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REPORT OF

FOREST INSECT SURVEYS

IN OREGON AND WASHINGTON,

Season of 1952

Compiled by

Oregon State Board of Forestry

and

Bureau of Entomology and Plant Quarantine
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INTRODUCTION

In the opinion of experienced observers, 1952 has been the worst "forest insect" year on record in Oregon and Washington. The results of the cooperative forest insect surveys of 1952, herein reported, support this opinion. Of the 49,000,000 acres of forest lands in the two states, a total of 7,411,680 acres harbor outbreaks of forest insects. A combination of defoliators, bark beetles, windstorms and drought have brought about the present situation. From the evidence at hand, 1953 may see even greater insect-caused losses. Thus, the owners, managers, and users of the forest resources are faced with an unprecented salvage and control problem.

Three separate cooperative surveys were necessary in 1952 to obtain data on forest insect epidemics. During the period from February to April an aerial survey of the Douglas-fir stands in western Oregon and southern Washington was conducted to obtain preliminary information on the extent and seriousness of a Douglas-fir beetle epidemic that developed in 1951 from a buildup in windthrown timber. A second and more intensive aerial survey of this situation, supplemented by ground sampling, was made during the summer to obtain detailed data on the location and amount of beetle-killed and windthrown timber as a basis for developing salvage-control operations. The third or regional survey, to collect data on the spruce budworm and all other major forest insects in the two states, had to be postponed nearly a month later than usual because of the priority of the special survey in the Douglas-fir region and because of the spruce budworm control project. The regional survey had to be called off on September 22 because of dense layers of smoke and resulting poor visibility, leaving a large acreage of timberland in western Oregon and Washington unsurveyed. It is planned to complete this survey when the fall rains have cleared the air.

A summary of the preliminary survey of the Douglas-fir beetle situation has been issued 1/. Detailed maps resulting from the special Douglas-fir beetle-blowdown survey have been issued and a summary statement 2/ released. The results of the regional survey, so far as completed, are presented in the following report. The spruce budworm situation is summarizied in Graph 1 and in Tables 1 and 2 and is considered in detail in Part I. Part II presents a brief discussion of other major forest insect problems in 1952. Part III contains: (1) An acknowledgment of the cooperation on the project; (2) tables 3 to 7, which present the 1952 field data; (3) a list of reports and publications on the spruce budworm problem, surveys and control operations; and (4) a map showing the status of the spruce budworm in 1952.

1/ Weyerhaeuser Timber Company, Oregon State Board of Forestry, and U. S. Bureau of Entomology and Plant Quarantine - Report of Reconnaissance Surveys of the 1951 Douglas Fir Bark Beetle Epidemic in Oregon and Washington. Mimeographed report, April 28, 1952.

2/ Pacific Northwest Forest & Range Experiment Station and Portland Forest Insect Laboratory - Summary Statement on the 1952 Blowdown - Bark-Beetle Survey in the Douglas-fir Region of Oregon and Washington. Multigraphed Report, October 20, 1952.

PART I - SPRUCE BUDWORM PROBLEM

General Statement

Four aerial spraying projects to control an aggressive spruce budworm epidemic in the Douglas-fir and true fir forests of Oregon and Washington have treated 2,793,000 acres during the period 1949-1952 at a cost of approximately $3,000,000. These projects have carried out the recommendations of the Northwest Forest Pest Action Committee (formerly the Spruce Budworm Action Committee). The major accomplishments of this cooperative program (Graph 1) have been:

(1) The outbreak which started in 1944 and reached a peak of 2,276,000 acres in 1949, has been reduced to 1,579,000 acres in 1952, despite continued development of the outbreak on the unsprayed areas.

(2) The acreage of heavy defoliation was reduced from 887,000 acres in 1949 to 82,000 acres in 1951, but in 1952 it increased to 153,000 acres.

(3) The acreage of timber killed directly by the budworm has been kept to slightly less than 10,000 acres.

(4) The epidemic has been kept from rampant spreading and tree killing in the valuable fir forests of western Oregon.

As reported in 1951, the present spruce budworm control program has reached what should be the concluding phases, provided natural control factors soon become fully effective. There were local indications in 1950, 1951 and again in 1952 that natural control was becoming effective. However, natural control has not yet become effective enough to turn the course of infestation downward on the unsprayed areas.

