2	4,299.2	14,085.3	22,086.1

[1] For description of types, see p. 4.
[2] Exclusive of Spokane, Stevens, and Pend Oreille Counties.

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Region total

1,000 acres

66. 4

419. 2

the virgin ponderosa pine sawlog types (5½, 20, 20A, 20B, 20½, 27) where cutting coupled with insect epidemics and fire have reduced the stands from an estimated original area of 12.0 million acres to 9.2 million acres.

By far the most important type of this group is pure ponderosa

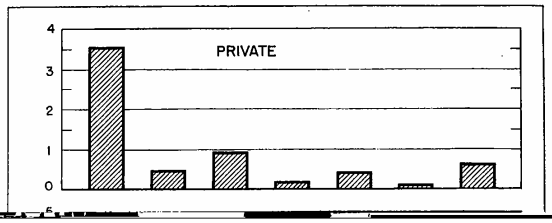

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TABLE 5.—*Area and average volume per acre, and total volume of saw-timber types in eastern Oregon by forest-survey unit, 1936*

Type definition [1] and No.	North Blue Mountain unit			Deschutes River unit			South Blue Mountain unit		
	Area	Volume per acre		Area	Volume per acre		Area	Volume per acre	
		Ponderosa pine	All species		Ponderosa pine	All species		Ponderosa pine	All species
	1,000 acres	*M board feet*	*M board feet*	*1,000 acres*	*M board feet*	*M board feet*	*1,000 acres*	*M board feet*	*M board feet*
Woodland, scattered ponderosa pine (5½)	50.7	1.2	1.3	122.4	1.9	1.9	218.5	1.1	1.1
Ponderosa pine:									
Large (20)	280.9	5.0	8.2	195.9	9.7	14.4	208.4	6.1	9.4
Pure, large (20½)	469.2	7.9	8.8	975.0	12.6	13.3	1,551.8	9.7	10.2
Ponderosa pine-sugar pine, large (20A)				1.4	8.3	13.6			
Small (21)	159.6	2.2	2.5	100.6	3.8	3.8	156.0	2.8	3.2
Ponderosa pine mixture, large (27)	202.7	2.2	6.6	78.0	4.5	12.8	109.1	2.3	7.0
Sugar pine mixture, large (20B)									
Summary pine types	1,163.1	5.1	7.1	1,473.3	10.3	11.8	2,243.8	7.7	8.6
Douglas-fir:									
Large old growth (6)									
Small old growth (7)	1.0		4.3	25.0		17.8	6.0		5.0
Large second growth (8)	14.4		7.1	.2		5.2	2.3		9.4
Large poles (9A)	30.2		4.0	1.3		1.4	2.2		3.7
Western redcedar, large (17)				.2		7.5			
Fir-mountain hemlock, large (23)				128.0		15.0			
Upper-slope mixture, large (27½)	403.6		6.9	51.0		14.1	346.7		6.1
White fir, large (29)									

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TABLE 6.—*Area and average volume per acre, and total volume of saw-timber types in eastern Washington* [1] *by forest-survey unit, 1936*

Type definition [2] and No.	Chelan-Colville unit			Yakima River unit			North Blue Mountain unit			Total eastern Washington				
	Area	Volume per acre		Area	Volume per acre		Area	Volume per acre		Area	Volume per acre		Total volume [3]	
		Ponderosa pine	All species		Ponderosa pine	All species		Ponderosa pine	All species		Ponderosa pine	All species	Ponderosa pine	All species
	1,000 acres	*M board feet*	*M board feet*	*1,000 acres*	*M board feet*	*M board feet*	*1,000 acres*	*M board feet*	*M board feet*	*1,000 acres*	*M board feet*	*M board feet*	*Million board feet*	*Million board feet*
Woodland, scattered ponderosa pine (5½)	275.8	0.9	1.1	49.1	1.3	1.3	9.2	1.0	1.0	334.1	1.0	1.1	334.1	367.5
Ponderosa pine:														
Large (20)	406.7	5.0	7.6	205.0	7.7	11.4	27.8	3.7	6.1	639.5	5.8	8.8	3,709.1	5,627.6
Pure, large (20½)	661.5	7.2	7.9	481.8	9.5	10.2	36.7	6.7	7.0	1,180.0	8.1	8.8	9,558.0	10,384.0
Small (21)	323.5	1.9	2.1	207.6	3.1	3.2	5.0	1.3	1.3	536.1	2.4	2.5	1,286.6	1,340.3
Ponderosa pine mixture, large (27)	233.9	2.2	6.6	139.6	4.0	10.8	15.7	1.7	6.1	389.2	2.8	8.1	1,089.8	3,152.5
Summary pine types	1,901.4	4.3	5.7	1,083.1	6.9	8.8	94.4	4.1	5.7	3,078.9	5.2	6.8	15,977.6	20,871.9
Douglas-fir:														
Large old growth (6)				.9		17.7				.9		17.7		15.9
Small old growth (7)	153.0		10.5	143.1		17.5				296.1		13.9		4,115.8
Large second growth (8)	65.4		9.2	64.1		14.5				129.5		11.8		1,528.1
Large poles (9A)	93.5		4.4	20.4		3.7				113.9		4.3		489.8
Western redcedar:														
Large (17)	2.3		20.5	1.0		13.3				3.3		18.4		60.7
Poles (19A)	.1		5.8							.1		5.8		.6
Fir-mountain hemlock, large (23)	69.0		20.3	192.2		14.2				261.2		15.8		4,127.0
Upper-slope mixture, large (27½)	493.0		8.3	265.7		11.8	62.8		6.8	821.5		9.3		7,640.0
White fir, large (29)	.5		20.6	3.2		13.0	10.1		5.8	13.8		8.0		110.4
Lodgepole pine, large (25)	9.8		4.2	17.3		2.4				27.1		3.1		84.0
Hardwoods, large (31½)	2.9		7.0	8.5		3.4	.4		1.2	11.8		4.6		54.3
Summary all types	2,790.9		6.9	1,709.5		10.6	167.7		6.1	4,758.1		8.2		39,098.5

[1] Exclusive of Spokane unit.

[2] For description of types, see p. 4.

[3] The difference between total volumes in this table and table 10 is accounted for by volume in nonsaw-timber types. Since average volume per acre values are rounded off to nearest 100 board feet, the sum of unit total volumes computed by applying volume per acre to area will not exactly equal regional

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occupied by ponderosa pine stands of saw-timber size which average 2.4 M board feet per acre. They vary considerably in density and often contain scattered mature trees as well as the younger age classes. A large part of this type is in southern Oregon, and more than a fourth of the regional

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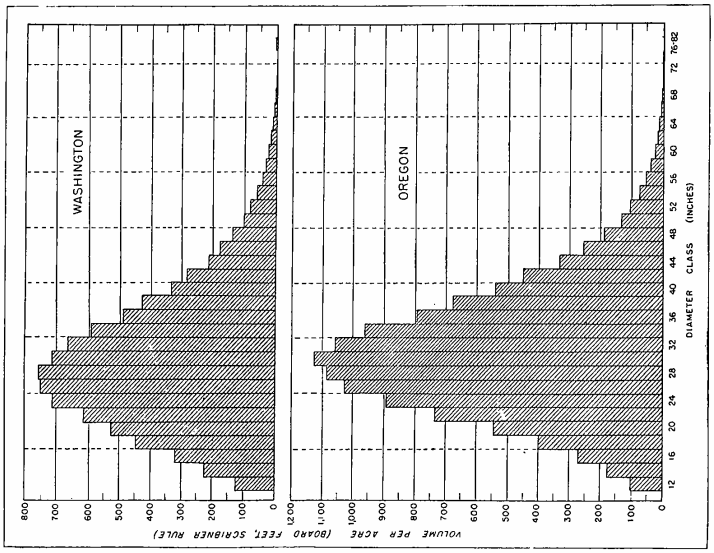

FIGURE 10.—*Distribution of saw-timber volume in the pure large ponderosa pine type (20½), by diameter class.*

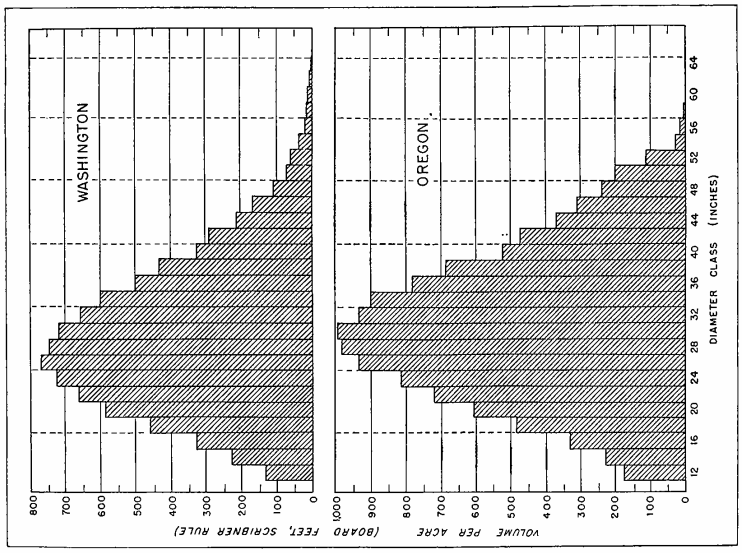

FIGURE 9.—*Distribution of saw-timber volume in the large ponderosa pine type (20), by diameter class.*

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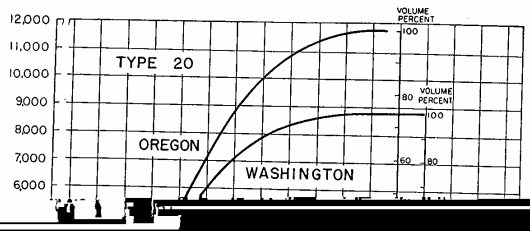

cade Range, where the summits are low, Douglas-fir forms a type resembling the forests of western Oregon and western Washington. The largest area of these stands is in the upper Yakima River drainage in Washington. Otherwise the Douglas-fir types have

TABLE 7.-
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TABLE 7.—*Area of immature conifer forest types [1] in the ponderosa pine region, on cut-over and other areas, by degree of stocking*

Degree of stocking and type of second growth	On cut-over areas	On uncut areas [2]	All areas
	1,000 acres	*1,000 acres*	*1,000 acres*
Good stocking:			
Ponderosa pine, large (21)	277.7	184.5	462.2
Ponderosa pine, small (22, 28)	404.2	80.2	484.4
Other conifer, large (9A, 19A)	5.0	75.5	80.5
Other conifer, small (9B, 10, 19B, 24, 28½, and 30)	86.6	464.4	551.0
Total	773.5	804.6	1,578.1
Medium stocking:			
Ponderosa pine, large (21)	433.7	153.6	587.3
Ponderosa pine, small (22, 28)	476.0	127.2	603.2
Other conifer, large (9A, 19A)	12.6	47.3	59.9

Range is more rugged. Very little land of this kind is privately owned. Of no value for timber production, it protects the headwaters of streams and has definite value for recreational use. The most beautiful roads and trails in the region are in the subalpine type (fig. 15).

Deforested Lands

Fortunately only a comparatively small portion of the land is deforested—only about 1 percent as a result of fire or cutting, and fire is the principal cause. Deforested burns, about equally divided between Oregon and Washington, are chiefly at

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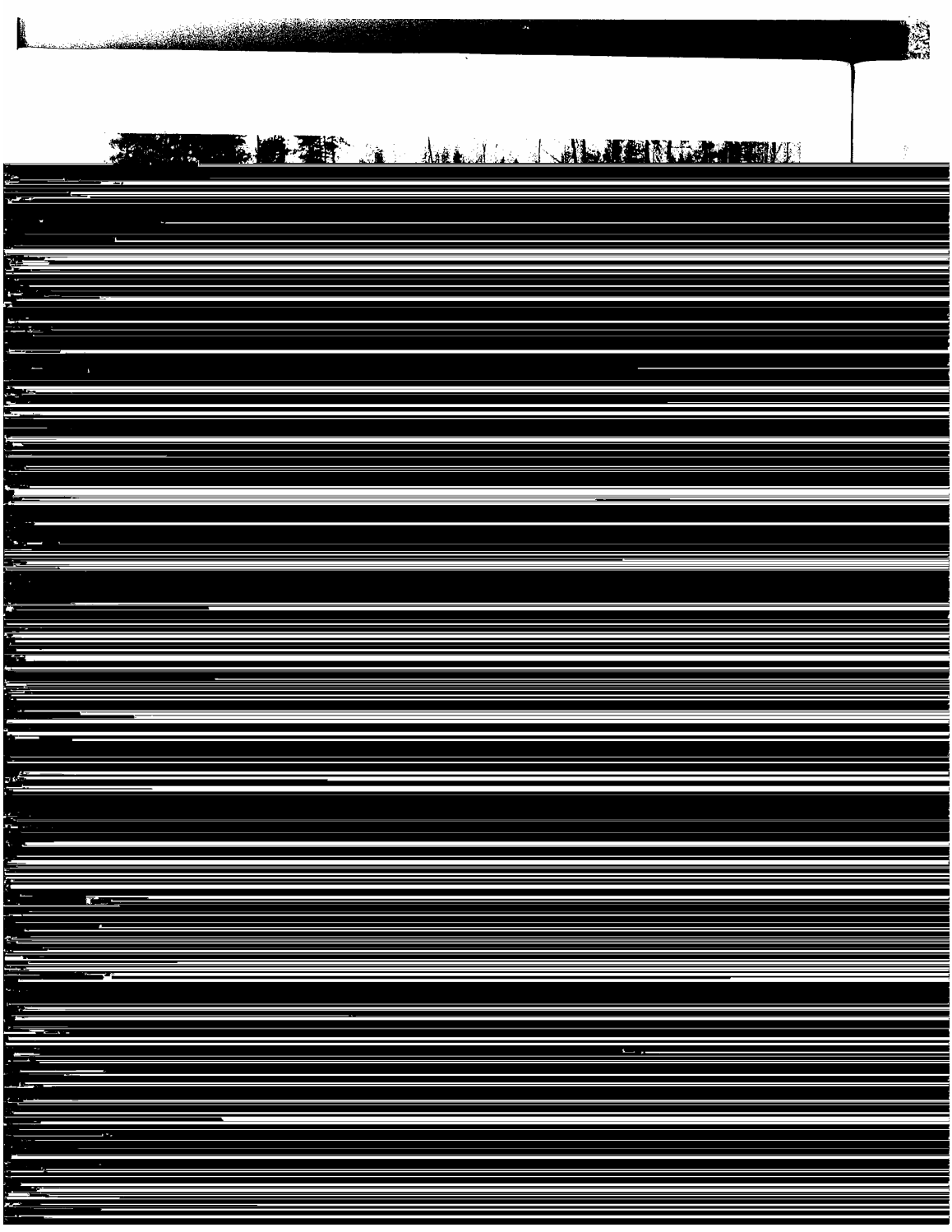

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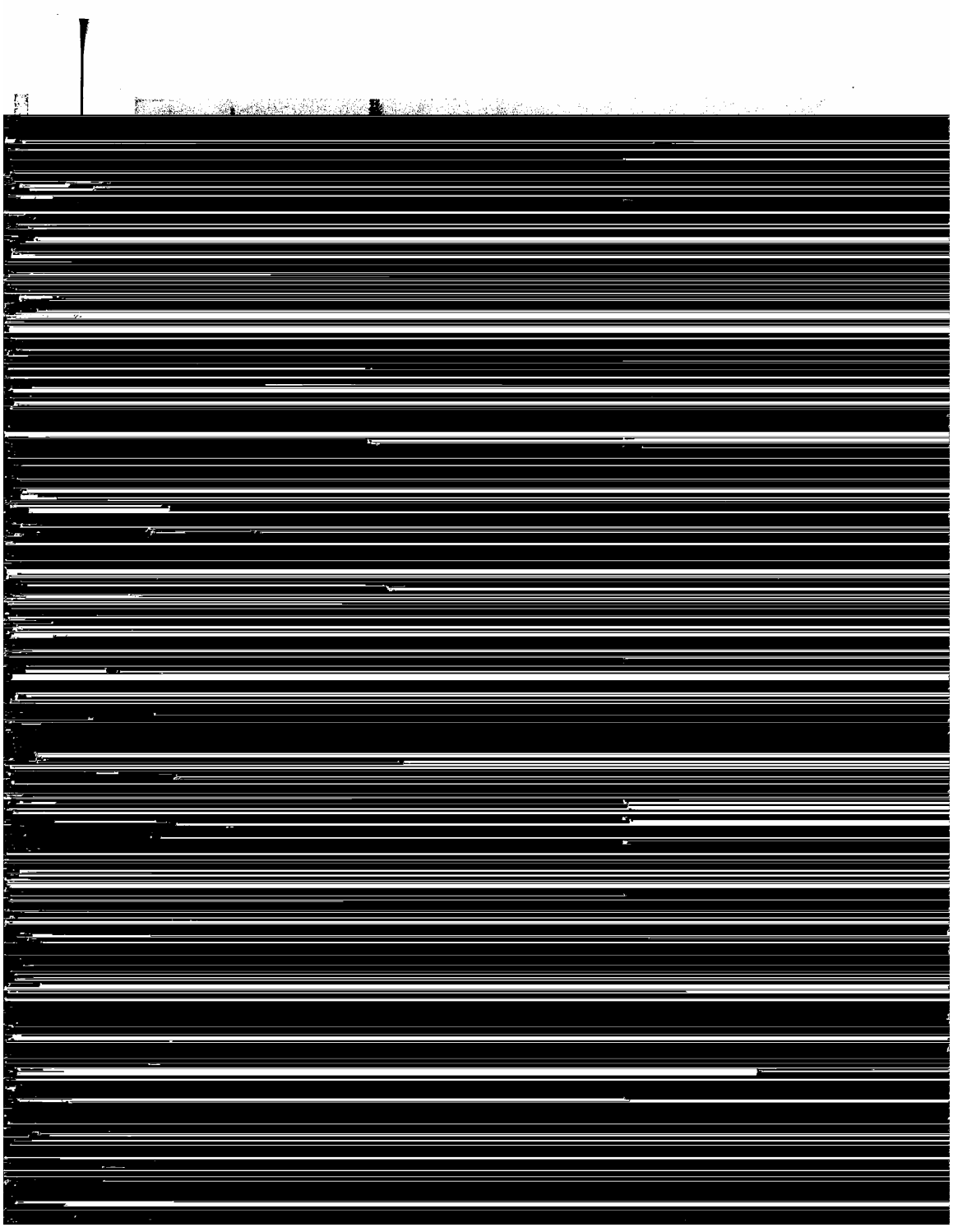

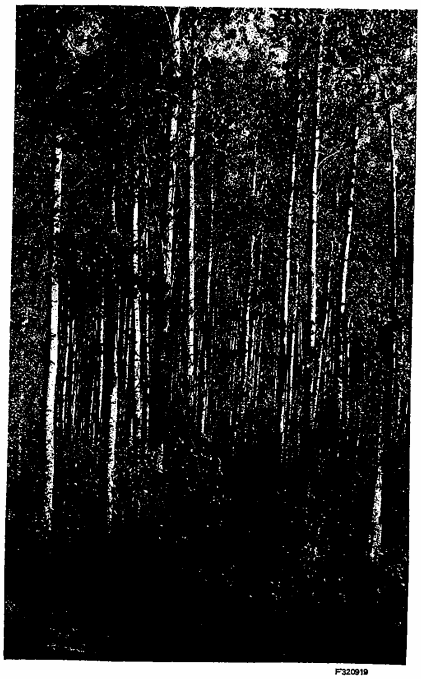

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FIGURE 17.—*A stand of aspen bordering the Sanpoil River in northeastern Washington. These trees range from 4 inches to 10 inches d. b. h.*

Nearly two-thirds of the total ponderosa pine land is site IV, which is the most common site class in every forested county. More than three-fourths of the remainder, however, is site V or VI.

More than two-thirds of the 712,000 acres of site III land is in Oregon, and half of it is in the Klamath unit. Most of the small area of site classes I and II is in Washington, on the east slope of the Cascade Range immediately north of the Columbia River. The small area of site II that occurs in Oregon is scattered along the east slope of the Cascade Range from Warm Springs Indian Reservation south to the California line.

Lands judged by the Douglas-fir site classification are decidedly substandard. There is no Douglas-fir site I land, very little site II, and comparatively little site III. The area of Douglas-fir site V land is nearly three times that of site V in all of western Oregon and western Washington where Douglas-fir is the predominant forest type.

Timber Volume

The determination of the extent and character of the region's timber stand was one of the most important parts of the forest survey. The resulting data can be used in analyzing the immediate supply of raw materials for the region's forest industries and for other markets.

TABLE 8.—*Land areas in the ponderosa pine region, forest-land areas, and commercial conifer areas, by site-quality class,*[1] *1936*

Kind of forest and site-quality class	Total land area		Area in forest land	Area in commercial conifers
	Acres	*Percent*	*Percent*	*Percent*
Commercial conifer:				
Ponderosa pine:				
Class I	480			
Class II	18,018	0.03	0.08	0.11
Class III	711,604	1.09	3.22	4.40
Class IV	7,849,633	11.99	35.54	48.55
Class V	3,193,731	4.88	14.46	19.76
Class VI	268,801	.41	1.22	1.66
Total	12,042,267	18.40	54.52	74.48
Douglas-fir:				
Class II	320			
Class III	117,400	.18	.53	.73
Class IV	971,641	1.48	4.40	6.01
Class V	3,036,152	4.64	13.75	18.78
Total	4,125,513	6.30	18.68	25.52
Total commercial conifer	16,167,780	24.70	73.20	100.00
Lodgepole pine	2,001,875	3.06	9.06	
Juniper and mountain mahogany	1,537,700	2.35	6.96	
Noncommercial rocky	1,039,005	1.58	4.71	
Subalpine	1,233,465	1.88	5.59	
Oak	66,380	.10	.30	
Hardwood	39,905	.07	.18	
Total other than commercial conifer	5,918,330	9.04	26.80	
All forest types	22,086,110	33.74	100.00	
Nonforest types	43,373,830	66.26		
Grand total	65,459,940	100.00		

[1] Deforested areas, types 35A, 35B, and 37, were classified as to site on the basis of original type; some lodgepole pine type areas were assigned ponderosa pine or Douglas-fir site qualities; and some deforested burns and insect-killed areas were included in the lodgepole pine, subalpine, western juniper, or noncommercial rocky areas.

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Saw-Timber Volume

The region's saw-timber volume, in millions of board feet, log scale, Scribner Decimal C rule, is given in table 9 and figure 18 by species and ownership and in table 10 by species and forest-survey unit. Table 11 summarizes saw-timber volume data on commercial forest land by broad type and ownership class.

Practically all of the total volume of 127.1 billion board feet is conifer. Eighteen conifer and 4 hardwood species were found of saw-timber size and quantity. Approximately 87.7 billion board feet occurs in Oregon and 39.4 billion board feet in Washington.

Ponderosa pine is the most widely distributed conifer in the United States. In saw-timber volume it ranks second in the country, exceeded only by Douglas-fir. In this region it is the preeminent timber species. The wood is moderately soft, light in weight, fine grained, and easily worked. Its excellent properties make it valuable for interior finish, sash and doors, and boxes. It is also used for sheathing, small dimension, and siding. Four-fifths of the 81.5 billion feet of ponderosa pine in the region is in Oregon. Approximately two-thirds of the total volume is publicly owned or managed, a situation almost the reverse of that in the Douglas-fir region where nearly two-thirds of the Douglas-fir volume (*7*), the most important species, is privately owned.

Douglas-fir is second in point of volume. As already noted, this species fails to attain the size or quality here that it does west of the Cascade Range, and consequently it is restricted in use to common boards, dimension, and small timbers, for which, however, it answers satisfactorily. Only in a few localities near low summits of the Cascade Range do Douglas-fir trees produce the highly prized fine-grained "yellow fir" typical of the west side of the summit. Approximately three-fifths of the Douglas fir volume in this region is in Washington.

Western larch volume totals 6.7 billion board

TABLE 9.—*Volume of timber, log scale, Scribner*

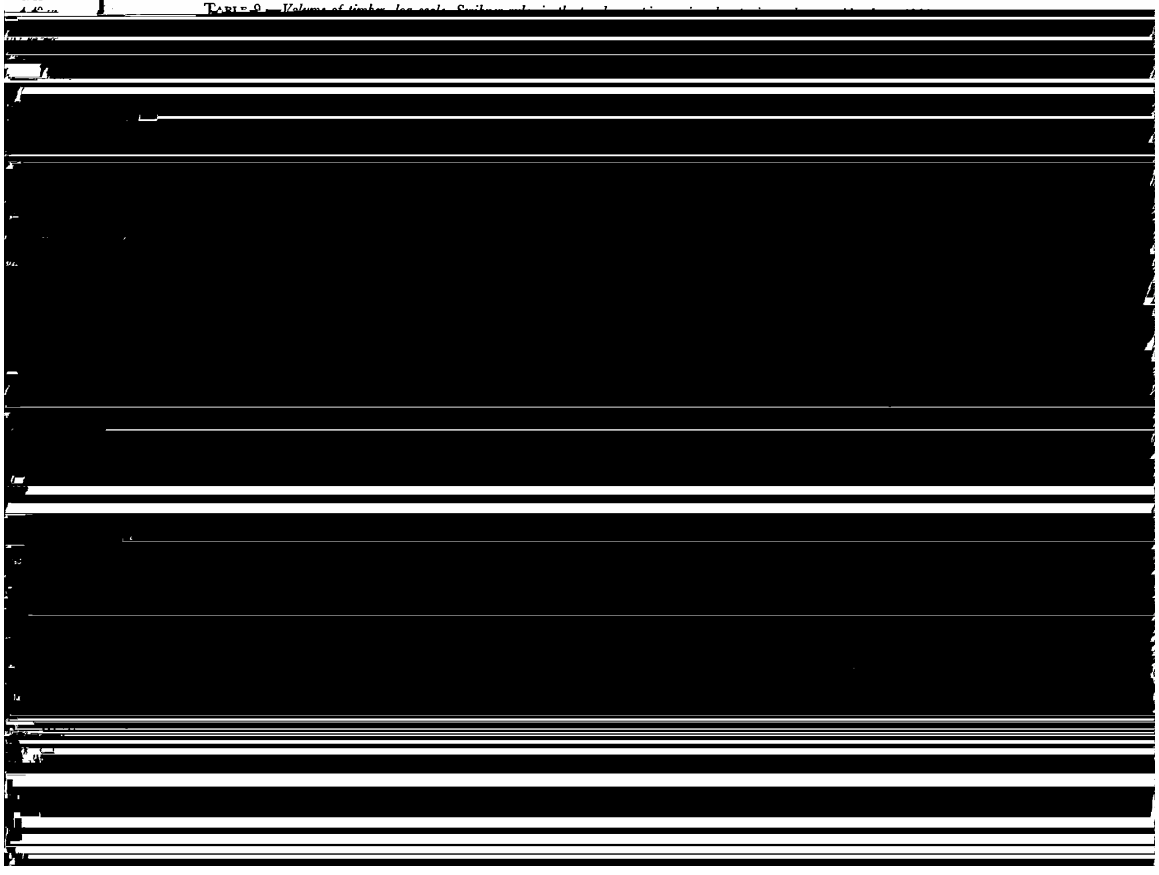

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TABLE 10.—*Volume of timber, log scale, Scribner rule, in the ponderosa pine region, by species and forest-survey unit, 1936*

[In million board feet—i. e., 000,000 omitted]

Species	Eastern Washington				Eastern Oregon					Region total
	Chelan-Colville	Yakima River	North Blue Mountain	Total	North Blue Mountain	Deschutes River	South Blue Mountain	Klamath Plateau	Total	
Ponderosa pine[illegible]	8 207 0	7 [illegible] 0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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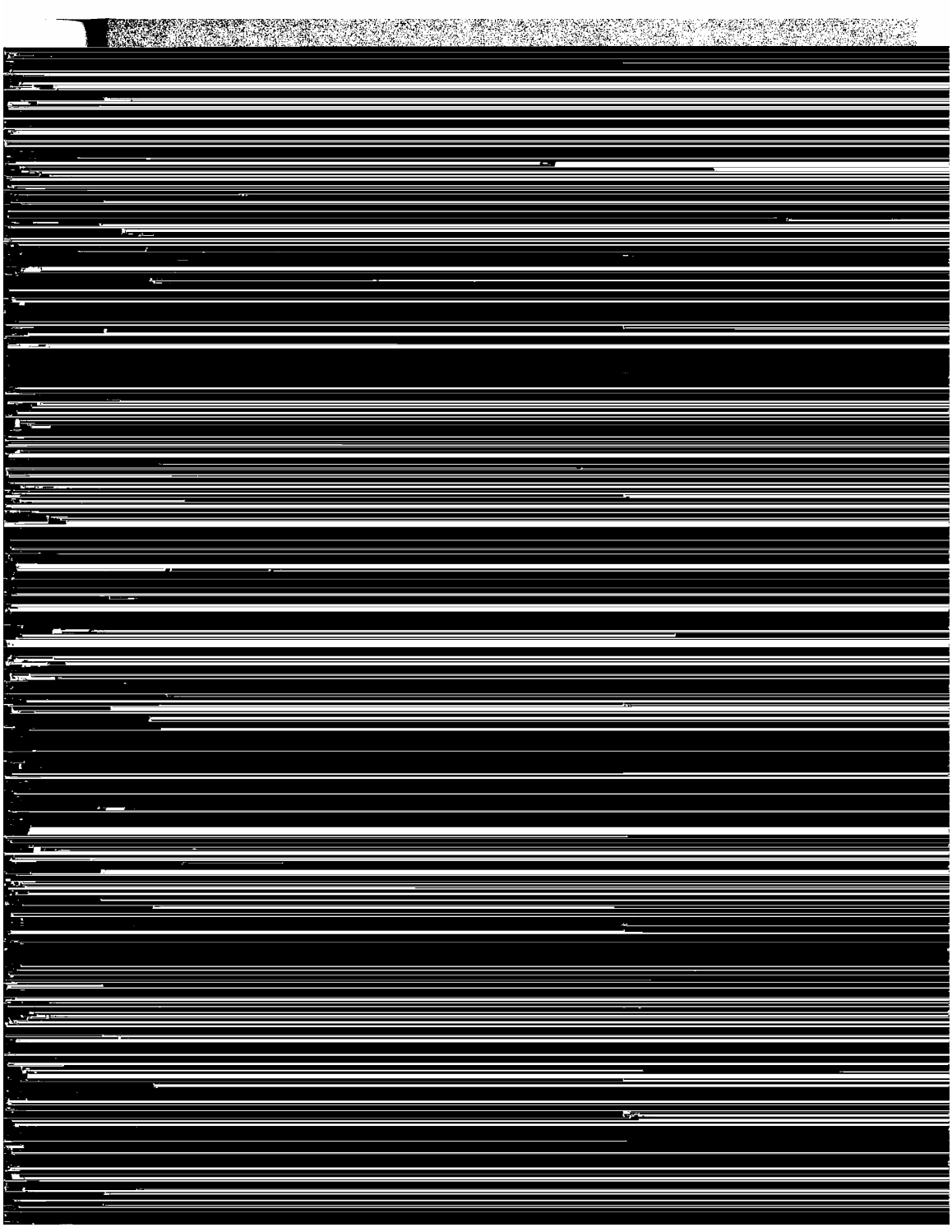

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TABLE 12.—*Cubic volume of timber,*[1] *in the ponderosa pine region, by species and ownership class, 1936*

[In million cubic feet—i. e., 000,000 omitted]

Specie	Private	State	County	Municipal	Federally owned or managed							Total
					Indian	Revested land grants	Public domain: Available for cutting	Public domain: Railroad selection pending	Reserved from cutting [2]	National forest: Available for cutting	National forest: Reserved from cutting	
Ponderosa pine	5,362.2	321.2	76.6	1.5	2,939.9	27.6	154.8	67.5	32.0	6,932.2	54.3	15,969.8
Sugar pine	74.0	1.1	(3)	.....	34.8	6.6	.1	.....	.2	25.2	.1	142.1
Western white pine	21.5	2.1	.1	(3)	14.4	1.8	.1	8.9	1.8	152.3	15.7	218.7
Lodgepole pine	278.4	65.3	9.6	.4	148.2	1.8	31.2	7.9	29.5	1,447.0	125.5	2,144.8
Douglas-fir	1,248.1	185.4	49.5	1.7	553.8	13.0	40.5	68.1	1.0	2,752.4	103.6	5,017.1
Western redcedar	16.1	1.6	.2	.....	6.0	.....	.2	5.4	.....	48.1	4.4	82.0
Alaska yellow-cedar	.3	(3)	.....	.....	.4	.....	.....	.6	.....	7.3	.9	9.5
California incense-cedar	31.5	.3	.1	.....	12.8	.3	.2	.....	.1	13.7	.2	59.2
Western hemlock	68.5	2.2	.2	.....	6.3	.....	.3	14.6	.9	164.8	16.6	274.4
Mountain hemlock	19.6	.8	(3)	.....	53.5	.4	(3)	21.7	35.2	417.3	47.7	596.2
White and grand fir	600.4	26.1	10.0	1.3	195.9	12.3	8.5	18.9	6.8	1,366.2	44.8	2,291.2
Noble and Shasta red fir	18.3	.4	.3	.....	12.1	15.5	.9	1.3	41.7	165.8	26.6	282.9
Pacific silver fir	80.8	2.0	.1	.....	1.3	.....	.1	46.6	.....	367.6	57.7	556.2
Alpine fir	15.0	1.9	.1	.2	28.0	.....	(3)	6.9	.....	136.0	34.3	222.4

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Considerably more than half the national-forest timber available for cutting is ponderosa pine. This timber is practically all economically available, that is, operable from the standpoints both of accessibility and quality.

