

MOUNTAIN PINE BEETLE

IN THE
PACIFIC NORTHWEST
1955 - 1966



MOUNTAIN PINE BEETLE DAMAGE
in the
PACIFIC NORTHWEST
1955-1966

by

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U.S. Department of Agriculture

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Logging infested trees reduces beetle populations and saves timber values.

INTRODUCTION

The mountain pine beetle *Dendroctonus ponderosae* Hopk. = *D. monticolae* Hopk.¹ is an important tree killer in the Pacific Northwest. Each year this beetle kills pine trees of all ages and in some years may cause serious stand depletion. Between 1955 and 1966, a total of 4,213,600 acres of pine was infested (table 1). The estimated volume loss during this 12 year period is 485 MM board feet. About 70 percent of this mortality occurred in western white pine stands. Tree killing in lodgepole pine stands accounted for 24 percent of the loss; ponderosa pine, 6 percent; and sugar pine, less than 1 percent.

This report is intended as a reference for land managers and forest pest control personnel.

METHODS

Mountain pine beetle outbreaks in the Pacific Northwest are generally detected from the air during annual aerial survey. Each outbreak is classified either light, moderate, heavy or very heavy as determined by the number of dead trees per section, and the number of trees per group. The classification of intensity and grouping of damage per section is presented for each host in the text.

The data from 1955-1966 were compiled from the annual Forest Insect Conditions Reports. These data are summarized by host species, States, and the various reporting areas as shown on the map on the outside back cover.

The volume estimates are based upon an average size tree infested for each major host. The average board foot per acre factor was calculated by multiplying the average board foot per tree by the maximum number of dead trees per section for each intensity class and divided by 640 acres. These intensity classes are listed in the text for each host.

The four infestation maps illustrate the total number of years mountain pine beetle was active in a township between 1955 and 1966. This 12-year period was arbitrarily divided into 3 periods of 4 years each

HOSTS

The major hosts in the Pacific Northwest are lodgepole, ponderosa, western white, and sugar pines.

During epidemic conditions, a few beetles may attack another species of pine or other species such as Engelmann spruce, white fir, Douglas-fir and western hemlock. These attacks often abort or the broods seldom complete their life cycles.

¹ Wood, S. L. A revision of the bark beetle genus *Dendroctonus* Erichson (Coleoptera: Scolytidae). Great Basin Naturalist 23(1-2): 1-117, illus.

Table 1.—Summary of mountain pine beetle infestations by hosts in Oregon and Washington 1955-66
(In Acres)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total	
													<i>Est.</i>	
													<i>Acres</i>	<i>Vol.bd. ft.</i>
LOGEPOLE PINE:														
Oregon	52,360	52,420	73,920	36,640	34,640	40,080	77,680	65,200	50,220	55,790	94,190	89,390	722,530	98,693,525
Washington	27,240	28,360	5,120	5,920	7,600	6,440	1,520	3,050	17,620	8,770	1,970	80	113,690	16,420,524
Sub-total	79,600	80,780	79,040	42,560	42,240	46,520	79,200	68,250	67,840	64,560	96,160	89,470	836,220	115,114,049
PONDEROSA PINE:														
Oregon	2,060	7,440	640	2,560	4,240	14,560	16,640	3,820	32,220	42,440	109,620	54,230	290,470	25,536,932
Washington	0	0	0	0	6,080	4,740	1,200	1,345	1,155	13,830	31,930	21,730	82,010	8,965,872
Sub-total	2,060	7,440	640	2,560	10,320	19,300	17,840	5,165	33,375	56,270	141,550	75,960	372,480	34,502,804
WESTERN WHITE PINE:														
Oregon	12,160	34,680	29,280	32,160	59,520	31,040	114,380	73,720	67,845	92,700	72,120	71,540	691,145	71,929,338
Washington	81,120	130,180	102,560	190,880	153,340	210,400	291,760	349,770	410,545	175,990	127,330	74,410	2,298,285	262,210,088
Sub-total	93,280	164,860	131,840	223,040	212,860	241,440	406,140	423,490	478,390	268,690	199,450	145,950	2,989,430	334,139,426
SUGAR PINE:														
Oregon	0	0	160	0	0	480	0	160	0	6,160	6,110	2,370	15,440	1,477,256
Sub-total	0	0	160	0	0	480	0	160	0	6,160	6,110	2,370	15,440	1,477,256
TOTAL:														
Oregon	66,580	94,540	104,000	71,360	98,400	86,160	208,700	142,900	150,285	197,090	282,040	217,530	1,719,585	197,637,051
Washington	108,360	158,540	107,680	196,800	167,020	221,580	294,480	354,165	429,320	198,590	161,230	96,220	2,493,985	287,596,484
REGIONAL TOTAL	174,940	253,080	211,680	268,160	265,420	307,740	503,180	497,065	579,605	395,680	443,270	313,750	4,213,570	485,233,535

LOGEPOLE PINE

History

Large mountain pine beetle outbreaks developed periodically in lodgepole pine stands throughout the Pacific Northwest. The first major outbreak reported was in 1908 near Joseph, Oregon, on the Wallowa National Forest. Control was directed against this outbreak, making it the first project in the Pacific Northwest. Since that time, many other outbreaks have been reported, primarily in the Cascade Mountains in Oregon. Since 1925, extensive tree killing occurred periodically in and near Crater Lake National Park. A large outbreak was detected on the Deschutes National Forest between Wanoga Butte and Swampy Lakes in the late 1940's. This outbreak did not subside until the late 1950's. The most recent outbreak developed on the Fremont and Winema National Forests near Bald Mountain Lookout in 1962 and losses are still occurring.

Damage Classification

The intensity classification and the estimated board foot per acre used when mapping mountain pine beetle infestations in lodgepole pine during aerial surveys is:

Infestation intensity	Trees per section	Trees per group	Estimated volume loss
	— — <i>Number</i> — —		<i>Bd. ft./acre</i>
Light	50-350	50 or less	31.7
Moderate	350-1,000	200 or less	90.6
Heavy	1,000-2,600	400 or less	235.6
Very heavy	2,600 or more	400 and over	1,161.8

Location of Damage

Most of the damage in the Pacific Northwest has occurred east of the Cascade Mountains (map 1). From 1955 through 1966 a total of 836,220 acres of lodgepole pine was reported infested with an estimated loss of over 115 MM board feet (tables 2 and 3). Eighty-eight percent of the Regional losses occurred in Oregon (figure 1-1). Eighty-two percent of the damage in Oregon was centered on the Deschutes, Fremont, and Winema National Forests (figures 1-2, 1-3). The heaviest tree killing on the Deschutes National Forest occurred in 1955 near Wanoga Butte and again in 1965 near Bearwallow Butte. Heaviest losses on the Fremont National Forest have been in the vicinity of Bald Mountain and Slide Mountain. For the Winema National Forest, the heaviest tree mortality occurred in the Cottonwood drainage and near Teatable Mountain.

Tree killing in Washington has been moderate. About 71 percent of the damage occurred on the Wenatchee, Colville, and Okanogan National Forests (figures 1-4, 1-5). Significant losses also occurred on the Gifford Pinchot National Forest and the Yakima Indian Reservation.

Control Measures

Chemicals have not been recommended for controlling mountain pine beetle in lodgepole pine stands in Region 6. Logging is the only practical method for control. This includes removing all merchantable infested and noninfested trees to as small a diameter as economically possible. The sale area should cover a sufficiently large geographic area so as to completely alter the beetle breeding site inside and outside the existing infestation boundary.

Mountain pine beetle outbreaks in lodgepole pine can be kept to a minimum by maintaining a vigorous healthy stand. This is usually done by shortening the rotation. Many lodgepole pine stands become susceptible to attack at age 80. To help reduce future losses, it is suggested that foresters determine the age of their lodgepole pine stands and log the oldest stands first.

Table 2.—Trend of mountain pine beetle infestations in lodgepole pine in Oregon and Washington by reporting area
1955-66
(In Acres)

Reporting Area ¹	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total
Oregon:													
Deschutes N.F.	26,080	12,680	30,880	13,760	2,800	3,520	9,160	17,730	10,330	9,100	11,930	10,480	158,450
Fremont N.F.	5,600	13,100	17,440	9,120	10,400	20,120	25,280	18,120	13,390	21,950	47,100	38,380	240,000
Malheur N.F.	2,440	5,600	2,720	160	1,280	440	960	1,450	610	2,060	8,410	4,540	30,670
Ochoco N.F.	--	--	--	--	--	--	--	10	--	--	40	--	50
Rogue River N.F.	6,720	8,480	3,200	3,680	4,800	2,880	--	640	360	1,100	--	180	32,040
Siskiyou N.F.	--	--	--	--	--	--	--	--	--	190	80	30	300
Umatilla N.F.	480	960	--	320	1,120	240	--	60	2,025	530	140	670	6,545
Umpqua N.F.	1,920	160	320	--	--	--	2,400	200	2,190	160	--	200	7,550
Wallowa-Whitman N.F.	960	5,600	160	640	2,560	40	160	1,160	2,640	1,440	3,130	4,230	22,720
Willamette N.F.	--	400	--	--	1,600	--	--	--	355	160	--	--	2,515
Winema N.F.	8,160	4,160	18,880	7,040	5,760	9,840	31,960	20,390	17,055	17,100	21,560	29,650	191,555
Crater Lake N.P.	--	1,280	--	960	3,520	3,000	6,400	5,440	1,180	2,000	1,800	1,030	26,610
Warm Springs I.R.	--	--	320	960	800	--	1,360	--	85	--	--	--	3,525
Sub-total	52,360	52,420	73,920	36,640	34,640	40,080	77,680	65,200	50,220	55,790	94,190	89,390	722,530
Washington:													
Colville N.F.	--	--	--	--	--	2,800	--	1,720	4,360	3,540	--	--	12,420
Gifford Pinchot N.F.	--	--	--	--	--	--	--	--	8,960	880	--	--	9,840
Kaniksu N.F.	--	--	--	--	--	480	--	10	600	--	--	--	1,090
Okanogan N.F.	640	3,360	480	640	1,120	960	240	390	1,200	2,170	440	--	11,640
Olympic N.F.	--	320	--	--	--	--	--	--	680	--	80	--	1,080
Snoqualmie N.F.	1,280	2,240	--	--	--	--	--	--	--	--	--	--	3,520
Umatilla N.F.	320	--	--	1,600	640	--	--	10	195	--	50	--	2,815
Wenatchee N.F.	21,760	20,480	2,080	3,040	3,840	1,120	640	800	390	1,800	840	--	56,790
Colville I.R.	800	520	800	480	1,680	480	640	120	480	180	--	--	6,180
Spokane I.R.	--	--	--	--	--	120	--	--	--	--	--	--	120
Yakima I.R.	2,240	1,440	1,760	160	320	480	--	--	755	200	560	80	7,995
Glenwood Dist.	200	--	--	--	--	--	--	--	--	--	--	--	200
Sub-total	27,240	28,360	5,120	5,920	7,600	6,440	1,520	3,050	17,620	8,770	1,970	80	113,690
Regional Total	79,600	80,780	79,040	42,560	42,240	46,520	79,200	68,250	67,840	64,560	96,160	89,470	836,220

¹ N.F., National Forest; I.R., Indian Reservation; N.P., National Park; District, State ownership.

Table 3.—Extent and estimated volume of lodgepole pine killed by the mountain pine beetle in Oregon and Washington by reporting unit 1955-66¹

Reporting Area ²	Light		Moderate		Heavy		Very Heavy		Total	
	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume
Oregon:										
Deschutes N.F.	71,600	2,269,720	46,600	4,221,960	32,330	7,616,948	7,920	9,201,456	158,450	23,310,084
Fremont N.F.	110,480	3,502,216	68,160	6,175,296	40,900	9,636,040	20,460	23,770,428	240,000	43,083,980
Malheur N.F.	12,180	386,106	8,220	744,732	8,165	1,923,674	2,105	2,445,589	30,670	5,500,101
Ochoco N.F.	40	1,268	--	--	10	2,356	--	--	50	3,624
Rogue River N.F.	16,200	513,540	7,520	681,312	5,120	1,206,272	3,200	3,717,760	32,040	6,118,884
Siskiyou N.F.	300	9,510	--	--	--	--	--	--	300	9,510
Umatilla N.F.	4,350	137,895	2,035	184,371	160	37,696	--	--	6,545	359,962
Umpqua N.F.	3,970	125,849	2,840	257,304	180	42,408	560	650,608	7,550	1,076,169
Wallowa-Whitman N.F.	11,255	356,784	7,625	690,825	3,515	828,134	325	377,585	22,720	2,253,328
Willamette N.F.	1,795	56,902	560	50,736	--	--	160	185,888	2,515	293,526
Winema N.F.	132,050	4,185,985	43,075	3,902,595	12,840	3,025,104	3,590	4,170,862	191,555	15,284,546
Crater Lake N.P.	23,100	732,270	3,510	318,006	--	--	--	--	26,610	1,050,276
Warm Springs I.R.	2,245	71,167	160	14,496	1,120	263,872	--	--	3,525	349,535
Sub-total	389,565	12,349,212	190,305	17,241,633	104,340	24,582,504	38,320	44,520,176	722,530	98,693,525
Washington:										
Colville N.F.	3,670	116,339	2,610	236,466	4,900	1,154,440	1,240	1,440,632	12,420	2,947,877
Gifford Pinchot N.F.	5,360	169,912	840	76,104	3,640	857,584	--	--	9,840	1,103,600
Kaniksu N.F.	770	24,409	320	28,992	--	--	--	--	1,090	53,401
Okanogan N.F.	7,450	236,165	2,990	270,894	1,200	282,720	--	--	11,640	789,779
Olympic N.F.	240	7,608	840	76,104	--	--	--	--	1,080	83,712
Snoqualmie N.F.	1,760	55,792	480	43,488	1,280	301,568	--	--	3,520	400,848
Umatilla N.F.	565	17,911	2,240	202,944	10	2,356	--	--	2,815	223,211
Wenatchee N.F.	19,865	629,721	21,945	1,988,217	11,620	2,737,672	3,360	3,903,648	56,790	9,259,258
Colville I.R.	2,080	65,936	2,500	226,500	1,600	376,960	--	--	6,180	669,396
Spokane I.R.	120	3,804	--	--	--	--	--	--	120	3,804
Yakima I.R.	1,915	60,706	5,000	453,000	960	226,176	120	139,416	7,995	879,298
Glenwood Dist.	200	6,340	--	--	--	--	--	--	200	6,340
Sub-total	43,995	1,394,643	39,765	3,602,709	25,210	5,939,476	4,720	5,483,696	113,690	16,420,524
Regional Total	433,560	13,743,855	230,070	20,844,342	129,550	30,521,980	43,040	50,003,872	836,220	115,114,049

¹ Estimated average tree: 10 in. d.b.h.; 55 ft. tall; 58 bd. ft./tree.

² N.F., National Forest; N.P., National Park; I.R., Indian Reservation; District, State ownership.