Other Federal Ownership

This group includes unappropriated public domain, Federal lands designated for selection as rail-

very little cutting on the Warm Springs and Yakima Reservations and only moderate cutting on the Colville Reservation.

State Ownership

The total volume of State-owned saw timber is 2.7 billion board feet, practically all of which is in Washington. A little more than half of this is

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Forest Depletion

DEPLETION involves the drain caused by cutting, forest insects, fires, disease, and wind throw. The rate of drain was determined separately for ponderosa pine and for all other species combined. Determination of depletion of ponderosa pine on account of cutting, fire, and insects was based on past records covering a recent and representative period. For depletion due to disease and wind throw, since no reliable records were available, rates were estimated. For species other than ponderosa pine, records of cutting and fire depletion were available, but insect, disease, and wind-throw depletion had to be estimated for these other species.

Cutting Depletion

From the beginning of settlement by white men, cutting of the forests has kept pace with the economic growth of the region; the forests furnished building material, fuel wood, fence posts and rails for domestic development, later ties and timber for the construction of railroads, and finally sawlogs for a huge lumber industry.

Detailed statistics for the years prior to 1925 are not available, but Bureau of the Census records of ponderosa pine lumber production in Oregon and Washington from 1899 to 1924, together with Forest Service estimates for the 3 preceding decades;

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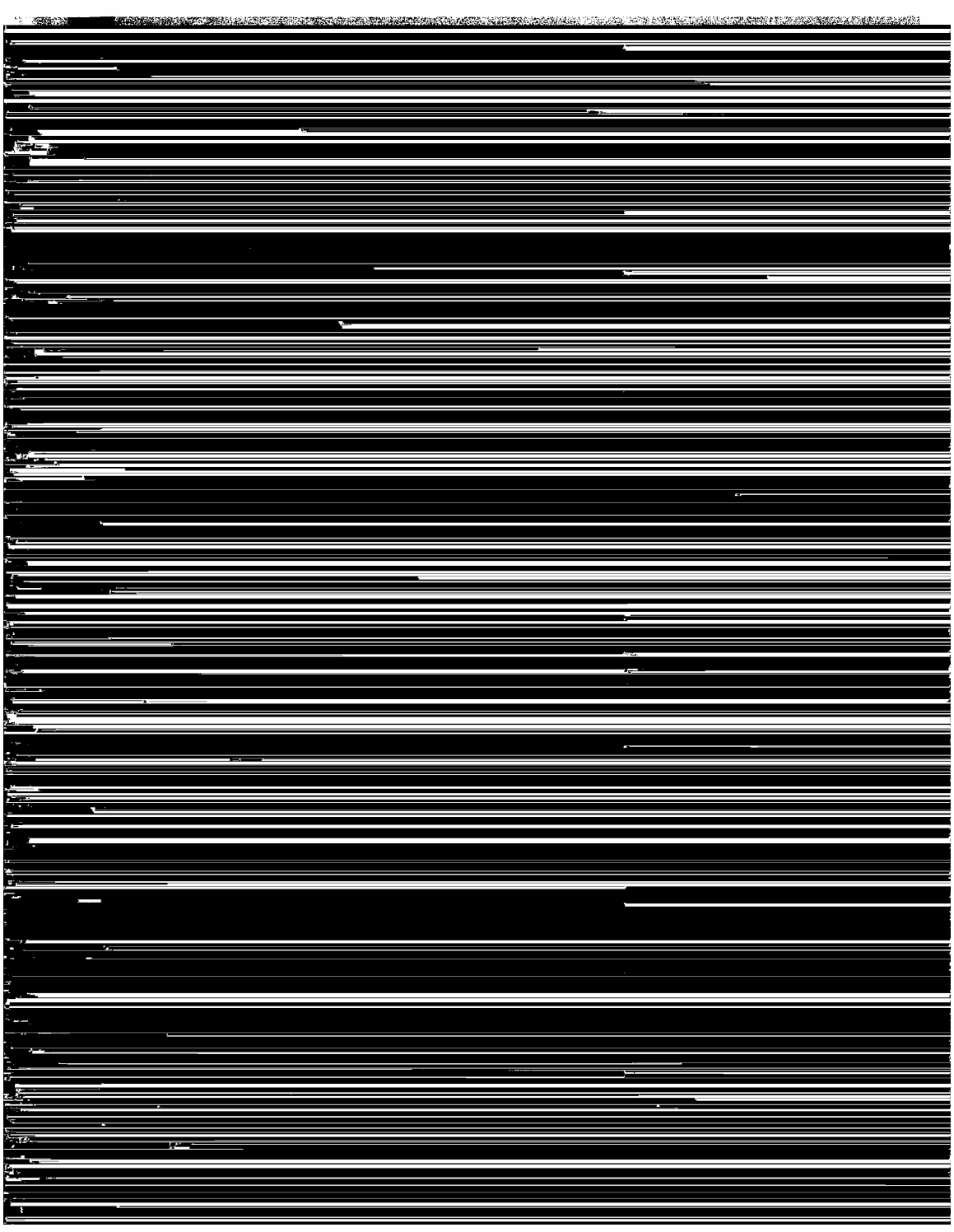

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owing to the beginning of a large operation in Grant County in 1929.

In general the cut in the three Washington units varied little from the regional trend except that in none was recovery from the 1932 low as rapid as in the Oregon units and in none was the 1929 volume again reached.

rately. Average annual production for the period was based on a study of minor forest products made in 1930 by H. M. Johnson and an estimated annual per capita consumption of live forest fuel wood for both urban and rural areas. Per capita consumption was higher in the rural districts than in urban

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TABLE 16.—*Production of round and split fence posts in the ponderosa pine region by State, forest-survey unit, and species*

Forest-survey unit	From trees of saw-timber size[1]							From smaller trees		
	Western redcedar	Western larch	Douglas-fir	Ponderosa pine	California incense-cedar	Others	Total	Lodgepole pine	Sierra juniper	Total
	M board feet	*M board feet*	*M board feet*	*M board feet*	*M board feet*	*M board feet*	*M board feet*	*M cubic feet*	*M cubic feet*	*M cubic feet*
Eastern Washington:										
Chelan-Colville	1,503	1,170	334	100	----------	67	3,174	36	----------	36
Yakima River	954	700	255	64	----------	21	1,994	27	----------	27
North Blue Mountain	----------	1,221	610	610	----------	61	2,502	119	----------	119
Total	2,457	3,091	1,199	774	----------	149	7,670	182	----------	182
Eastern Oregon:										
North Blue Mountain	----------	996	569	569	----------	142	2,276	92	31	123
Deschutes River	131	164	164	246	----------	33	738	35	159	194
South Blue Mountain	----------	1,037	314	314	----------	63	1,728	68	238	306

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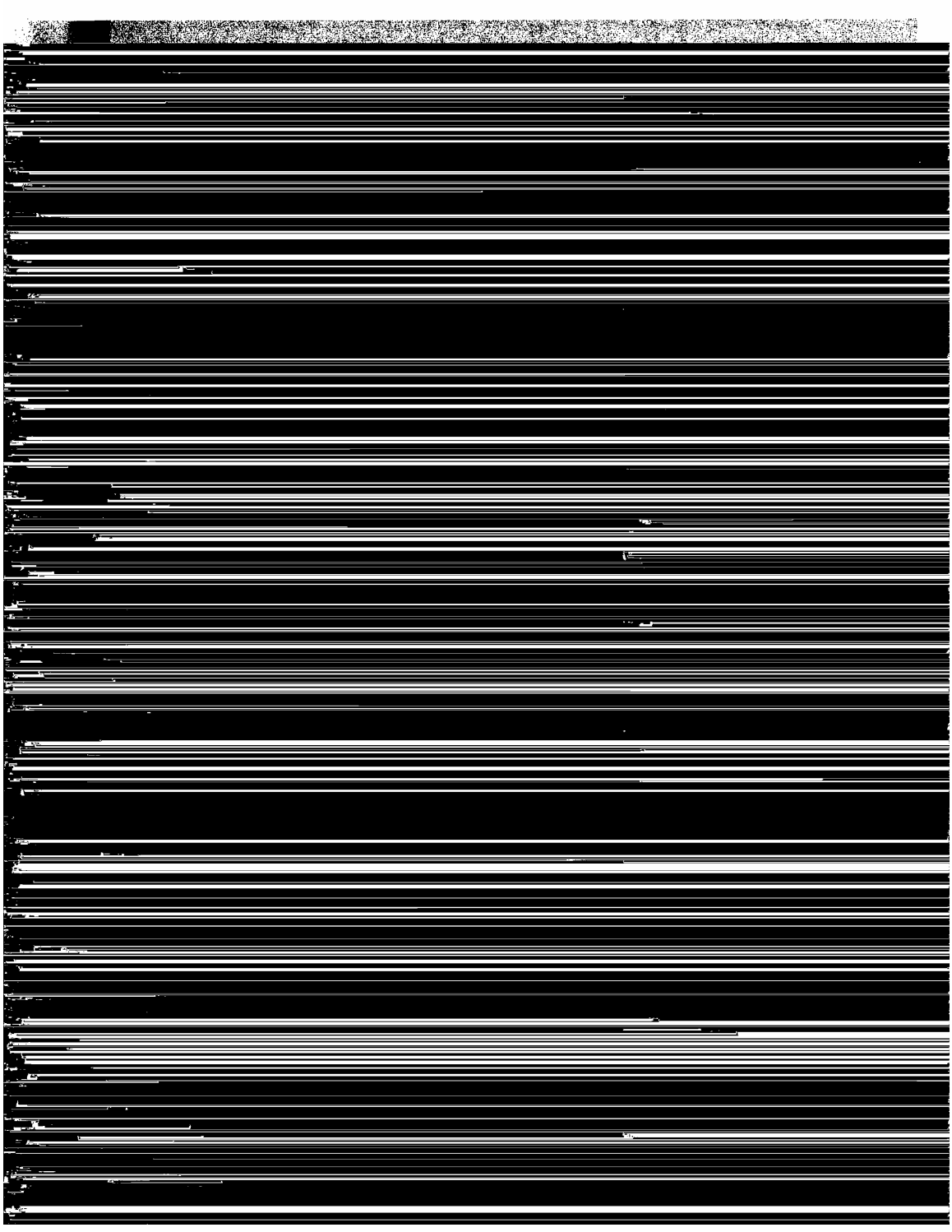

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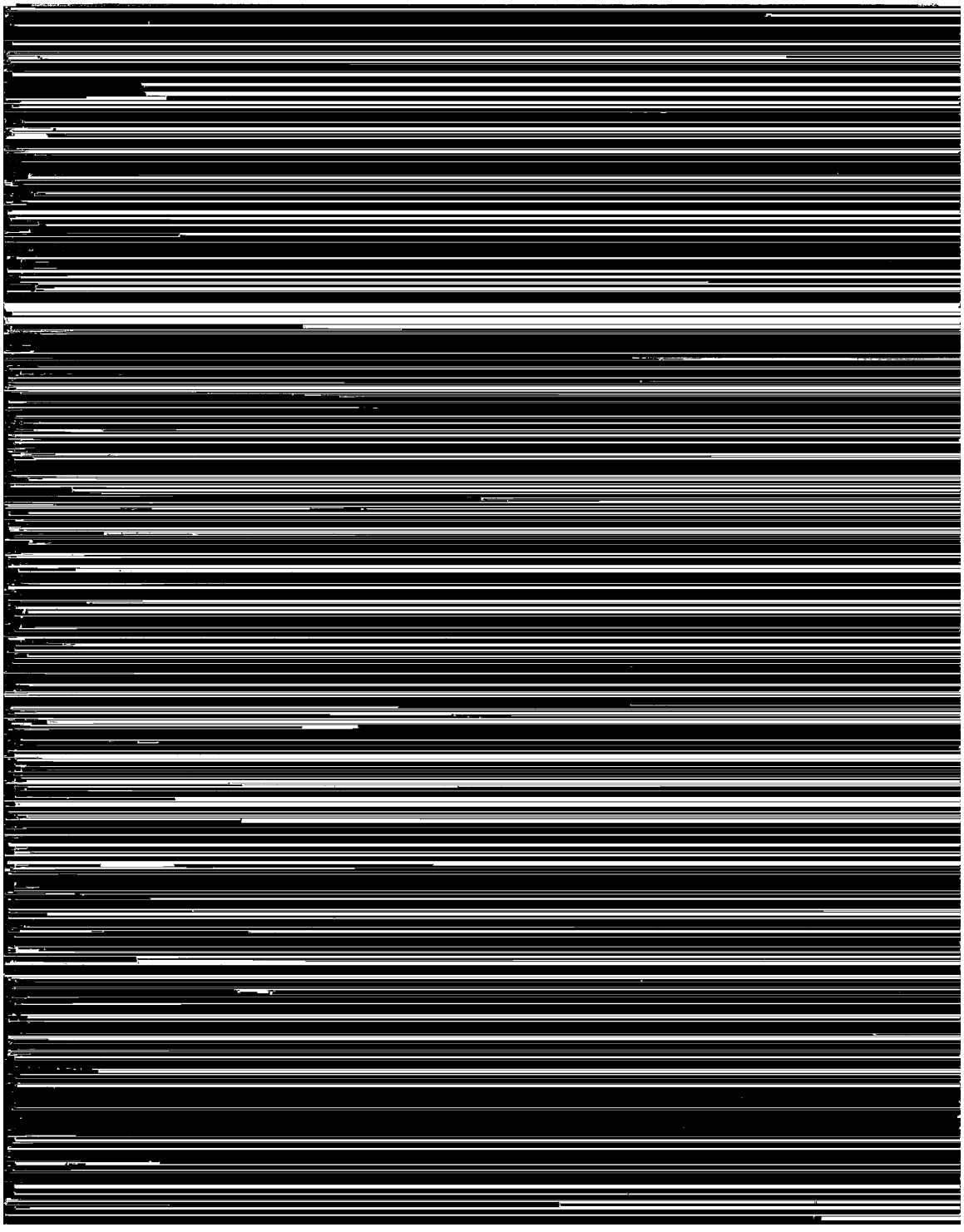

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species other than ponderosa pine was grouped with the losses caused by disease and wind throw and an annual loss rate of 0.75 percent of the total stand of these species was estimated, or 342 million board feet.

Fire Depletion

Although fire causes a much smaller loss of saw timber than does cutting or insects, it is nevertheless an important agency. Unlike cutting depletion, the total loss from fire cannot be measured in board or cubic feet. The outright killing of trees of saw-timber size is only a portion of the loss; often the greater part is in timber defective because of fire scars, the destruction of immature stands or reduction in their stocking, and material losses in the productivity of the forest soils.

The study of fire depletion was based on fires that occurred during the 12-year period, 1924–35. From data obtained from these fires were computed average annual gross area covered by fire, the area deforested, the net loss of saw-timber volume in board feet (table 18), and loss in trees 5.1 inches d. b. h. and larger in cubic feet (table 19). Detailed fire-depletion data by type and unit are given in supplemental tables in the appendix.

National Forests

The average of 36,000 acres of national-forest land covered by fire annually during the 12-year period amounted to 0.33 percent of the total, but considerably less than half of this was deforested. Of the area deforested, approximately 40 percent was occupied by noncommercial types, 35 percent by saw-timber stands, and 25 percent by second-growth conifer stands. Less than a third of the burned area of saw timber was classed as deforested, in contrast to more than half of the area of other types in this class. The noncommercial group of types includes the lodgepole pine types which are highly inflammable (fig. 22), usually

TABLE 18.—*Estimated annual average gross forest-land area covered by fire, area deforested, and saw-timber volume (log scale) lost, ponderosa pine region, 1924-35*

Ownership and forest-type groups	Area of burns	Deforested area	Saw-timber volume loss
National forest:			
Conifer saw timber (5½, 20, 20½, 20A, 20B, 21, 27, 6, 7, 8, 9A, 23, 27½, and 29)	*Acres* 16,676	*Acres* 5,334	*M board feet* 46,002
Conifer second growth (22, 28, 10, 9B, 24, 28½, and 30)	5,307	3,859	31
Noncommercial (4, 5, 25, 26, 33, and 38)	13,654	6,111	402
Old cut-over areas, nonrestocked, and previously deforested burns (35A and 37)	77	------	------
Hardwood timber (31½ and 31)	6	------	------
Total	35,720	15,304	46,435
Other ownerships:			
Conifer saw timber (5½, 20, 20½, 20A, 20B, 21, 27, 6, 7, 8, 9A, 23, 27½, and 29)	31,876	14,955	39,528
Conifer second growth (22, 28, 10, 9B, 24, 28½, and 30)	11,737	5,634	627
Noncommercial (4, 5, 25, 26, 33, and 38)	5,144	1,140	99
Old cut-over areas, nonrestocked, and previously deforested burns (35A and 37)	981	------	------
Hardwood timber (31½ and 31)	13	------	------
Total	49,751	21,729	40,254
All ownerships:			
Conifer saw timber (5½, 20, 20½, 20A, 20B, 21, 27, 6, 7, 8, 9A, 23, 27½, and 29)	48,552	20,289	85,530
Conifer second growth (22, 28, 10, 9B, 24, 28½, and 30)	17,044	9,493	658
Noncommercial (4, 5, 25, 26, 33, and 38)	18,798	7,251	501
Old cut-over areas, nonrestocked, and previously deforested burns (35A and 37)	1,058	------	------
Hardwood timber (31½ and 31)	19	------	------
Total	85,471	37,033	86,689

The 46 million board feet of saw timber killed by fire and not salvaged was only 0.07 percent of the total volume of the national-forest saw timber. Approximately 45 percent was ponderosa pine. Timber salvaged annually averaged only 370 M board feet, practically all ponderosa pine.

Other Lands

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TABLE 19.—*Summary of total average annual depletion, in saw timber and in all stands by State and forest-survey unit, depletion agency, and species group*

STANDS OF SAW-TIMBER SIZE (IN MILLION BOARD FEET)

State and unit	Cutting			Fire			Other [1]			Total		
	Ponderosa pine	Other species	Total	Ponderosa pine	Other species	Total	Ponderosa pine [2]	Other species [3]	Total	Ponderosa pine	Other species	Total
Eastern Washington:												
Chelan-Colville	125.8	35.2	161.0	14.7	34.6	49.3	54.2	83.1	137.3	194.7	152.9	347.6
Yakima River	97.1	48.6	145.7	.9	5.1	6.0	85.5	87.2	172.7	183.5	140.9	324.4
North Blue Mountain	13.1	7.7	20.8	.1	.....	.1	2.4	4.9	7.3	15.6	12.6	28.2
Total	236.0	91.5	327.5	15.7	39.7	55.4	142.1	175.2	317.3	393.8	306.4	700.2
Eastern Oregon:												
North Blue Mountain	90.7	22.5	113.2	.5	.3	.8	41.0	43.8	84.8	132.2	66.6	198.8
Deschutes River	251.8	4.5	256.3	9.2	1.7	10.9	188.7	40.6	229.3	449.7	46.8	496.5
South Blue Mountain	126.3	6.7	133.0	5.8	.8	6.6	203.8	32.8	236.6	335.9	40.3	376.2
Klamath Plateau	410.5	18.8	429.3	10.3	2.7	13.0	322.4	49.6	372.0	743.2	71.1	814.3
Total	879.3	52.5	931.8	25.8	5.5	31.3	755.9	166.8	922.7	1,661.0	224.8	1,885.8
Region total	1,115.3	144.0	1,259.3	41.5	45.2	86.7	898.0	342.0	1,240.0	2,054.8	531.2	2,586.0

ALL STANDS [4] (IN MILLION CUBIC FEET)

Eastern Washington:												
Chelan-Colville	22.5	7.1	29.6	3.0	22.9	25.9	10.2	24.3	34.5	35.7	54.3	90.0
Yakima River	17.3	9.3	26.6	.2	1.7	1.9	15.9	20.5	36.4	33.4	31.5	64.9
North Blue Mountain	2.3	1.7	4.0	.....	.....	.....	.5	1.7	2.2	2.8	3.4	6.2
Total	42.1	18.1	60.2	3.2	24.6	27.8	26.6	46.5	73.1	71.9	89.2	161.1

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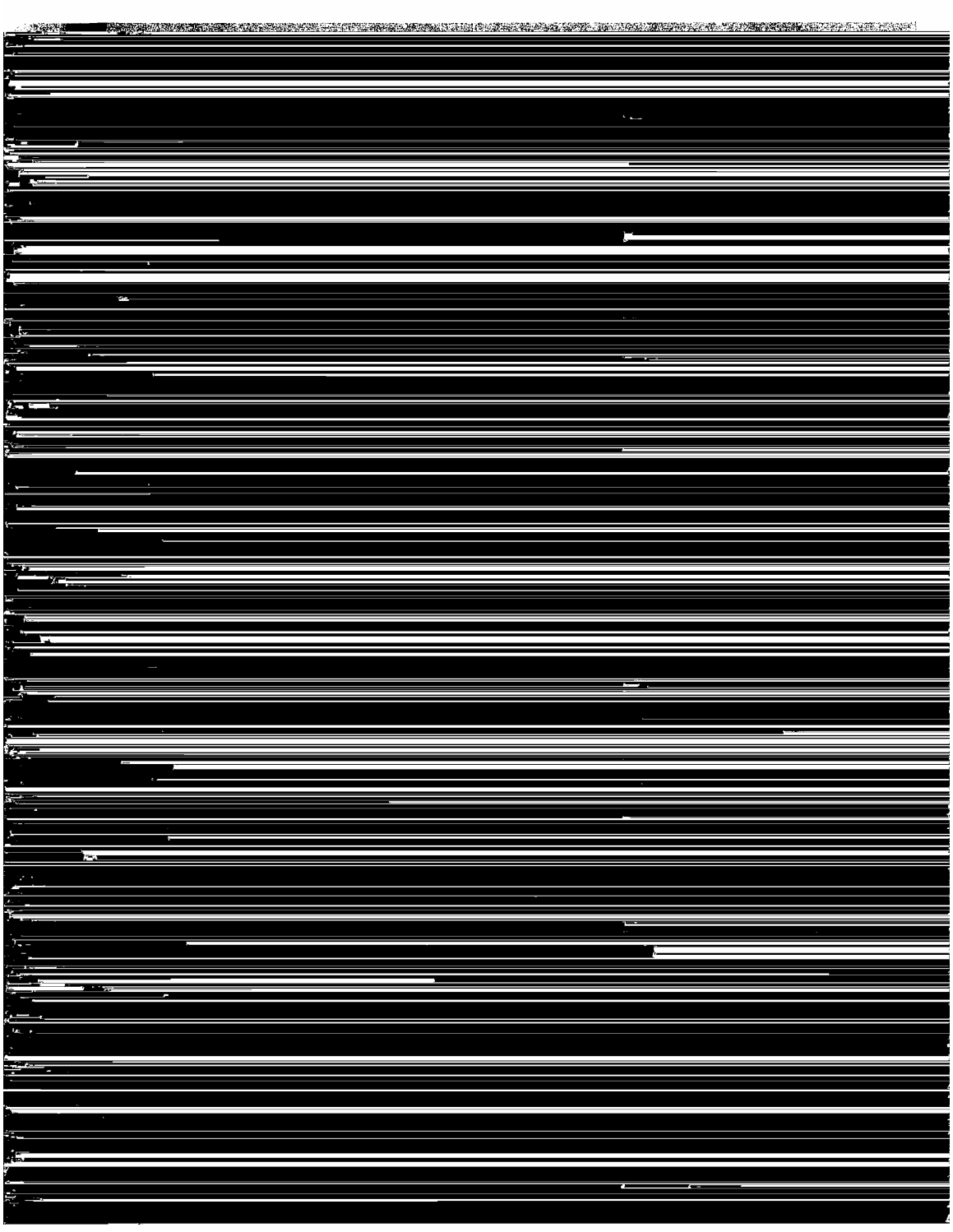

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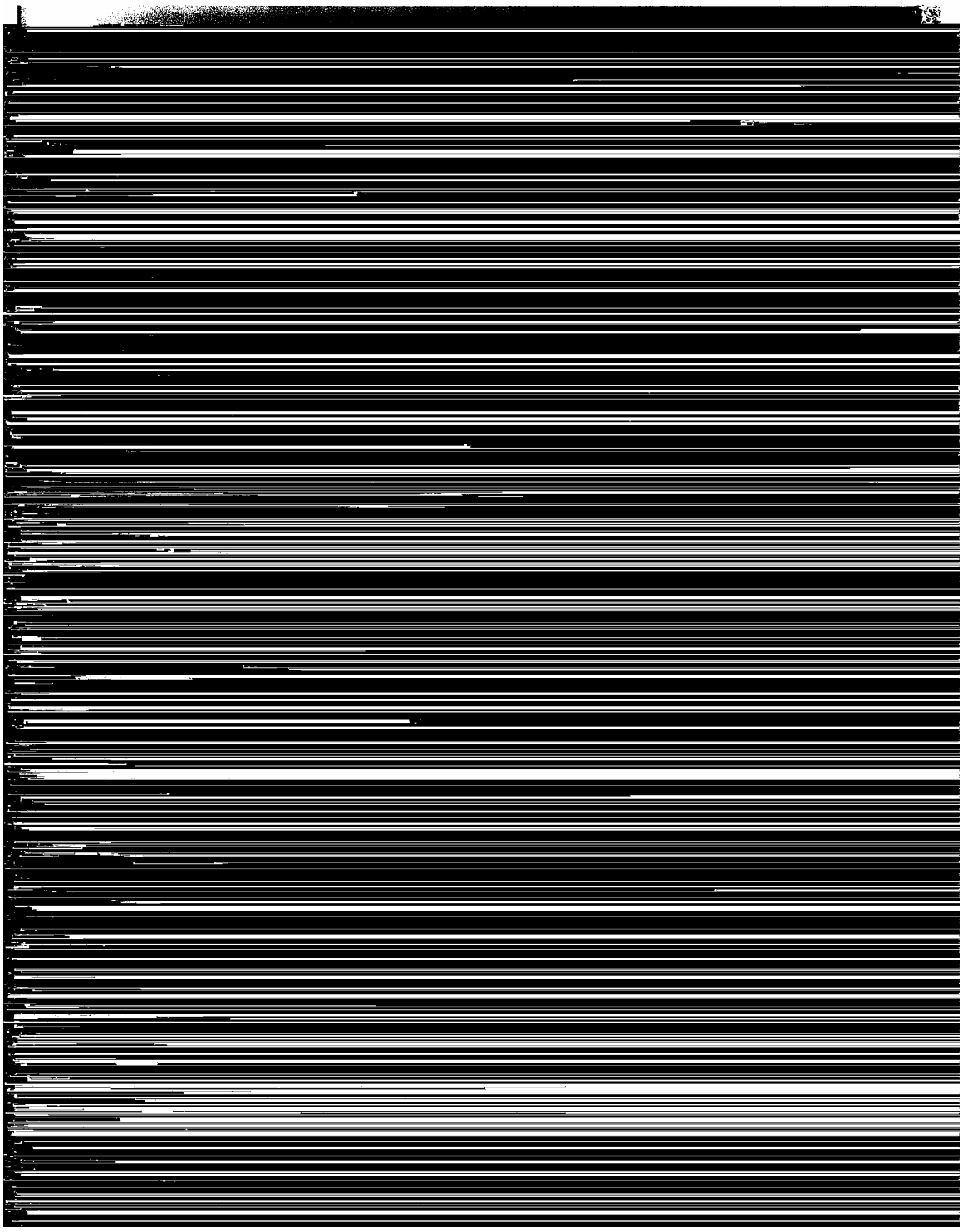

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Forest Growth

IN a region such as this with extensive areas of unmanaged, mature forests, the forest capital is constantly being depleted by human and natural agencies, at the same time that it is replenished to an extent by growth. Growth and depletion are characteristically out of balance

normal yield tables,[5] those for uneven-aged stands from the growth charts for selectively cut forests (*11*). For the virgin saw-timber types growth rates were derived from 323 samples taken throughout the region and analyzed especially for this study, as detailed in the appendix, p. 91. Rates for the

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sions drawn from this simple comparison are likely to be misleading unless they are modified by analysis of existing growing stock and prevailing forest practices.

Sites occupied by commercial forest stands total

TABLE 21.—*Current annual growth* [1] *ponderosa pine region, 1936*
MATURE STANDS [2]

State and unit	Area	Cubic-foot growth	Board-foot growth

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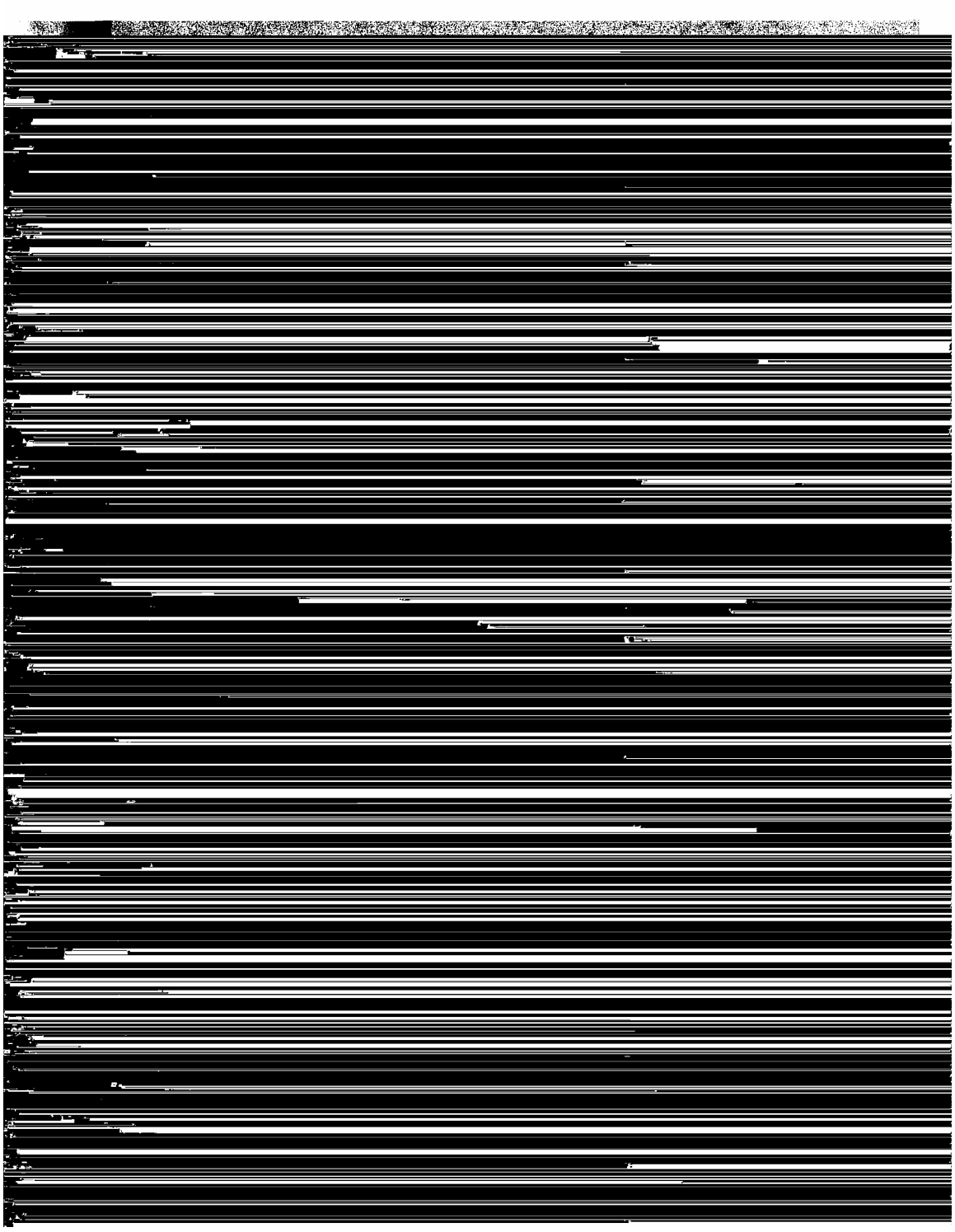

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cent) on lands of other ownerships; (3) virtual clear cutting (95 percent of virgin stand per acre) on private lands and heavy selection cutting (75 percent) on lands of other ownerships. The third class of cutting practice approximates that which has prevailed prior to the date of the survey; the current trend is toward lighter cutting. In each instance it was assumed that the portion of the stand removed would be the slowest growing of the

tion cutting of the same total volume in the pine stands, the estimated net growth for the region as of 1966 would reach 900 million board feet, an increase in growth 72 percent greater than that anticipated under continuation of past practice. Under heavy selection on private lands and light selection on all other, a net annual growth of 815 million board feet could be attained by the year 1966.

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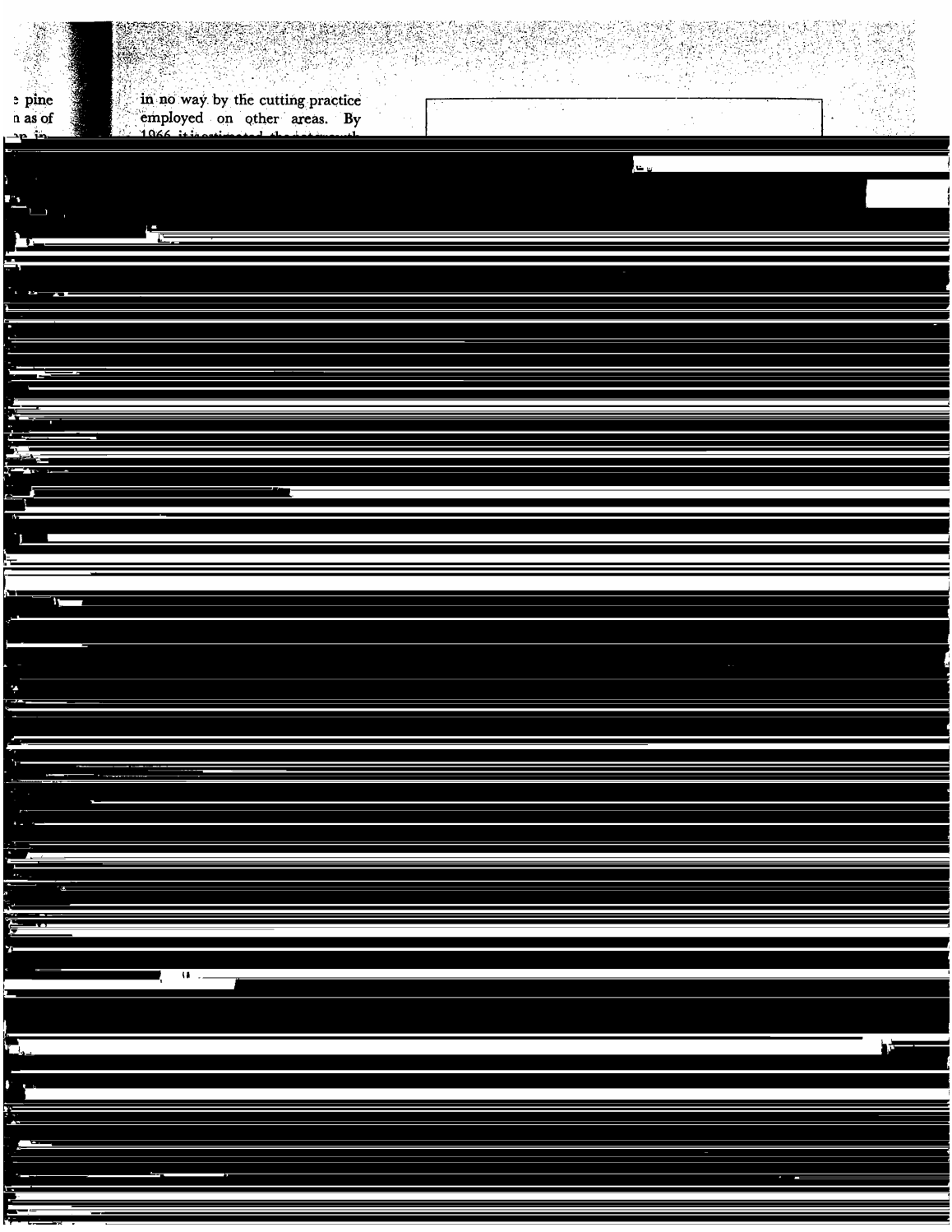

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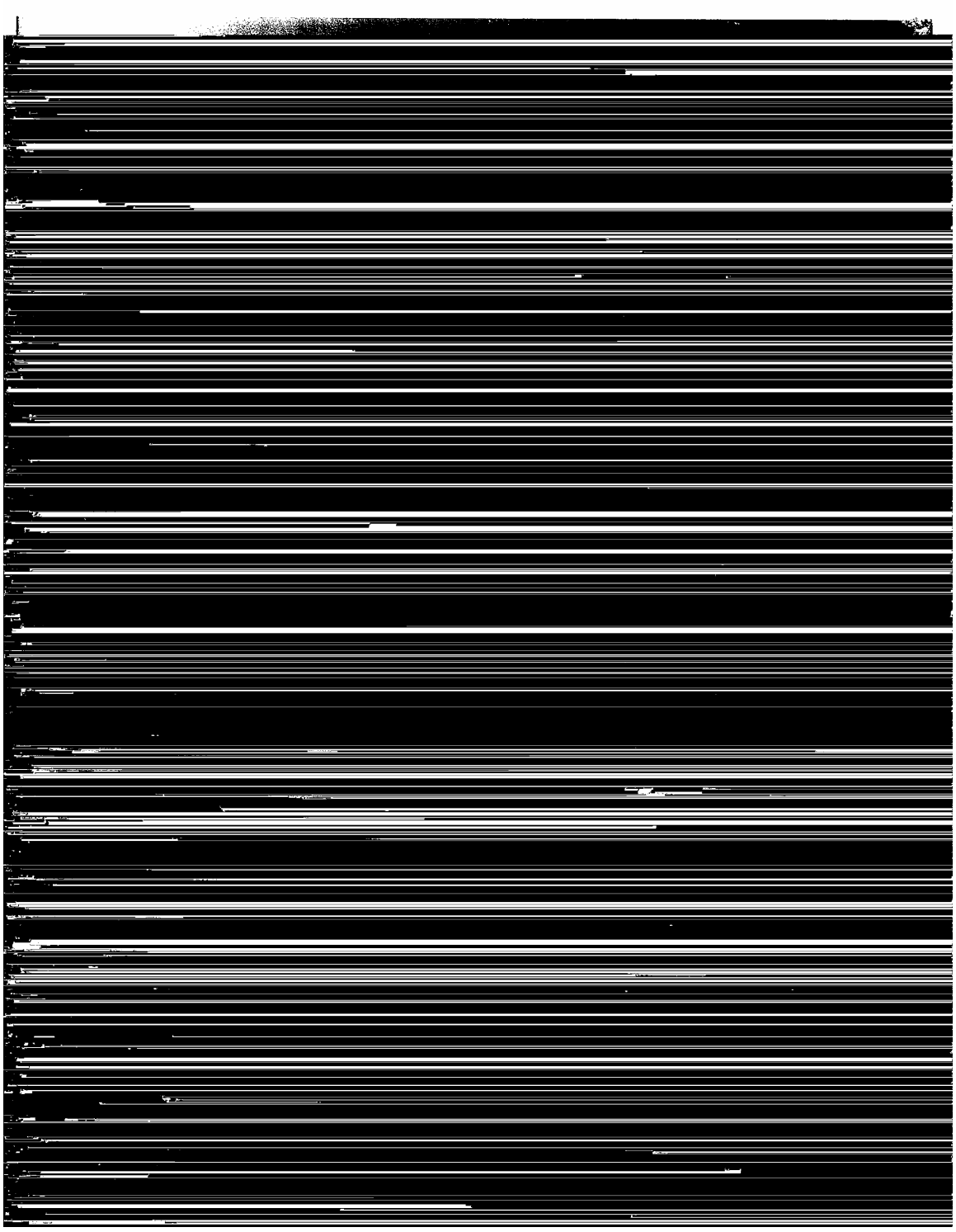

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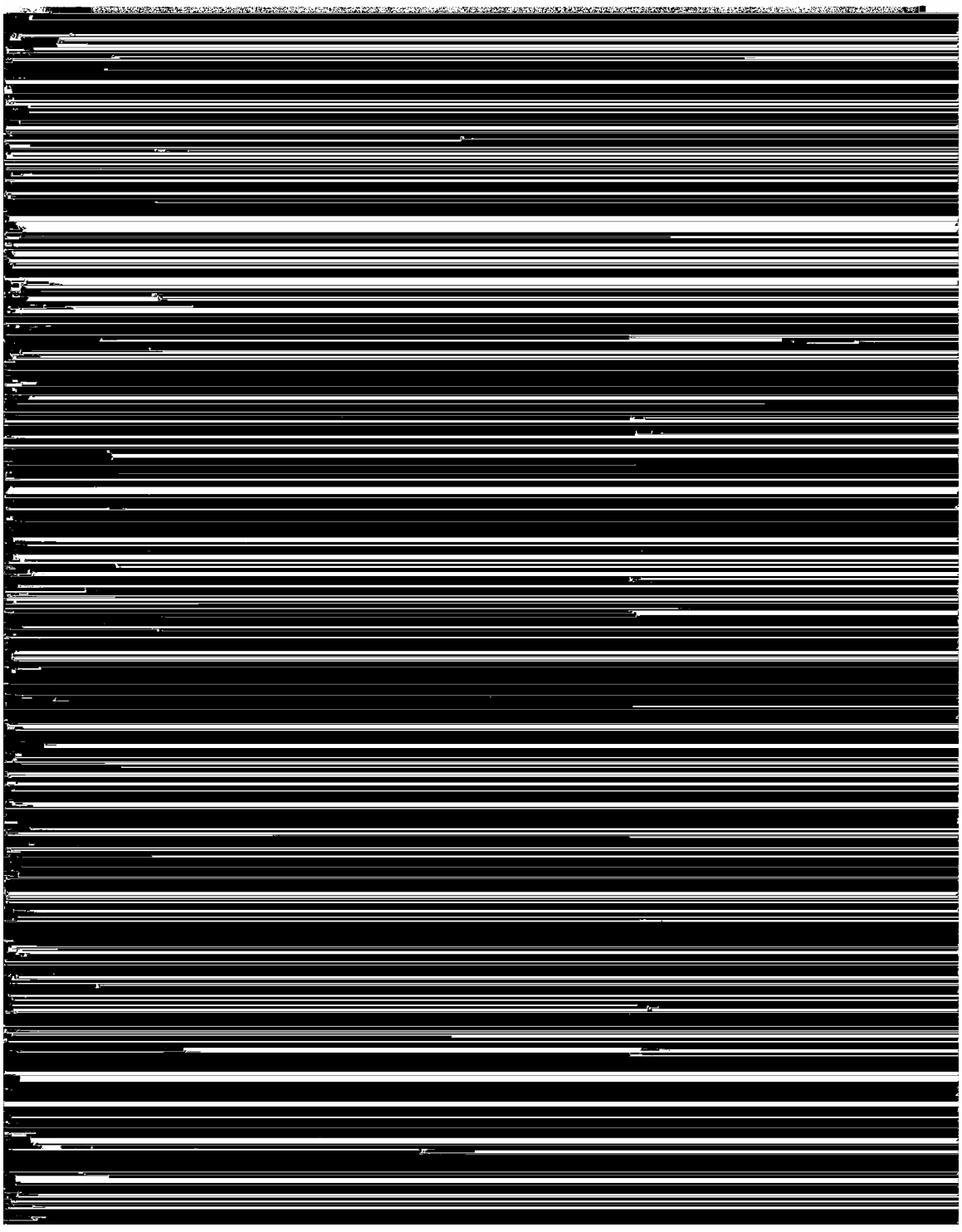

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every unit, but the discrepancy in cubic-foot growth is relatively small. Cubic-foot increment is progressing at a comparatively satisfactory rate in the existing immature stands, particularly in the Deschutes River and in the three Blue Mountain units. The deficiency of board-measure growth so pronounced in every unit is additional evidence of the low quality of current increment. The situation is due largely to the dearth of saw-timber-size growing stock in the immature stands.

As cutting continues to convert virgin to growing stands, and as the existing immature stands increase in age, board measure growth will increase substantially without change in forestry practice, but the quality of such growth will be low for many decades. Growth can be further increased in volume, and also materially in value, only by improved cutting practices.

Comparison of Growth and Drain

The Current Situation

Normal regional mortality depletion [7]—principally from insect, windfall, and disease loss—added to the average depletion from cutting and fire during the recent past (table 27)—1,259 million board feet for cutting and 87 million board feet for fire—gives a total depletion figure of 2,272 million board feet, or twice the gross annual growth. The region's saw-timber stand is thus being reduced by 1,127 million board feet annually. If, however, comparison is made directly between that portion of the total growth which is currently effective, i. e., between net growth and cutting depletion plus fire loss, the ratio of saw-timber drain to growth is about 6 to 1.

On the same basis but in terms of cubic feet, current gross growth is 73 percent of gross depletion. Current net cubic-foot growth is 52 percent of net cubic-foot depletion, and (table 27) the regional cubic-foot volume of wood is being currently reduced by approximately 126 million cubic feet annually.

The annual net reduction in timber volume in the region amounts to 0.9 percent of the saw-timber stand, but to only 0.4 percent of total cubic volume. The disparity between these percentages is further evidence that net growth is occurring principally on small trees of low quality while larger, more valuable trees are being harvested in logging and killed by insects. Net saw-timber growth is exceeded by depletion from cutting and fire in every unit in the region and net cubic-volume growth in all but the North Blue Mountain units. Growth in these units also is substantially exceeded by depletion on a value basis.

Fortunately, as already implied, the region's timber budget is not out of balance to the extent indicated by these direct comparisons of growth and depletion. The large excess of depletion over growth is partly explained by the fact that three-quarters of the region's commercial forest land is still covered with virgin stands that are considered as making no net growth, although they contain a large saw-timber supply and the land they occupy possesses a substantial growth capacity. Because of this, the regional cut may exceed growth for several decades without damage; in fact, if such cut is confined to the most mature or decadent trees, the eventuality of greatly increasing net growth can be highly favorable; the extent and rate of increase and the quality are all directly dependent upon the character of forestry practice that will prevail. In the region's principal sawmill centers, however, even the best of forestry measures cannot increase net growth to equal the current overcutting.

Comparison of Potential Growth and Depletion

Total potential saw-timber growth exceeds recent regional depletion from cutting and fire by about 51 percent. The productive capacity of the ponderosa pine sites alone is about 5 percent greater than recent saw-timber depletion. In terms of cubic volume, however, the growth capacity of the ponderosa pine sites is only 83 percent of total drain from cutting and fire. Potential cubic-volume growth of all sites exceeds depletion by 25 percent. As shown in the last two columns of table 27, physical opportunity for net saw-timber growth eventually exceeding current drain exists in all but Deschutes River and

[7] Estimated normal mortality for immature stands plus loss allowance for virgin stands equal to total gross growth therein.

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As cutting continues, growth will increase, the rate depending largely upon the prevailng cutting practice. If no significant change is made, it is estimated that by 1966 depletion will exceed net growth, not by the current ratio of 6 to 1 but by about 2 to 1, owing to anticipated increase in increment following conversion of mature stands to net growth condition by cutting. If cutting took the form of 50 percent selection of the most mature

prompt and effective forest management can mitigate the severity of the curtailment. The excess of cut over permanent productive capacity is even greater in the Bend area, the unit's principal industrial center, than it is for the unit as a whole. The area tributary to Bend has been so badly overcut for several decades that drastic reduction in output will be unavoidable in less than two decades.

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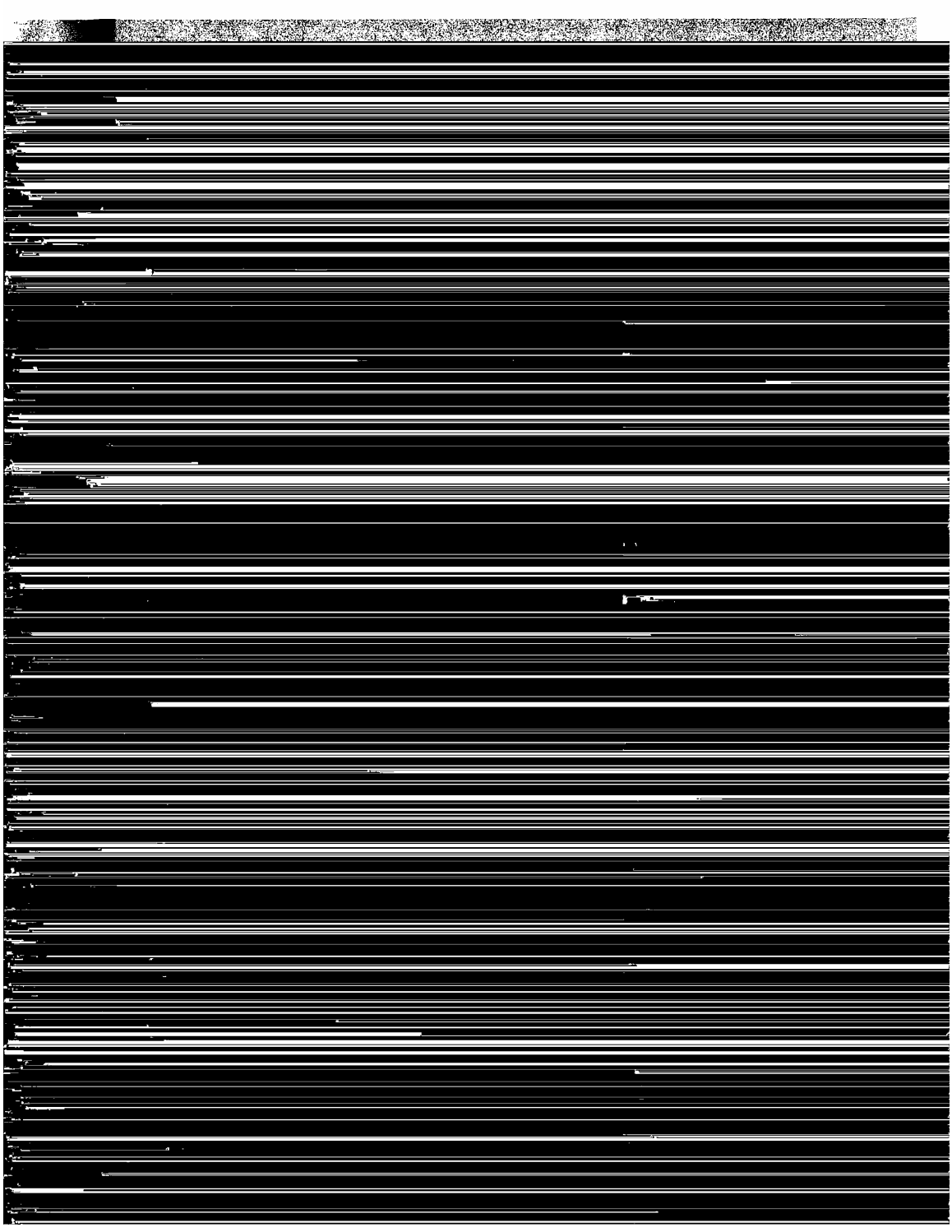

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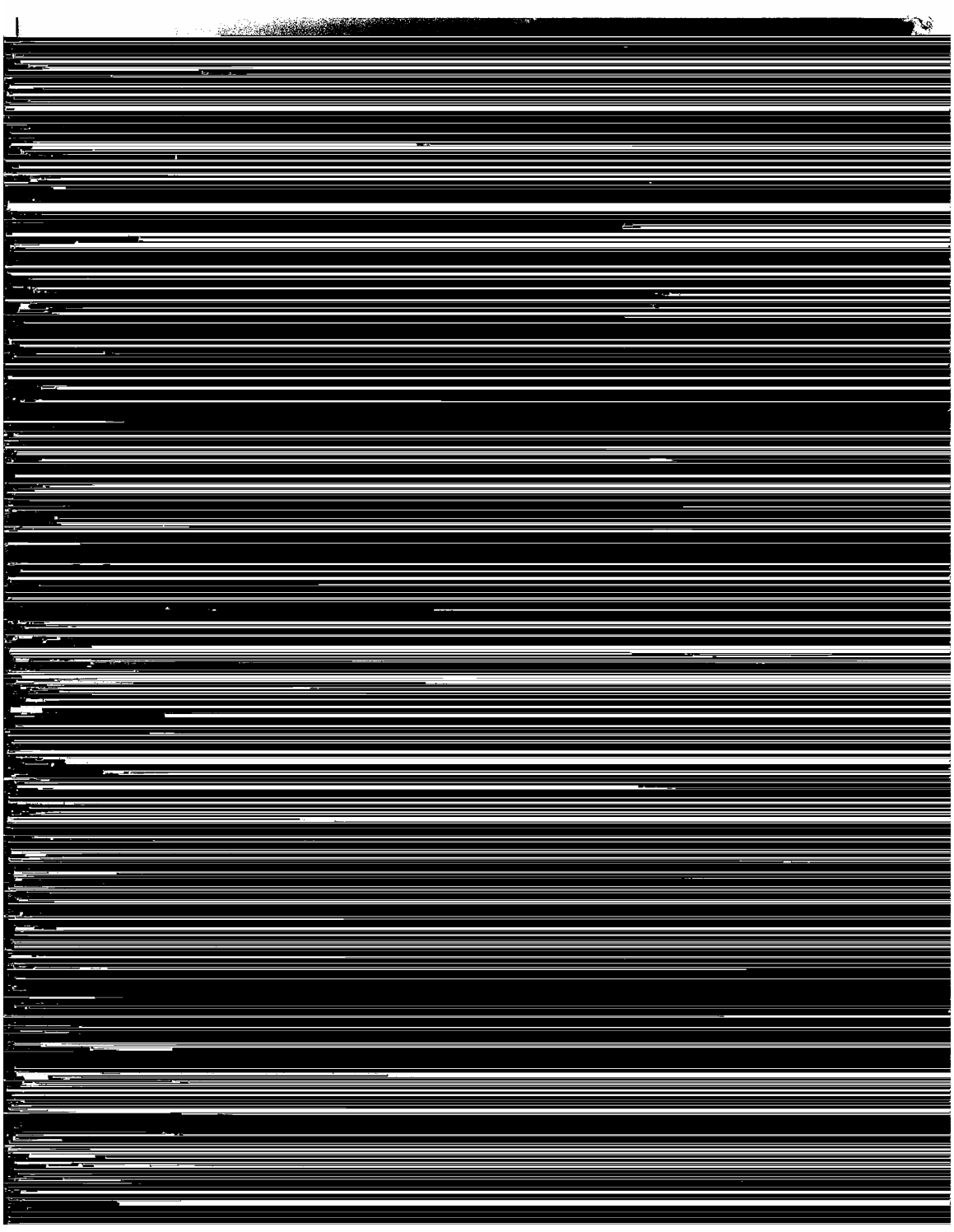

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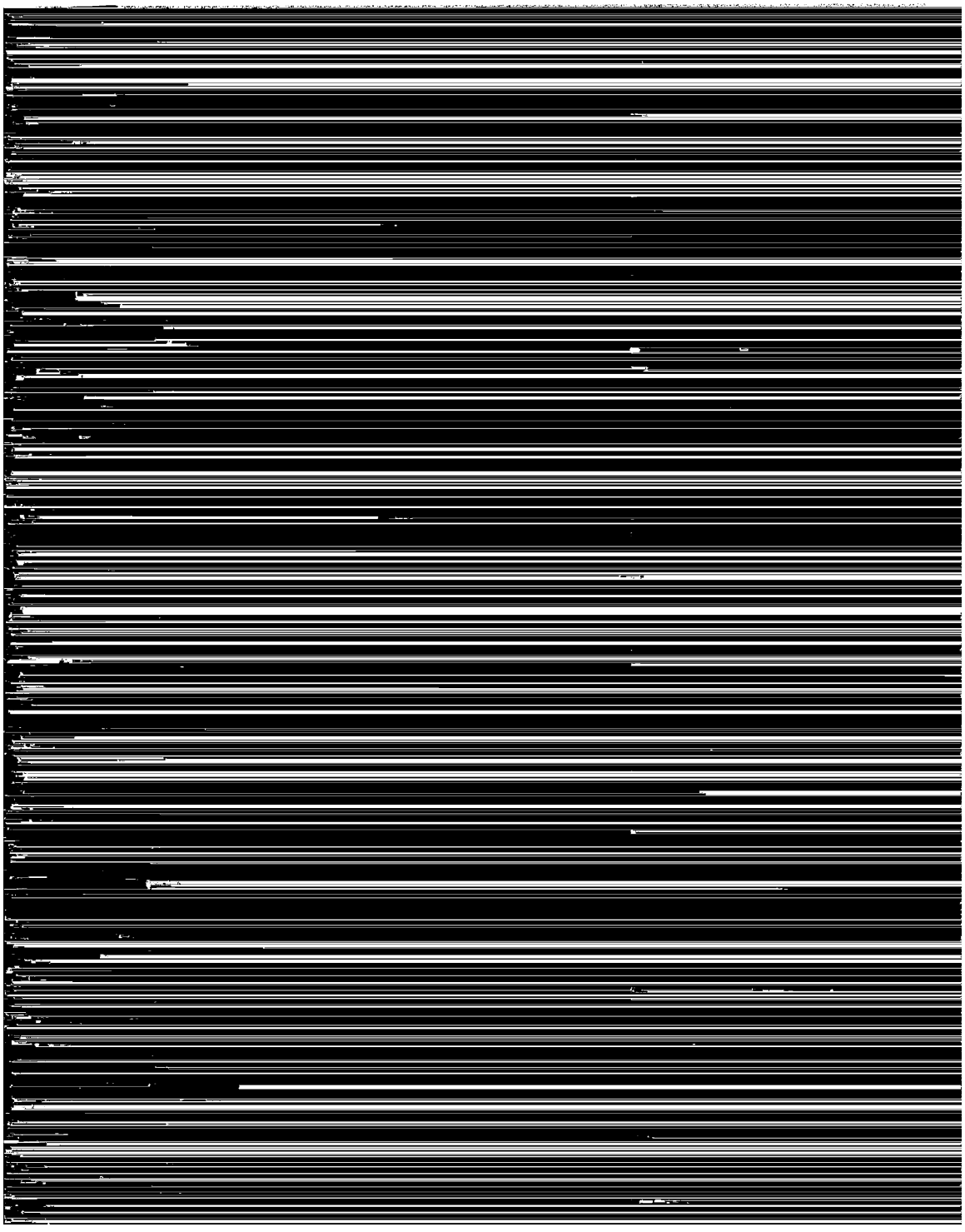

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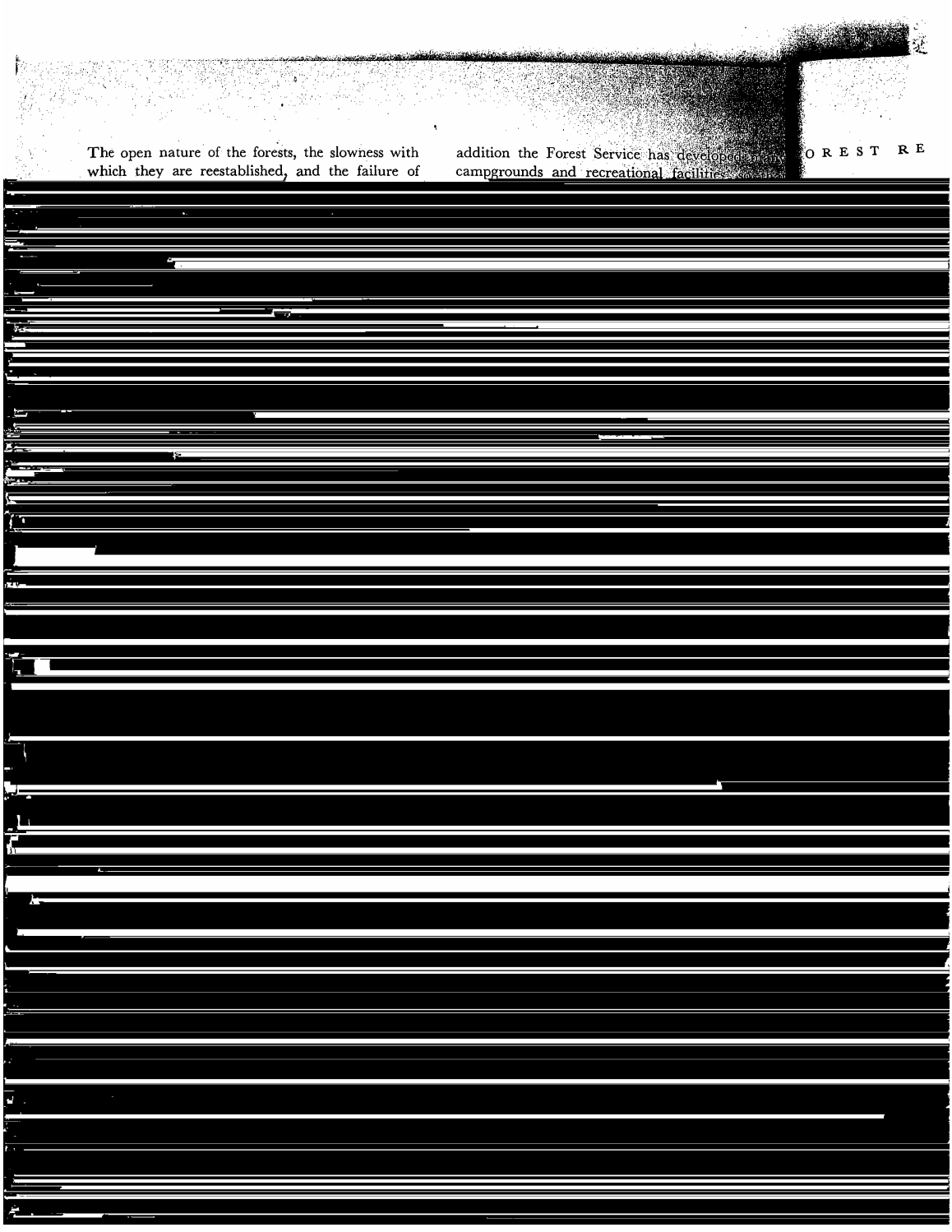

The open nature of the forests, the slowness with which they are reestablished, and the failure of

addition the Forest Service has developed

O R E S T R E

campgrounds and recreational facilit

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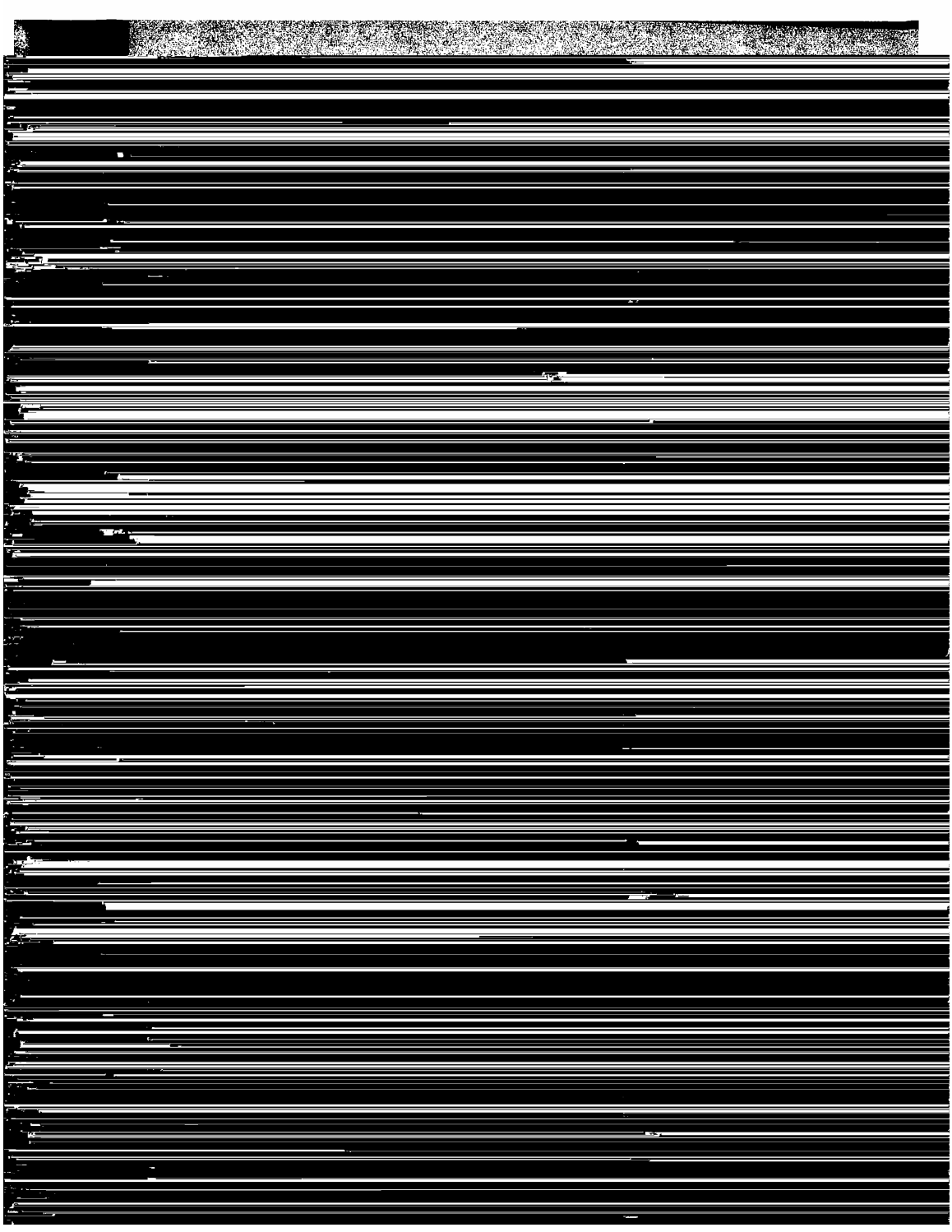

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alternate host. Ribes eradication work has been carried on in northeastern Washington under the supervision of the Bureau of Entomology and Plant Quarantine.