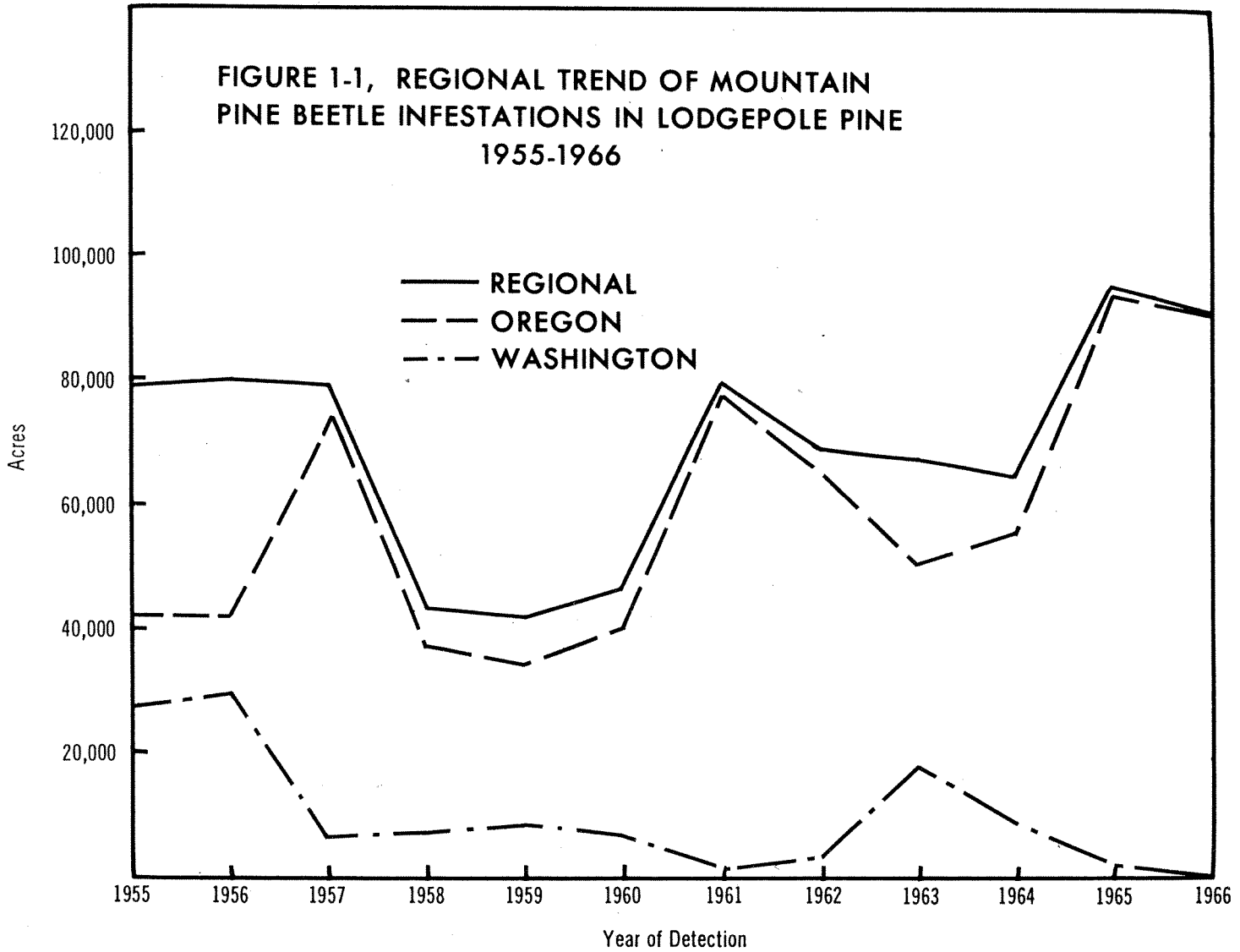
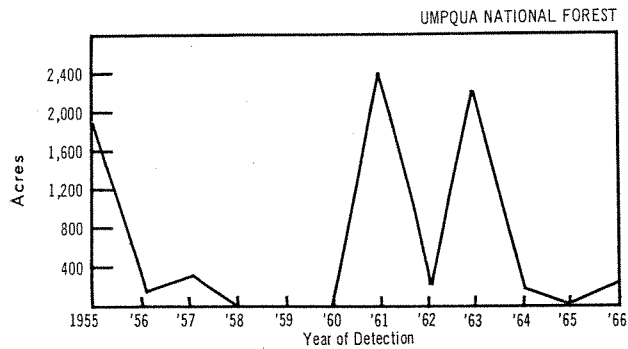
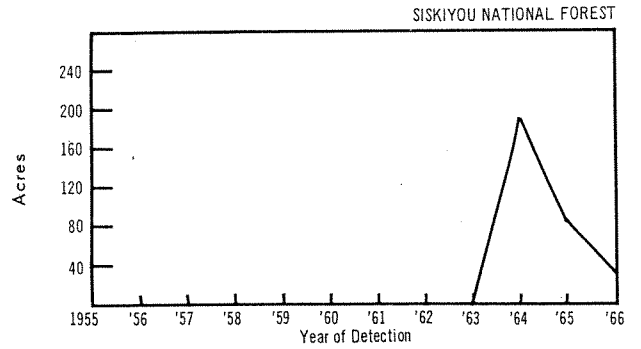
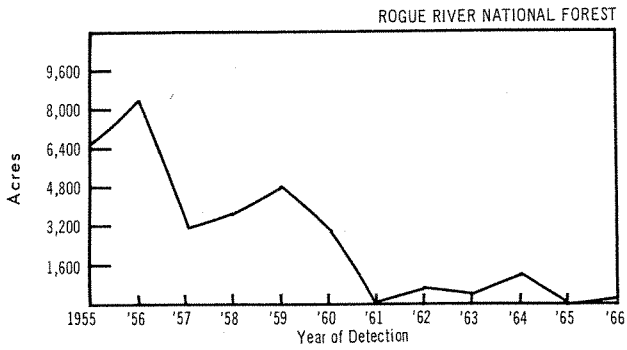
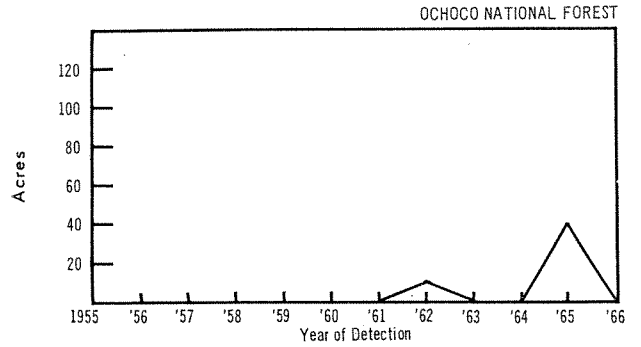
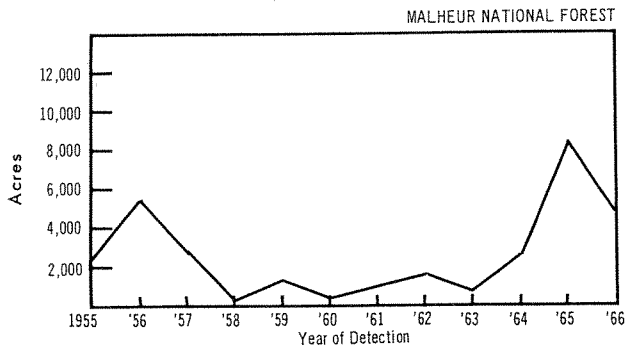
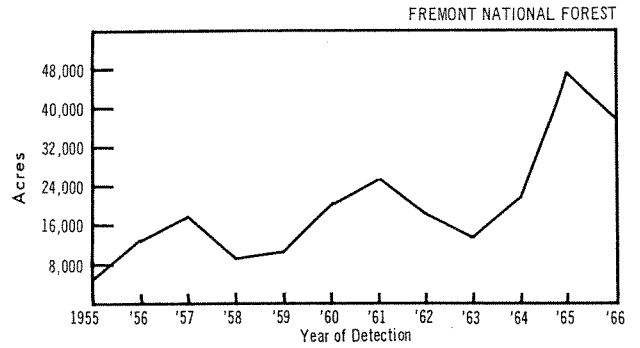
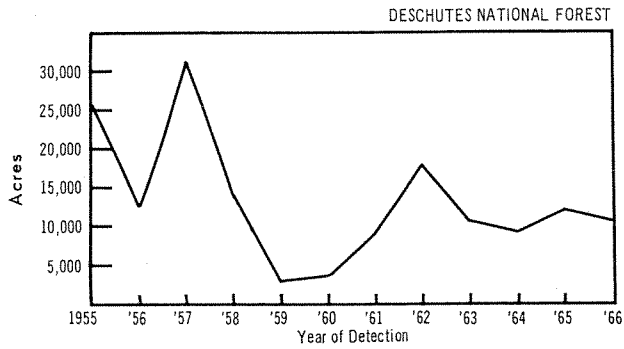


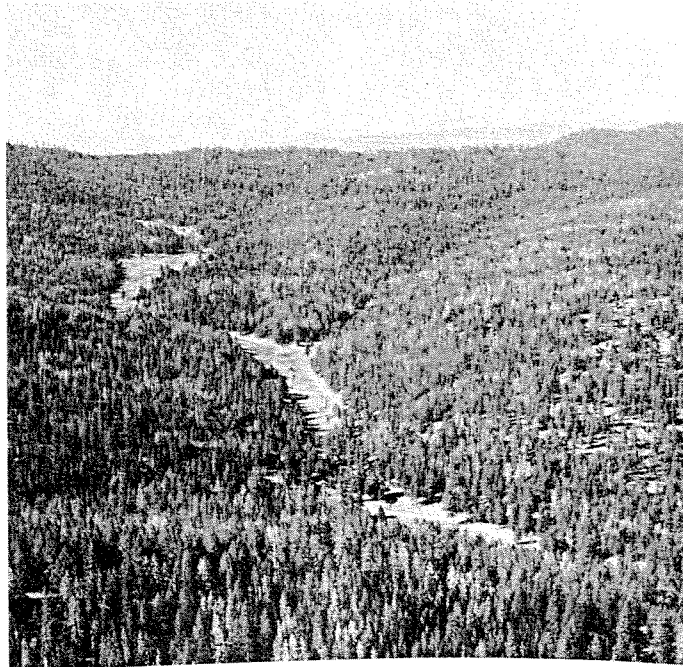
FIGURE 1-2, OREGON LANDS



PONDEROSA PINE

History

The mountain pine beetle is a pest of second-growth ponderosa pine, particularly dense, stagnated, pole-size stands. The first major outbreak on record in the Northwest occurred in 1908 near Sumpter, Oregon on the Whitman National Forest. Control was attempted in 1910. This was the first cooperative control project between State and Federal Governments in the Northwest. Thousands of trees were felled, peeled, and either exposed to the sun or burned to kill the broods. Since that time no control efforts were undertaken until 1960 when several thousand trees on the Fremont National Forest were sprayed with ethylene dibromide. Another outbreak occurred in Sumpter Valley on the Wallowa-Whitman N.F. in 1964 and the fell, pile, and burn method was used to reduce the beetle population.



Mountain pine beetle infestation in an overstocked young ponderosa pine stand.

Damage Classification

The intensity classifications and the estimated board foot per acre used to map mountain pine beetle outbreaks in pole-size ponderosa pine stands during aerial surveys follows:

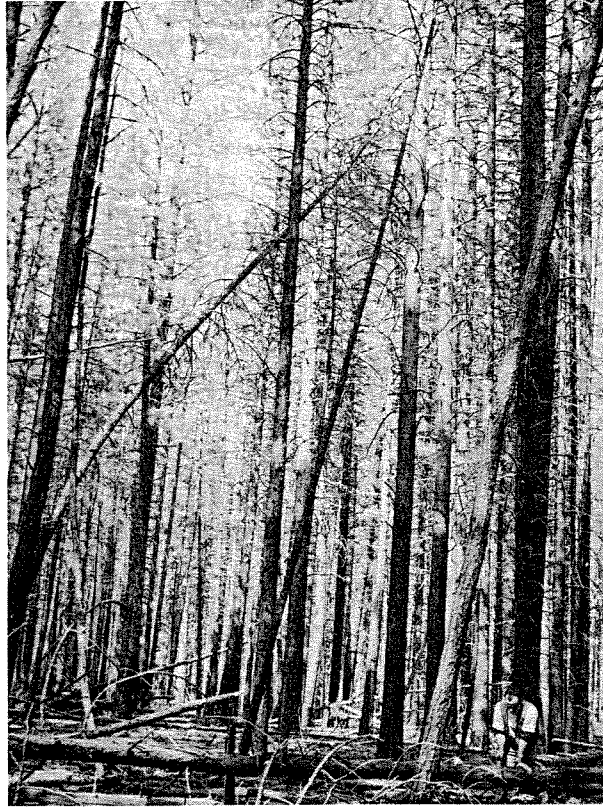
Infestation intensity	Trees per section	Trees per group	Estimated volume loss
	— — <i>Number</i> — —		<i>Bd. ft./acre</i>
Light	50-350	50 or less	27.3
Moderate	350-1,000	200 or less	78.1
Heavy	1,000-2,600	400 or less	203.1
Very heavy	2,000 or more	400 and over	750.0

Location of Damage

Most of the tree killing in the Northwest has occurred in the Blue Mountains in eastern Oregon and southeastern Washington (map 2). Between 1955 and 1966 a total of 372,485 acres was infested with an estimated loss of 34.5 MM board feet (tables 4 and 5, figure 2-1). Over 77 percent of the Regional losses occurred in Oregon. Seventy-eight percent of the damage in Oregon was centered on the Wallowa-Whitman, Fremont, and Malheur National Forests (figures 2-2, 2-3).



Mountain pine egg galleries on an infested ponderosa pine.



Overstocked second-growth ponderosa pine stands such as this are potential breeding sites for the mountain pine beetle.

Results of a ground survey on the Wallowa-Whitman National Forest in a 10-year-old mountain pine beetle infestation showed growth had been set back 30 years.² In this outbreak a reduction in stand density, basal area, and average tree diameter had occurred. In some areas the stand has become either grossly understocked or completely converted from a ponderosa pine type to a fir-larch type.

In Washington, 45 percent of the losses were located on the Okanogan National Forest (tables 4 and 5, figure 2-4). Significant tree killing also occurred on the Yakima and Colville Indian Reservations (figure 2-5).

² Wortendyke, John. Appraisal of mountain pine beetle-caused tree mortality in a young ponderosa pine stand on the Wallowa Whitman National Forest. Portland, Oregon, U.S. Forest Service. 13pp. 1968.

Control Measures

If direct control is required, the fell, pile, and burn method is recommended. However, this method is only a stopgap measure. The stand is protected only for a short duration of time, usually less than 5 years. Beetle activity is a result of overstocking. Stand density must be reduced before any "beetle proofing" can be attained. The amount of reduction necessary depends upon age, site, and degree of stocking.



The fell, pile, and burn method — a "stopgap" measure for controlling the mountain pine beetle.

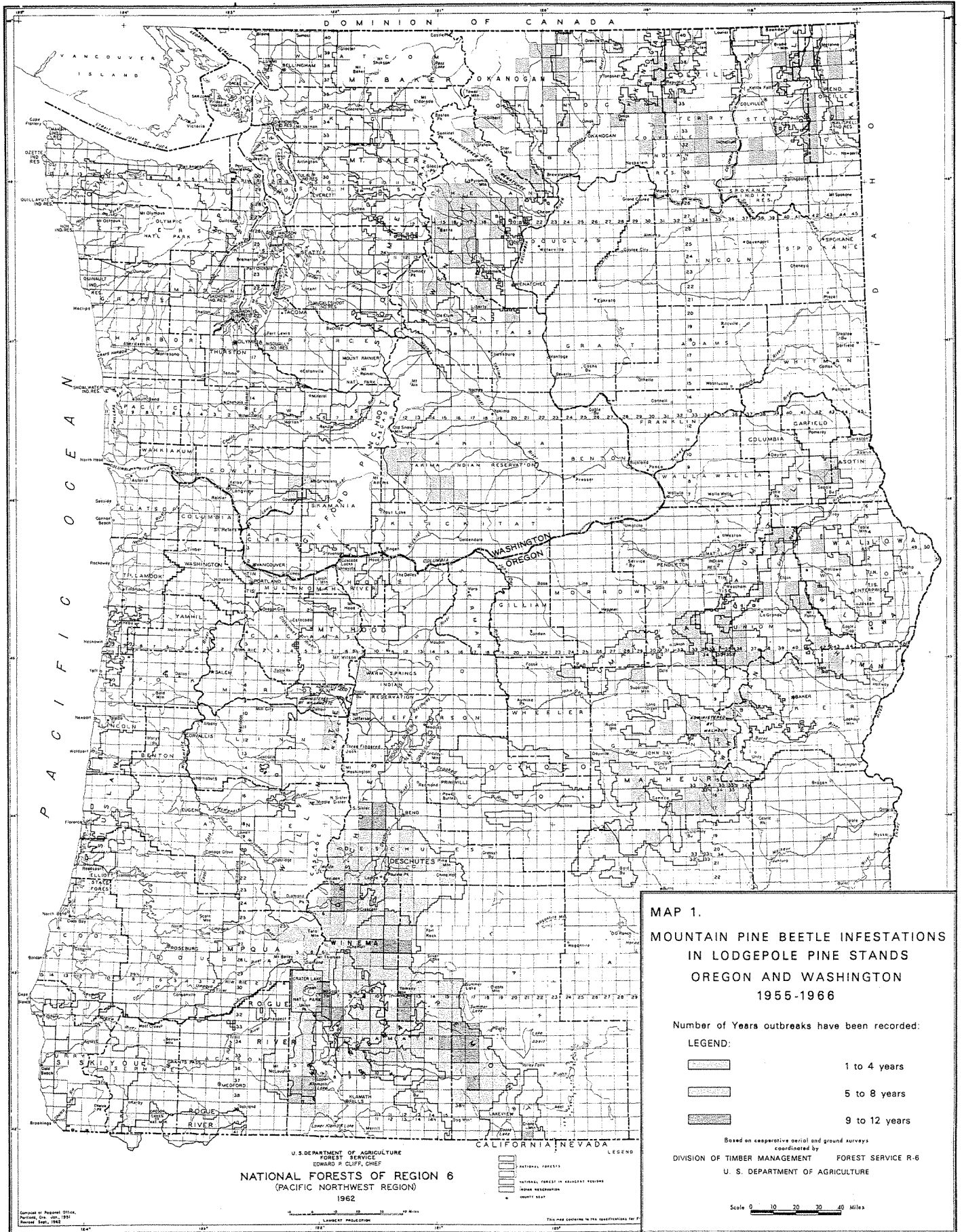
It appears that most potential mountain pine beetle outbreaks in dense, second-growth ponderosa pine can be prevented through precommercial and commercial thinnings. Proper silvicultural methods that reduce basal area to 60 percent of normal are necessary since fast growing healthy trees do not readily attract mountain pine beetle.³

³ For additional information, refer to Timber Stand improvement Handbook—FSH 2476.1.

Table 4.—Trend of mountain pine beetle infestations in ponderosa pine in Oregon and Washington by reporting area 1955-66
(In Acres)

Reporting Area ¹	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total
Oregon:													
Deschutes N.F.	480	640	--	1,760	--	2,560	640	--	275	120	2,550	1,000	10,025
Fremont N.F.	160	240	160	480	3,440	5,080	1,440	1,380	4,965	2,920	16,740	8,150	45,155
Malheur N.F.	--	--	--	--	--	1,240	480	280	1,760	6,730	29,170	4,040	43,700
Mt. Hood N.F.	--	--	--	--	--	280	--	--	--	30	50	900	1,260
Rogue River N.F.	--	1,280	--	--	--	320	960	1,200	940	1,840	170	370	7,080
Siskiyou N.F.	--	--	--	--	--	--	--	--	--	1,600	1,290	260	3,150
Umpqua N.F.	--	960	--	--	--	--	--	--	830	--	120	200	2,110
Umatilla N.F.	--	--	--	--	160	320	1,200	50	3,085	4,680	3,140	1,460	14,095
Wallowa-Whitman N.F.	620	3,360	480	--	480	4,320	11,520	910	18,685	21,400	48,410	28,480	138,665
Winema N.F.	--	960	--	320	--	--	--	--	155	910	4,910	5,590	12,845
Crater Lake N.P.	--	--	--	--	--	--	--	--	--	200	--	--	200
Warm Springs I.R.	800	--	--	--	160	240	400	--	160	70	--	320	2,150
Umatilla I.R.	--	--	--	--	--	--	--	--	--	80	20	80	180
Central Oregon Dist.	--	--	--	--	--	--	--	--	665	520	680	2,510	4,375
Coos-Douglas Dist.	--	--	--	--	--	--	--	--	--	--	--	240	240
Ochoco N.F.	--	--	--	--	--	200	--	--	700	1,340	2,370	630	5,240
Sub-total	2,060	7,440	640	2,560	4,240	14,560	16,640	3,820	32,220	42,440	109,620	54,230	290,470
Washington:													
Gifford Pinchot N.F.	--	--	--	--	--	1,440	80	--	--	160	--	--	1,680
Colville N.F.	--	--	--	--	--	--	320	160	200	2,530	3,280	2,080	8,570
Kaniksu N.F.	--	--	--	--	--	200	--	--	--	--	--	--	200
Okanogan N.F.	--	--	--	--	3,040	--	--	--	--	6,480	15,400	12,040	36,960
Snoqualmie N.F.	--	--	--	--	--	200	--	--	--	--	280	--	480
Umatilla N.F.	--	--	--	--	--	640	--	185	435	1,270	4,280	1,030	7,840
Wenatchee N.F.	--	--	--	--	800	1,360	160	--	520	120	580	860	4,400
Colville I.R.	--	--	--	--	1,120	320	480	--	--	2,070	1,010	4,000	9,000
Spokane I.R.	--	--	--	--	--	--	--	--	--	--	280	200	480
Yakima I.R.	--	--	--	--	640	180	--	960	--	680	6,780	720	9,960
Glenwood Dist.	--	--	--	--	480	--	--	40	--	520	40	560	1,640
Northeast Washington Dist.	--	--	--	--	--	400	160	--	--	--	--	240	800
Sub-total	0	0	0	0	6,080	4,740	1,200	1,345	1,155	13,830	31,930	21,730	82,010
Regional Total	2,060	7,440	640	2,560	10,320	19,300	17,840	5,165	33,375	56,270	141,550	75,960	372,480




¹ N.F., National Forest; N.P., National Park; I.R., Indian Reservation; District, State ownership.