Fire Control

Even though losses from insect epidemics are much greater, fire loss is an important factor in saw-timber stands. The forests are dry for a large part of the year, resinous trees predominate, and lightning storms are common during the driest time of the year. Yet, in spite of these adverse conditions, fire losses are relatively smaller than in the Douglas-fir region. This is accounted for by the open nature of the ponderosa pine forests and the scarcity of the undergrowth, which retard the rate of spread and make fires less likely to crown. Also, the easy topography and open stands make possible a high degree of mechanization and effectiveness in fire suppression, at least in the ponderosa pine forests.

The most critical fire problem area in the region

protected by the State foresters and private associations through agreement with the Forest Service.

Protection standards have improved steadily in recent years as a result of increased facilities, more scientific planning, training of personnel in organization and technique, and cooperation of the Civilian Conservation Corps and other emergency work programs. Fire detection has benefited through the construction and betterment of guard stations, lookouts, and telephone lines. Attack on fires has been made more effective through construction of new roads and trails and airplane landing fields. Reduction of hazards along roads and in especially inflammable areas has prevented many fires from starting. Moreover, C. C. C. units have constituted a mobile fire-fighting force which can be organized and trained, held in readiness, and its organized units quickly transported to fires, with the result that fires have been attacked more intensively and effectively than by pick-up labor.

Other Federal Lands

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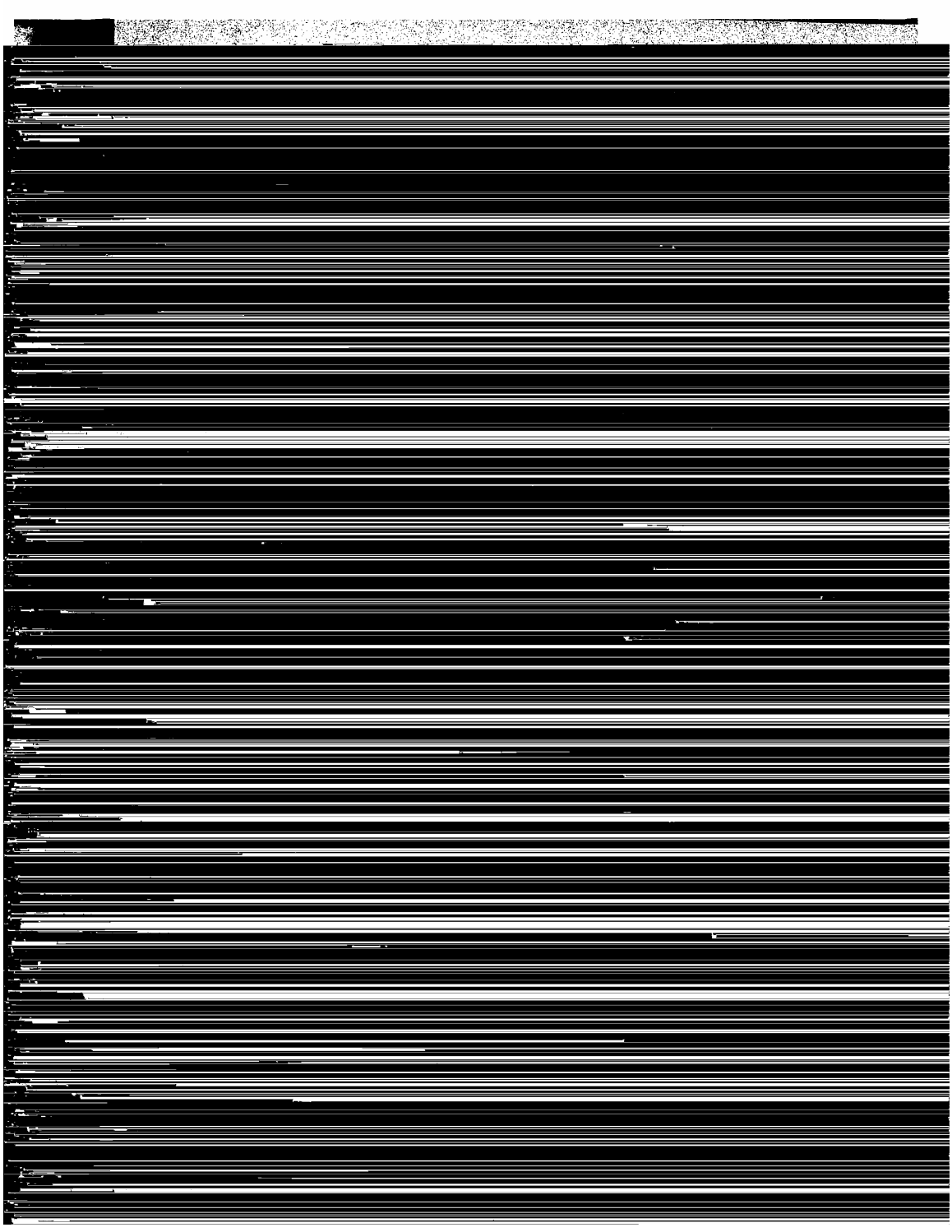

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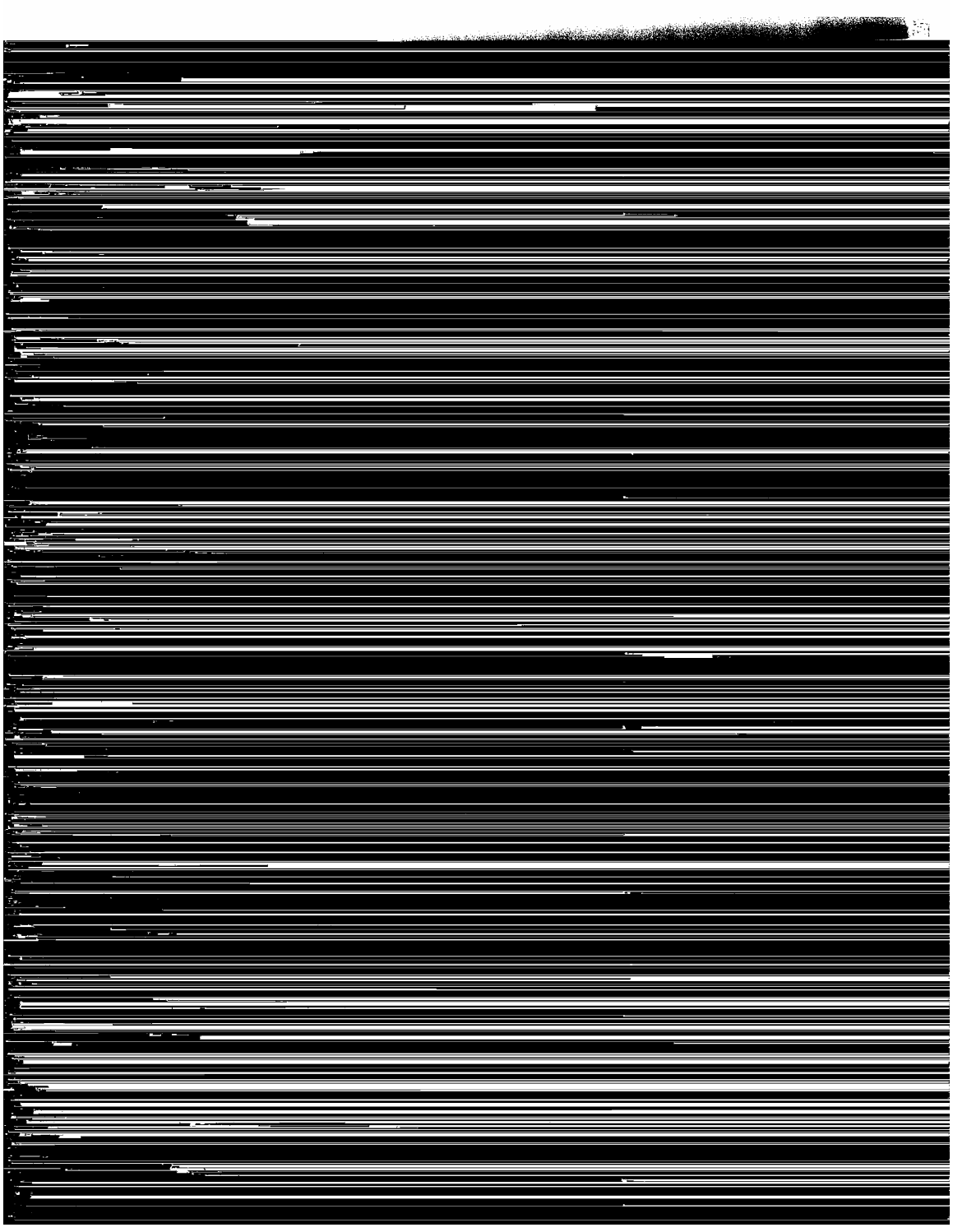

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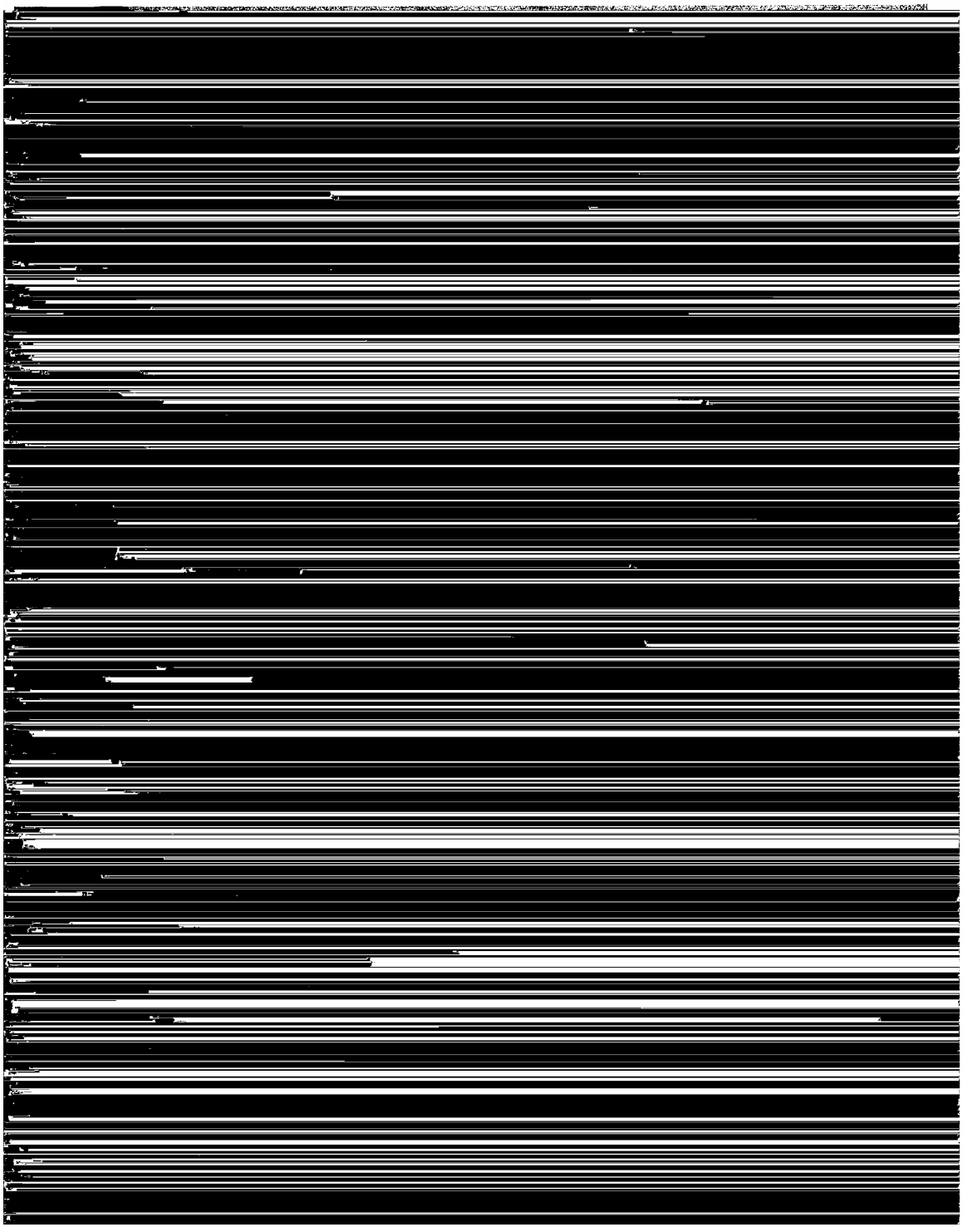

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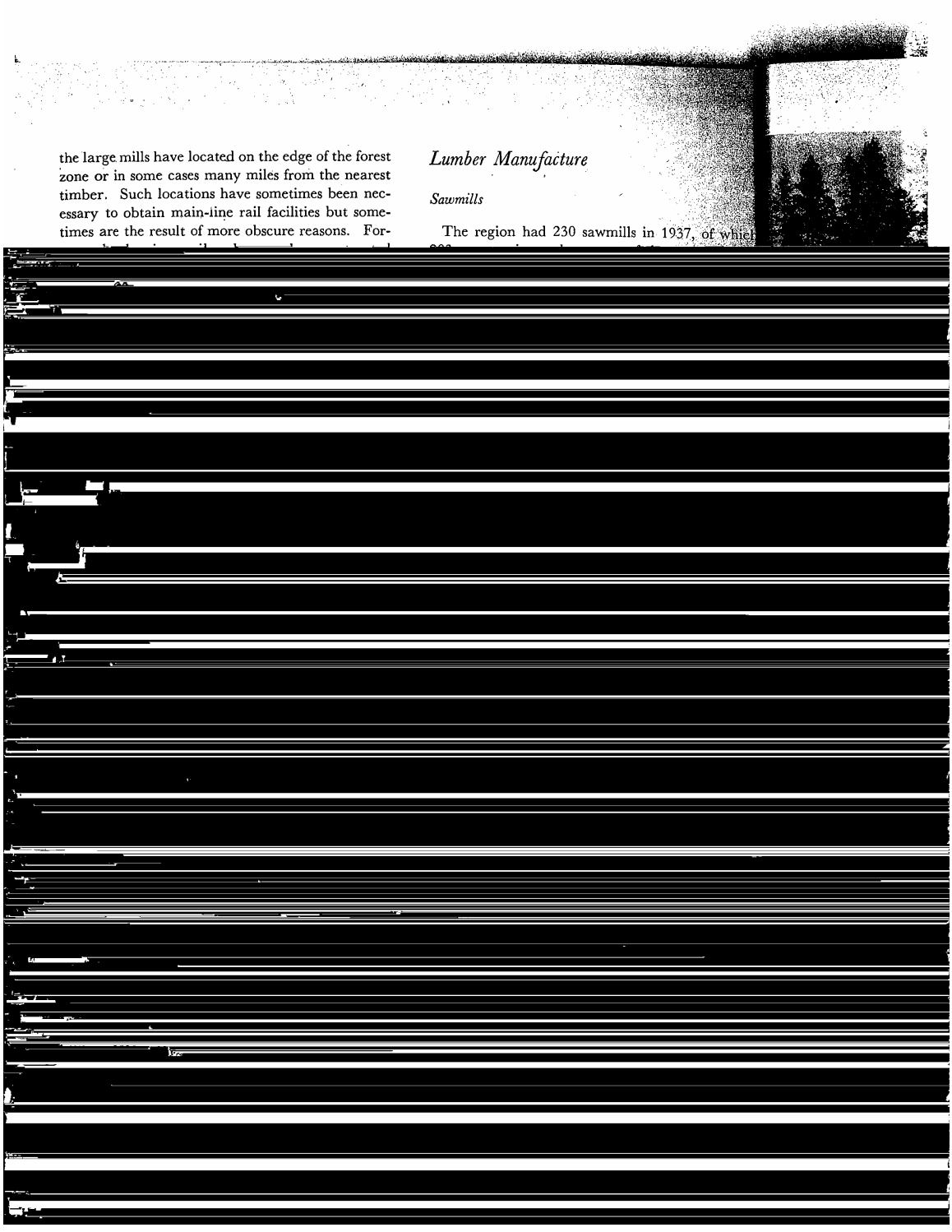

the large mills have located on the edge of the forest zone or in some cases many miles from the nearest timber. Such locations have sometimes been necessary to obtain main-line rail facilities but sometimes are the result of more obscure reasons. For-

Lumber Manufacture

Sawmills

The region had 230 sawmills in 1937, of whic

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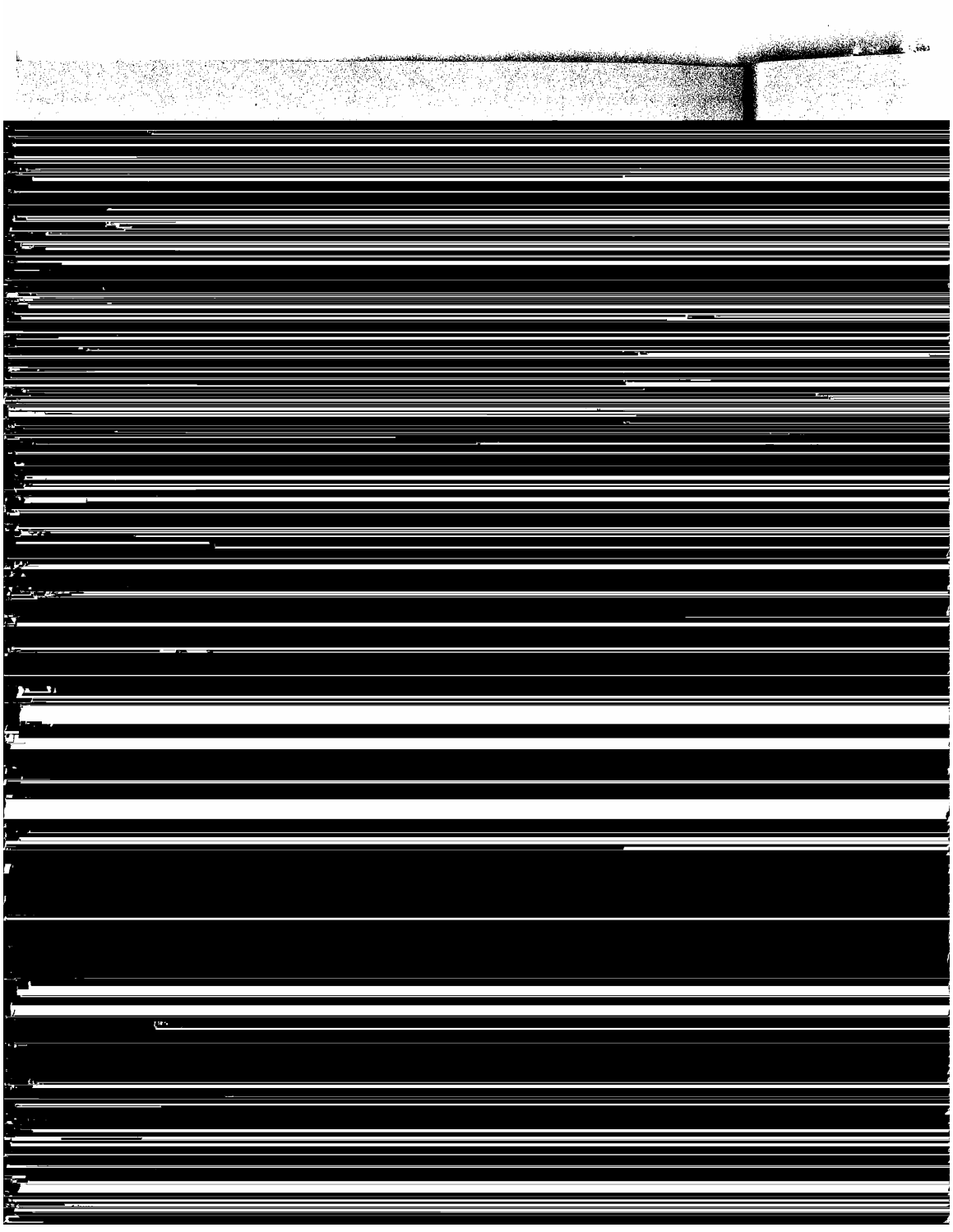

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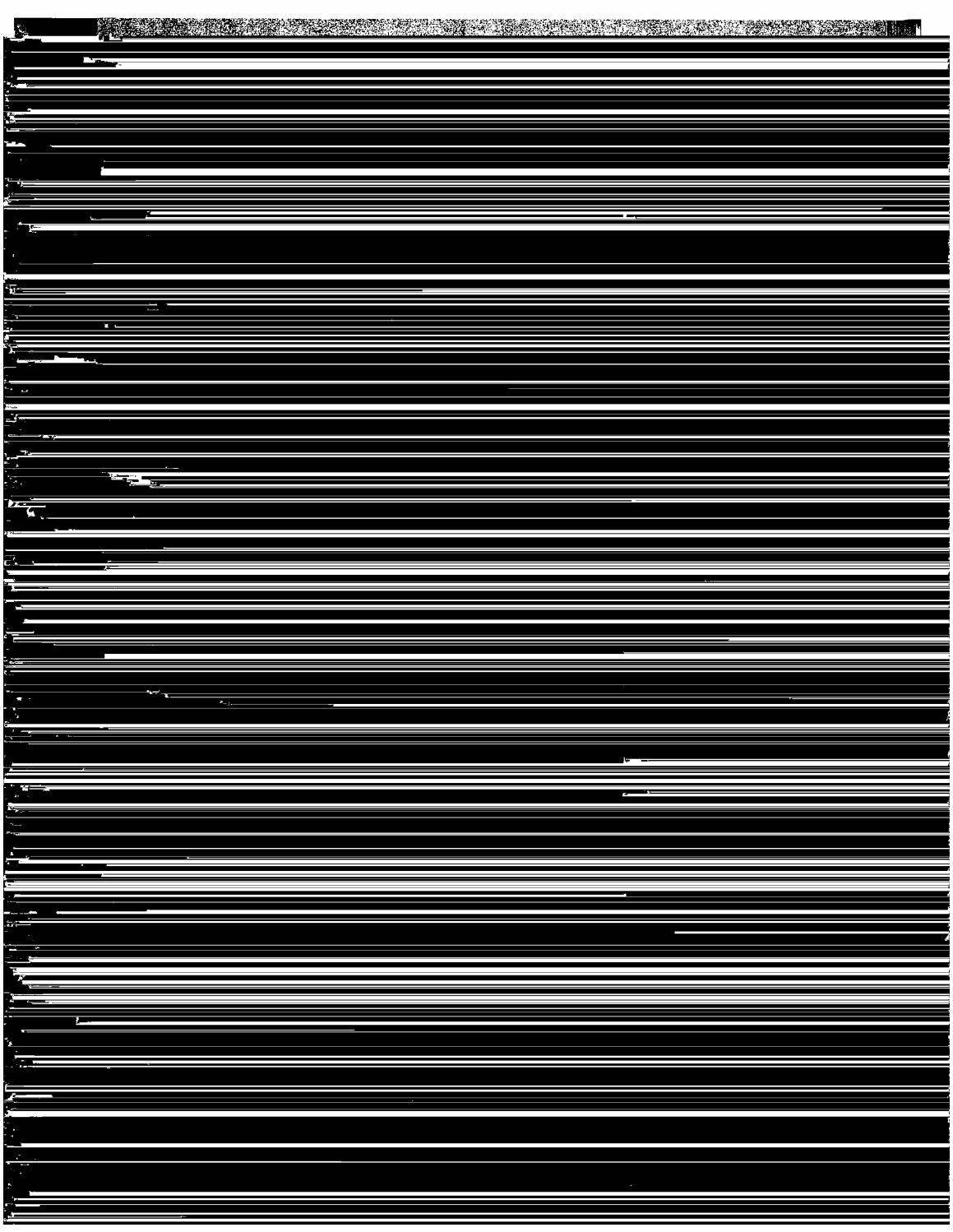


Lumber production here deviated from trends in other regions and for the country as a whole in not receding proportionately as much during the depression period 1931 to 1934 and in recovering thereafter more rapidly (table 29). Oregon sawmills produced more than three-quarters of the average annual regional production during the period 1925–38, inclusive.

Ponderosa pine amounted to 96 percent of the total lumber production in the pine region of Oregon, 77 percent in Washington, and 91 percent in the entire region. This region produces about two-fifths of the entire cut of ponderosa pine lumber in the country (fig. 32).

Lumber transportation and markets

Transportation of lumber to primary consuming markets is almost entirely by rail. It is estimated that less than 1 percent of the regional lumber production is exported to foreign countries, and about 40 percent is sold in Oregon and Washington. It is doubtful, however, that more than 10 percent of the lumber sold locally is finally consumed within the region; the remainder is remanufactured and shipped to other parts of the country in such forms as sash and doors and box shook. The principal outside markets for lumber are California, New York, Illinois, Iowa, Wisconsin, and Minnesota. A large part of these shipments consists of factory or shop lumber destined for further finishing. Freight amounts to a large part of the delivered price of lumber shipped to middle western and eastern points. The rail rate from Bend or Klamath Falls to Des Moines is 69½ cents per hundredweight, to Chicago 73½ cents, and to points eastward to the Atlantic Coast 82 cents. Assuming an average shipping weight of 2,000 pounds per M board feet, these rates amount to $13.90, $14.70, and $16.40, respectively, per M board feet. Partly, at least, because of the heavy burden of freight charges which ponderosa pine must bear, this species is marketed in a more orderly fashion and with better control by the manufacturers than many other woods.

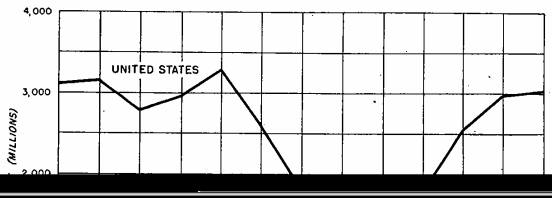
Because of the high freight cost, the shipment of the lower grades to distant markets is not justified, but a large part goes to local box factories.

Manufacture of cedar shingles is the only other primary wood-using industry and it is of little importance. There are only a few small mills producing cedar shingles.

Other Manufactures

The chief sawmill byproducts are lath, fuel wood, hogged fuel, and sawdust. The use of hogged fuel and sawdust for industrial fuel is limited almost entirely to the wood-using industries. Sawdust, slabs, and edgings are used as fuel in homes, schools, and office buildings in the forest-industry communities, but this use is limited by the sparseness of population in these localities.

The leading secondary wood-using industry is manufacture of box shooks. It is estimated that in the Klamath Falls district two-thirds of the lumber cut is manufactured into box shooks. In other parts of the region the amount going to box factories is much less but still a substantial part of the total cut. Most of the large sawmills and



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installed capacity of 2.5 million board feet of shooks per 8-hour shift. These plants range from small factories with 1 cut-off saw and a daily capacity of 8 to 10 M board feet per day to large factories with 10 to 15 cut-offs and daily capacities of 100 to 150 M feet or more. The excellent qualities of ponderosa pine box shooks give them a commanding position in consuming markets. Among many kinds of shooks manufactured, the principal types are designed for apple and pear boxes for local markets, orange boxes, lug boxes for grapes, tomatoes, etc., vegetable crates, and cannery cases chiefly for the salmon canneries.

Sash and door factories and planing mills are also operated by most of the large lumber manufacturers. Sash, doors, cut stock, casket shooks, mouldings, paneling, and various other specialty items are manufactured. In addition there are a few plants located in Klamath Falls manufacturing moulding and other planing-mill products exclusively. The region has one veneer plant also located at Klamath Falls, but the use of ponderosa pine for veneers and plywood is still new here. Small quantities of ponderosa pine logs have been shipped from central Oregon to a Portland basket and veneer plant.