MAP 1.
MOUNTAIN PINE BEETLE INFESTATIONS
IN LODGEPOLE PINE STANDS
OREGON AND WASHINGTON
1955-1966

Number of Years outbreaks have been recorded:

LEGEND:

-  1 to 4 years
-  5 to 8 years
-  9 to 12 years

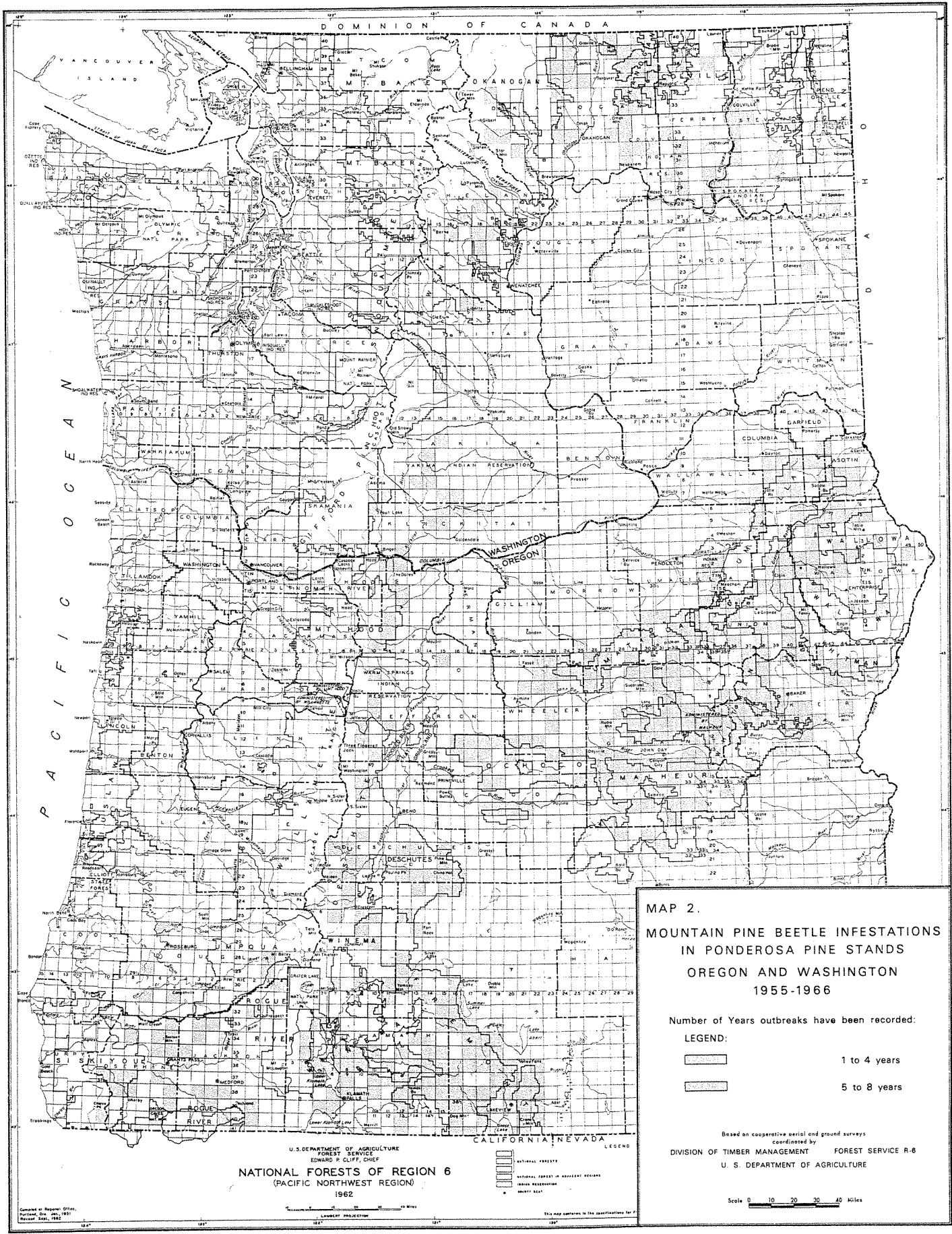
Based on cooperative aerial and ground surveys coordinated by

DIVISION OF TIMBER MANAGEMENT FOREST SERVICE R-6
 U. S. DEPARTMENT OF AGRICULTURE

Scale 0 10 20 30 40 Miles

U. S. DEPARTMENT OF AGRICULTURE
 FOREST SERVICE
 EDWARD P. CLIFF, CHIEF
NATIONAL FORESTS OF REGION 6
 (PACIFIC NORTHWEST REGION)
 1962

LEGEND
 NATIONAL FORESTS
 NATIONAL FOREST IN ADJACENT REGION
 INDIAN RESERVATION
 "HOT SPOT"



MAP 2.
MOUNTAIN PINE BEETLE INFESTATIONS
IN PONDEROSA PINE STANDS
OREGON AND WASHINGTON
1955-1966

Number of Years outbreaks have been recorded:

LEGEND:

- 1 to 4 years
- 5 to 8 years

Based on cooperative aerial and ground surveys coordinated by
 DIVISION OF TIMBER MANAGEMENT FOREST SERVICE R-6
 U. S. DEPARTMENT OF AGRICULTURE

Scale 0 10 20 30 40 Miles

U. S. DEPARTMENT OF AGRICULTURE
 FOREST SERVICE
 EDWARD P. CLIFF, CHIEF
NATIONAL FORESTS OF REGION 6
 (PACIFIC NORTHWEST REGION)
 1962

LEGEND
 NATURAL FORESTS
 NATURAL FOREST IN ADJACENT STATES
 BOUND RESERVATION
 MOUNTAIN BEAT

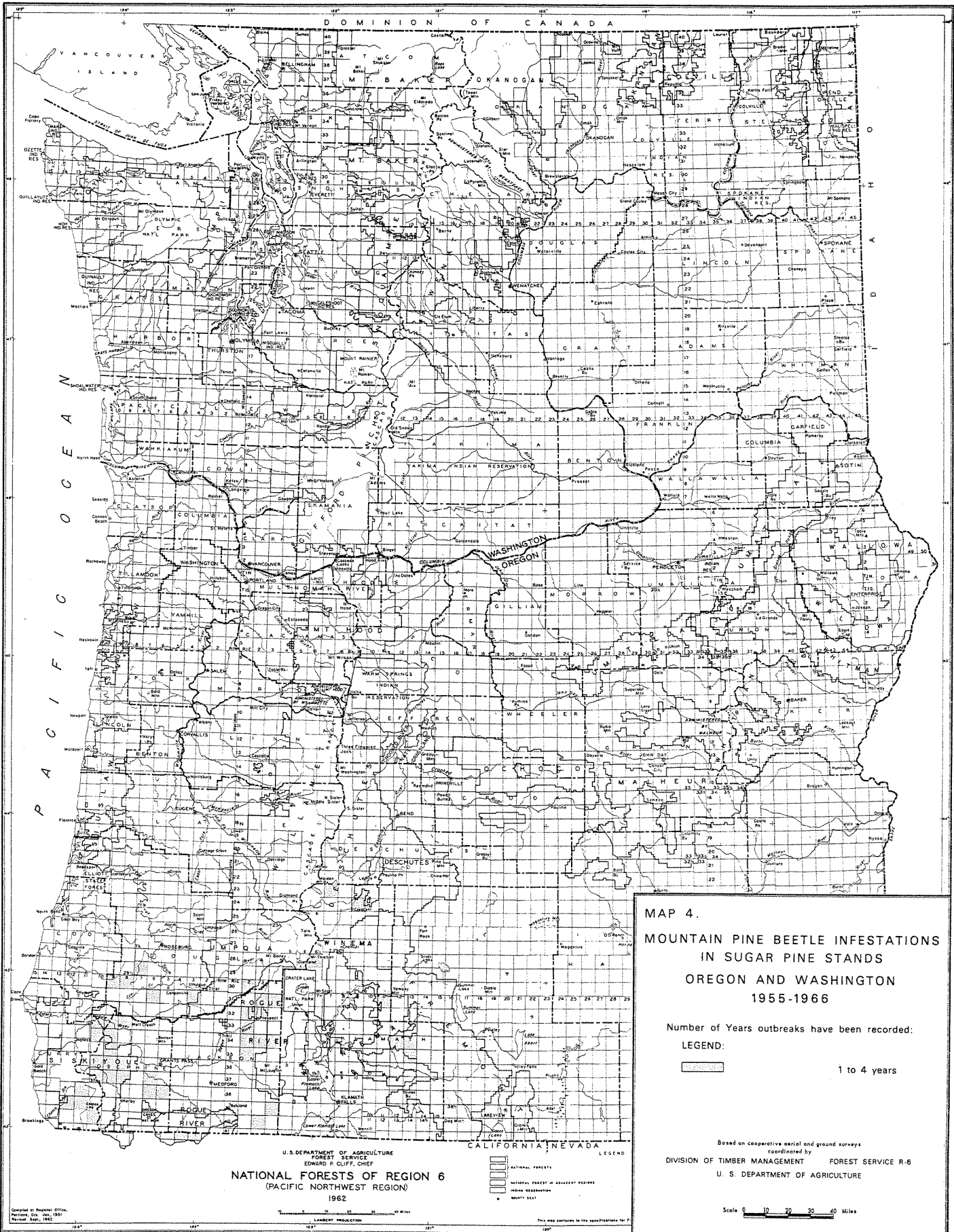


Table 5.—Extent and estimated volume of ponderosa pine killed by the mountain pine beetle in Oregon and Washington by reporting unit 1955-66¹

Reporting Area ²	Light		Moderate		Heavy		Very Heavy		Total	
	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume
Oregon:										
Deschutes N.F.	8,105	221,267	1,560	121,836	360	73,116	--	--	10,025	416,219
Fremont N.F.	19,665	536,855	19,375	1,513,188	5,155	1,046,981	960	720,000	45,155	3,817,024
Malheur N.F.	30,495	832,514	8,845	690,795	4,360	885,516	--	--	43,700	2,408,825
Mt. Hood N.F.	630	17,199	270	21,087	360	73,116	--	--	1,260	111,402
Ochoco N.F.	5,240	143,052	--	--	--	--	--	--	5,240	143,052
Rogue River N.F.	4,760	129,948	2,080	162,448	160	32,496	80	60,000	7,080	384,892
Siskiyou N.F.	3,030	82,719	120	9,372	--	--	--	--	3,150	92,091
Umpqua N.F.	910	24,843	1,200	93,720	--	--	--	--	2,110	118,563
Wallowa-Whitman N.F.	72,130	1,969,149	38,220	2,984,982	17,735	3,601,979	10,580	7,935,000	138,665	16,491,110
Umatilla N.F.	12,005	327,737	2,090	163,229	--	--	--	--	14,095	490,966
Winema N.F.	9,865	269,315	2,120	165,572	620	125,922	240	180,000	12,845	740,809
Crater Lake N.P.	200	5,460	--	--	--	--	--	--	200	5,460
Warm Springs I.R.	710	19,383	1,440	112,464	--	--	--	--	2,150	131,847
Central Oregon Dist.	3,415	93,230	920	71,852	40	8,124	--	--	4,375	173,206
Coos-Douglas Dist.	240	6,552	--	--	--	--	--	--	240	6,552
Umatilla I.R.	180	4,914	--	--	--	--	--	--	180	4,914
Sub-total	171,580	4,684,137	78,240	6,110,545	28,790	5,847,250	11,860	8,895,000	290,470	25,536,932
Washington:										
Gifford Pinchot N.F.	1,680	45,864	--	--	--	--	--	--	1,680	45,864
Colville N.F.	2,770	75,621	1,700	132,770	2,980	605,238	1,120	840,000	8,570	1,653,629
Kaniksu N.F.	200	5,460	--	--	--	--	--	--	200	5,460
Okanogan N.F.	13,240	361,452	14,690	1,147,289	6,560	1,332,336	2,470	1,852,500	36,960	4,693,577
Snoqualmie N.F.	200	5,460	280	21,868	--	--	--	--	480	27,328
Umatilla N.F.	7,250	197,925	590	46,079	--	--	--	--	7,840	244,004
Wenatchee N.F.	2,480	67,704	440	34,364	1,120	227,472	360	270,000	4,400	599,540
Colville I.R.	5,570	152,061	2,600	203,060	590	119,829	240	180,000	9,000	654,950
Spokane I.R.	480	13,104	--	--	--	--	--	--	480	13,104
Yakima I.R.	3,860	105,378	4,940	385,814	760	154,356	400	300,000	9,960	945,548
Glenwood Dist.	1,640	44,772	--	--	--	--	--	--	1,640	44,772
Northeast Dist.	480	13,104	320	24,992	--	--	--	--	800	38,096
Sub-total	39,850	1,087,905	25,560	1,996,236	12,010	2,439,231	4,590	3,442,500	82,010	8,965,872
Regional Total	211,430	5,772,042	103,800	8,106,781	40,800	8,286,481	16,450	12,337,500	372,480	34,502,804

¹ Estimated average tree: 9 in. d.b.h.; 50 ft. tall; 50 bd. ft.

² N.F., National Forest; N.P., National Park; I.R., Indian Reservation; Dist., State ownership.