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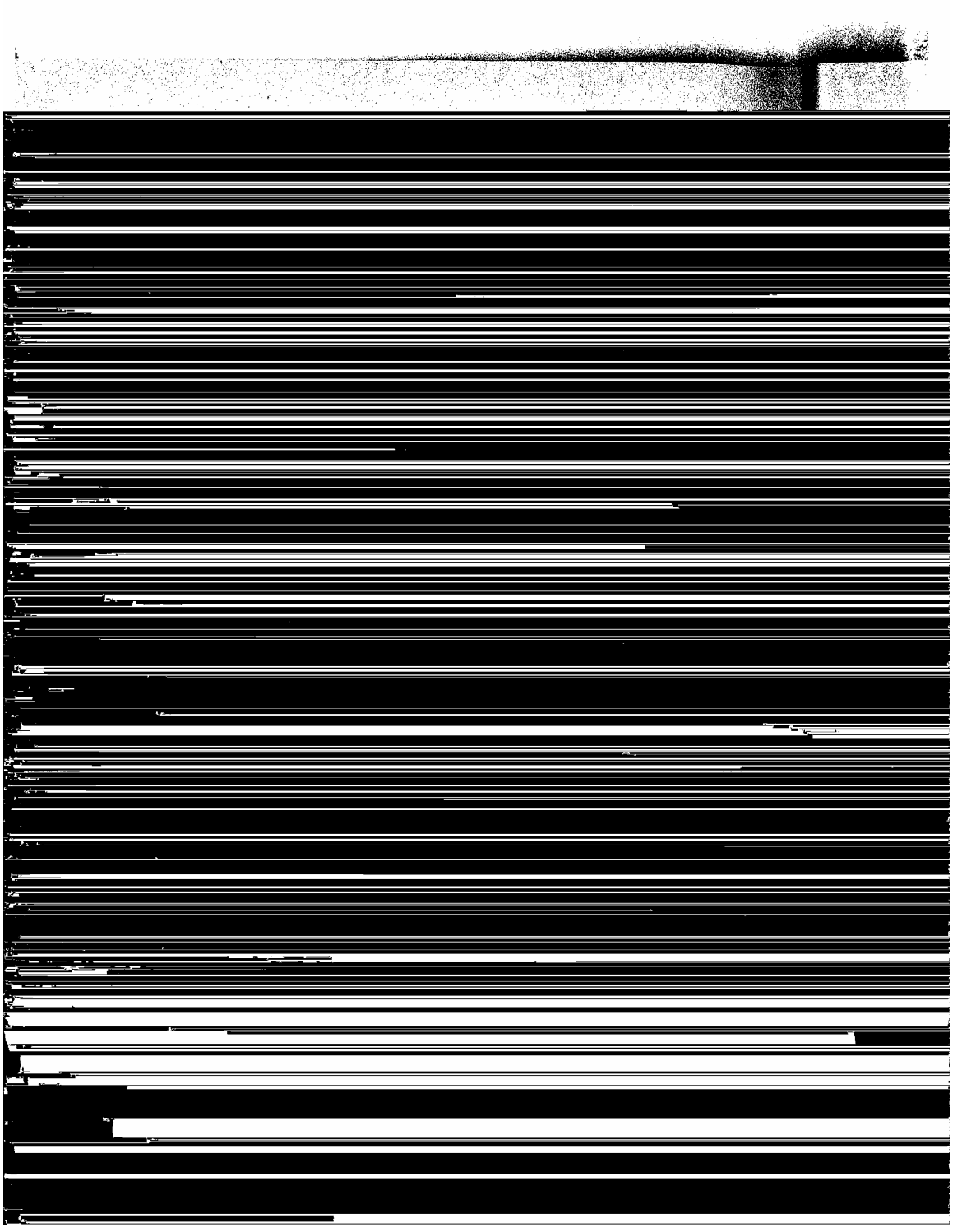

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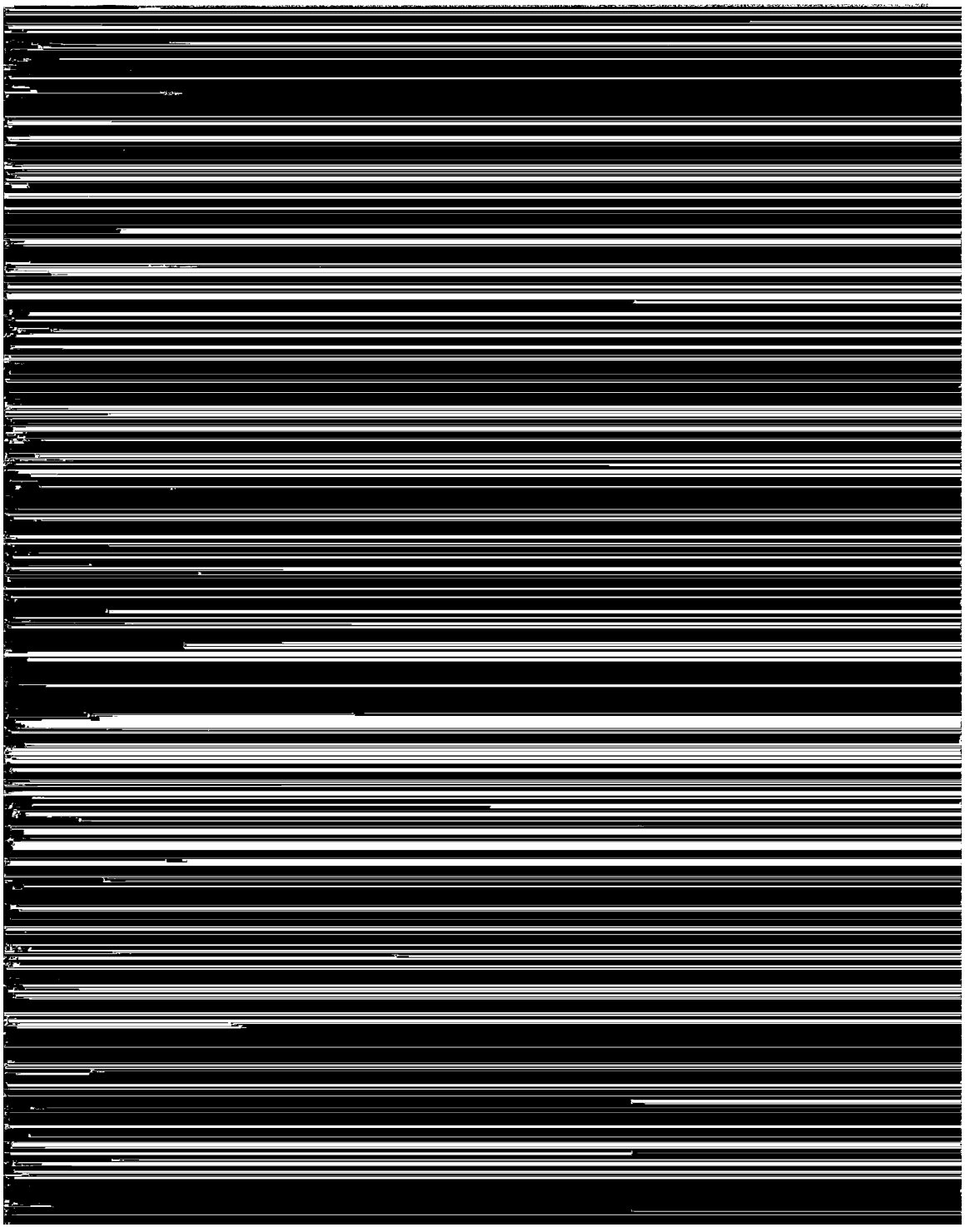

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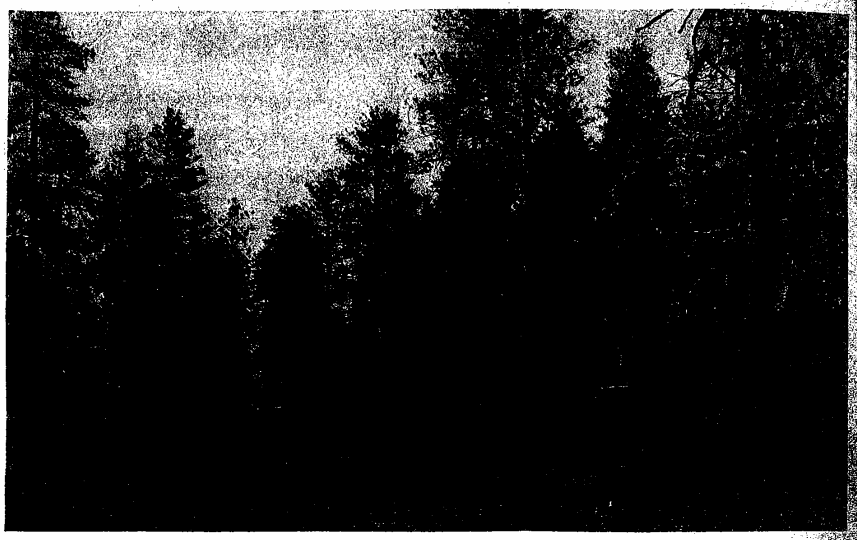

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FIGURE 35.—*Reserve stand after 40 percent cutting. Trees felled were high in quality and large in size.*

In actually applying these rules to specific stands many trees fall into one or another of these categories without question, but conflicts also occur. For example, what shall be done with low-quality trees of low-value increment, high-quality trees of high-value increment, and low-quality trees of high-mortality probability? Many other conflicts occur in practice. It is not always possible to eliminate all highly insect-susceptible trees through logging and still cut lightly enough to avoid accelerated windfall losses.

The Maturity-Selection System

Recent studies by Brandstrom (*2*) on the eco-

instance as low as 40 percent (fig. 35). Exceptions from the basic rule allow cutting of certain low-value trees of poor vigor and leaving high-value trees of above-average vigor. Generally there is close correlation between silvicultural and economic objectives under this system, and removal of the high-value trees converts the stagnant forest to a growing condition. Under this light cut it is unnecessary to dispose of slash except in certain vulnerable locations, thereby so improving soil conditions as eventually to increase the productive capacity of the forest site.

Region-wide application of such a system would greatly facilitate and hasten sustained-yield man-

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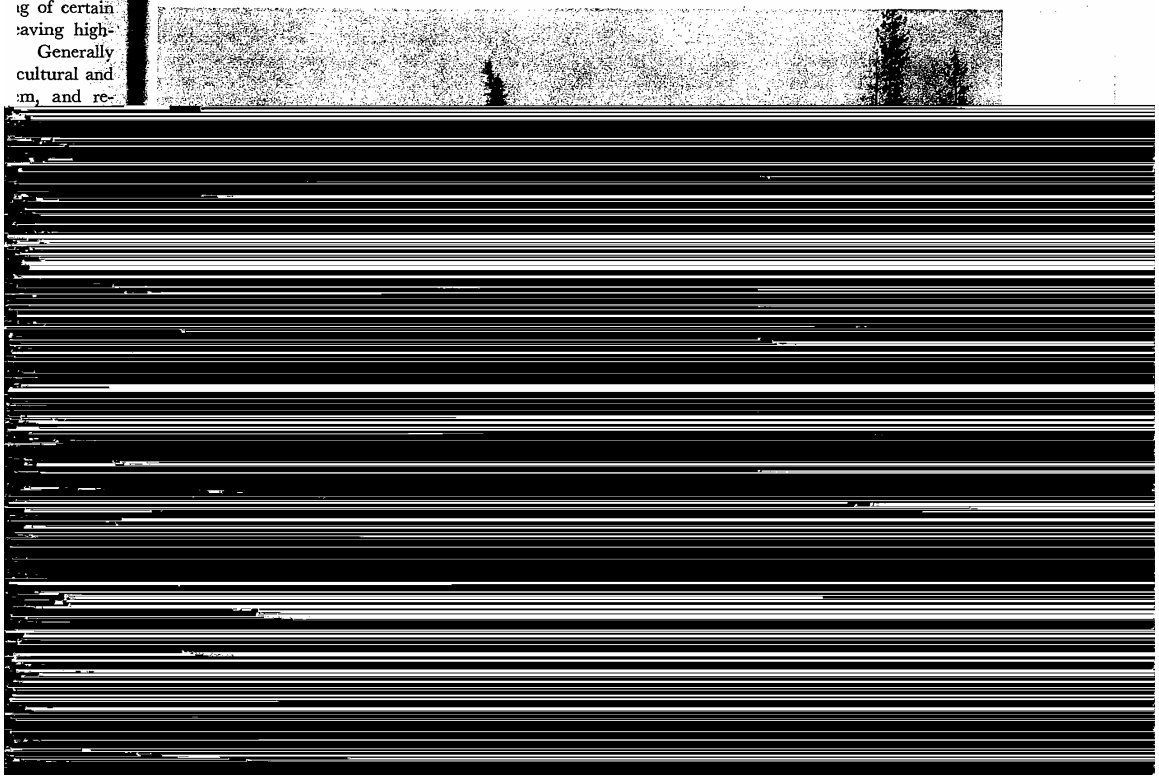
universal application of the maturity-selection system should assist in control of insect epidemics by establishing healthy growing conditions and ridding the forest of many insect-susceptible trees.

Even on public forest lands the maturity-selection system has been used only in recent years. Its development, of comparatively recent origin, has been fostered to a great extent by increased mobility of logging equipment. Tractors, trucks, motorized log loaders, and improved road-building machinery permit greater flexibility in logging. The exchange policy of the Forest Service, whereby Government stumpage is exchanged for selectively cut pine land in good condition, has stimulated light selection cutting on some private land, but as yet not widely. It is generally agreed among foresters that a lighter cut than has been practiced on private or even on most public lands is desirable. Under the impetus and leadership of Federal forest agencies, it is safe to predict that the maturity-selection system will spread more widely to private lands.

Disadvantages in the System

It is obvious that the maturity-selection system cannot be universally applied even in this region. Some forest stands are not suitable; for example, those more nearly even-aged with a large part of the stand in the same size, value, and maturity classes. In this case a heavier first cut would be advantageous. In other logging units in this region, particularly in northern Washington where the mature stand is not more than 5 to 10 M board feet per acre, the volume taken under a light selection system would be too small to make a profitable operation under present conditions. Such stands will probably continue to be cut heavily. (Fig. 36).

Removal of too few trees from heavy mature stands, in order to harvest quickly the highest value trees on the entire tract, may leave an adequate reserve for an early return cut, but growth will be little stimulated if at all. It is frequently impossible to cut stands on rough ground lightly enough to cover the tract quickly, avoid excessive windfall loss, leave an adequate reserve stand, and still maintain an economic operation. Cutting to eliminate all insect-susceptible trees in overmature stands may result in not leaving sufficient volume for an early return cut or not providing adequate seed sources for restocking the area. It is not often that all desirable silvicultural and economic objectives can be achieved during the initial cut. Compromise is inevitable, and obviously a



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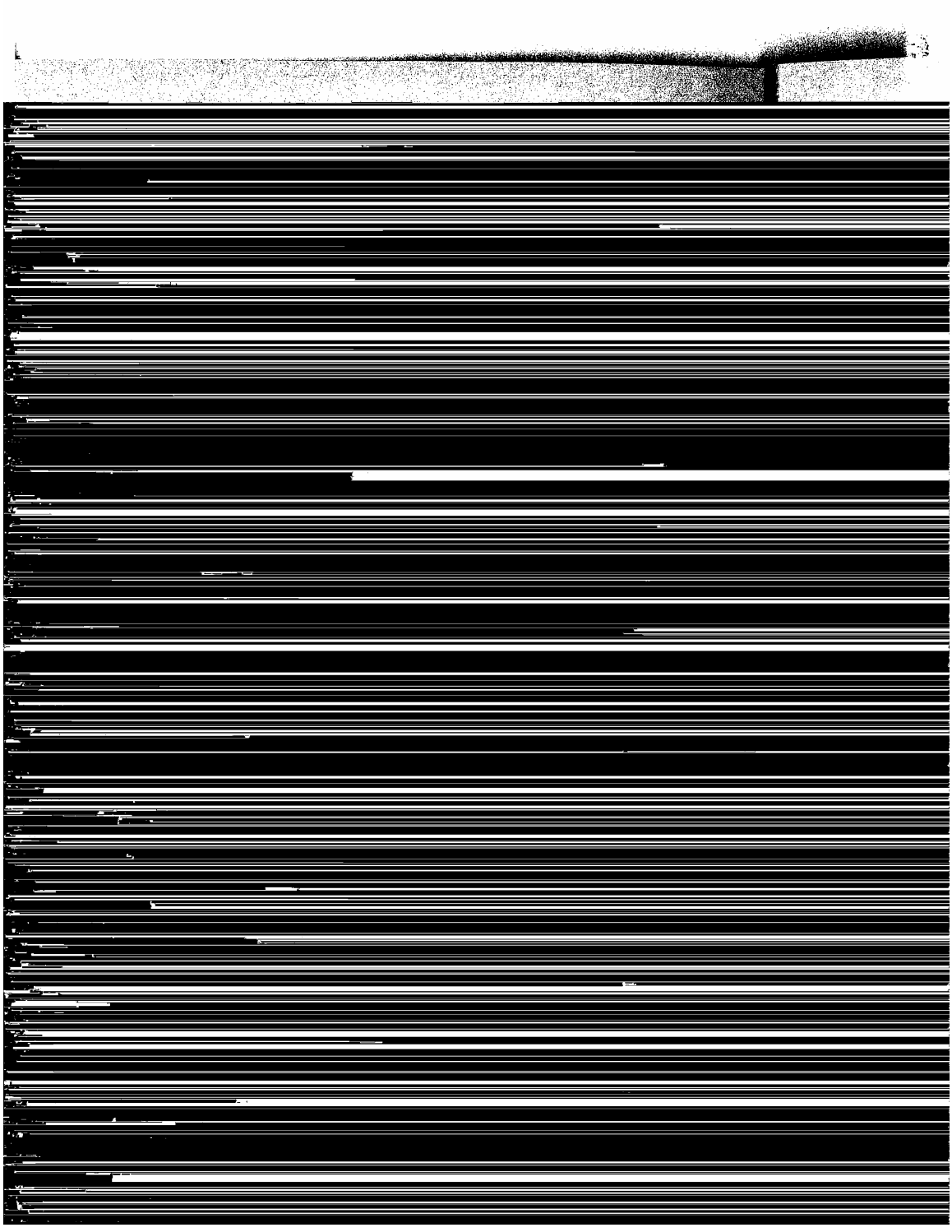

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The Timber Supply

VITALLY important to forest industries and communities is the timber supply upon which both depend. Appraisals of the adequacy of this primary resource for maintaining flow of timber have in many instances resulted in conflicting conclusions. Discrepancies have arisen both from variation in method of analysis and from differences in statistics employed. The forest survey eliminated inconsistencies in basic data, but considerable variation in interpretation of these data persists.

Relation of Timber Cut to Timber Supply

In the past, forest industry has generally been migratory, the life of the principal operation in each locality being determined largely by the available stand of virgin timber. Based on a system of liquidation, the duration of forest industry has frequently been estimated simply by dividing total timber stand by annual production. For example, it would be computed that this region's present timber supply, subjected to an annual depletion equal to the average cut of saw timber for the period 1925–36, would endure for about 101 years. Such crude calculation disregards entirely the effect on timber supply of depletion by agencies other than cutting on one hand and effect of growth

fails to emphasize the urgency of the forest problem. For example, similar calculations made by unit and by species groups show an indicated life of ponderosa pine supply for the region of only 73 years, while, for example, in the heavy-producing Deschutes River and Klamath Plateau units the hypothetical life of ponderosa pine is but 60 and 65 years, respectively, and for communities such as Bend and Klamath Falls the time must be halved or quartered.

Privately owned timberlands, however, are being cut over much more rapidly than the average. The one-third of the region's ponderosa pine saw timber that is in private ownership is suffering about 70 percent of the pine depletion. In addition the rate of depletion has accelerated rapidly since 1936. For example, if cutting continued at the 1937 rate, the region's privately owned pine would be completely exhausted in 21 years.

Sustained-Yield Capacity

The Region as a Whole

A far more rational analysis of the forest resource, anticipating timber harvest under a forward-looking plan of management, involves computation of sustained-yield capacity, i. e., the volume of

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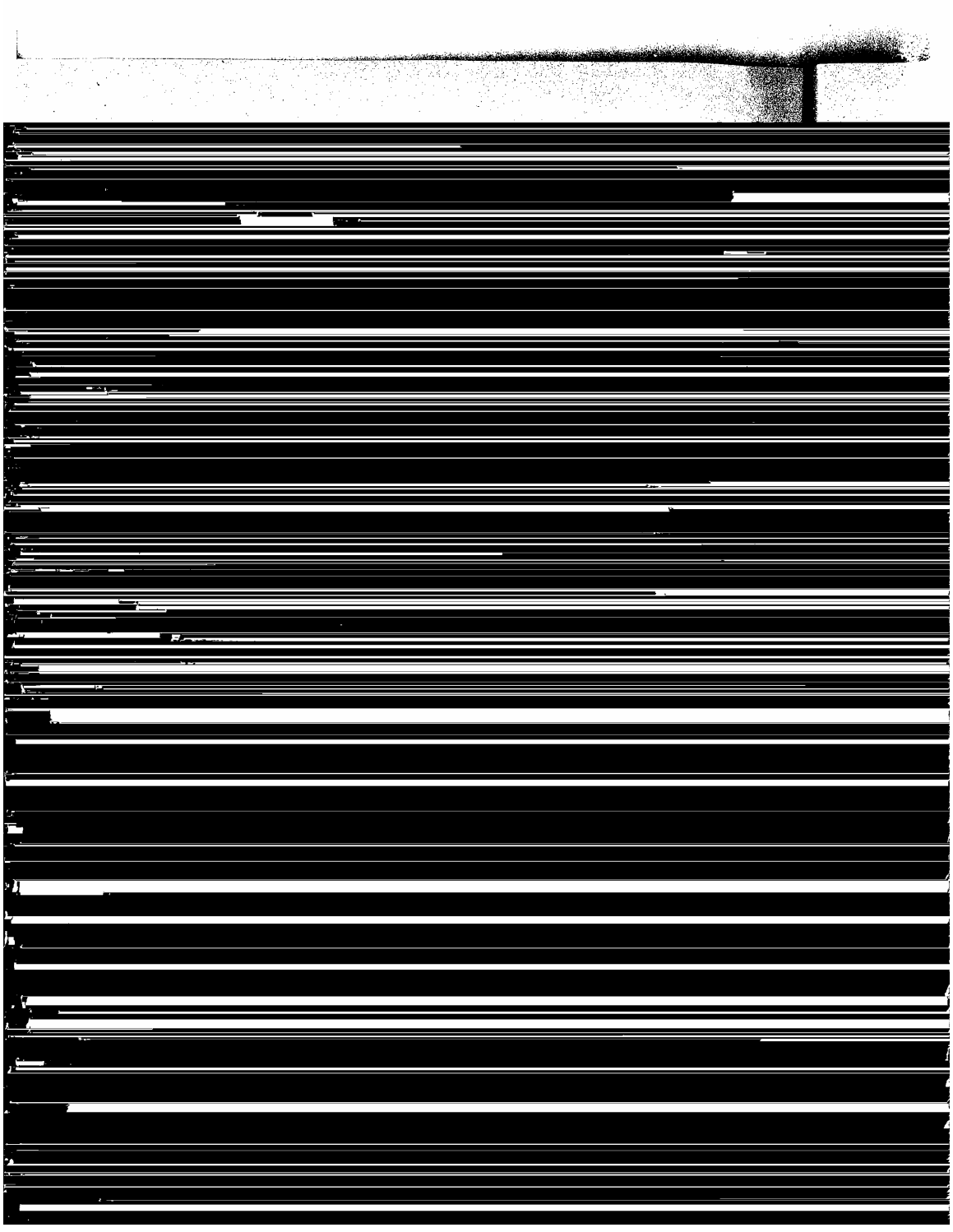

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TABLE 30.—*Average annual cut of trees of saw-timber size 1925–36, 1937–39, theoretical allowable cut under sustained yield 1936, and ultimate sustained-yield capacity on available lands*

[In million board feet—i. e., 000,000 omitted]

Unit	Annual cut 1925–36	Annual cut 1937–39	Allowable under sustained yield, 1936				Ultimate sustained-yield capacity [2]	
			Ponderosa pine types [1]			Other types	Ponderosa pine sites	Other sites
			50–50	75–50	95–75			
Eastern Washington:								
Chelan-Colville	161	190	126	123	106	114	224	171
Yakima River	145	161	108	103	88	119	152	181
North Blue Mountain	21	23	8	8	7	13	18	18
Total	327	374	242	234	201	246	394	370
Eastern Oregon:								
North Blue Mountain	113	131	94	88	77	57	166	91
Deschutes River	256	343	205	195	170	36	210	39
South Blue Mountain	133	232	195	187	168	27	290	47
Klamath Plateau	430	667	390	365	314	21	344	42
Total	932	1,373	884	835	729	141	1,010	219
Region total	1,259	1,747	1,126	1,069	930	387	1,404	589

[1] Allowable cut under sustained yield if cutting in the ponderosa pine types during the period 1936–65 takes the form (50–50) of light maturity-thrift selection on both private and public lands; and (75–50) of heavy maturity-thrift selection on private, and light maturity-thrift selection on other lands; and (95–75) of virtual clear cutting on private, and heavy maturity-thrift selection on other lands.

[2] Potential annual growth.

timber-supply problem is most acute here, owing to the heavy concentration of sawmill capacity and the extremely high cut in the Klamath Basin. In fact if the relation of cut to timber supply is be derived from this source will likely be much less, owing to competition for stumpage from northern California mills.

Saw-timber cut at the average rate for 1925–36

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Adequacy of the Forest Resource in Relation to Production Trend

The desirability of sustained-yield management is widely appreciated, but the obstacles involved are so formidable that its wide-scale adoption, if achieved on private lands, will unquestionably be gradual rather than instantaneous. Thus the questions arise—What of the timber supply in the absence of sustained-yield management? What will be the opportunities of maintaining timber production in the future if apparent trends continue?

The Situation Predicted for 1966

It should be borne in mind that future depletion figures used in these calculations are not presented as estimates and by no means as recommendations.

ing allowance for the fact that roughly two-thirds of the region's timber resource is in public and Indian ownership and now being managed with the objective of sustaining production. By applying these depletion assumptions to the 1936 saw-timber inventory and making allowance for the growth that would occur, estimates of saw-timber volume as of 1966 (table 31) are obtained.

It is estimated that by 1966, if future cutting is largely a continuation of past practice (95–75), the saw-timber volume in ponderosa pine types, which totaled 96.8 billion board feet in 1936, will be reduced to 63.1 billion board feet. If, however, an equal volume of timber were removed in lighter cuts (50–50), it is estimated that in 1966 the ponderosa pine types would contain 68.2 billion board feet. The favorable effect of lighter cutting on growth has been emphasized previously. It is

TABLE 32.—*Average*

Eastern Washington:
Chelan-Colville
Yakima River
North Blue Mount
Total

Eastern Oregon:
North Blue Mount
Deschutes River
South Blue Mount
Klamath Plateau
Total

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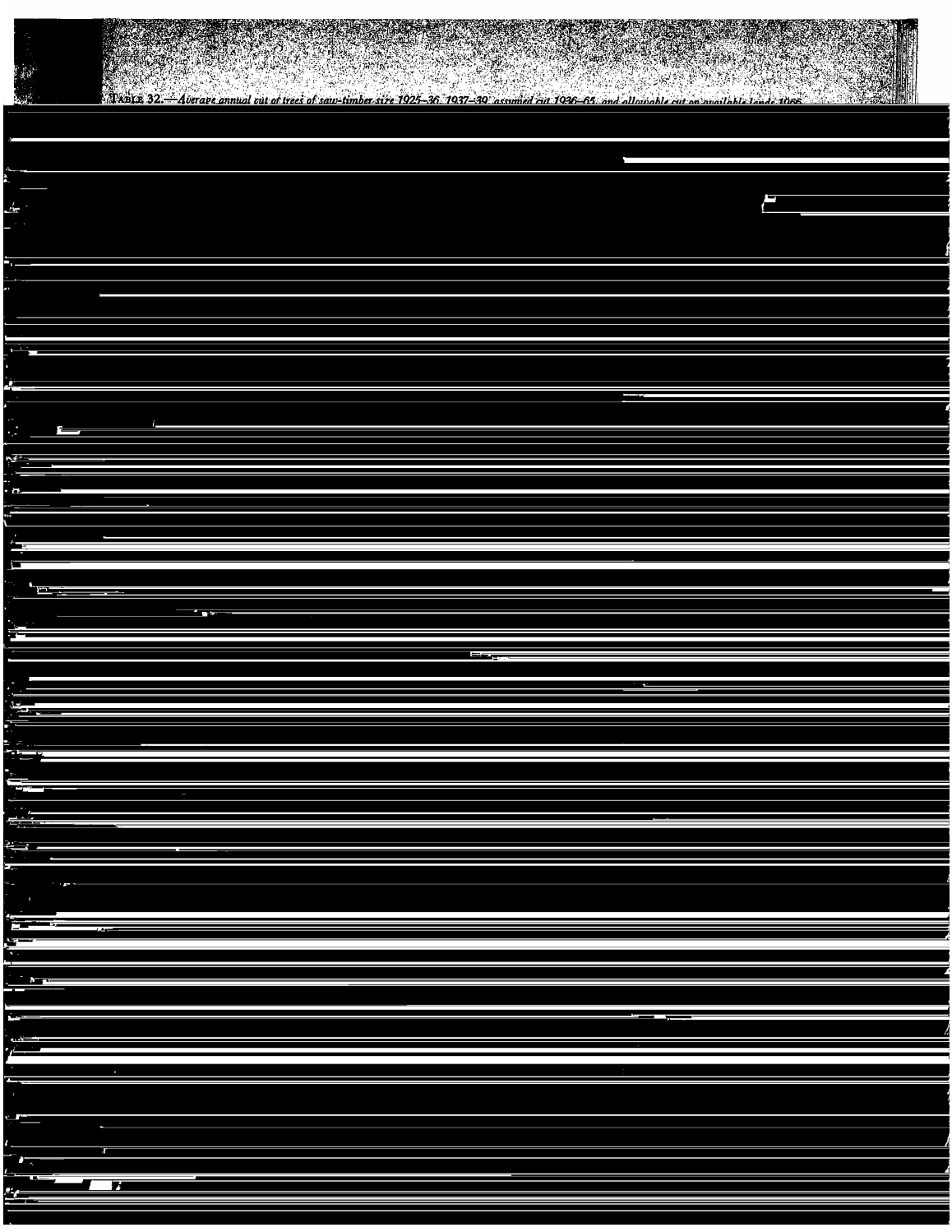

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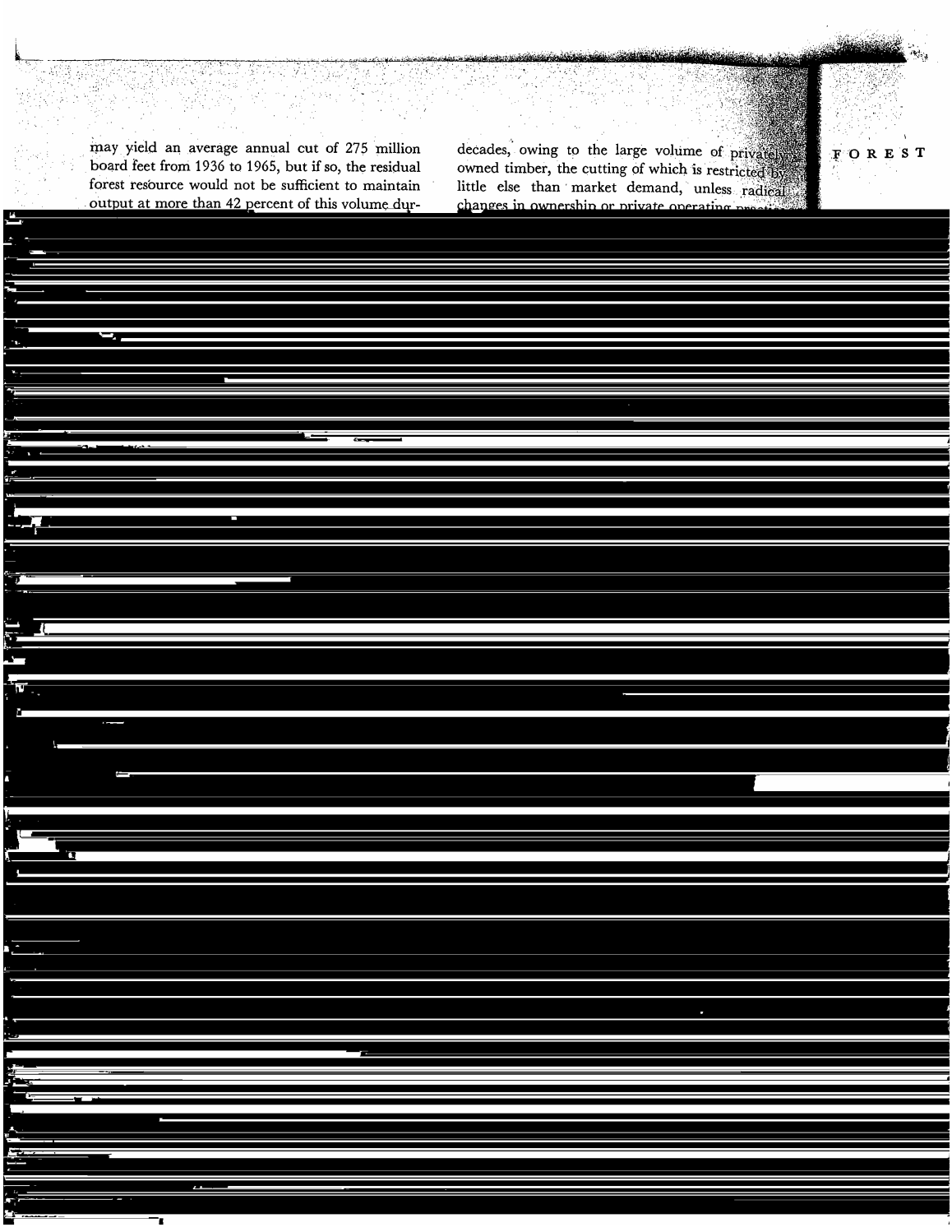