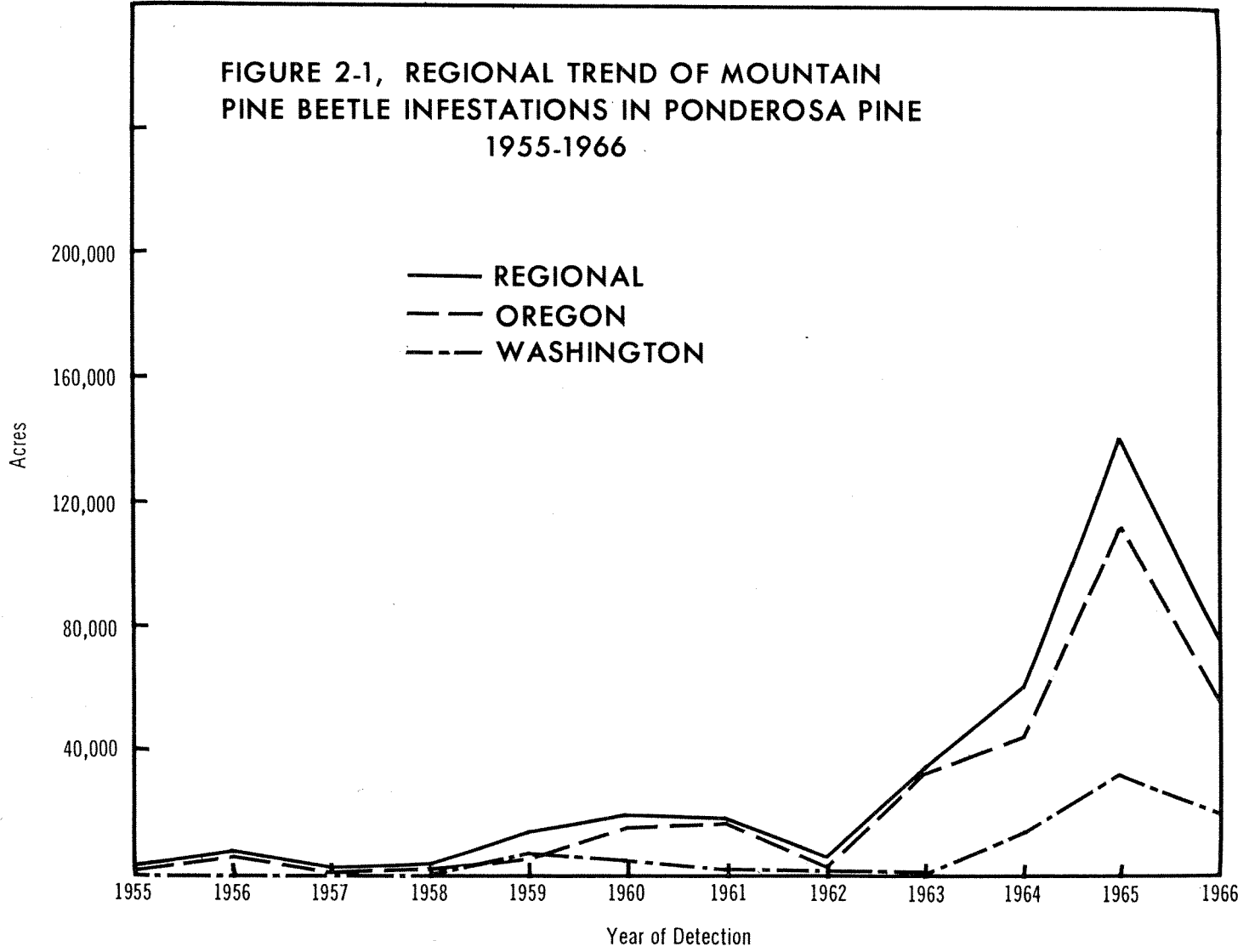


FIGURE 2-2, OREGON LANDS

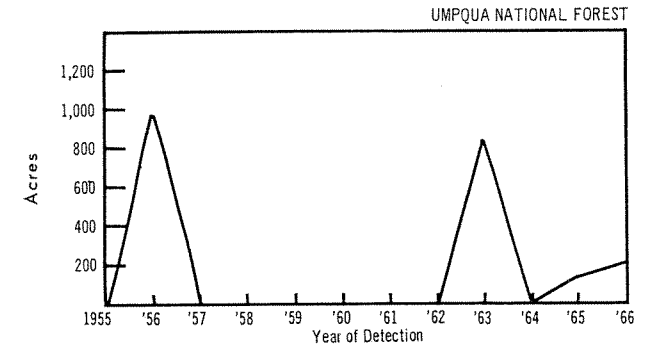
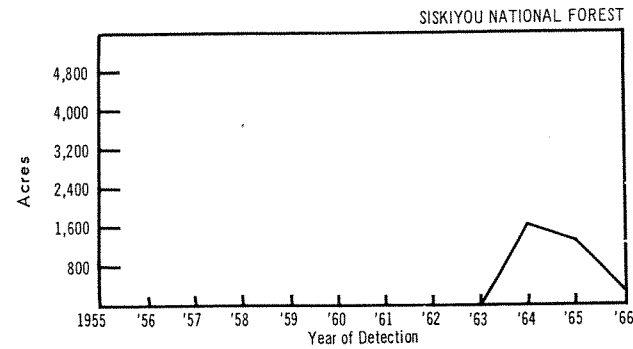
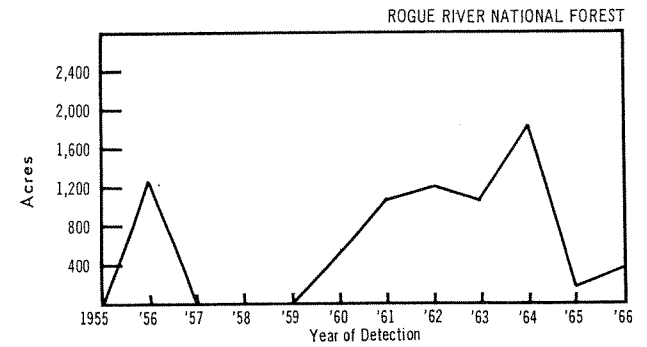
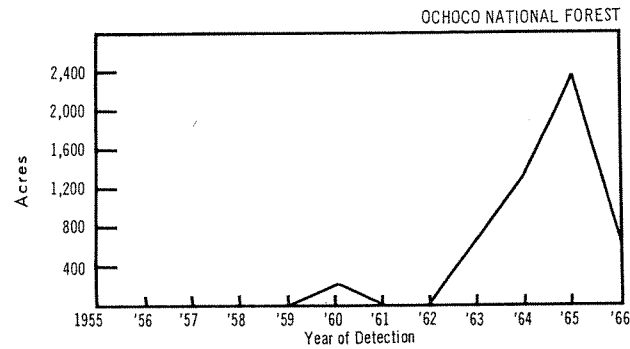
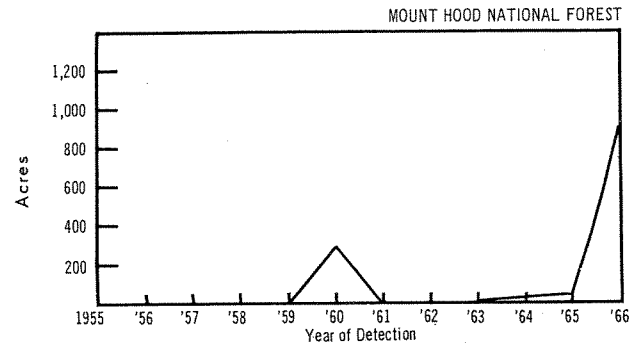
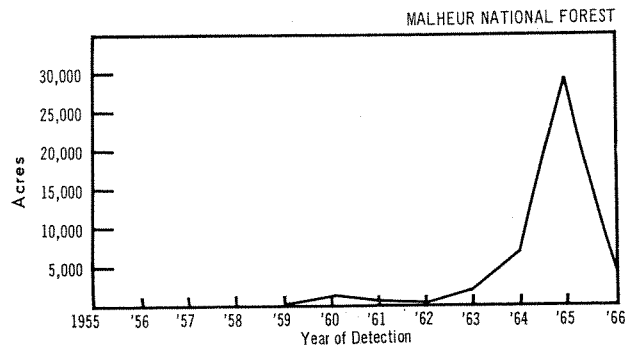
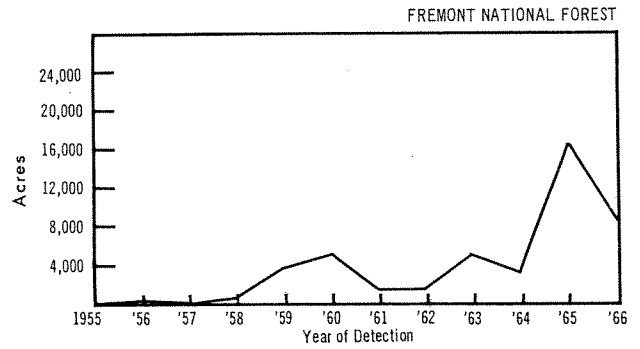
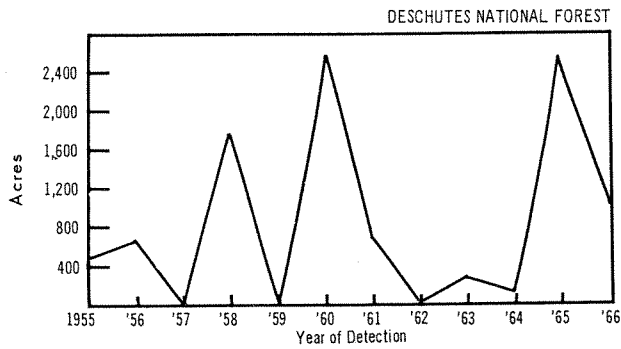


FIGURE 2-3, OREGON LANDS

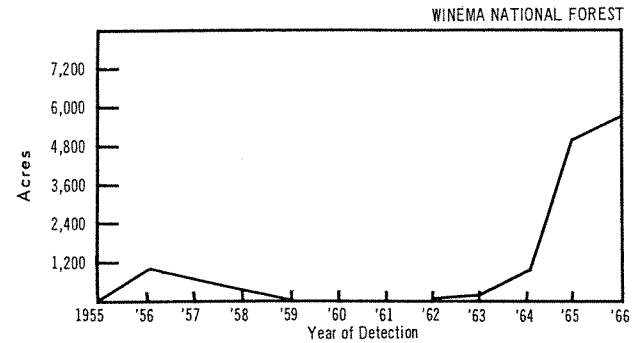
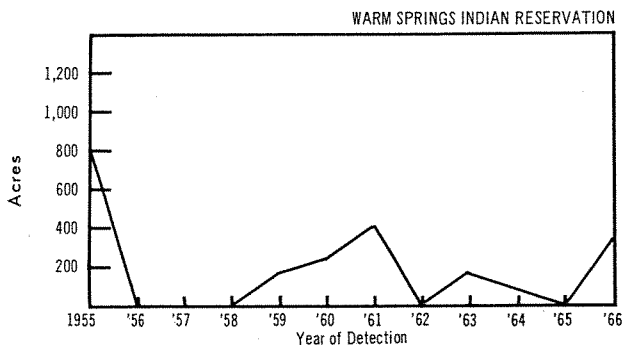
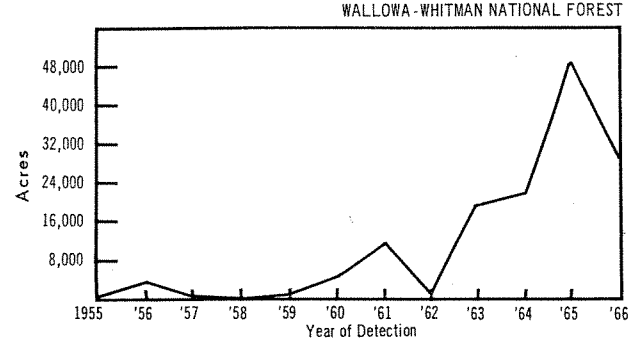
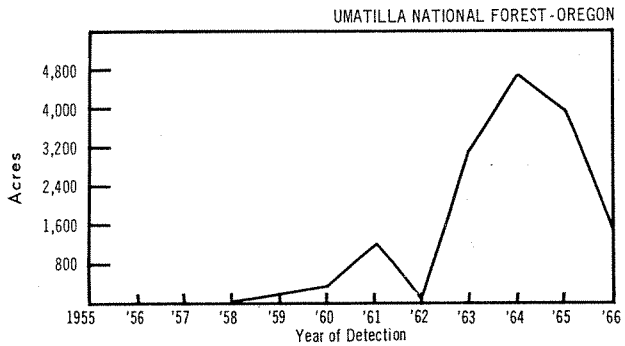
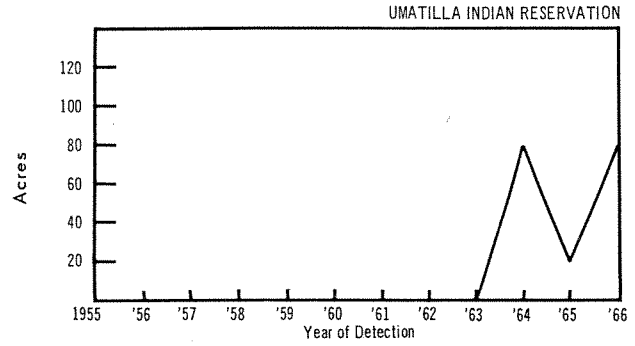
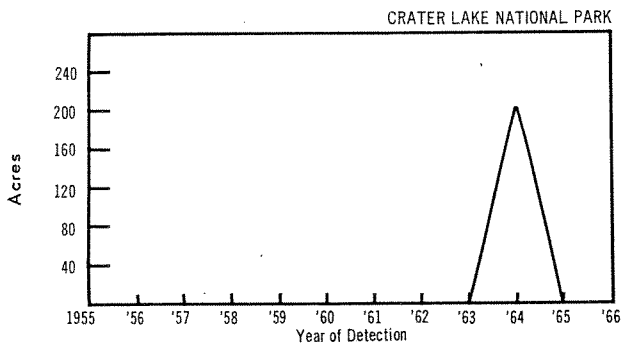
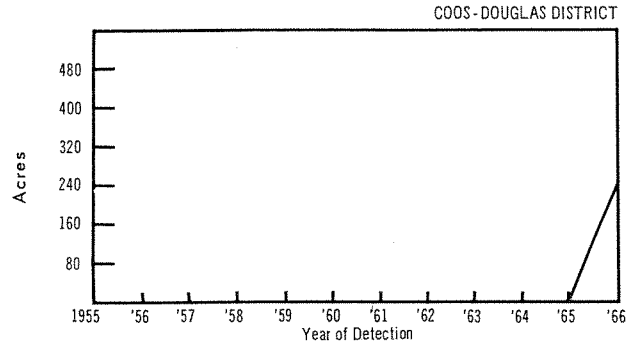
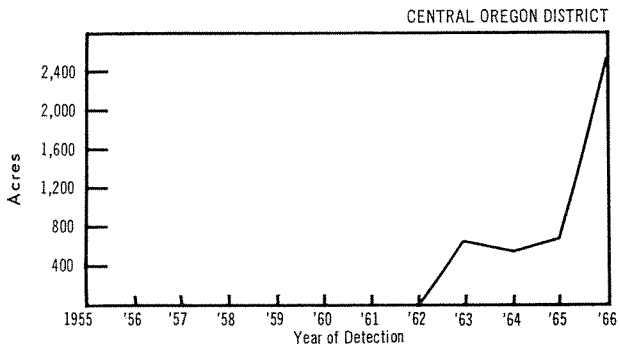


FIGURE 2-4, WASHINGTON LANDS

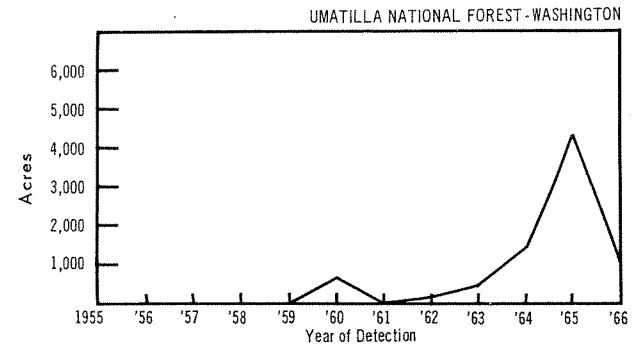
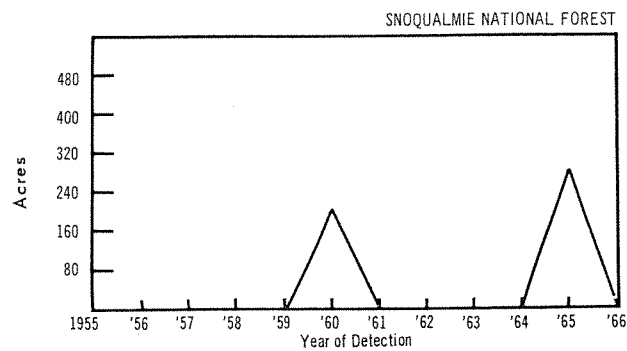
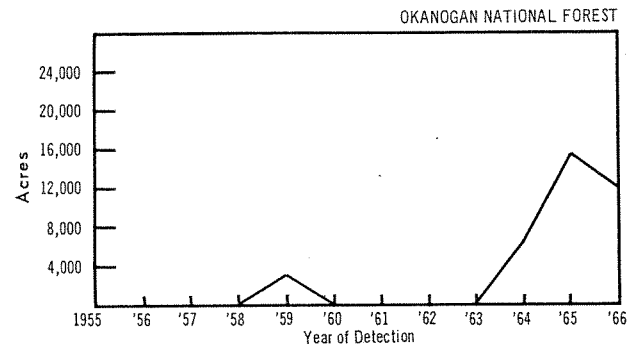
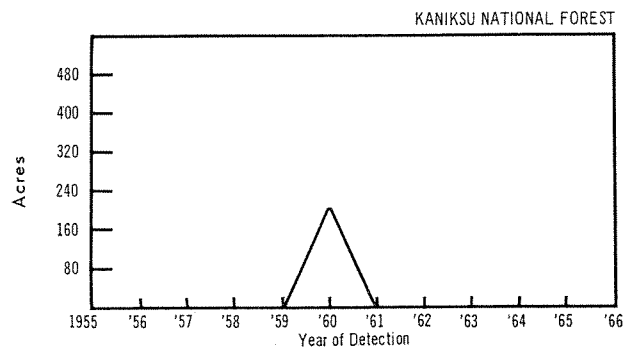
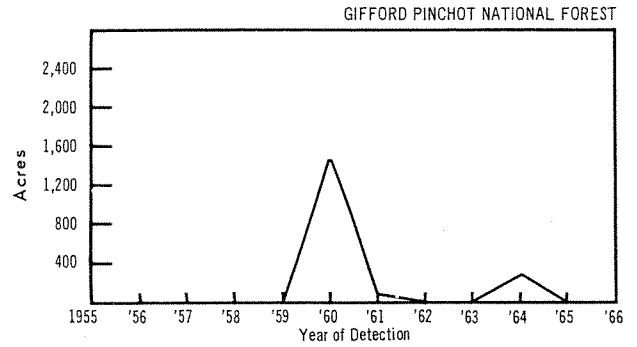
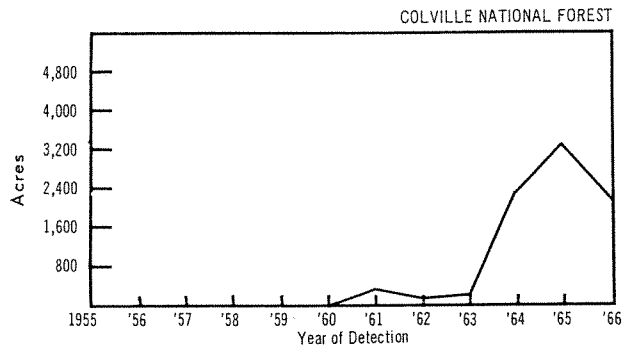
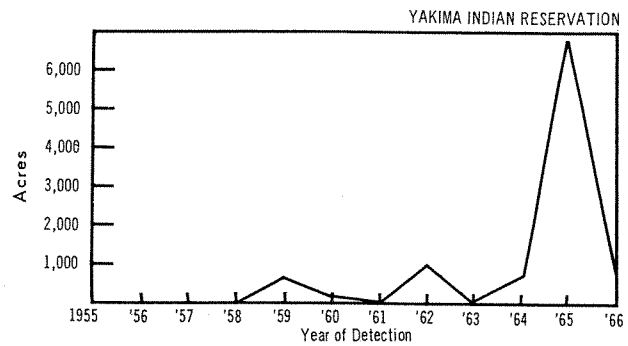
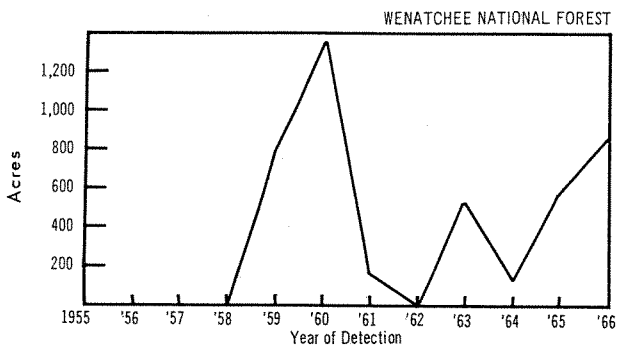
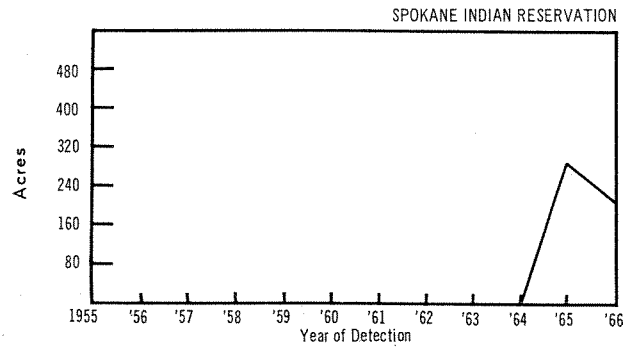
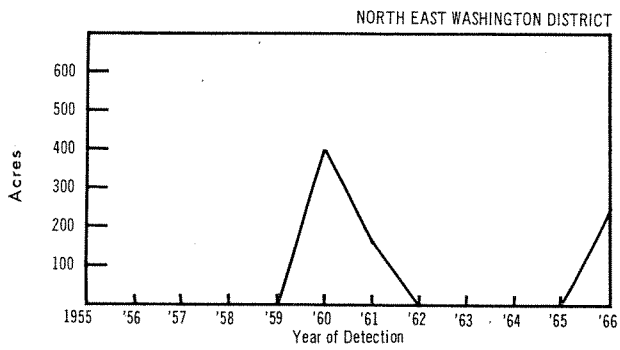
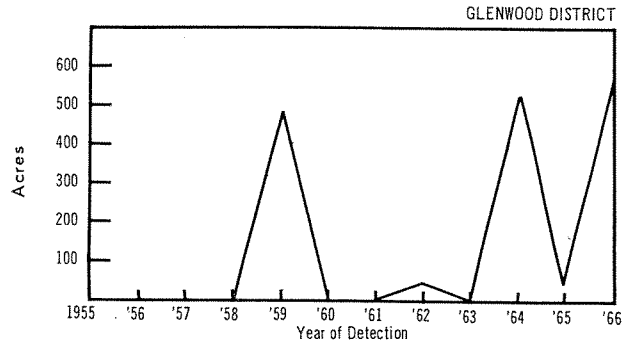
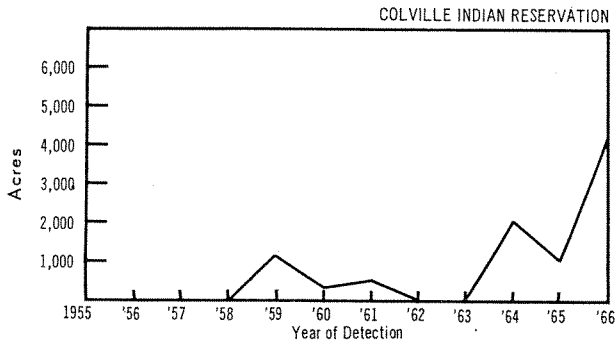


FIGURE 2-5, WASHINGTON LANDS



WESTERN WHITE PINE

History

The mountain pine beetle is a serious pest of mature and overmature western white pine stands. It has killed large volumes of white pine, particularly in the Cascade Mountains. Such losses have been of special concern in Mount Rainier National Park where direct control was tried during the late 1920's.

Damage Classification

The intensity classification used when mapping mountain pine beetle infestations in western white pine during aerial surveys follows:

Infestation intensity	Trees per section	Trees per group	Estimated volume loss
	— — <i>Number</i> — —		<i>Bd. ft./acre</i>
Light	20-50	5 or less	39.1
Moderate	50-150	15 or less	117.2
Heavy	150-300	30 or less	234.4
Very heavy	300 or more	30 and more	709.3

Location of Damage

Since 1955 the mountain pine beetle has destroyed the western white pine on nearly 3 million acres. Most of this loss occurred in overmature stands (map 3, table 6). The estimated volume loss during this 12-year period is nearly 334 MM board feet (table 7). Regionwide, 77 percent of the tree killing occurred in Washington with two-thirds of this loss located on the Olympic National Park and the Gifford Pinchot and Wenatchee National Forests (table 7, figures 3-1, 3-4). Significant losses also occurred on the Mount Baker and Snoqualmie National Forests (figure 3-4).

In Oregon, 88 percent of the State's losses occurred on the Mount Hood and Willamette National Forests (figures 3-2, 3-3). Lesser damage was found on the Umpqua and Siskiyou National Forests.

Control Measures

In most instances the mountain pine beetle problem in western white pine stands can be kept at a minimum with shorter rotations. Young thrifty trees are fairly resistant, but in older stands this beetle is usually present in endemic form causing an annual loss. Direct control has not been considered practical in the Northwest due to the prevalence of white pine blister rust. This rust has infected many western white pine stands in the Cascade Mountains in both States and has caused tree mortality. Control efforts against the mountain pine beetle have been limited to salvaging all accessible, merchantable infested and noninfested trees in the outbreak centers.

Table 6.—Trend of mountain pine beetle infestations in western white pine in Oregon and Washington by reporting area 1955-66
(In Acres)

Reporting Area ¹	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total
Oregon:													
Deschutes N.F.	--	--	--	--	--	--	3,040	--	1,525	1,640	230	30	6,465
Fremont N.F.	--	--	--	--	--	--	--	--	--	--	--	100	100
Mt. Hood N.F.	6,720	20,580	4,640	7,040	28,480	11,720	29,000	33,240	39,770	36,820	27,810	7,720	253,540
Rogue River N.F.	--	--	--	--	--	--	--	--	--	190	920	480	1,590
Siskiyou N.F.	--	--	--	--	--	--	160	--	--	4,340	1,680	5,660	11,840
Siuslaw N.F.	--	160	--	--	--	--	--	--	--	--	--	--	160
Umpqua N.F.	--	400	320	1,120	1,600	720	14,080	7,760	3,355	6,070	2,920	21,130	59,475
Willamette N.F.	4,960	13,540	24,320	24,000	29,440	18,600	68,100	32,560	22,500	43,440	38,240	34,750	354,450
Winema N.F.	--	--	--	--	--	--	--	--	615	--	240	--	855
Crater Lake N.P.	--	--	--	--	--	--	--	--	--	--	--	1,590	1,590
Coos-Douglas Dist.	--	--	--	--	--	--	--	--	--	--	--	80	80
Warm Sprgs. I.R.	480	--	--	--	--	--	--	160	80	200	80	--	1,000
Sub-total	12,160	34,680	29,280	32,160	59,520	31,040	114,380	73,720	67,845	92,700	72,120	71,540	691,145
Washington:													
Colville N.F.	--	--	--	--	--	40	160	--	--	3,690	9,280	4,820	17,990
Gif. Pinchot N.F.	36,800	71,040	55,840	59,680	76,400	109,920	164,520	140,370	98,330	31,300	12,870	3,720	860,790
Kaniksu N.F.	--	--	--	--	--	240	--	940	1,290	10,440	3,480	2,120	18,510
Mt. Baker N.F.	19,520	24,900	14,880	29,280	21,600	6,040	20,200	25,540	43,060	4,270	1,440	8,320	219,050
Okanogan N.F.	--	--	160	--	--	6,560	--	250	1,005	130	840	1,560	10,505
Olympic N.F.	6,880	6,200	4,480	22,080	8,640	6,000	14,760	19,000	23,600	15,870	7,960	2,320	137,790
Snoqualmie N.F.	7,360	16,740	16,160	33,280	4,700	14,280	12,800	32,055	32,060	22,640	11,960	9,100	213,135
Wenatchee N.F.	6,880	4,320	6,080	15,360	17,440	43,600	24,360	34,480	79,285	20,640	40,520	21,640	314,605
Mt. Rainier N.P.	2,080	2,740	640	1,920	960	920	3,360	7,255	9,740	4,240	1,920	880	36,655
Olympic N.P.	960	2,640	3,840	24,800	16,400	19,440	46,160	87,000	114,600	57,270	26,940	12,980	413,030
Spokane I.R.	--	--	--	--	--	--	--	--	--	--	--	240	240
Yakima I.R.	640	--	--	--	--	--	--	320	535	1,040	2,920	1,920	7,375
Quinault I.R.	--	1,600	480	4,480	7,040	3,360	4,800	2,560	7,040	2,180	5,320	4,750	43,610
Glenwood Dist.	--	--	--	--	--	--	160	--	--	--	1,160	--	1,320
Puget Sound Dist.	--	--	--	--	--	--	--	--	--	--	720	--	720
N.W. Wash. Dist.	--	--	--	--	160	--	480	--	--	1,560	--	--	2,200
N.E. Wash. Dist.	--	--	--	--	--	--	--	--	--	720	--	40	760
Sub-total	81,120	130,180	102,560	190,880	153,340	210,400	291,760	349,770	410,545	175,990	127,330	74,410	2,298,285
Regional Total	93,280	164,860	131,840	223,040	212,860	241,440	406,140	423,490	478,390	268,690	199,450	145,950	2,989,430

¹ N.F., National Forest; N.P., National Park; I.R., Indian Reservation; District, State ownership.

Table 7.—Extent and estimated volume of western white pine killed by the mountain pine beetle in Oregon and Washington by reporting unit 1955-66¹

Reporting Area ²	Light		Moderate		Heavy		Very Heavy		Total	
	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume
Oregon:										
Deschutes N.F.	5,295	207,035	730	85,556	441	103,136	--	--	6,466	395,727
Fremont N.F.	100	3,910	--	--	--	--	--	--	100	3,910
Mt. Hood N.F.	133,590	5,223,369	71,210	8,345,812	42,320	9,919,808	6,420	4,553,706	253,540	28,042,695
Rogue River N.F.	1,310	51,221	280	32,816	--	--	--	--	1,590	84,037
Siskiyou N.F.	10,090	394,519	1,750	205,100	--	--	--	--	11,840	599,619
Siuslaw N.F.	160	6,256	--	--	--	--	--	--	160	6,256
Umpqua N.F.	42,595	1,665,465	14,010	1,641,972	2,060	482,864	810	574,533	59,475	4,364,834
Willamette N.F.	187,530	7,332,423	101,810	11,932,132	57,830	13,555,352	7,280	5,163,704	354,450	37,983,611
Winema N.F.	855	33,431	--	--	--	--	--	--	855	33,431
Coos-Douglas Dist.	80	3,128	--	--	--	--	--	--	80	3,128
Crater Lake N.P.	540	21,114	390	45,708	420	98,448	240	170,232	1,590	335,502
Warm Springs I.R.	520	20,332	480	56,256	--	--	--	--	1,000	76,588
Sub-total	382,665	14,962,203	190,660	22,345,352	103,071	24,159,608	14,750	10,462,175	691,146	71,929,338
Washington:										
Colville N.F.	6,260	244,766	3,220	377,384	7,190	1,685,336	1,320	936,276	17,990	3,243,762
Gifford Pinchot N.F.	329,960	12,901,436	325,680	38,169,696	165,170	38,715,848	39,980	28,557,814	860,790	118,344,794
Kaniksu N.F.	13,070	511,037	5,010	587,172	430	100,792	--	--	18,510	1,199,001
Mt. Baker N.F.	93,620	3,660,542	86,110	10,092,092	33,960	7,960,224	5,360	3,801,848	219,050	25,514,706
Okanogan N.F.	8,465	330,982	2,040	239,088	--	--	--	--	10,505	570,070
Olympic N.F.	70,190	2,744,429	48,700	5,707,640	15,000	3,516,000	3,900	2,766,270	137,790	14,734,339
Snoqualmie N.F.	134,065	5,241,942	67,265	7,883,458	10,965	2,570,196	840	595,812	213,135	16,291,408
Wenatchee N.F.	149,280	5,836,848	104,345	12,229,234	50,480	11,832,512	10,500	7,447,650	314,605	37,346,244
Mt. Rainier N.P.	21,335	834,199	9,240	1,082,928	5,440	1,275,136	640	453,952	36,655	3,646,215
Olympic N.P.	217,690	8,511,679	160,750	18,839,900	30,510	7,151,544	4,080	2,893,944	413,030	37,397,067
Spokane I.R.	240	9,384	--	--	--	--	--	--	240	9,384
Yakima I.R.	2,645	103,420	3,600	421,920	1,010	236,744	120	85,116	7,375	847,200
Quinalt I.R.	36,040	1,409,164	6,440	754,768	530	124,232	600	452,580	43,610	2,740,744
Glenwood Dist.	760	29,716	560	65,632	--	--	--	--	1,320	95,348
Puget Sound Dist.	--	--	560	65,632	160	37,504	--	--	720	103,136
Northwest Wash. Dist.	2,060	80,546	140	16,408	--	--	--	--	2,200	96,954
Northeast Wash. Dist.	760	29,716	--	--	--	--	--	--	760	29,716
Sub-total	1,086,440	42,479,806	823,660	96,532,952	320,845	75,206,068	67,340	47,991,262	2,298,285	262,210,088
Regional Total	1,469,105	57,442,009	1,014,320	118,878,304	423,916	99,365,676	82,090	58,435,437	2,989,431	334,139,426

¹ Estimated average tree: 20 in. d.b.h.; 80 ft. tall; 500 bd. ft./tree.² N.F., National Forest; N.P., National Park; I.R., Indian Reservation; Dist., State ownership.

**FIGURE 3-1, REGIONAL TREND OF MOUNTAIN
PINE BEETLE INFESTATIONS IN WESTERN WHITE PINE
1955-1966**

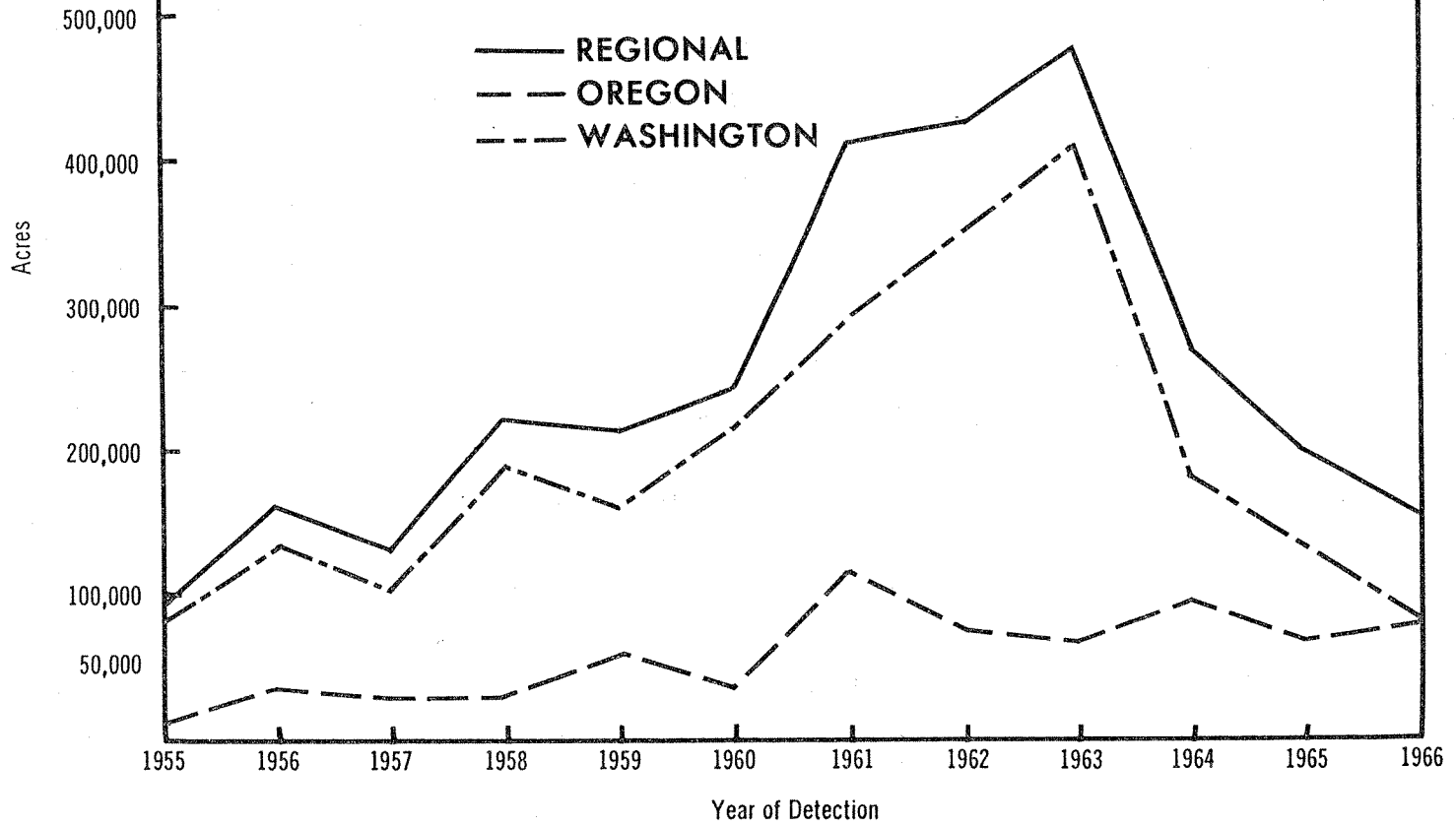


FIGURE 3-2, OREGON LANDS

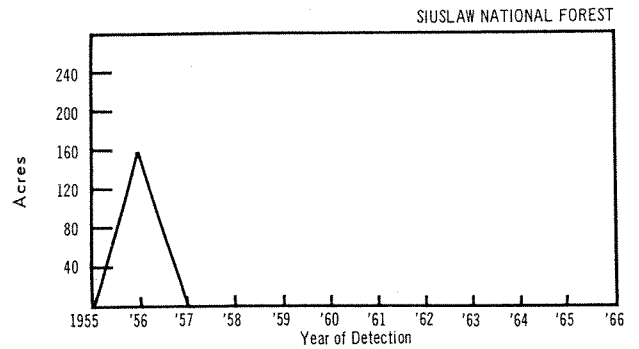
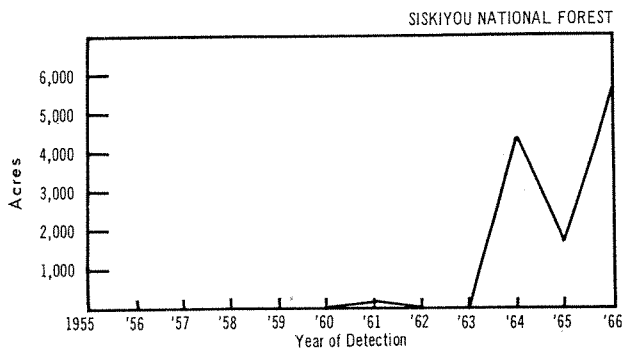
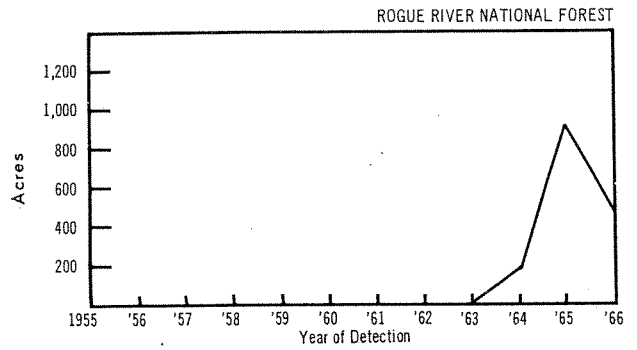
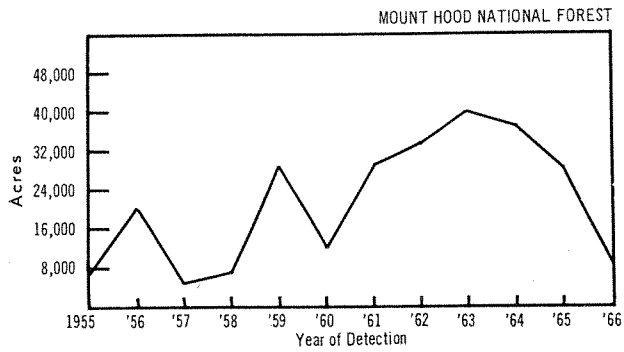
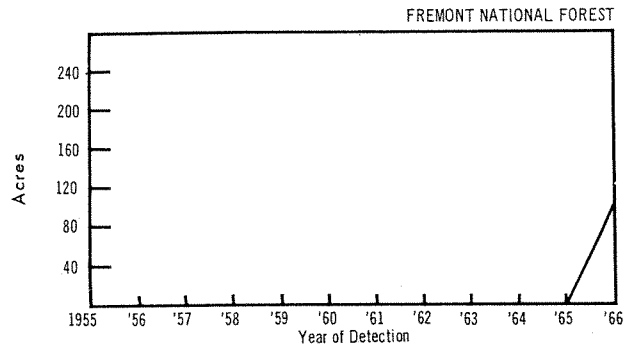
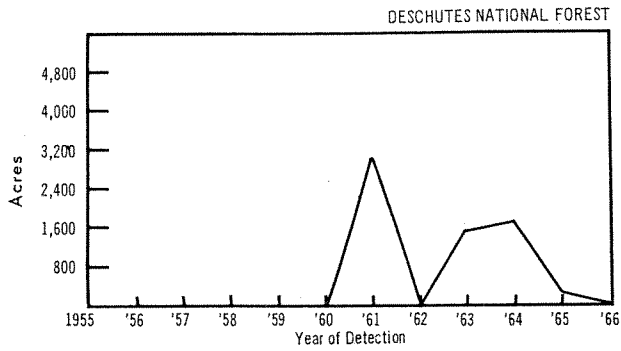