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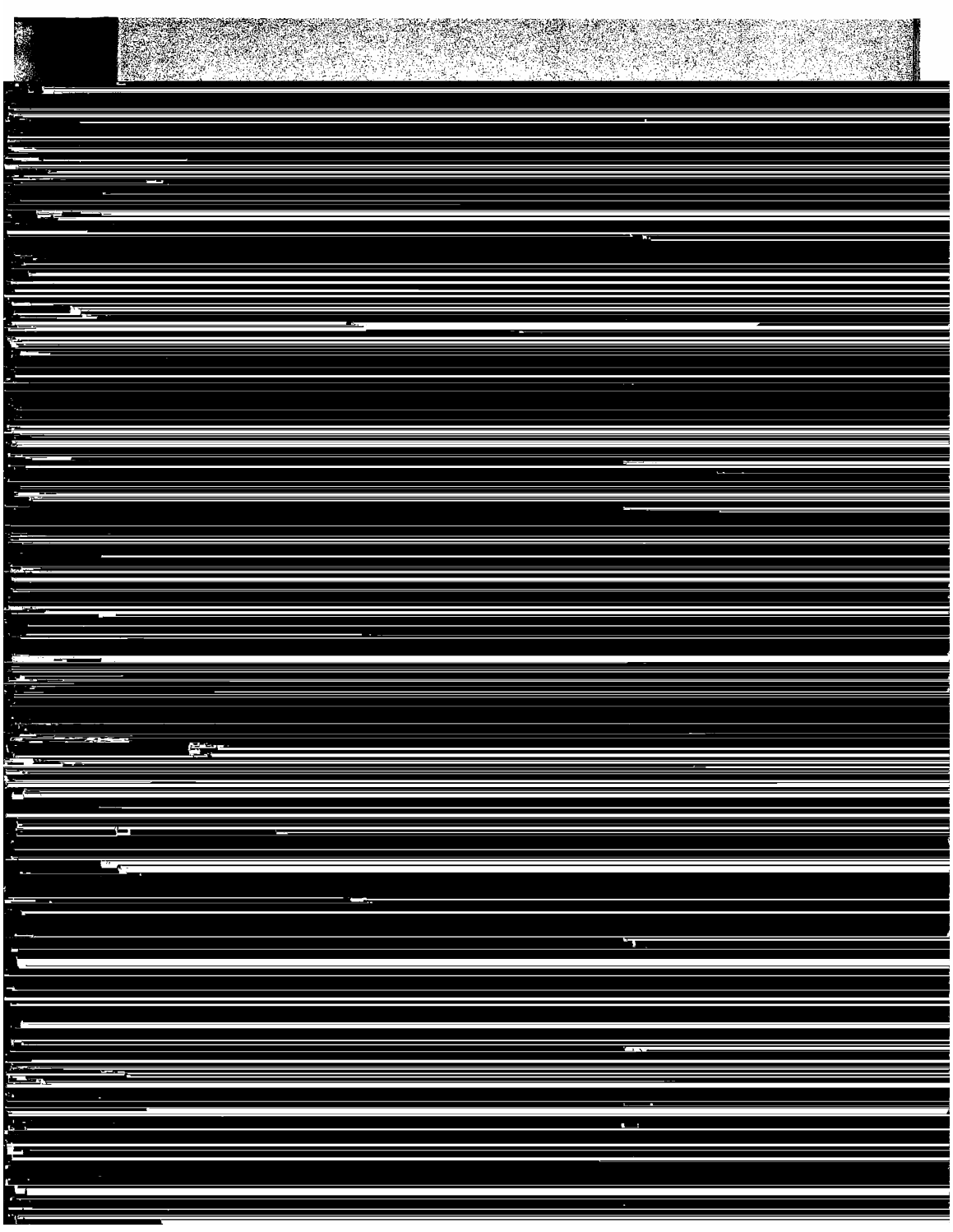

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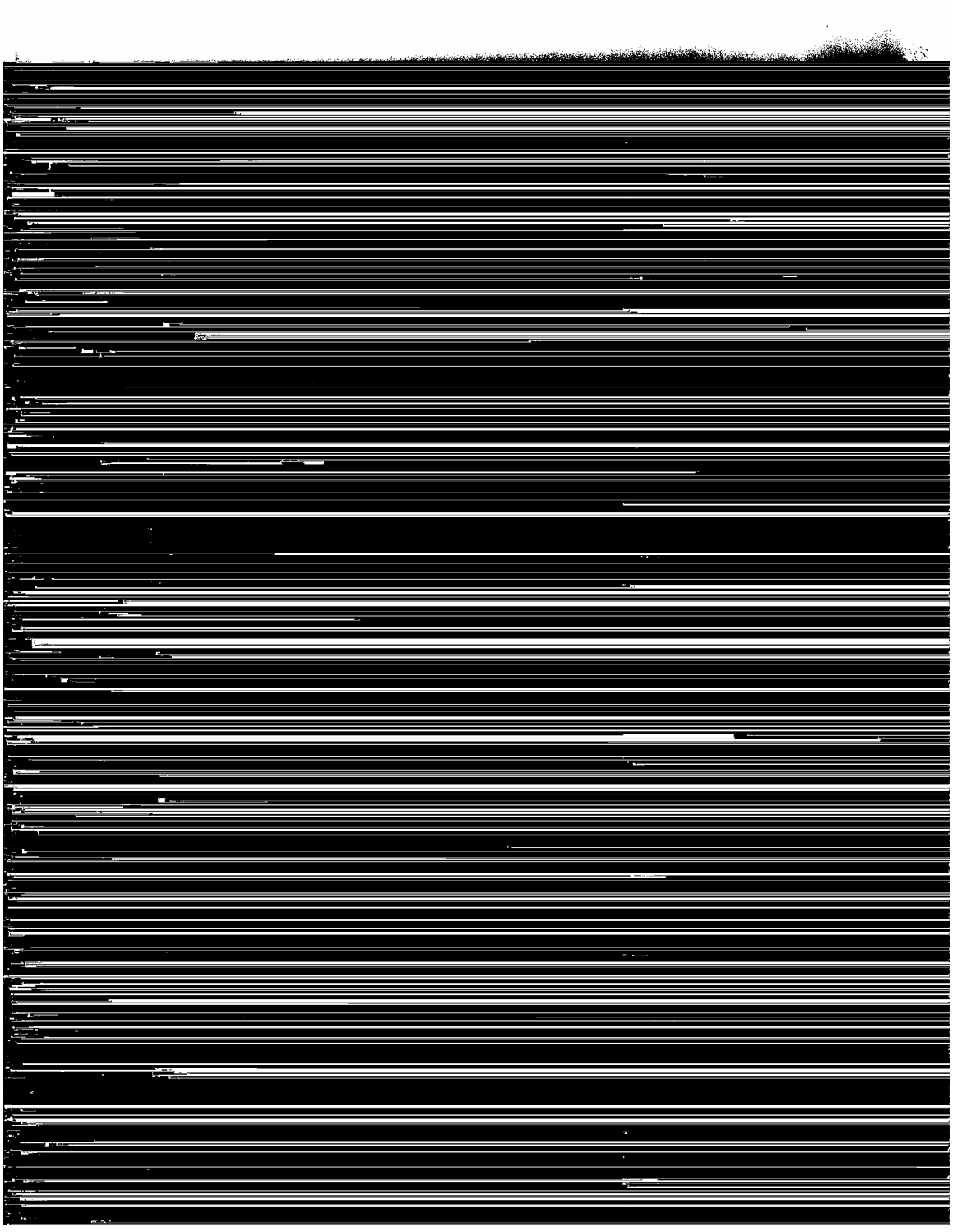

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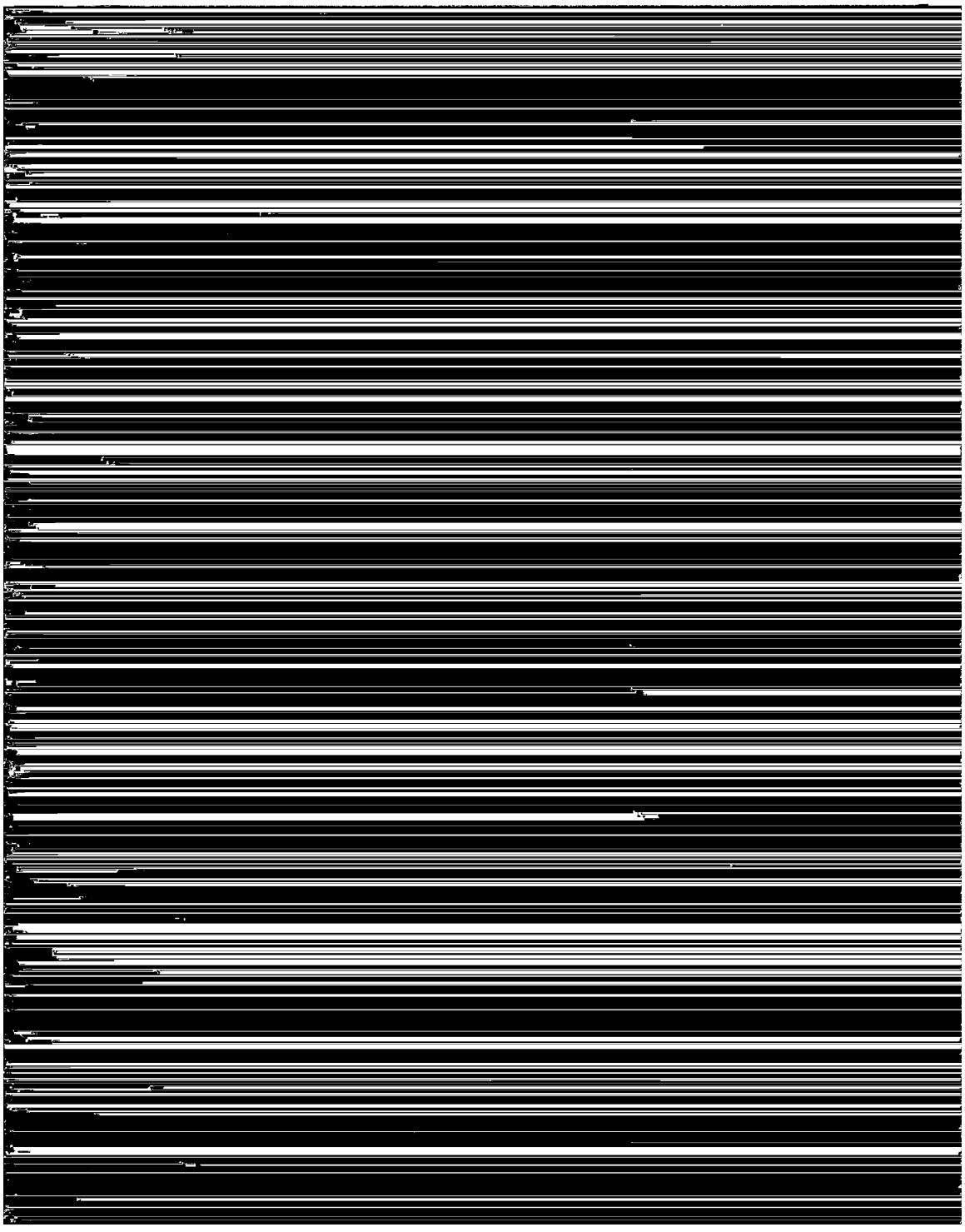

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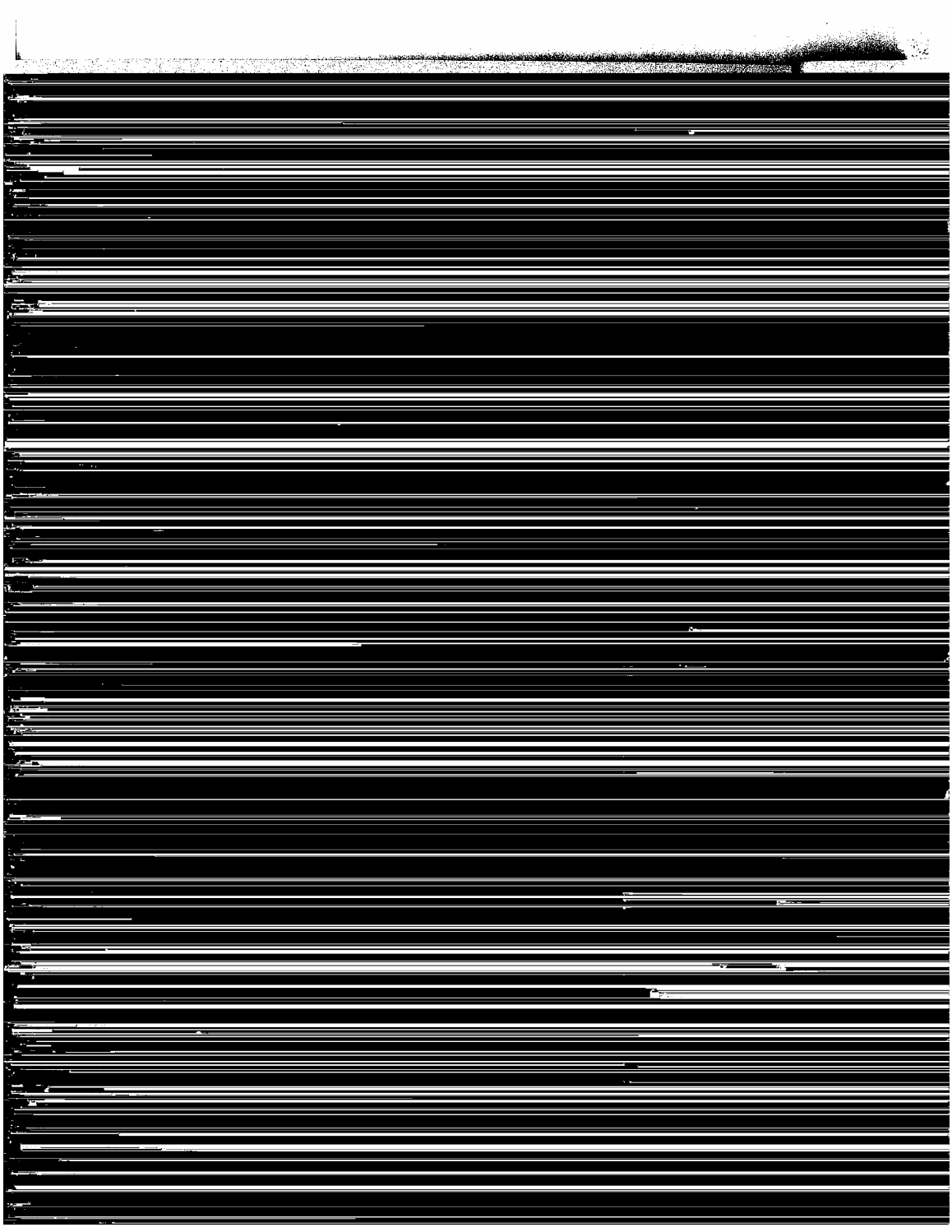

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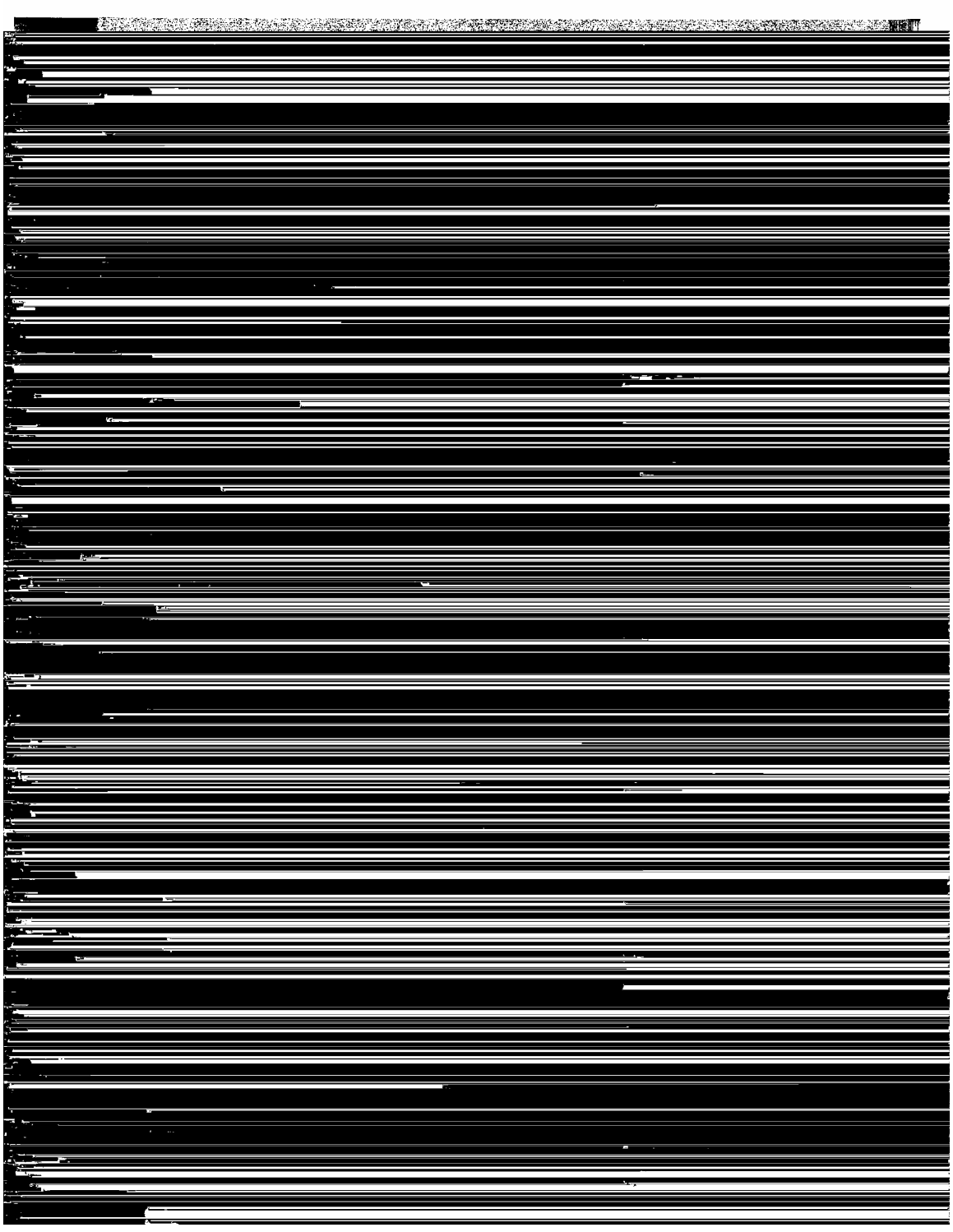

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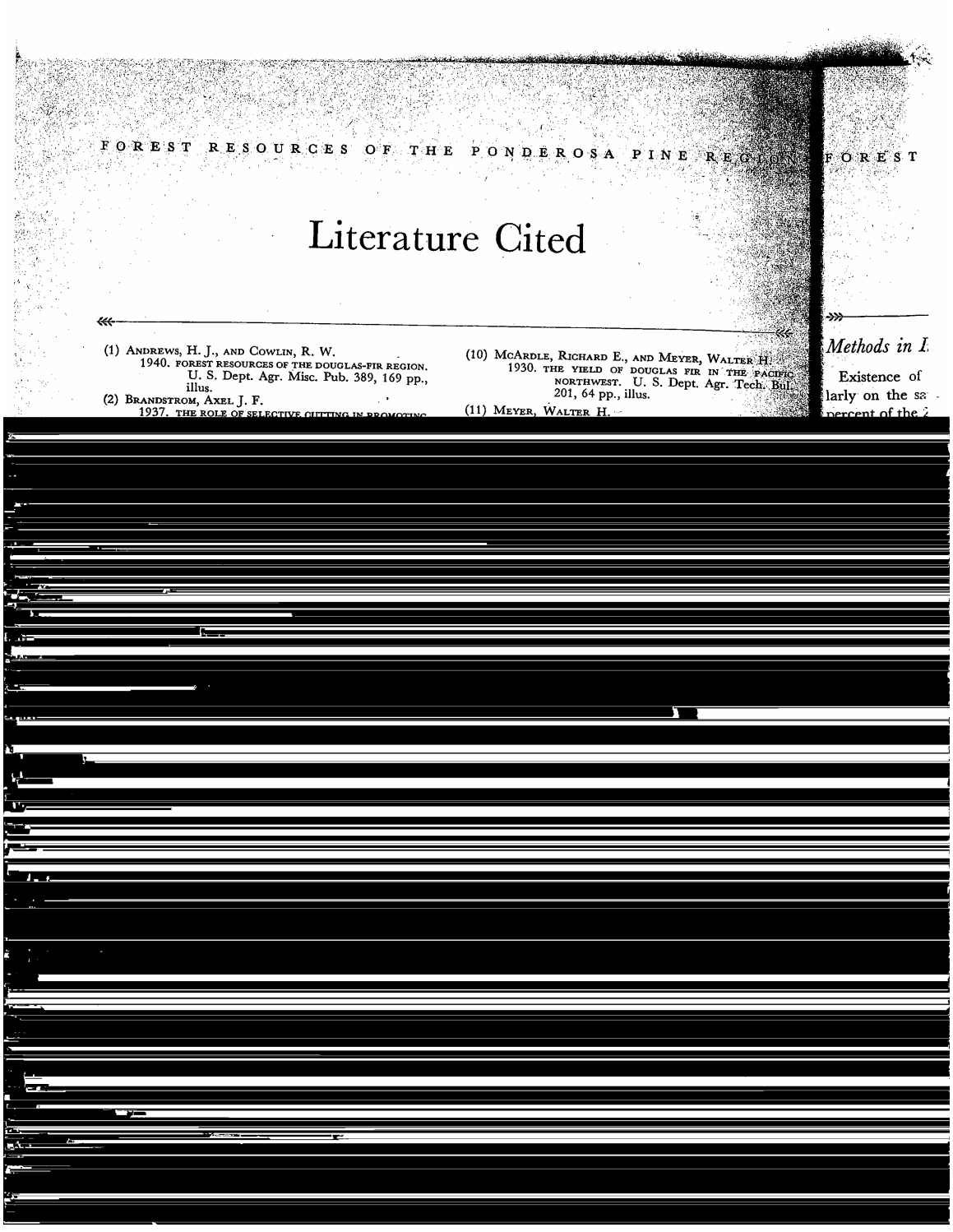

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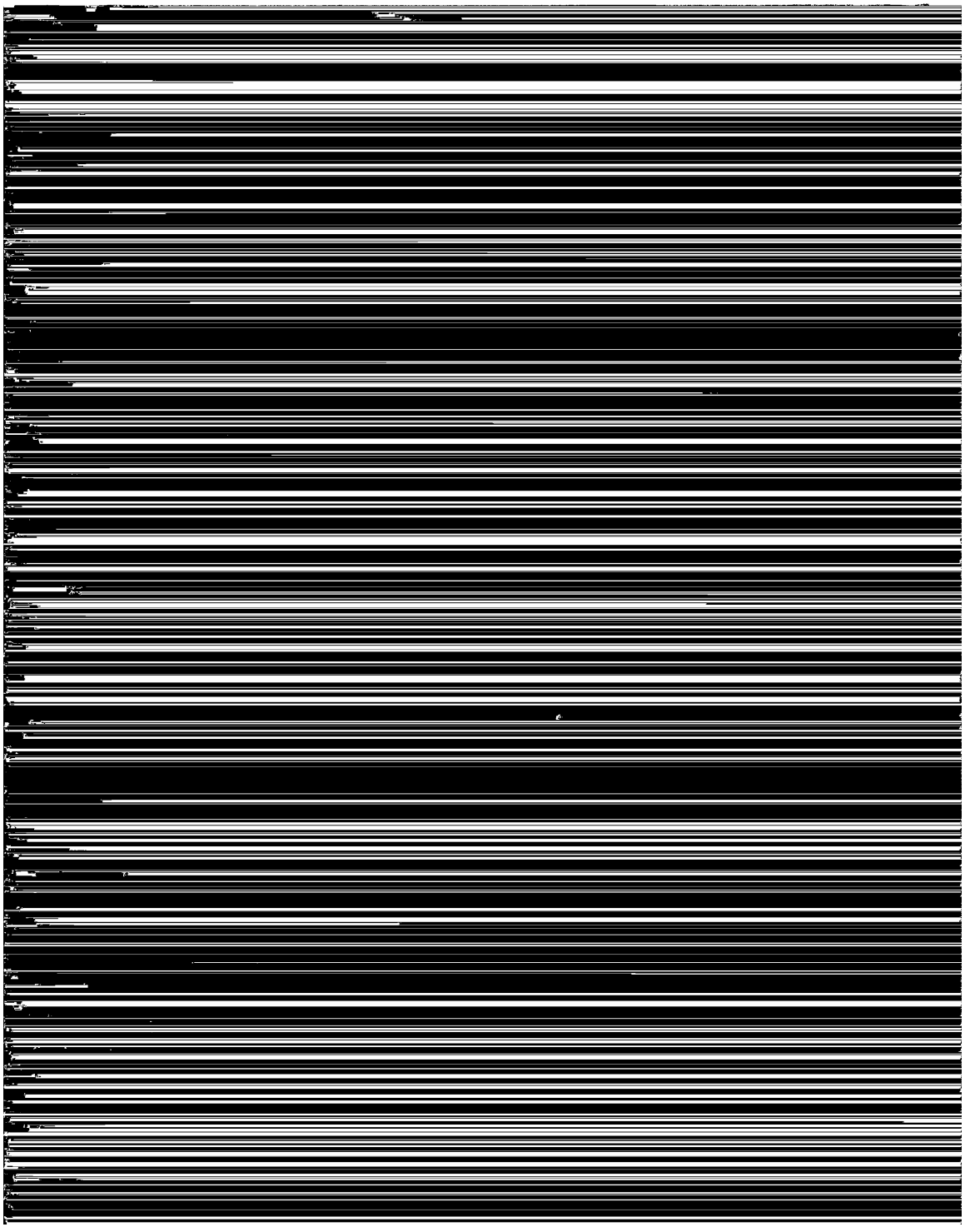

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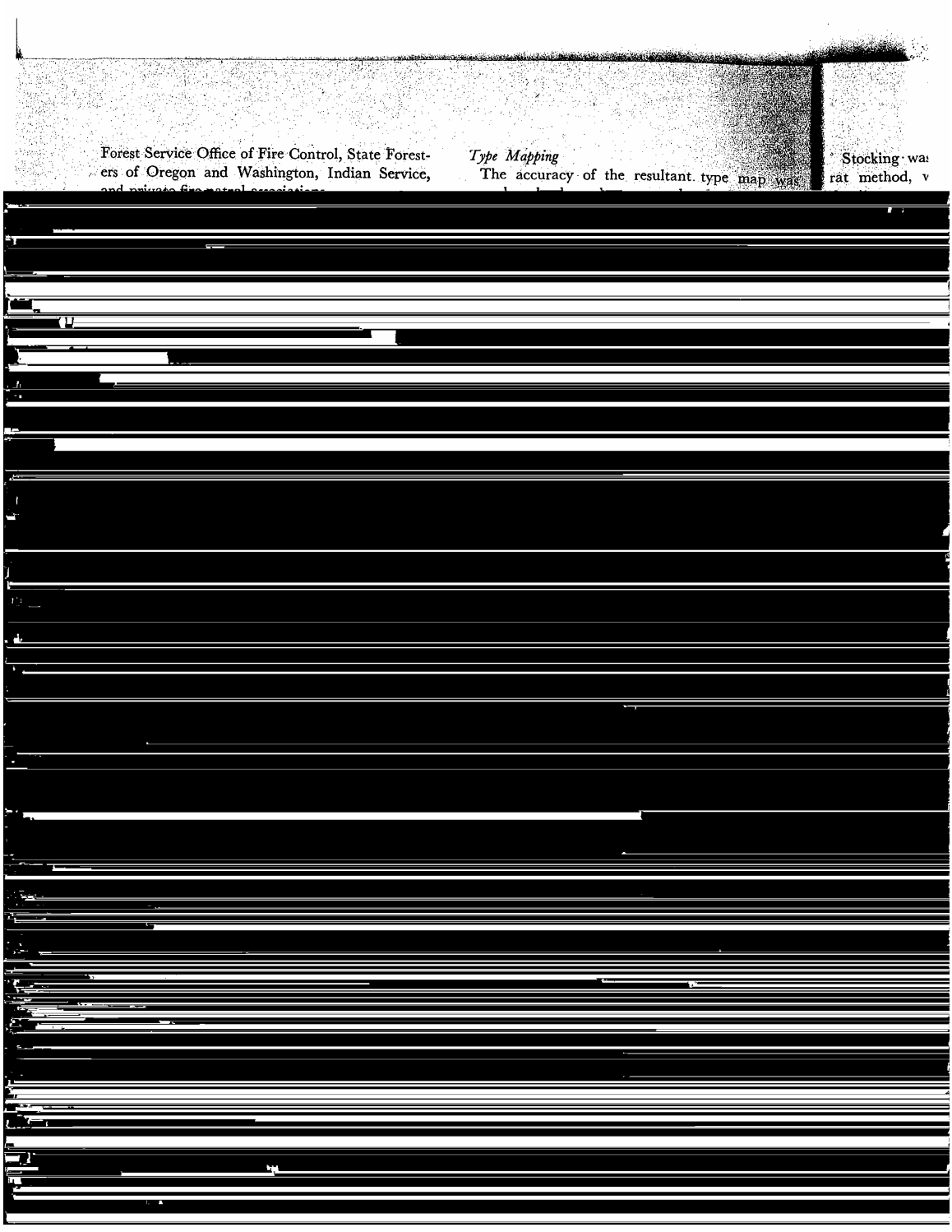

Forest Service Office of Fire Control, State Foresters of Oregon and Washington, Indian Service,

Type Mapping

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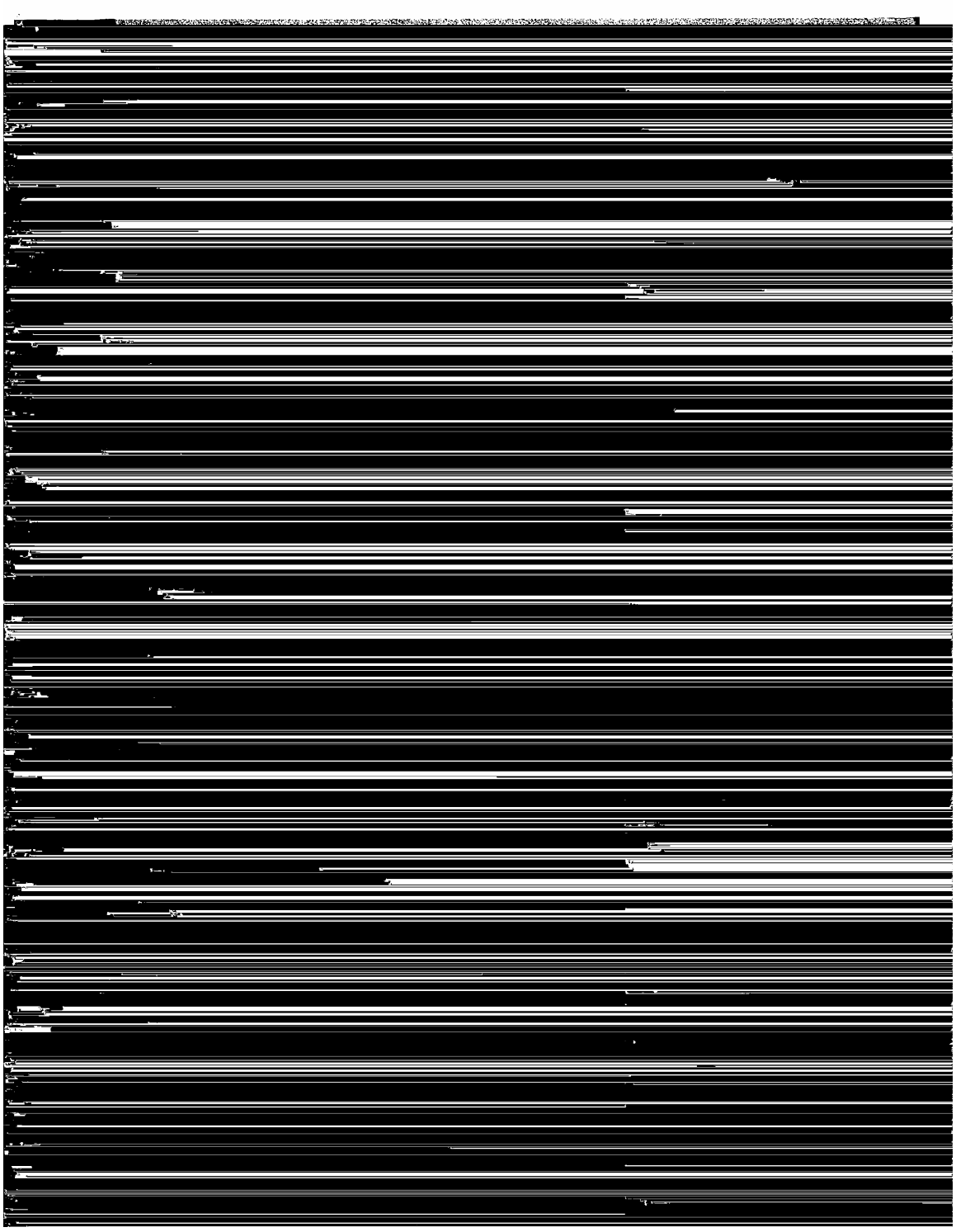

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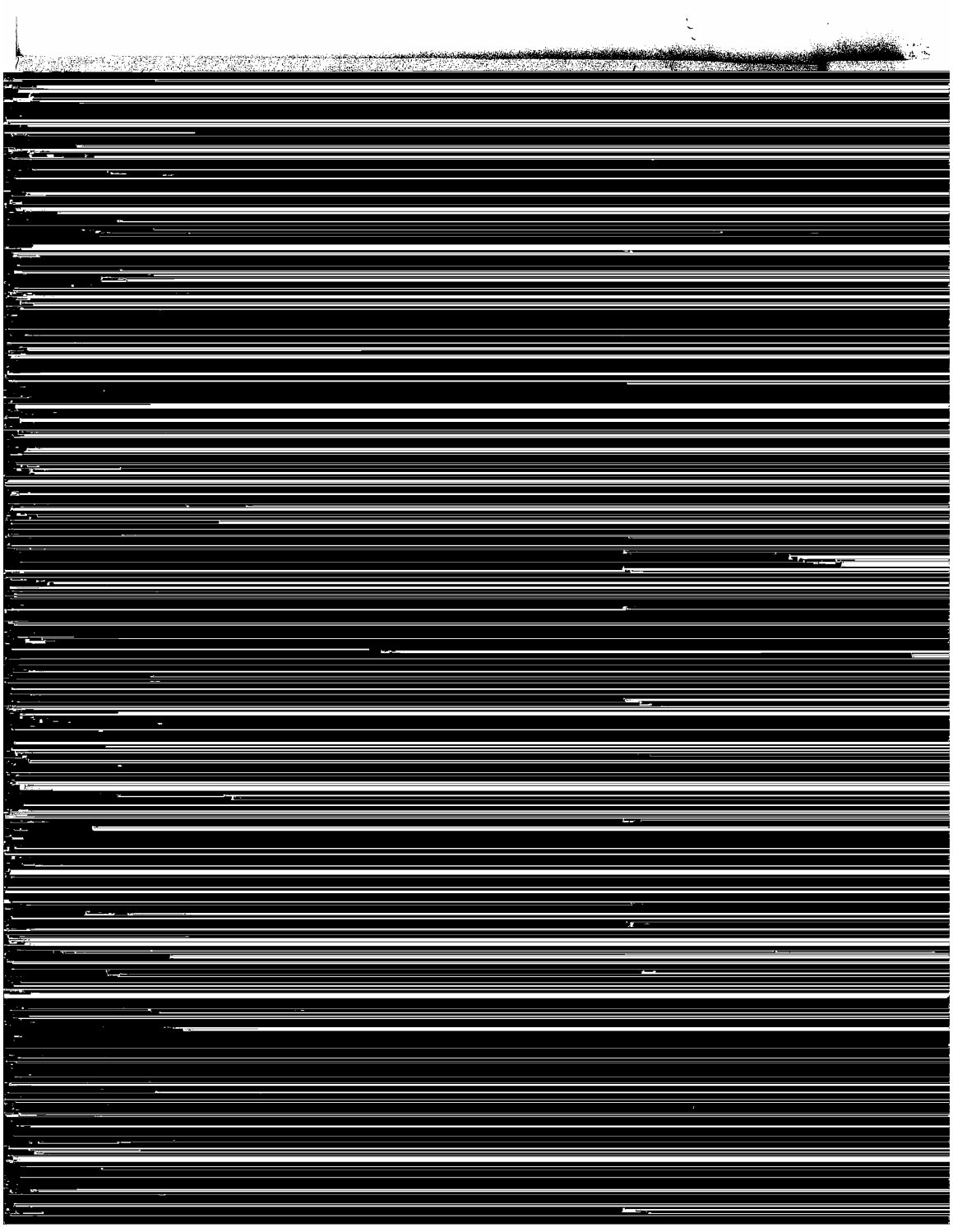

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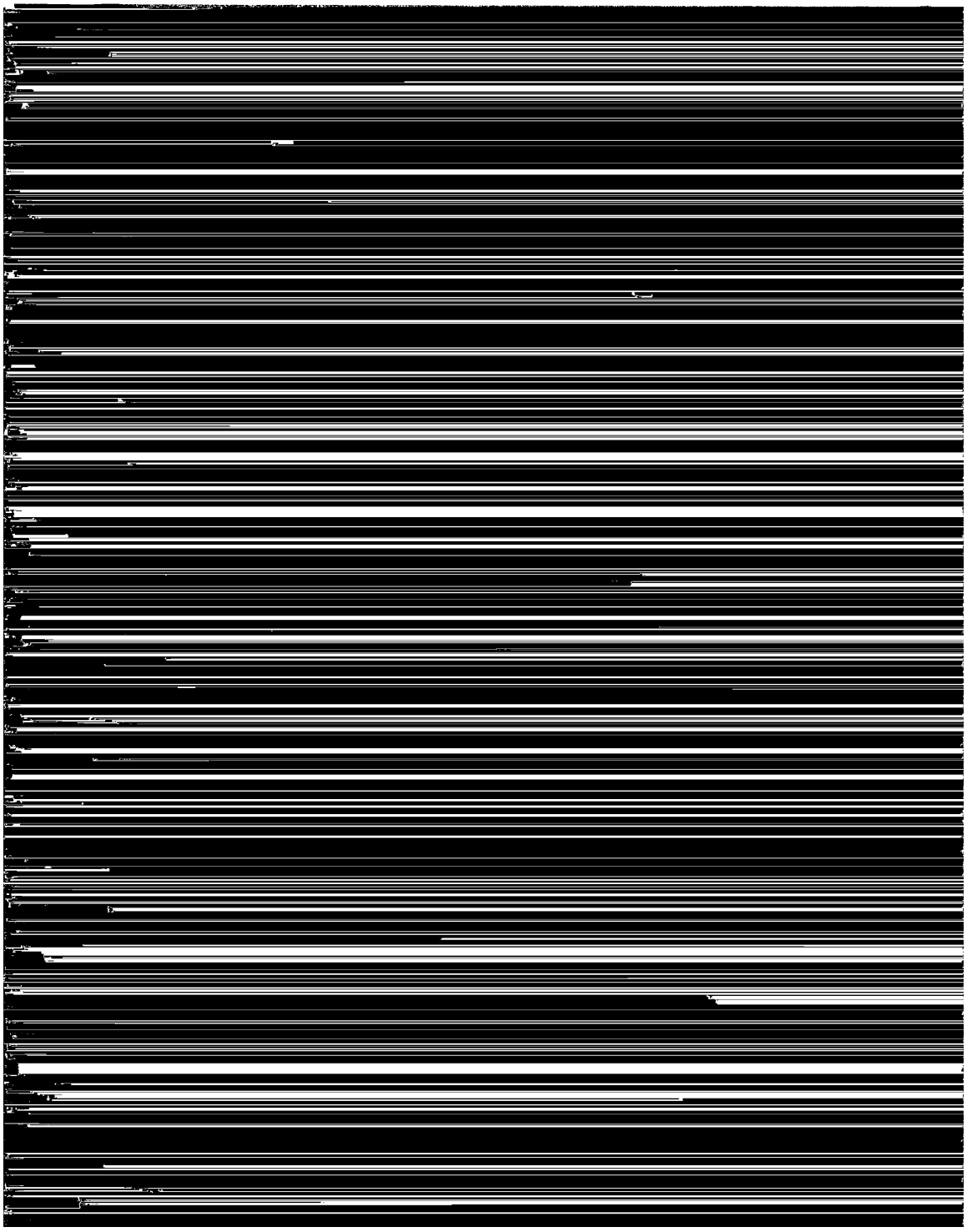

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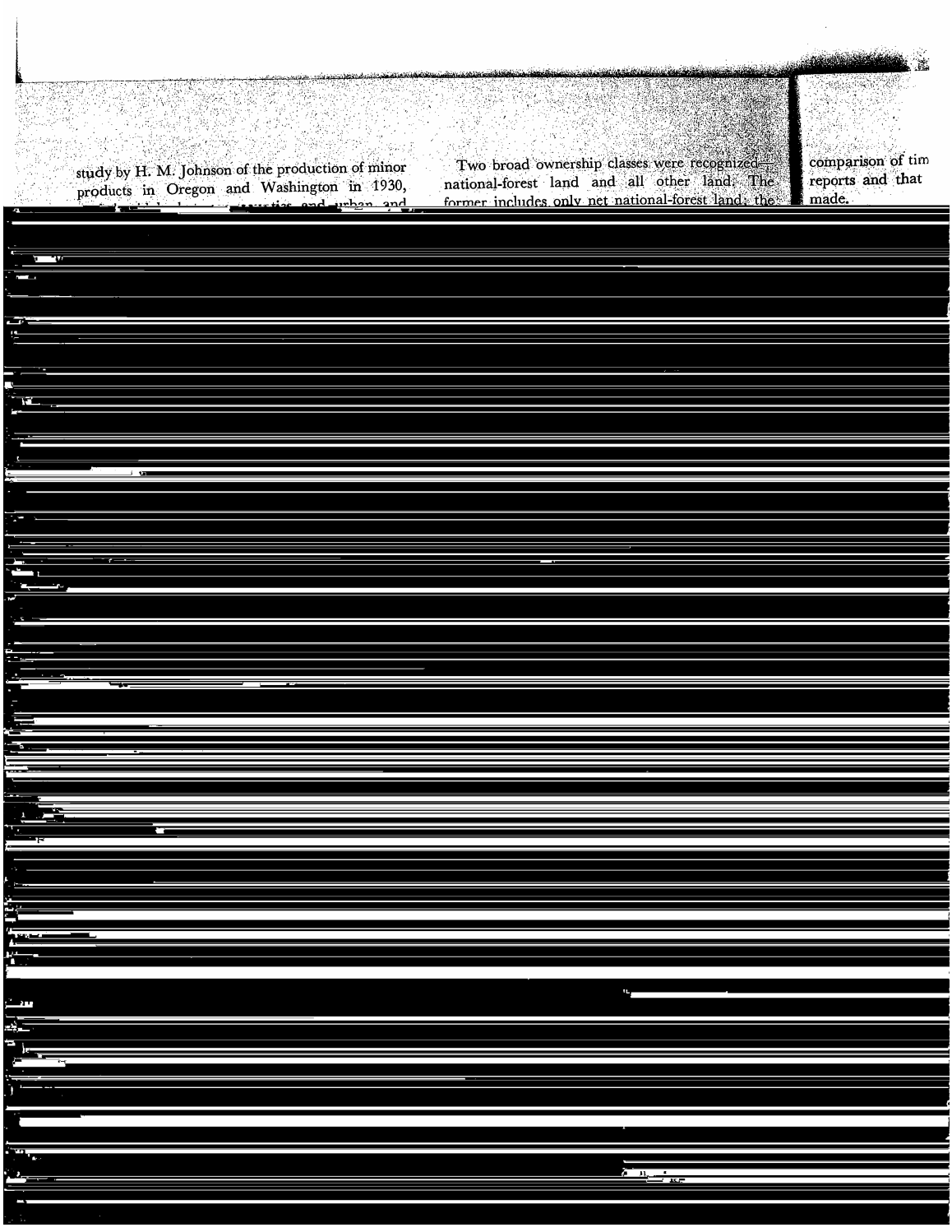

study by H. M. Johnson of the production of minor products in Oregon and Washington in 1930,

Two broad ownership classes were recognized— national-forest land and all other land. The former includes only net national-forest land, the

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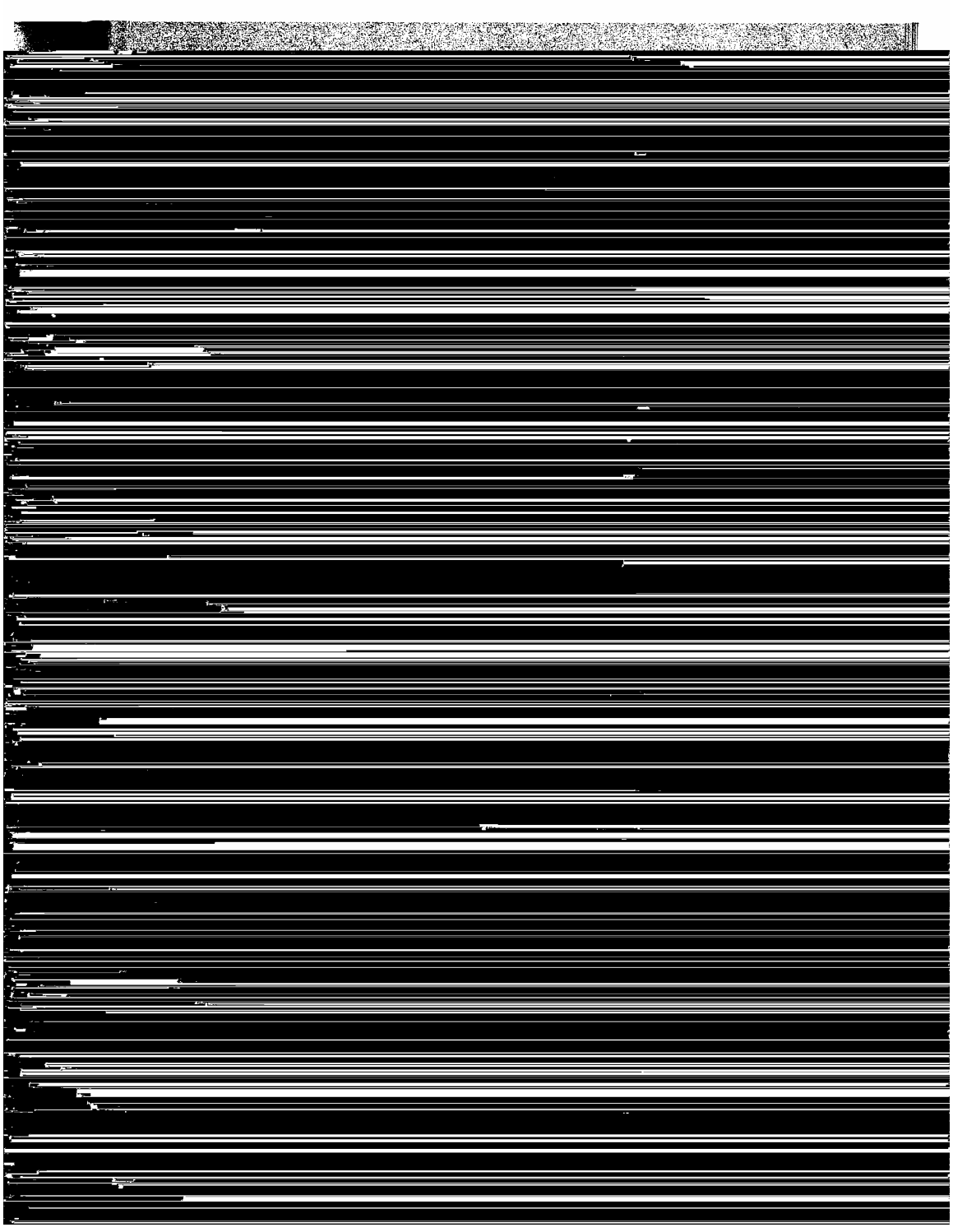

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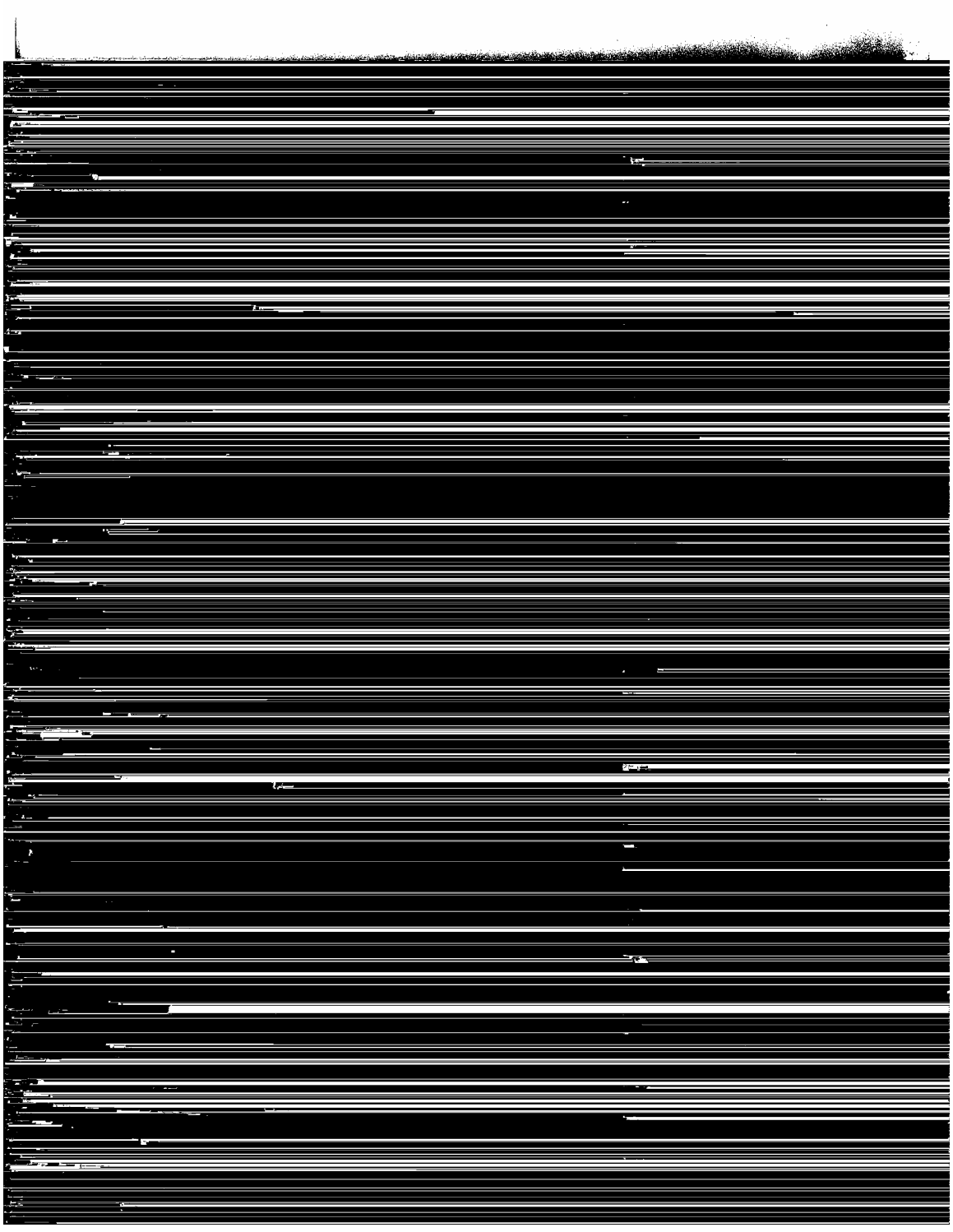

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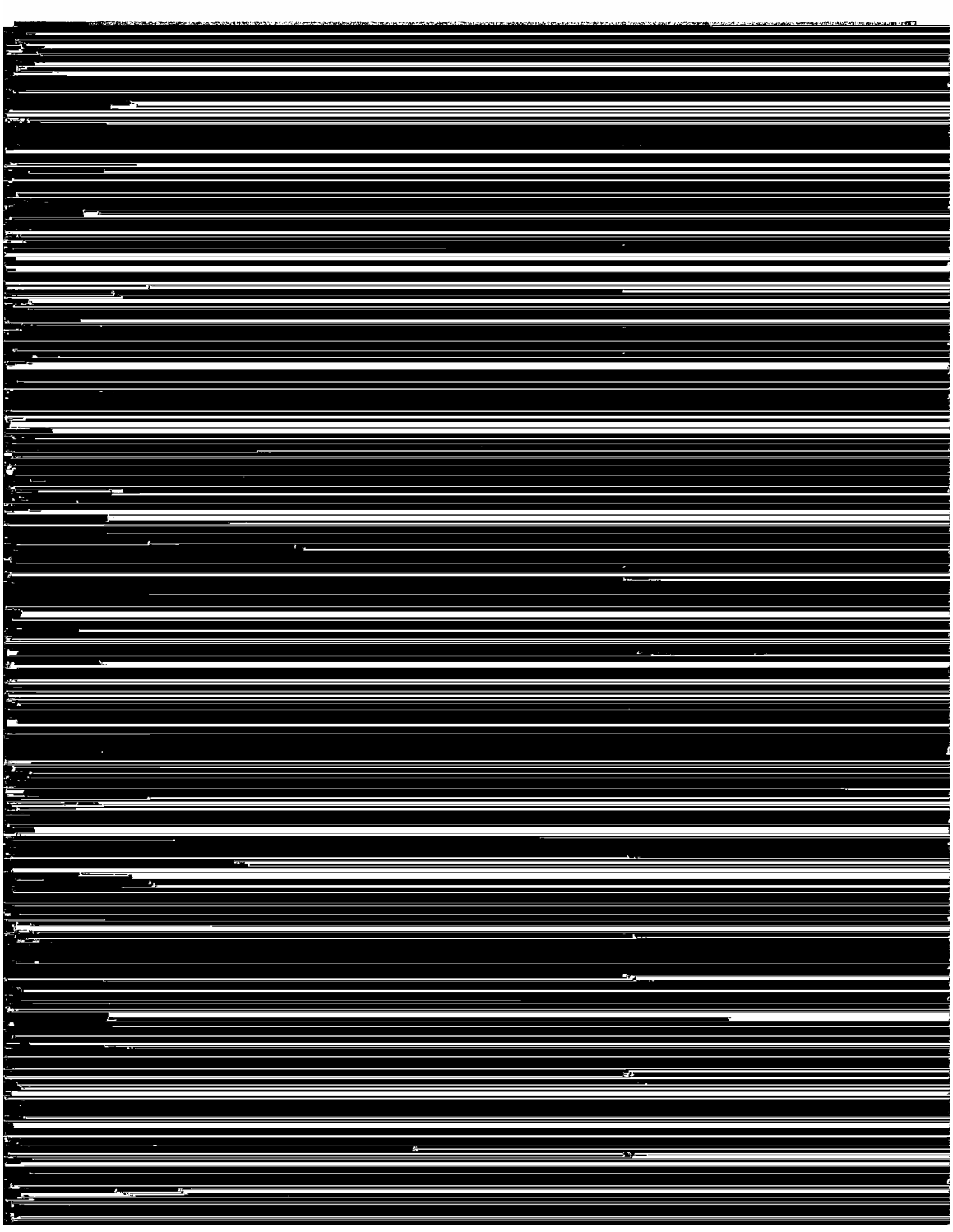

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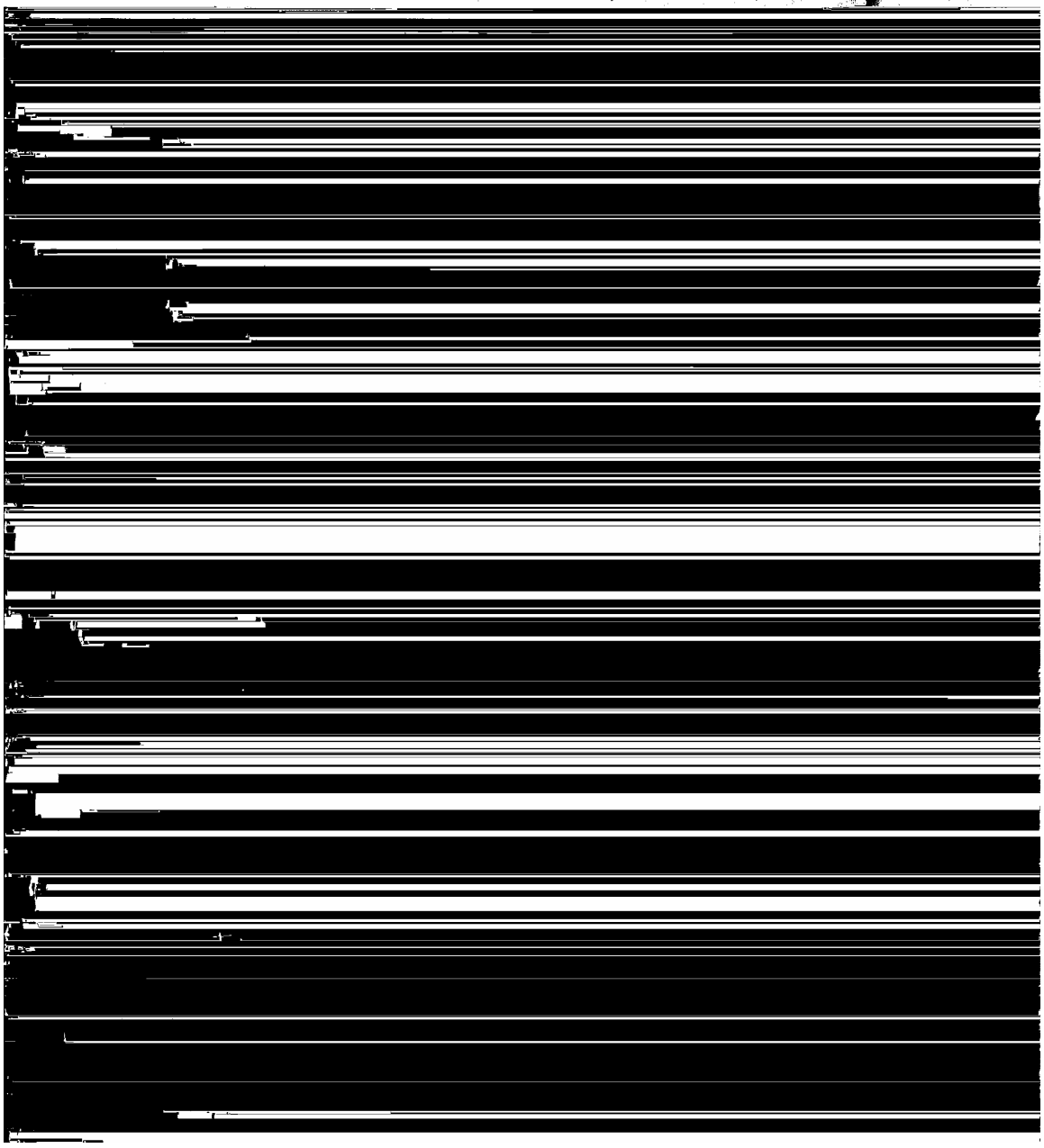
TABLE 35.—*Comparison of annual saw-timber growth and depletion, lumber tally, by unit, 1936*

[In million board feet—i. e., 000,000 omitted]



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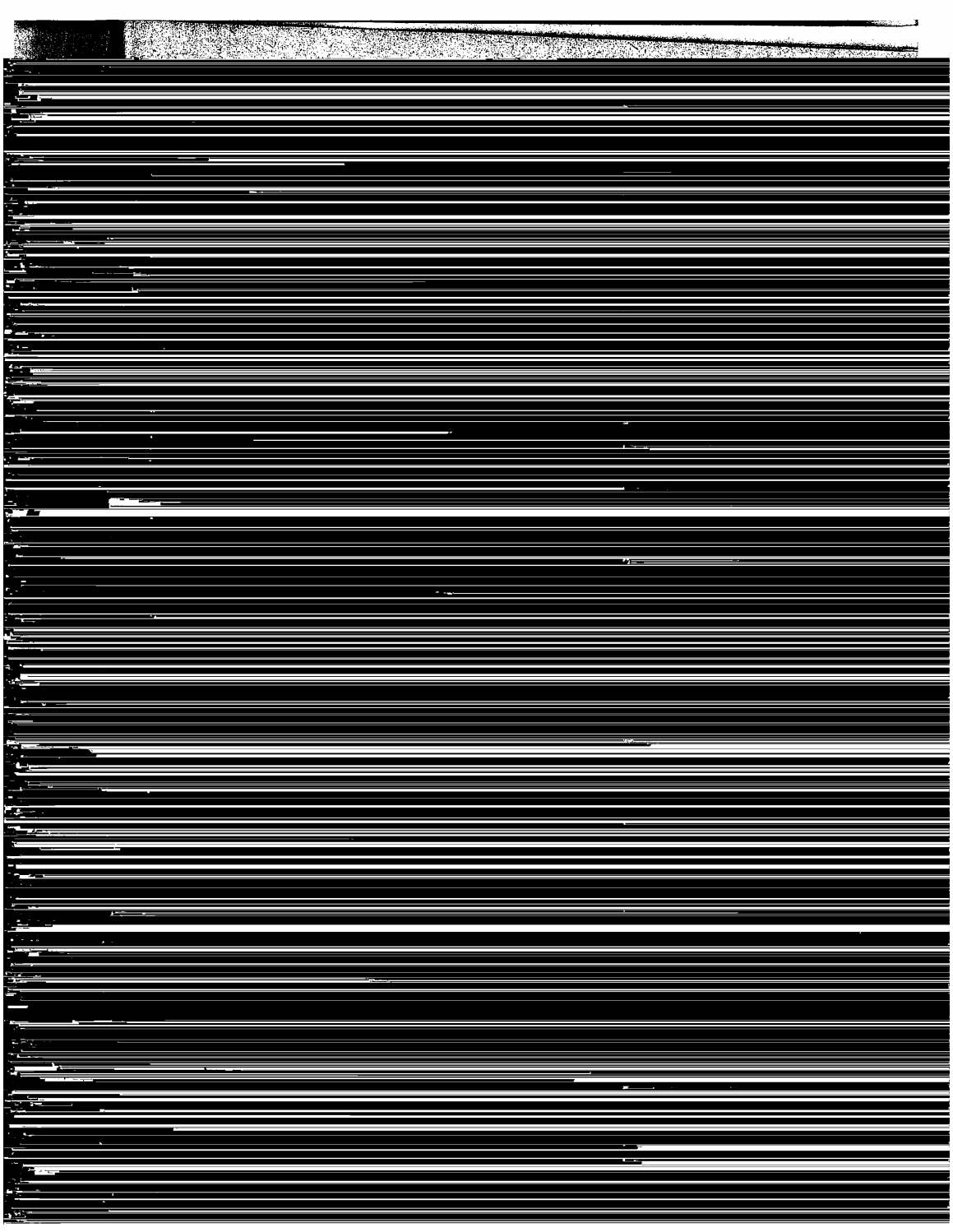