FIGURE 3-3, OREGON LANDS

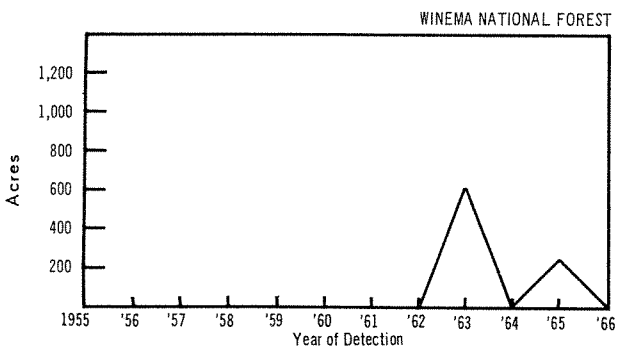
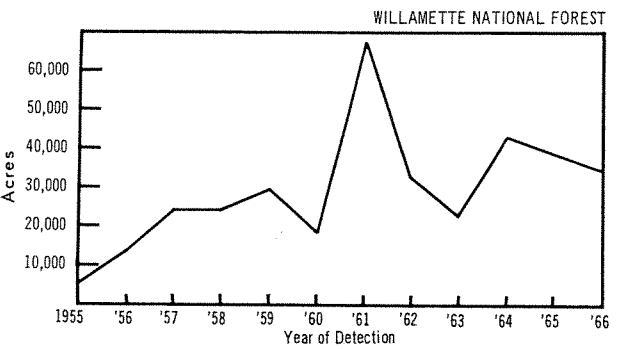
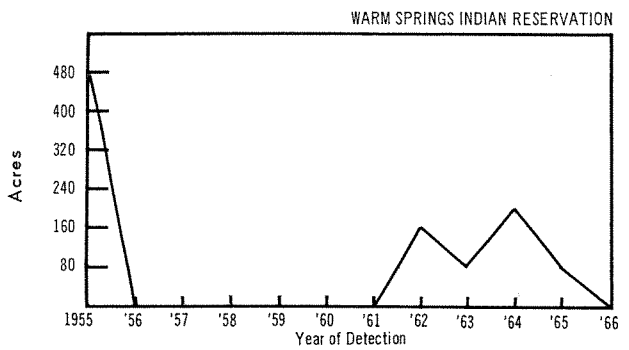
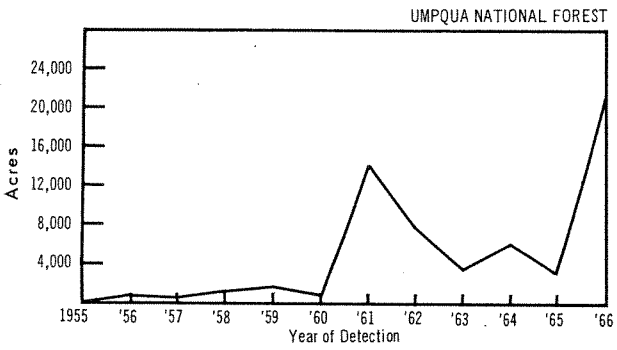
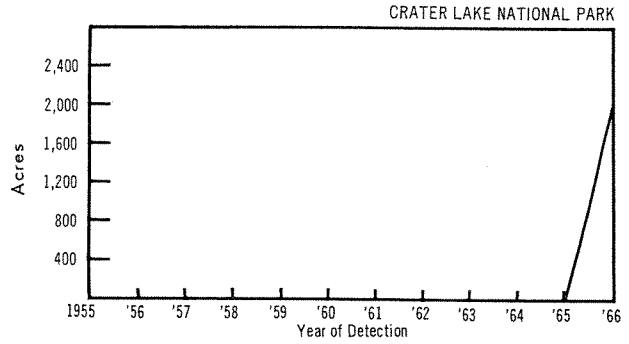
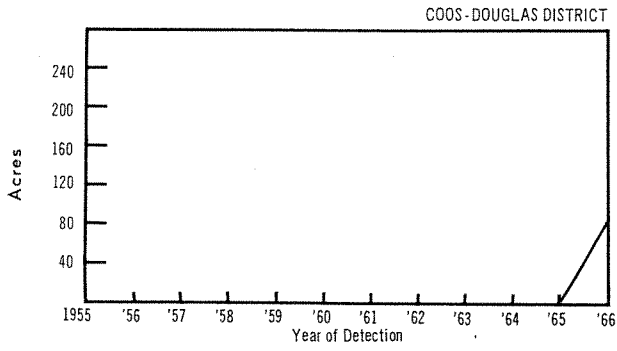


FIGURE 3-4, WASHINGTON LANDS

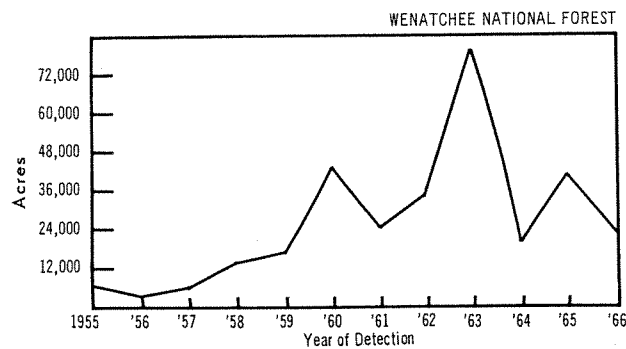
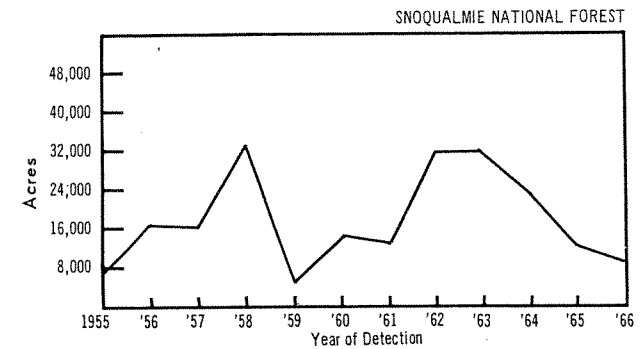
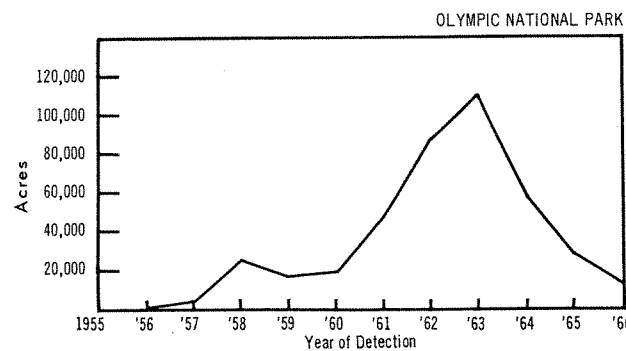
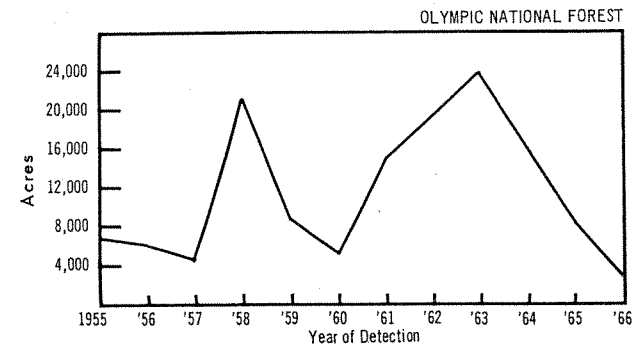
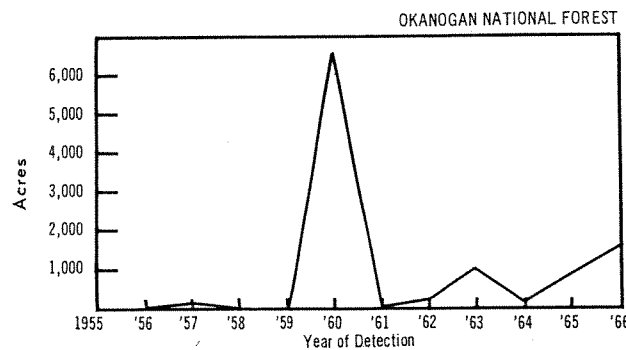
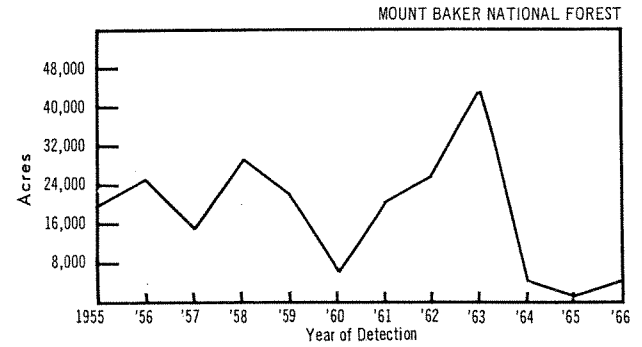
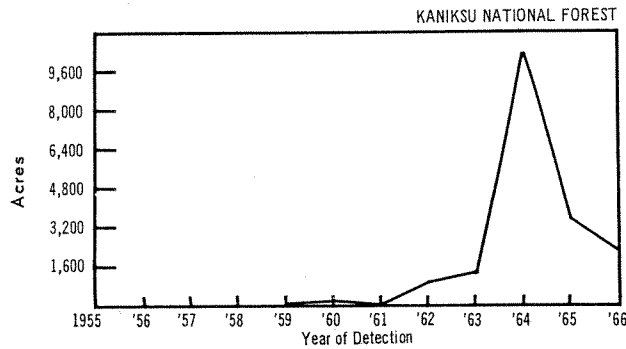
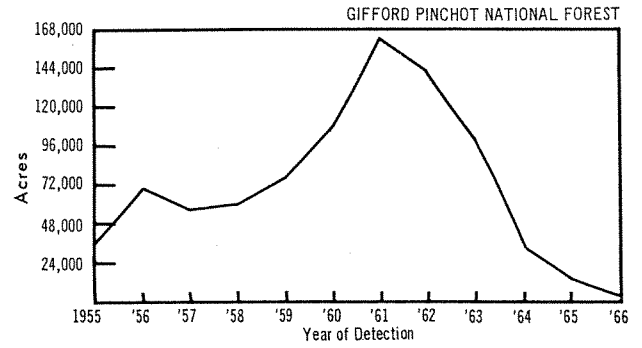
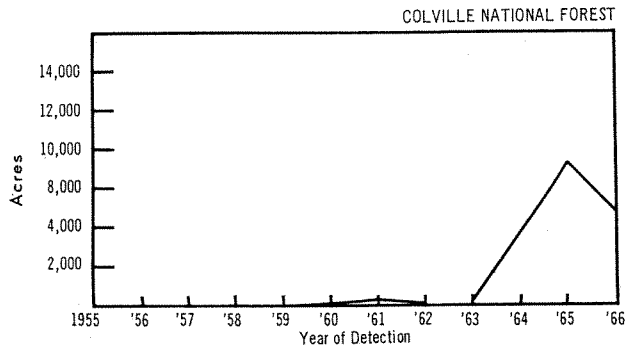
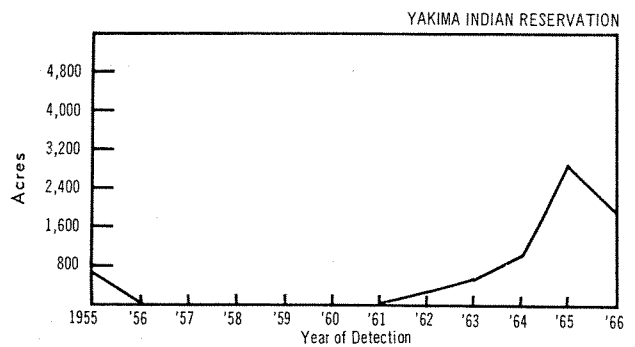
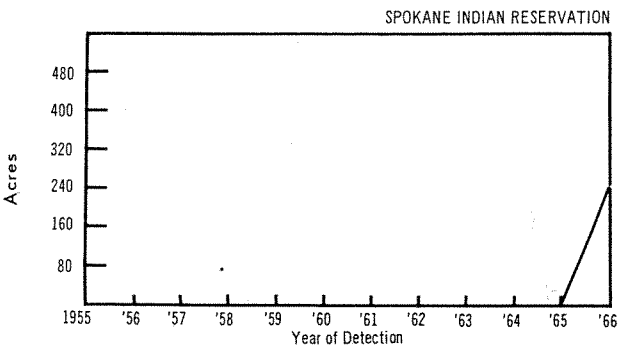
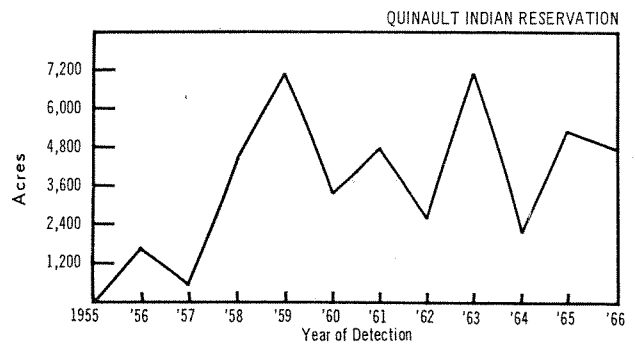
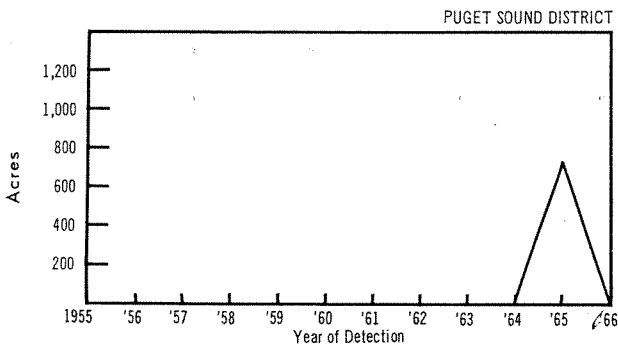
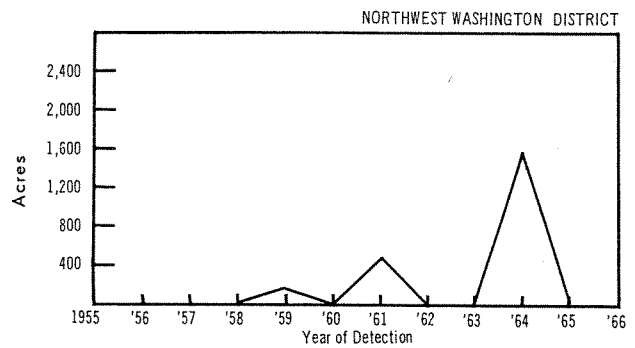
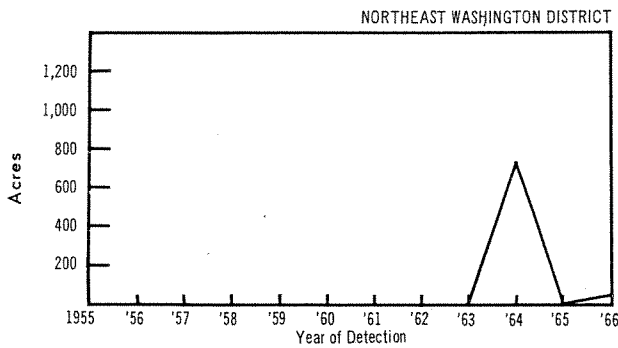
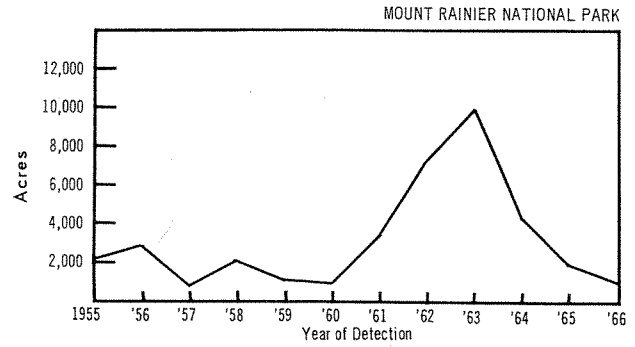
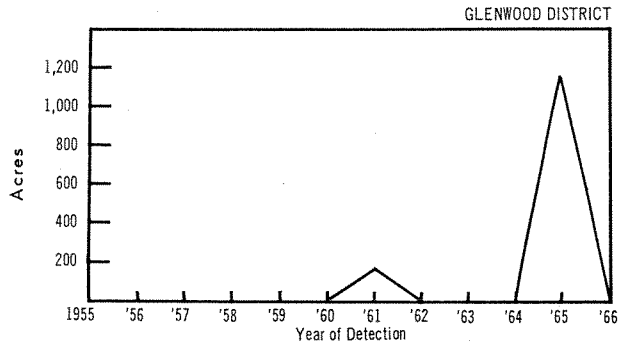


FIGURE 3-5, WASHINGTON LANDS



SUGAR PINE

History

Sugar pine stands are limited in the Northwest. Its range extends north from Baja, California, to Clackamas and Jefferson Counties in Oregon. No serious mountain pine beetle outbreak has occurred in the Pacific Northwest. Most of the damage has been endemic and the few outbreaks that occurred were short lived.

Damage Classification

The intensity classification used for mapping bark beetle damage in sugar pine stands during aerial detection surveys follows:

Infestation intensity	Trees per section	Trees per group	Estimated volume loss
	— — <i>Number</i> — —		<i>Bd. ft./acre</i>
Light	20-50	5 or less	49.6
Moderate	50-100	10 or less	186.3
Heavy	100-200	20 or less	0.0 ¹
Very heavy	200 or more	20 and over	0.0

¹ Data not available for estimating board foot loss.

Location of Damage

The mountain pine beetle kills mature and overmature sugar pine each year. Generally losses are very light and never reported. During the period 1955-1966, tree killing was not reported for 6 different years (table 8). The estimated volume killed during this 12-year period was 148 MM board feet (table 9). Although epidemic losses were reported during the remaining 6 years, 95 percent of damage occurred after 1963 (figure 4-1). Most of the tree killing was in southwest Oregon on the Coos-Douglas District, Bureau of Land Management, and the Rogue River and Siskiyou National Forests (map 5, figure 4-2).

The sudden surge of tree killing reported in 1964 may be directly related to the 1962 October windstorm. This storm damaged many trees throughout southwest Oregon and these trees provided the ideal breeding site conducive to an epidemic. The damaged trees attracted the beetles during the summer of 1963 and faded in 1964. The beetle populations remained high during the 1964 flight, resulting in significant losses by 1965. Thereafter, healthy, green trees resisted beetle attacks and the population dwindled to an endemic level.

Control Measures

Since most of the mortality occurs in old-growth stands, logging is recommended to minimize timber losses. To be effective, all merchantable infested trees should be logged and removed from the woods before July 1.

Direct control in sugar pine stands has not been recommended in Oregon because of the prevalence of blister rust.

Table 8.—Trend of mountain pine beetle infestations in sugar pine in Oregon by reporting area 1955-66
(In Acres)

Reporting Area ¹	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total
Oregon:													
Deschutes N.F.	--	--	--	--	--	320	--	--	--	40	50	440	850
Fremont N.F.	--	--	--	--	--	--	--	--	--	--	1,640	--	1,640
Rogue River N.F.	--	--	160	--	--	120	--	160	--	490	130	1,200	2,260
Siskiyou N.F.	--	--	--	--	--	--	--	--	--	1,030	4,110	300	5,440
Umpqua N.F.	--	--	--	--	--	40	--	--	--	--	--	70	110
Winema N.F.	--	--	--	--	--	--	--	--	--	--	20	360	380
Coos-Douglas District	--	--	--	--	--	--	--	--	--	4,600	160	--	4,760
Total	0	0	160	0	0	480	0	160	0	6,160	6,110	2,370	15,440

¹ N.F., National Forest; District, State ownership.

Table 9.—Extent and estimated volume of sugar pine killed by the mountain pine beetle in Oregon by reporting unit 1955-66¹

Reporting Area ²	Light		Moderate		Heavy		Very Heavy		Total	
	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume
Oregon:										
Deschutes N.F.	530	26,880	320	59,616	--	--	--	--	850	86,496
Fremont N.F.	1,640	81,344	--	--	--	--	--	--	1,640	81,344
Rogue River N.F.	2,260	112,096	--	--	--	--	--	--	2,260	112,096
Siskiyou N.F.	5,080	251,968	360	67,068	--	--	--	--	5,440	319,036
Umpqua N.F.	110	5,456	--	--	--	--	--	--	110	5,456
Winema N.F.	380	18,848	--	--	--	--	--	--	380	18,848
Coos-Douglas District	240	11,904	4,520	842,076	--	--	--	--	4,760	853,980
Total	10,240	508,496	5,200	968,760	0	0	0	0	15,440	1,477,256

¹ Estimated average tree: 30 in. d.b.h.; 112 ft. tall; 1,590 bd. ft./tree.

² N.F., National Forest; District, State ownership.

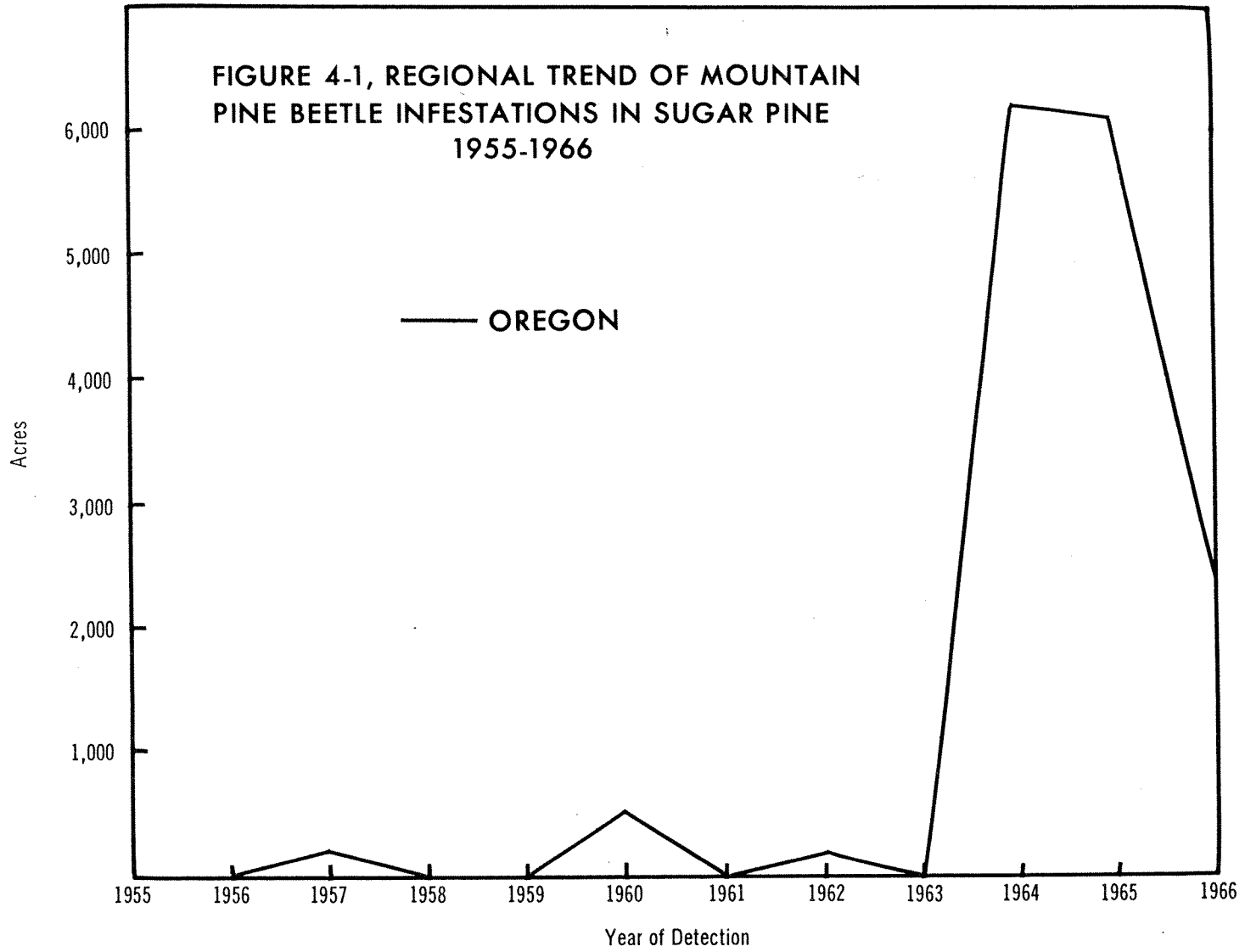
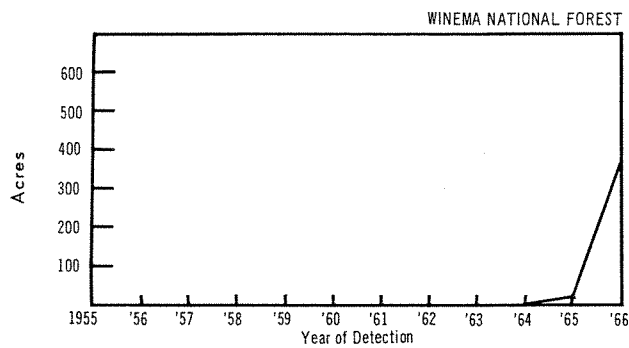
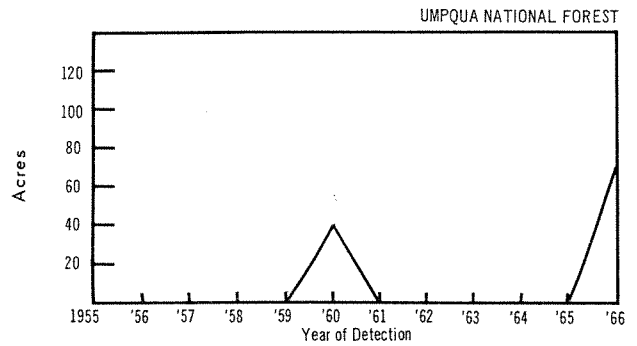
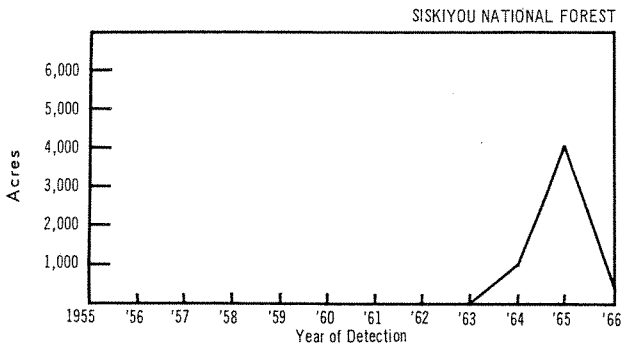
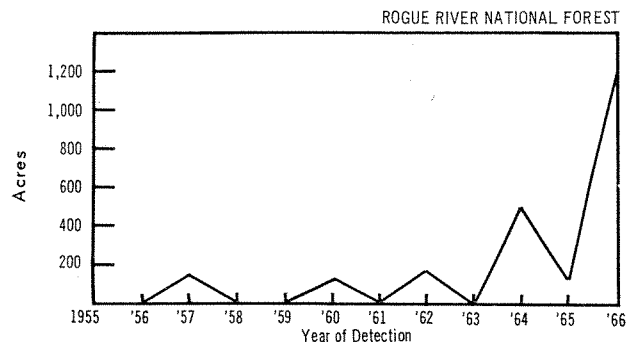
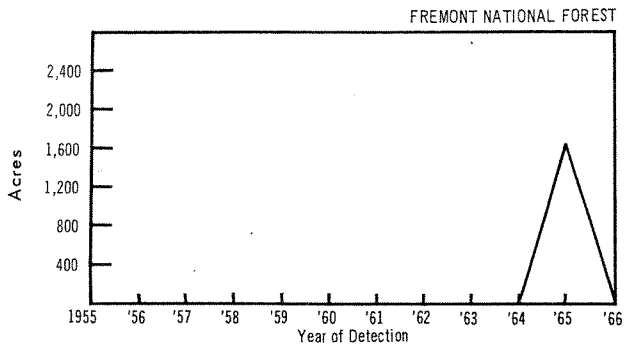
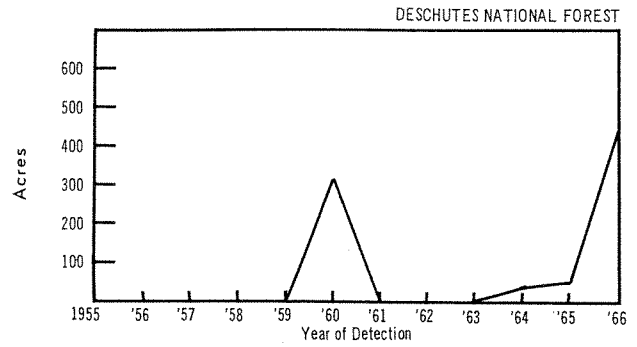
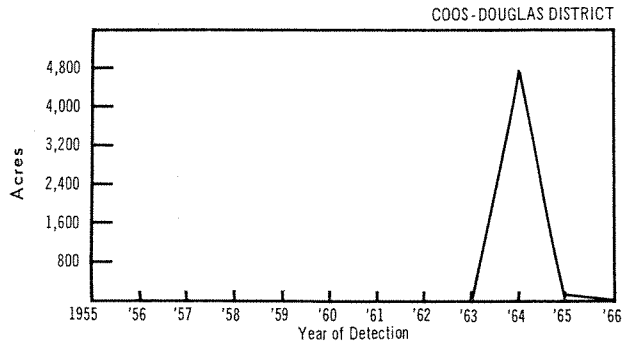


FIGURE 4-2, OREGON LANDS



1974

U. S. FOREST SERVICE
Region 6

5200
Portland, Oregon
October 1974

IMPORTANT FOREST PEST OUTBREAKS IN
OREGON AND WASHINGTON IN 1974

by

Donald J. Curtis, Entomologist
and

James S. Hadfield, Pathologist
Insect and Disease Control
State and Private Forestry

INSECT CONDITIONS IN BRIEF

Defoliator populations continued at a high level in the Pacific Northwest as a result of substantially increased activity recorded for the western spruce budworm in north central Washington and the modoc budworm in south central Oregon. Western spruce budworm infestations, causing variable amounts of damage over approximately 548,000 acres of Douglas-fir and true fir forests on the Okanogan and Wenatchee National Forests and the North Cascades National Park, more than doubled in area since 1973. One new infestation center, totaling 7,200 acres and consisting primarily of light defoliation, was observed on the Warm Springs Indian Reservation.

The modoc budworm, also more than doubling in area of visible feeding, caused primarily light defoliation over approximately 90,000 acres of white fir type in the Gearhart and Warner Mountains on the Fremont National Forest. One center of sugar pine tortrix observed in the North Warner Mountains caused light defoliation over 760 acres of lodgepole pine. Larch casebearer defoliation was again observed in both States. No formal surveys were conducted; however, field observers indicated that the intensity of damage appeared to be generally less than last year. Douglas-fir tussock moth populations significantly decreased following the application of DDT on 356,505 acres of infested forest lands in Oregon and Washington this past season.

The results of the 1974 aerial survey, confirming the post-spray sampling, indicate that Douglas-fir tussock moth populations have significantly declined in Oregon and Washington. Some additional defoliation was observed in and adjacent to research study sites in the Blue Mountains; in portions of the Eagle Cap Wilderness area; and in the untreated breaks of the Snake River Canyon. However, no significant defoliation was observed in any of the treatment areas and only one new center, totaling less than 10 acres and located in Stevens County near Daisy, Washington, was recorded.

Vertical stamp on the left margin with various initials and the word "Library" written at the bottom.

Sucking insect activity, primarily caused by the balsam woolly aphid, decreased in Oregon. However, specimens and damage resulting from this pest were found on subalpine fir near the headwaters of Tiger Creek on the Walla Walla Ranger District, Umatilla National Forest, in May of 1974. This is a new record and a significant range extension as this aphid had never been found east of the Cascade Mountains in Oregon.

Bark beetle activity increased in both Oregon and Washington in 1974. With the exception of mountain pine beetle populations in western white pine and silver fir beetle populations in Pacific silver fir, all recorded pests caused more damage this season than in the previous year. The volume of mountain pine beetle-caused mortality in lodgepole pine stands in eastern Oregon, estimated at 79.7 mm bd. ft., has more than doubled since last year. This is a result of recorded tree killing on nearly 423,000 acres of host type which is concentrated mostly on the Umatilla and Wallowa-Whitman National Forests and adjacent State and private lands. Fir engraver damage more than doubled in Oregon and decreased slightly in Washington. Douglas-fir beetle losses were generally light and scattered over both States. However, extensive tree killing, presumably triggered by brood buildup in ice storm-damaged and drought-weakened trees, has occurred over nearly 10,000 acres in the Cascade Mountains between Packwood and Randall, Washington. Western pine beetle losses in both Oregon and Washington remained at about the same level as 1973. However, increased activity was observed on the Fremont, Malheur, Ochoco, and Winema National Forests in Oregon. A somewhat unusual outbreak of the flatheaded fir borer, developing in drought-weakened Douglas-fir, has caused tree killing on approximately 5,000 acres in southern Oregon between Roseburg and Medford.