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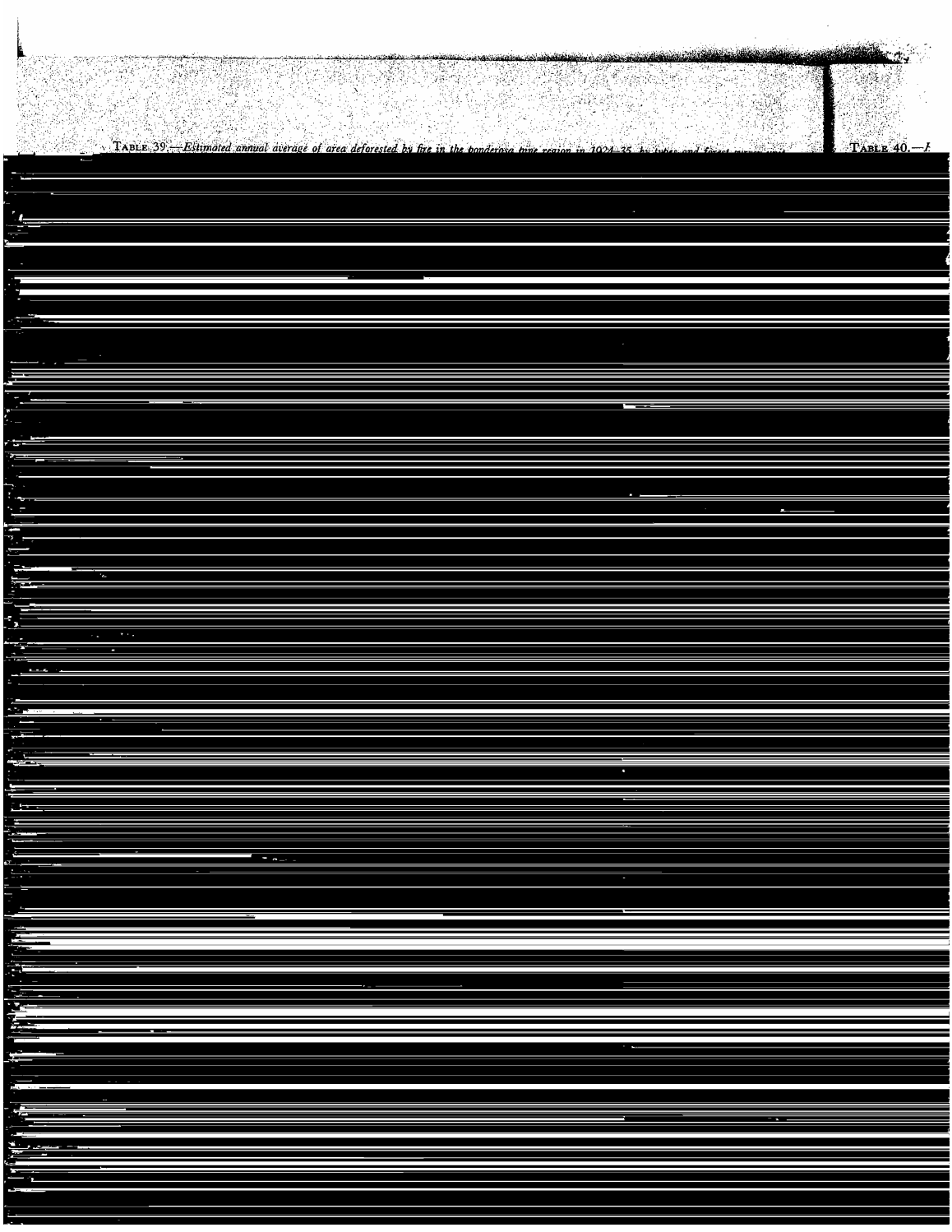

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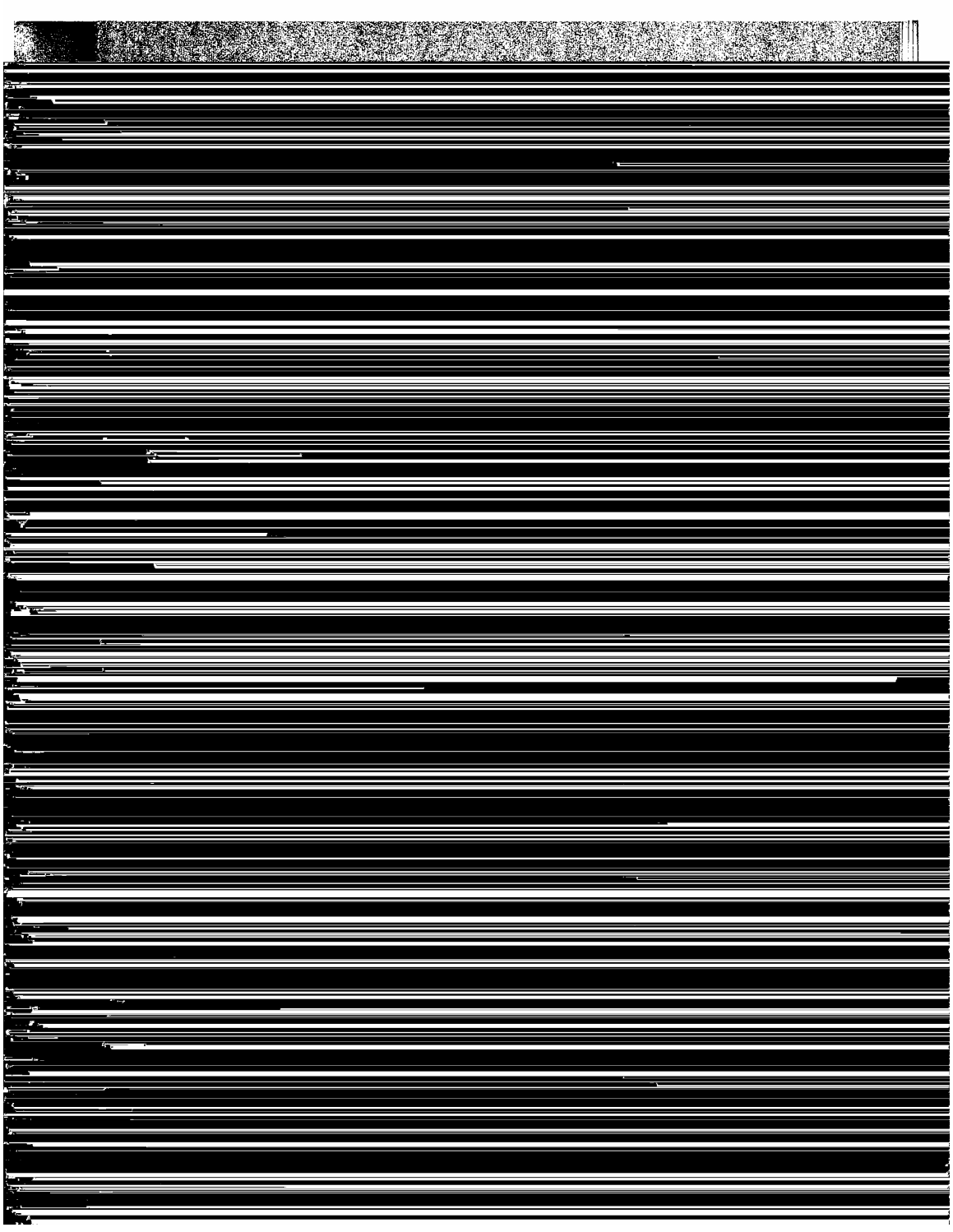

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TABLE 41.—*Summary of estimated annual average of losses by fire in the ponderosa pine region in 1924–35, by type and forest-survey unit*

Type No.	Type	AREA DEFORESTED (ACRES)									Grand total
		Eastern Washington				Eastern Oregon					
		Chelan-Colville	Yakima River	North Blue Mountain	Total	North Blue Mountain	Deschutes River	South Blue Mountain	Klamath Plateau	Total	
5½	Ponderosa pine woodland	726	31		757	2	26	24	271	323	1,080
20	Ponderosa pine, large	1,086	37		1,123	21	339	63	244	667	1,790
20½	Pure ponderosa pine, large	1,404	90	7	1,501	51	693	754	1,330	2,828	4,329
20A	Ponderosa pine-sugar pine, large						2		19	21	21
20B	Sugar pine mixture, large								10	10	10
21	Ponderosa pine, small	589	328		917	110	7	53	185	355	1,272
27	Ponderosa pine mixture, large	428	56	1	485	43	15	37	96	191	676
6	Douglas-fir, large old growth								1	1	1
7	Douglas-fir, small old growth	195	12		207		5		1	6	213
8	Douglas-fir, large second growth	184	347		531						531
9A	Douglas-fir, large poles	446	89		535		3			3	538
23	Fir-mountain hemlock, large	27	147		174		4		13	17	191
27½	Upper-slope mixture, large	9,529	51		9,580	21	17	19		57	9,637
22	Ponderosa pine seedlings and saplings	1,197	423	11	1,631	393	620	268	917	2,198	3,829
28	Ponderosa pine mixture, small	412	40	110	562	228	8	12	26	274	836
9B	Douglas-fir, small poles	49	36		85		14			14	99
10	Douglas-fir seedlings and saplings	14	61		75						75
24	Fir-mountain hemlock, small	6	10		16		4		45	49	65
28½	Upper-slope mixture, small	4,327	200	6	4,533	29	22	5		56	4,589
25	Lodgepole pine, large	34	44		78		39		5	44	122
26	Lodgepole pine, small	6,493	30		6,523	45	225	43	272	585	7,108
4	Oak woodland						15			15	15

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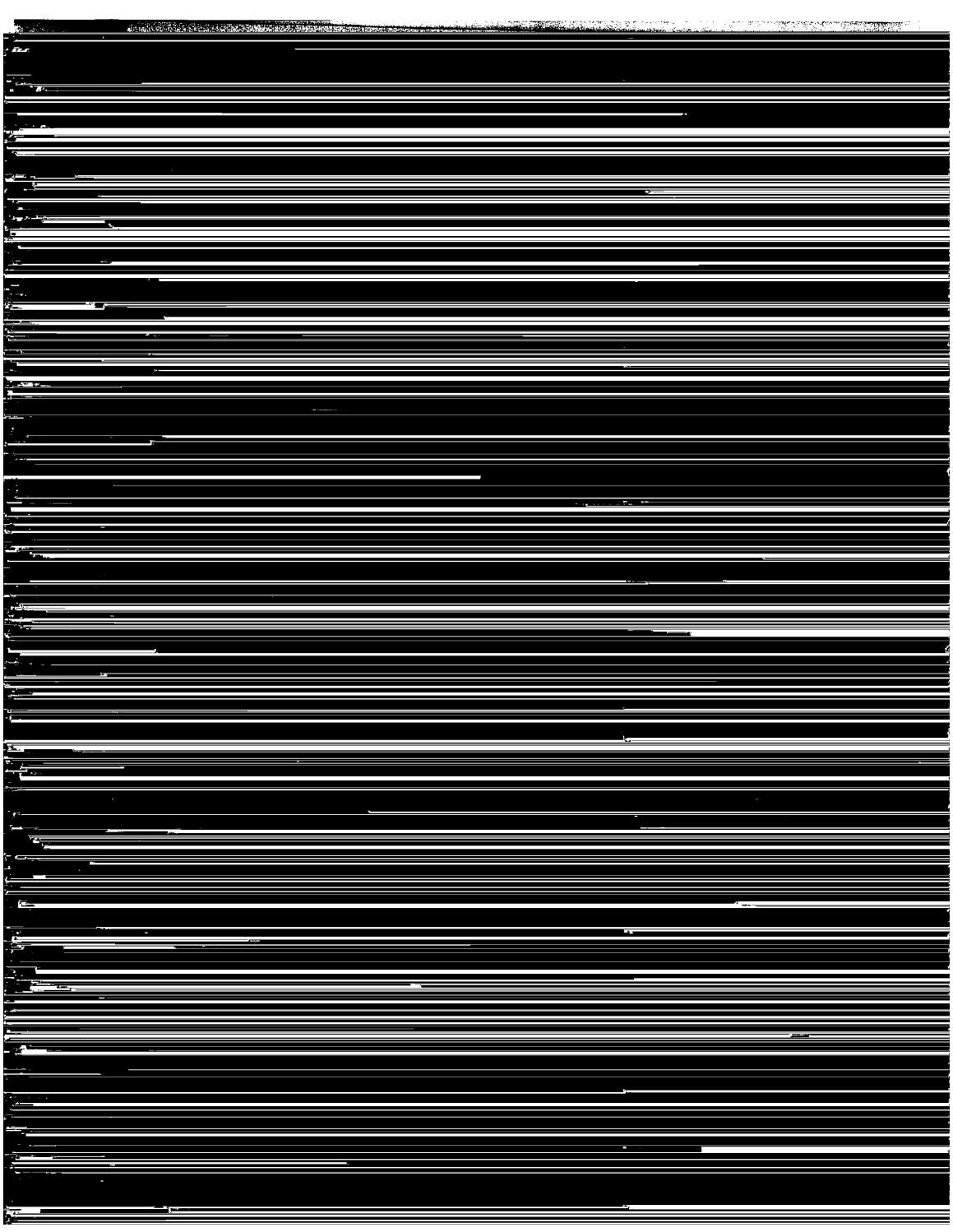

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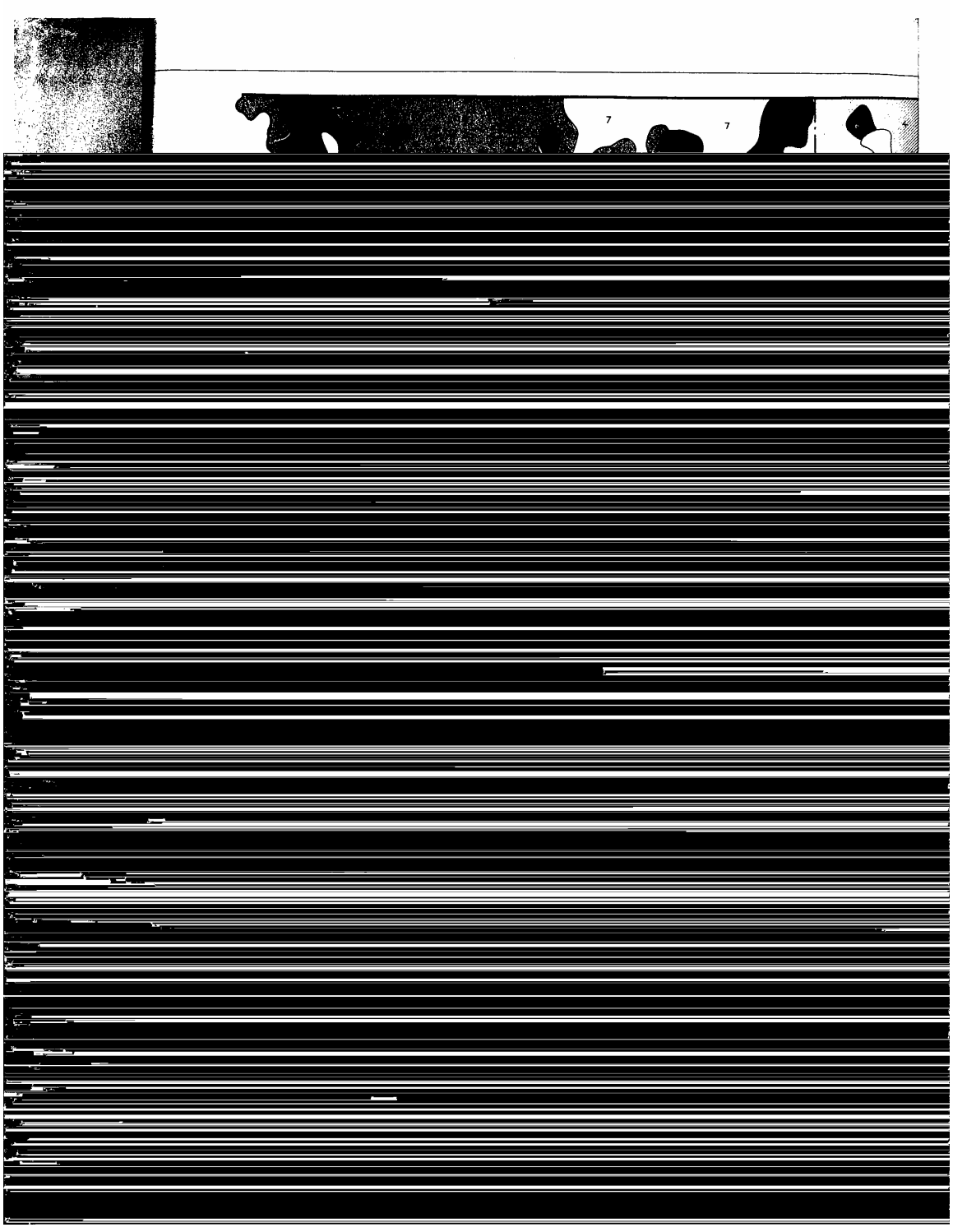

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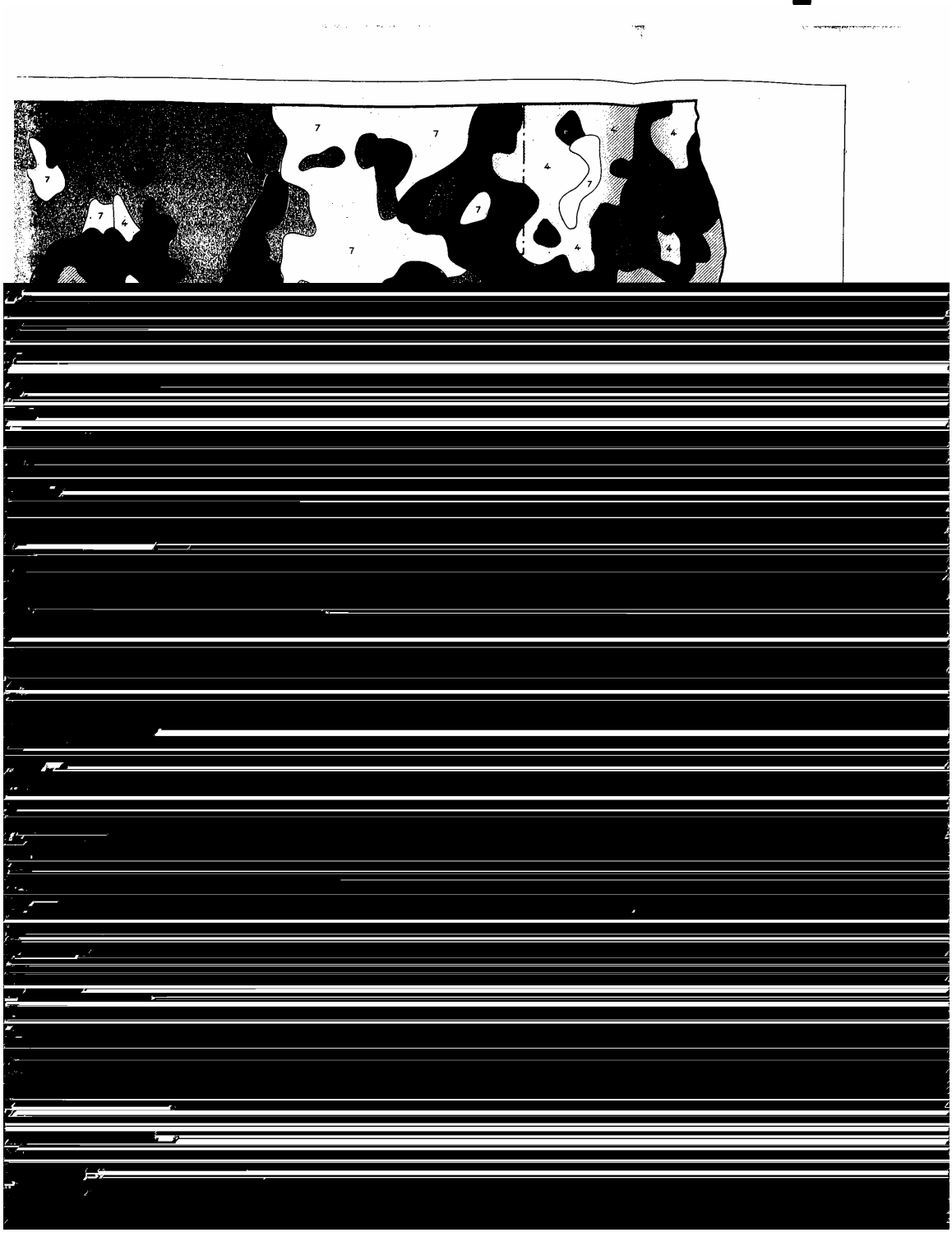

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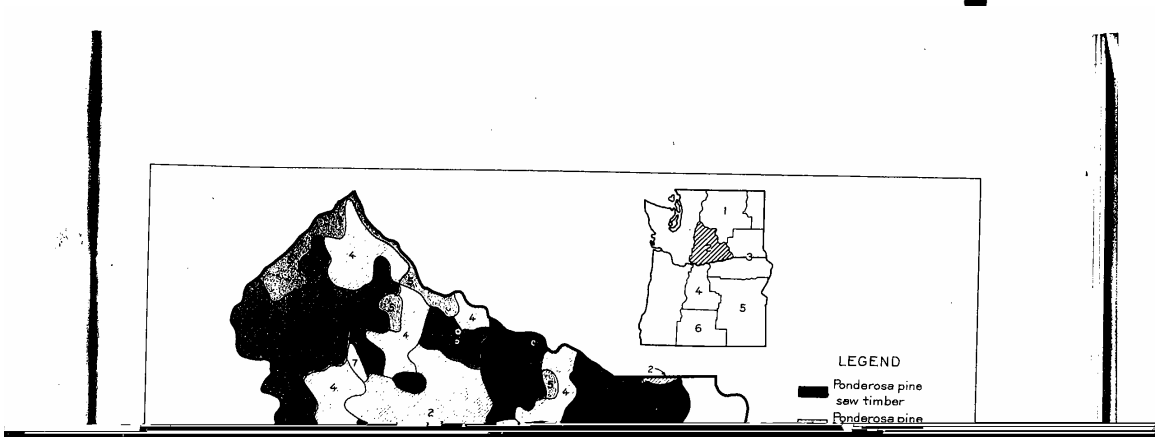

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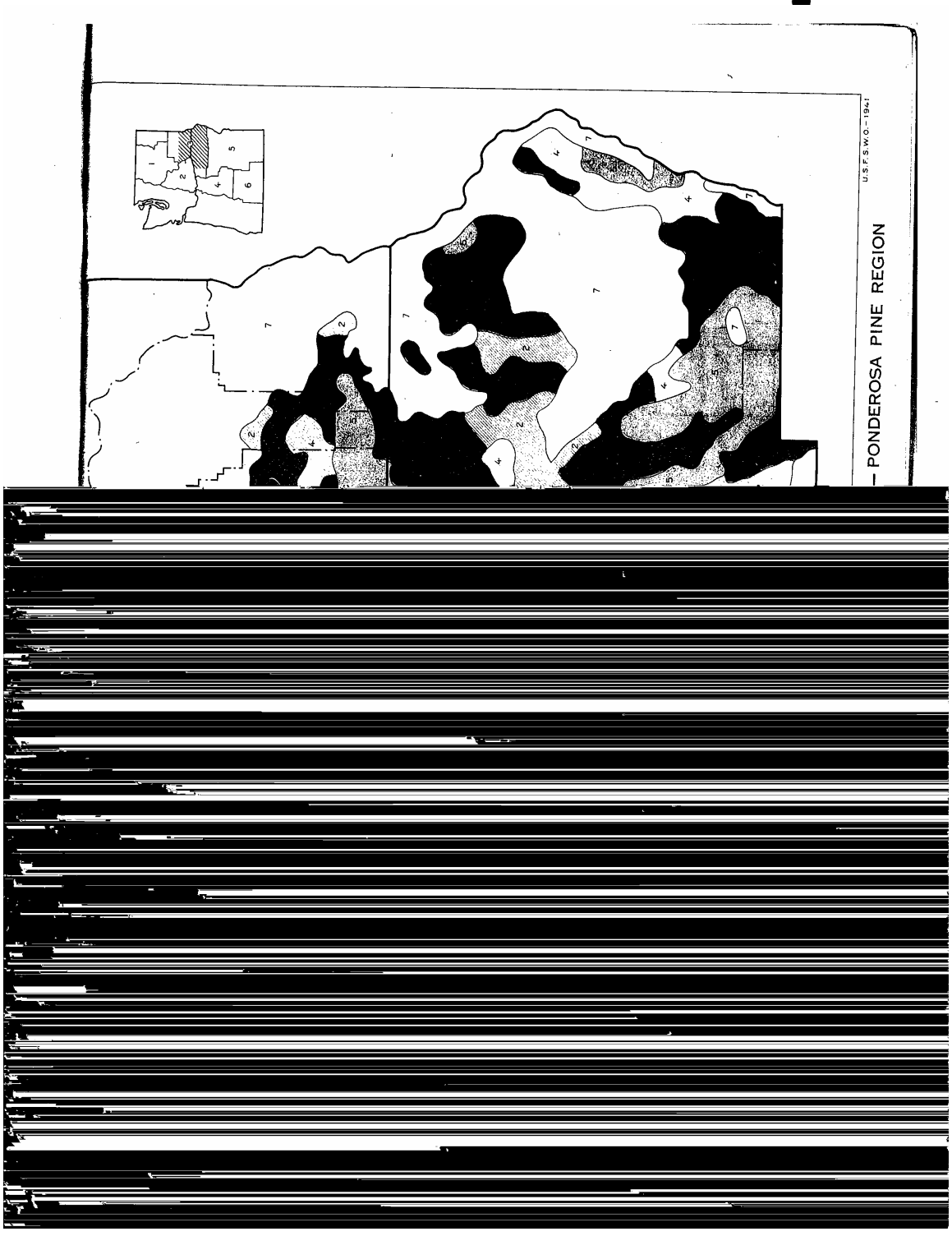

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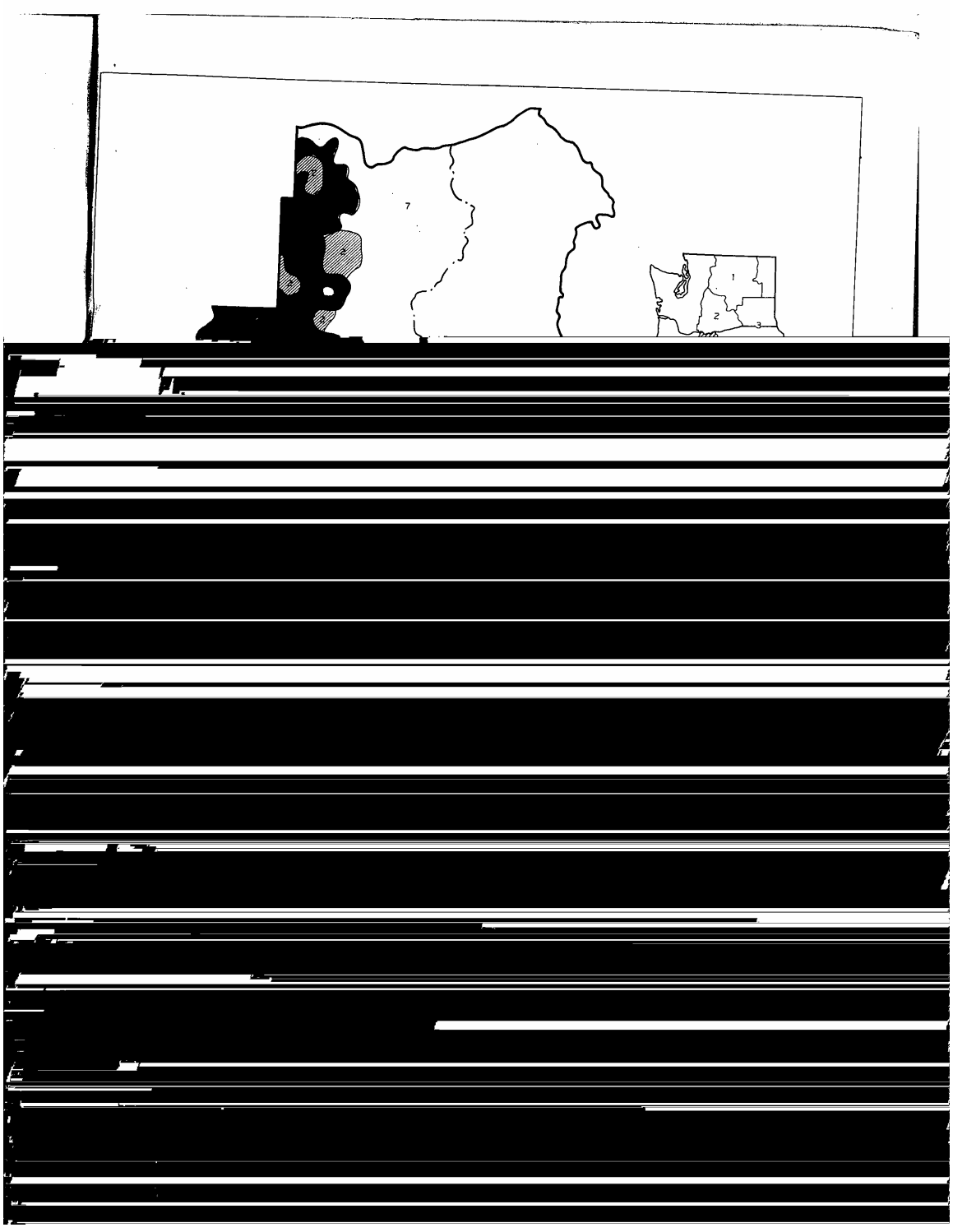

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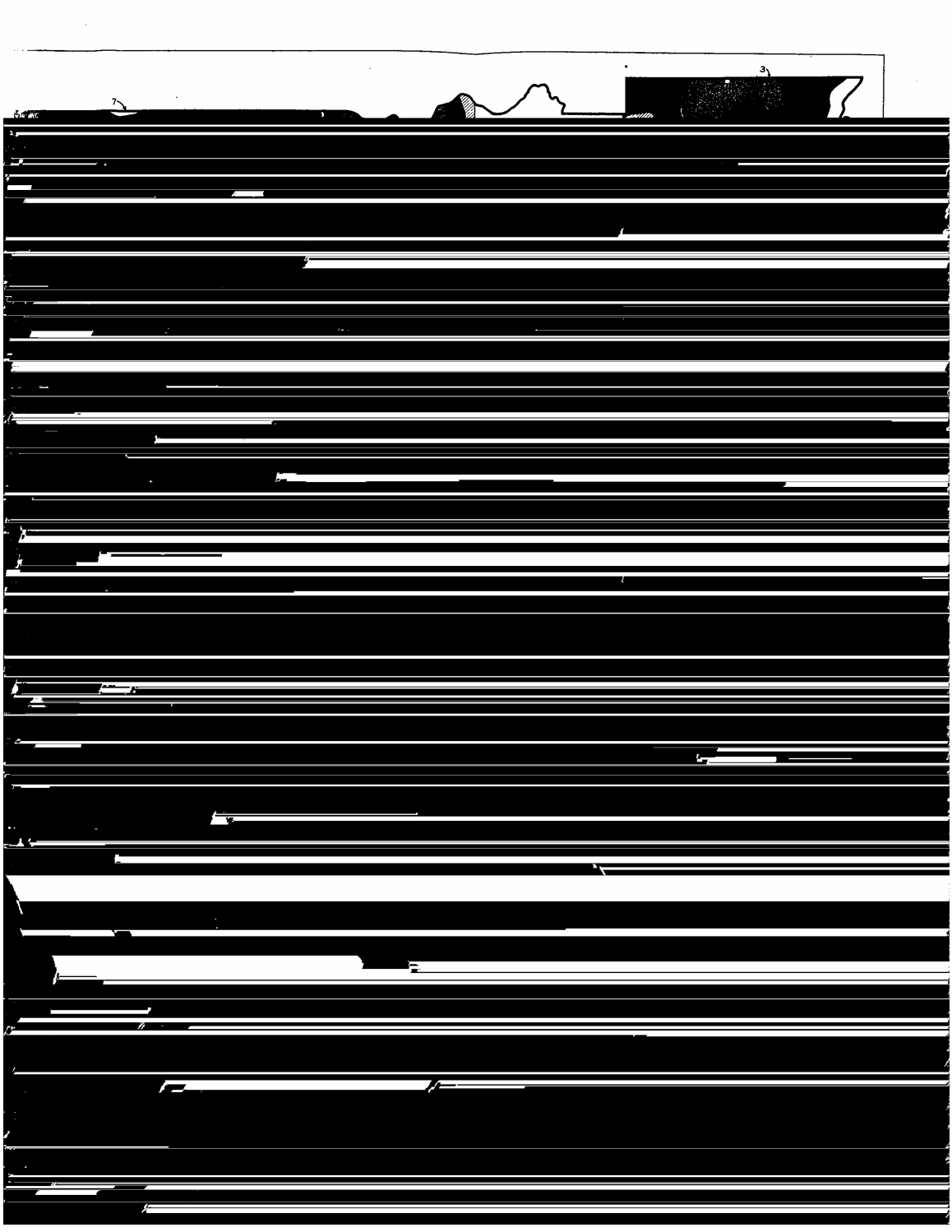

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