DISEASE CONDITIONS IN BRIEF

The incidence of foliage diseases and weather injuries increased considerably in 1974. Both forest nurseries and forest stands were affected. Damage by gray mold blight and *Fusarium* top blight was common in many western Oregon and Washington nurseries. Several Christmas tree plantings suffered serious losses from foliage rusts and weather injuries. Weather damage is suspected as a primary contributing factor in the extensive mortality in Douglas-fir and ponderosa pine stands in southern Oregon.

Root rots, heart rots, and dwarf mistletoes continue to be the most important forest diseases in the Pacific Northwest.

STATUS OF INSECTS

Western spruce budworm, *Choristoneura occidentalis* Free. Infestations of the western spruce budworm have more than doubled in area since last year. Slightly more than one-half million acres of Douglas-fir and true fir have been defoliated to some extent this year. The majority of the damage has occurred on the Okanogan and Wenatchee National Forests and

the North Cascades National Park in north central Washington. Scattered feeding, totaling less than 2,000 acres, has occurred on the Wallowa-Whitman National Forest in Oregon and a new center, totaling 7,200 acres and consisting primarily of light defoliation, was recorded on the Warm Springs Indian Reservation.

Some apparent top killing has occurred as a result of continuous defoliation over the past 4 years. However, no mortality has been observed. It is generally believed that most of the affected stands can sustain 2 or possibly even 3 more years of feeding before significant top killing will occur because the majority of the outbreaks are only 1 or 2 years old. These outbreaks are expected to continue in 1975. However, the trends will not be definitely known until data collected this fall during an egg mass survey and stand hazard appraisal have been analyzed (see attached map

Modoc budworm, *Choristoneura viridis* Free. Populations of this insect, more than doubling in area, caused primarily light defoliation over approximately 90,000 acres of white fir type on the Fremont National Forest. New defoliation occurred this year over most of the North Warner Mountains and the Gearhart Wilderness area. The current level of defoliation has not resulted in serious tree damage. Cone production has been apparently affected and some scattered top killing has been observed in isolated locations that have suffered 3 years of continuous defoliation. However, no mortality has been observed in any of the outbreak. These outbreaks are expected to continue next year. However, the actual trends will not be known until data collected this fall during an egg mass survey and stand hazard appraisal have been analyzed (see attached map for outbreak locations).

Sugar pine tortrix, *Choristoneura lambertiana* (Busck). A new center, totaling 720 acres and consisting primarily of light defoliation, was observed in the vicinity of Drake Mountain (North Warner Mountains) on the Lakeview Ranger District, Fremont National Forest. The trend of this infestation is not known. However, it is not expected to cause any serious problems next year.

Larch casebearer, *Coleophora laricella* Hbn., continued to spread in western larch stands throughout eastern Washington and northeast Oregon. The insect has not yet been observed in the Cascade Mountains of Oregon or Washington or in the Ochoco Mountains of central Oregon. No formal detection surveys were conducted this year. However, field observers indicated that defoliation was generally less than that of last year. This may, in part, have been a result of the cool and damp weather which existed throughout much of the Pacific Northwest this last spring.

Douglas-Fir tussock moth, *Orgyia pseudotsugata*, McD. Populations of this pest were reduced to nearly non-detectable levels following the application of DDT on 356,505 acres of infested forest lands in Oregon and Washington this past summer. No significant defoliation was observed in any treated areas and only one new center, totaling less than 10 acres in Stevens County, Washington, was found. During the summer following completion of the suppression project approximately 2,200 miles of timber land road system in Oregon and Washington were surveyed in an attempt to find tussock moth larvae. No active populations were detected.

356,505

The results of a recently completed egg mass survey indicate that the control effort was quite successful. No egg masses were found in any of the treatment areas except on the Pomeroy Unit in the vicinity of Anatone Butte. (see attached map for location of treatment areas)

Balsam woolly aphid, *Adelges piceae* (Ratz.), infestations continued to cause damage in the true fir stands of western Oregon and Washington. However, the amount of visible damage detected during the annual aerial survey in Oregon was approximately 100,000 acres less than the amount observed in 1973. Most of the observable damage occurs on the Willamette, Mt. Hood and Deschutes National Forests in Oregon and the Gifford Pinchot and Snoqualmie National Forests in Washington. However, a light infestation, not detectable from the air, was found in a small grove of subalpine fir near the headwaters of Tiger Creek on the Walla Walla Ranger District, Umatilla National Forest, in May of 1974. The results of a recent ground survey indicate that the insect is established in the subalpine type within a 3-mile radius of the initial find. Bole dissections indicate that host trees have been infested for at least 7 years. No top-killing or tree mortality has been observed and no damage has been observed on any grand fir (see attached map for location of infestations).

Mountain pine beetle, *Dendroctonus ponderosae* Hopk., continued to cause serious losses in lodgepole pine stands in Oregon. Approximately 80 million board feet of timber has been killed this past year. Nearly three-quarters of this loss has occurred on the Umatilla and Wallowa-Whitman National Forests. In Washington, losses in lodgepole pine continued to be light. Losses of western white pine declined throughout the mountainous regions of both States. In Oregon, the heaviest tree killing occurred on the Willamette National Forest while those in Washington occurred on the Snoqualmie and Wenatchee National Forests. Mountain pine beetle attacks in pole-size ponderosa pine increased slightly in both States with significant increases occurring on the Colville Indian Reservation in Washington and on State and private lands in the vicinity of Dooley Mt. in northeastern Oregon (see attached map for mountain pine beetle activity).

Fir engraver, *Scolytus ventralis* Lec., populations have generally increased over the Pacific Northwest. Losses in true firs were generally light over much of eastern Oregon and Washington. Significant damage in Oregon occurred on the Malheur, Umatilla, and Wallowa-Whitman National Forests. In Washington, the Mt. Baker, Okanogan, and Wenatchee National Forests received the most damage. The trend of these infestations is unknown.

Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopk., killed approximately 16.8 mm bd. ft. of Douglas-fir in Oregon and Washington in 1974. Losses this past year were slightly more than twice those of last year. The longest outbreaks have been observed on the Mt. Hood, Umpqua, Willamette and Gifford Pinchot National Forests. The most severe infestation is located on the Packwood Ranger District on the Gifford Pinchot National Forest within and adjacent to the Davis Mountain roadless area. An estimated 75 million bd. ft. of dead, green-infested and ice storm-damaged timber is being prepared for sale this fall.

The District is hopeful that the infested material will be logged by May 1, 1975, before the beetles emerge to infest other trees (see attached map for Douglas-fir beetle activity).

Spruce beetle, *Dendroctonus rufipennis* (Kby.). Tree killing continued in Engelmann spruce stands on the Okanogan National Forest in Washington. Elsewhere in Oregon and Washington, spruce beetle populations are generally increasing. Aerial detection surveys reported numerous widely scattered new patches of mortality. The trend of these outbreaks is unknown.

Western pine beetle, *Dendroctonus brevicomis* LeC., infestations continued in several mature and overmature ponderosa pine stands in Central Oregon where nearly 7 million bd. ft. of timber has been killed on the Fremont, Malheur, Ochoco and Winema National Forests. In Washington, losses were light with widely scattered tree killing occurring on most east side forests.

Flatheaded fir borer, *Melanophila drummondi* (Kirby). An outbreak of flat-headed borers developed on approximately 5,800 acres of low site forest lands in southwestern Oregon between Roseburg and the Oregon-California State line. Most of the tree killing occurs on dry rocky sites located along the foothills of the Rogue and Umpqua River drainages in the vicinity of Riddle, Grants Pass, Medford and Ashland. The probable cause of this outbreak is attributed, in large part, to the effect of adverse weather conditions on host tree; namely, unusually low temperatures in December 1972, followed by a long and severe drought in 1973.

The trend of this outbreak is not known. However, tree killing is expected to subside with the occurrence of normal precipitation.

Other insects: Gypsy moth, *Porthetria dispar* (L.). An adult male was captured this past summer in a pheromone trap placed in a residential area in Seattle, Washington. No additional adults were captured during a more comprehensive trapping program.

According to Dick Jackson, USDA, Plant Protection Officer and coordinator of the trapping program, additional evidence of gypsy moth has been found on mobile homes in Coeur d'Alene, Idaho and in Bend and Pendleton, Oregon. The find at Bend included dead larvae and an old egg mass. Followup surveys are planned for 1975.

European pine shoot moth, *Rhyacionia buoliana* (Schiff.). The European pine shoot moth pheromone was used operationally for the first time as a survey tool. Baited sticky traps were placed in the field from May through July in Jackson, Josephine, Clackamas, Washington, Multnomah and Umatilla Counties, Oregon, to attract and detect the presence of shoot moth.

Adult insects were found at Hermiston, Umatilla, Hat Rock Park, McNary Dam, McNary Golf Course and in a residential area of Pendleton, all within Umatilla County.

No shoot moths were detected in the other five counties.

STATUS OF FOREST TREE DISEASES IN OREGON AND WASHINGTON IN 1974

Gray mold blight caused by *Botrytis cinerea*, Pers. damaged seedlings in many of the forest nurseries in western Oregon and Washington. The increase in damage is directly attributable to the prolonged moist period which extended into late June. The disease is most damaging in dense beds where the foliage remains damp for several days. It can be prevented by thinning beds to promote foliage drying. Several fungicides including Bordeaux, maneb, zineb, ferbam, captan and thiram are effective in preventing gray mold blight.

Fusarium top blight, caused by species of *Fusarium* also was common in many forest nurseries this year. It can be prevented by avoiding excess moisture on foliage for long periods. Benlate has been found to be effective in preventing the disease in studies conducted by the Washington Department of Natural Resources.

Douglas-fir needle rust, caused by *Melampsora occidentalis*, damaged several Christmas tree plantings in Oregon and Washington in 1974. In some cases trees were so severely infected that they were rendered worthless for Christmas trees. The rust has an alternate host of black cottonwood. Damage can be reduced by removing cottonwood trees from the immediate vicinity of Douglas-fir Christmas tree plantings.

Other foliage diseases observed this year include *Melampsora - abietis - capraearum* on approximately 200 acres of grand fir on the Yakima Indian Reservation, a *Dothistroma - Lophodermium* complex on lodgepole pine along the Oregon coast, *Rhabdocline pseudotsugae* on Douglas-firs in many areas of Oregon and Washington, and larch needle cast caused by *Hypodermella laricis* in several larch stands in eastern Washington and northeastern Oregon.

Weather injuries to several tree species were very noticeable in 1974.

Extensive drought injury or scorch occurred over much of western Washington. Apparently a single week of extremely hot weather early in June when foliage was succulent caused the injury. Nearly all the grand fir in Washington Christmas tree plantations have had some degree of damage. Noble fir and Douglas-firs were affected to a lesser degree.

Freeze damage to the tops of conifers was common in the vicinity of Olympia, Washington. The top 5-20 feet of trees were killed by low temperatures.

Weather injury is strongly suspected as a contributing factor of extensive mortality of Douglas-firs and ponderosa pine in southern Oregon between Roseburg and Medford. An area around Canyonville and Riddle was highly visible from I-5 and generated considerable news coverage. Very cold weather experienced during December 1972 is suspected as the initial cause of the injury. Secondary damage by bark beetles was evident in dead and stressed trees. The Oregon State Department of Forestry is planning additional evaluations in the damaged areas.

Root rots, heart rots, and dwarf mistletoes continue to be the most important disease problem in the Pacific Northwest. There is very little if any change in the yearly incidence of these types of diseases.

A roadside survey for Port-Orford-cedar root rot caused by *Phytophthora lateralis* was conducted on 3 Districts of the Siskiyou National Forest in 1974. Approximately 55 percent of the 450-plus miles of roads examined were infected. This represents a very discouraging dramatic increase from a similar survey conducted in 1964 when the root rot was found to be just beginning to encroach on the Forest. A plant pathologist has been hired by Oregon State University with funds made available by Coos, Curry and Douglas Counties. This pathologist will devote all of his time to Port Orford-cedar-root rot for a minimum of 1 year.

Several additional infection centers of the black stain root disease were found in Douglas-fir stands in the vicinity of the Umpqua National Forest. Many infection centers which appear to be caused by *Poria weirii* are really caused by the black stain root disease, *Verticicladiella wagenerii*. Usually only a relatively small number of trees are killed in any one infection center.

A survey of 361 plantations ranging in age from 1 to 30 years revealed that Armillaria root rot is the most common disease found in plantations. Weather injury, white pine blister rust and *Phellinus weirii* were also frequently observed diseases.

The generic name of *Poria weirii* has been changed to *Phellinus weirii*.

The first large scale use of borax treatments to prevent infection of stumps by the root rot fungus *Fomes annosus* was made on the Fremont National Forest in September. Ponderosa pine stumps on approximately 150 acres adjacent to an infected plantation were treated. The cost averaged about \$4.50 per acre for materials and application. A very productive mycorrhizal conference was held in Corvallis in August. Mycorrhizal workers from all over the world attended.

Seed production by Douglas-fir dwarf mistletoe, *Arceuthobium douglasii*, and larch dwarf mistletoe, *A. laricis*, was very poor in 1974. In contrast, ponderosa pine dwarf mistletoe unfortunately produced a bumper crop.

A slide-tape program titled "Defect estimation in white fir on the Rogue River National Forest--a guide for cruisers," was prepared by the U.S. Forest Service this year. Copies will soon be available for purchase.

A survey of 30 lodgepole pine stands was conducted by the U.S. Forest Service in 1974 to measure the incidence of diseases. The following data were recorded:

Western gall rust was present in 23 stands and more than
28 percent of trees were infected
Dwarf mistletoe was present in 20 stands
Stalactiforme rust was present in 8 stands
Atropellis canker was found in 9 stands

The survey indicated diseases cause large losses in lodgepole pine stands.

A study was made by the U.S. Forest Service of the extent of defect associated with top-kill caused by the Douglas-fir tussock moth outbreak in 1964 near Burns. During the study, 9 grand firs and 7 Douglas-firs with dead tops were dissected to measure how far down the trees stain and decay had progressed. The extent of defect was very limited in Douglas-firs but wetwood, stain, and decay were common in grand fir and were found several feet down from the interface of the dead and live tops. Work is still underway on identification of the organisms involved. A report will be issued next spring.

Table 1.--Summary of 1974 budworm epidemic infestations
in Oregon and Washington

STATE FOREST	Defoliation			
	Light (Acres)	Moderate (Acres)	Heavy (Acres)	Total (Acres)
WESTERN SPRUCE BUDWORM <i>Choristoneura occidentalis</i> Free				
Oregon				
Wallowa-Whitman N.F.	1,980	--	--	1,980
Warm Springs I.R.	6,920	--	280	7,200
Sub-total (Oregon)	8,900	--	280	9,180
Washington				
Okanogan N.F.	156,340	17,200	2,600	176,140
Wenatchee N.F.	302,270	35,130	3,040	340,440
North Cascades N.F.	18,220	5,200	480	23,900
Sub-total (Washington)	476,830	57,530	6,120	540,480
Sub-total (<i>C. occidentalis</i>)	485,730	57,530	6,400	549,660
MODOC BUDWORM <i>C. viridis</i> Free				
Oregon				
Fremont N.F.	72,040	12,370	5,160	89,570
Sub-total (<i>C. viridis</i>)	72,040	12,370	5,160	89,570
Total (<i>C. occidentalis</i> and <i>C. viridis</i>)	557,770	69,900	11,560	639,230

Table 2.--Summary of 1974 forest insect epidemic infestations in Oregon and Washington

Insects	Oregon		Washington		Regional total	
	Infestation centers	Area	Infestation centers	Area	Infestation centers	Area
	Number	Acres	Number	Acres	Number	Acres
Defoliators:						
Sawflies on larch	2	560	0	0	2	560
Sawflies on knobcone pine	13	1,080	0	0	13	1,080
Spruce budworm	41	98,750	168	540,484	209	639,234
Douglas-fir tussock moth	31	30,930	1	40	32	30,970
Sugar pine tortrix	1	760	0	0	1	760
All defoliators	88	132,080	169	540,524	257	672,604
Sucking insects:						
Balsam woolly aphid	171	11,500	56	11,320	227	22,820
All sucking insects	171	11,500	56	11,320	227	22,820
Other:						
Oregon pine ips	311	15,760	15	1,250	326	17,010
All other	311	15,760	15	1,250	326	17,010
Not an insect:						
Bear damage	2	120	43	4,890	45	5,010
All not an insect	2	120	43	4,890	45	5,010
All damage	572	159,460	283	557,984	855	717,444

Table 3.--Summary of 1974 forest epidemic infestations in Oregon and Washington
for all bark beetle damage excluding Oregon pine ips

Insects ^{1/}	: Infestation : centers	:: Area	:: Number of :: trees	:: Volume
	<u>Number</u>	<u>Acres</u>	<u>Number</u>	<u>Board feet</u>
Oregon:				
Douglas-fir beetle (east side)	134	6,870	2,572	2,174,280
Douglas-fir beetle (west side)	190	2,850	4,540	7,663,200
Douglas-fir engraver	3	170	40	52,100
Engelmann spruce beetle	15	850	285	71,250
Fir engraver	332	31,620	13,633	3,583,770
Flatheaded borer	222	5,750	6,152	11,135,120
Mountain pine beetle (L)	1,167	422,610	1,139,714	79,710,680
Mountain pine beetle (S)	12	2,020	510	287,800
Mountain pine beetle (W)	140	3,750	5,845	2,734,400
Mountain pine beetle (P)	638	55,380	58,916	3,522,370
Western pine beetle	577	106,110	8,928	6,873,350
Oregon total	3,430	637,980	1,241,135	117,808,320
Washington:				
Douglas-fir beetle (east side)	56	6,890	3,565	1,960,750
Douglas-fir beetle (west side)	102	11,130	5,799	5,021,160
Engelmann spruce beetle	24	3,250	3,890	972,500
Fir engraver	99	9,630	6,805	1,754,000
Mountain pine beetle (L)	52	4,950	3,580	250,600
Mountain pine beetle (W)	278	26,980	19,170	8,659,200
Mountain pine beetle (P)	265	12,320	10,651	537,160
Western pine beetle	33	4,540	452	267,780
Silver fir beetles	4	680	55	71,250
Washington total	913	80,370	53,967	19,494,400
Regional total	4,343	718,350	1,295,102	137,302,720

^{1/} Mountain pine beetle infestations are separated by tree species: L, lodgepole pine; S, sugar pine; W, western white pine; P, ponderosa pine.