The 1952 spruce budworm survey revealed that the spruce budworm control program is continuing to make substantial progress:

(1) Epidemic infestations in western Oregon have been reduced to 23,840 acres, the lowest point in the past five years; killing by the budworm on this area has been entirely prevented.

(2) Epidemic infestations of the budworm have been eliminated from the eastern slopes of the Cascade Range in Oregon; killing by the budworm on this area has been largely prevented.

(3) The budworm population on most of the areas sprayed to date continues to be very low.

However, in several important respects the current situation is not as encouraging as it was in 1951, as evidenced by the following survey findings:

(1) New centers of epidemic infestation have developed on the Willamette, Malheur, Whitman, Wallowa, and Wenatchee National Forests.

(2) The budworm has reinfested the following previously sprayed areas: Browder Creek, Smith River and Carpenter Mountain on the Willamette National Forest, and the Tucannon River and Wolf Creek drainages on the Umatilla National Forest.

(3) Throughout most of the Blue Mountains area, in both Oregon and Washington, there has been a marked enlargement and intensification of the unsprayed centers of epidemic infestation.

(4) The acreage of heavy epidemic infestation increased from 82,000 acres in 1951 to 153,000 acres in 1952.

(5) A virulent and widespread epidemic of the Douglas-fir beetle has developed both on sprayed and unsprayed areas in the Blue Mountains of Oregon and Washington and is killing great numbers of trees weakened by the budworm.

The Spruce Budworm Situation in 1952

The status of the spruce budworm (Choristoneura fumiferana (Clem.) in Oregon and Washington 3/ in 1952 is summarized in the present report. Tables 1 and 2, which follow, present a summary of the 1952 infestations by intensities and ownership classes. For a history of spruce budworm epidemics, the findings of recent surveys, and the results of aerial spraying in the two states, the reader is referred to the list of reports and publications in the Appendix.

Since 1947, the Oregon and Washington cooperative insect survey program, covering some 49,000,000 acres of forested land, has had as its primary objective the location and appraisal of epidemic infestations of the spruce budworm. The aerial phase of the 1952 survey (Table 3) the sixth consecutive survey of this type, was started on July 29 and concluded on September 22. The aerial and ground survey techniques used during past surveys were again employed in 1952.

3/ Exclusive of Stevens, Spokane and Pend Oreille Counties, Washington, which are covered by the Forest Insect Laboratory at Coeur d'Alene, Idaho.

The acreage of spruce budworm epidemic infestations existing in 1952, as recorded by the survey and compared to the conditions in 1951, is as follows:

Area	1952	1951
Blue Mountains, Oregon	1,407,680 Acres	1,329,480 Acres
Blue Mountains, Washington	127,200 "	182,880 "
Western Oregon	23,840 "	56,960 "
Eastern Washington Cascades	19,840 "	3,840 "
Eastern Oregon Cascades	0 "	77,440 "
Area Totals	1,578,560 Acres	1,650,600 Acres
Total for Oregon	1,431,520 Acres	1,463,880 Acres
Total for Washington	147,040 "	186,720 "
State Totals	1,578,560 Acres	1,650,600 Acres

As in past years, there are extensive areas in both Oregon and Washington on which the budworm is present in numbers too small to cause defoliation recognizable from the air. These incipient infestations are recorded annually during the cooperative ground survey to guard against the development of undetected outbreaks. In 1952 the ground survey of the budworm situation had to be curtailed because of the magnitude of other survey jobs. Participants in the 1952 survey are listed in Tables 4 and 5.

Five degrees of epidemic infestation based on the degree of defoliation have been recognized during the course of the present outbreak. These are as follows:

Light - Defoliation light, barely visible from the air; no tree killing expected for at least two years.
Moderate - Defoliation moderate; no tree killing expected for at least one year.
Heavy - Defoliation moderate to severe; some tree killing in progress, general tree killing probable next year.
Very Heavy - Defoliation severe; general tree killing in progress.
Dead - Defoliation complete; trees predominantly dead on extensive areas.

During 1951 and again in 1952, only light, moderate and heavy infestations were present; no new centers of very heavy defoliation or dead timber were recorded in 1952.

GRAPH I

PROGRESS OF SPRUCE BUDWORM EPIDEMIC IN OREGON AND WASHINGTON

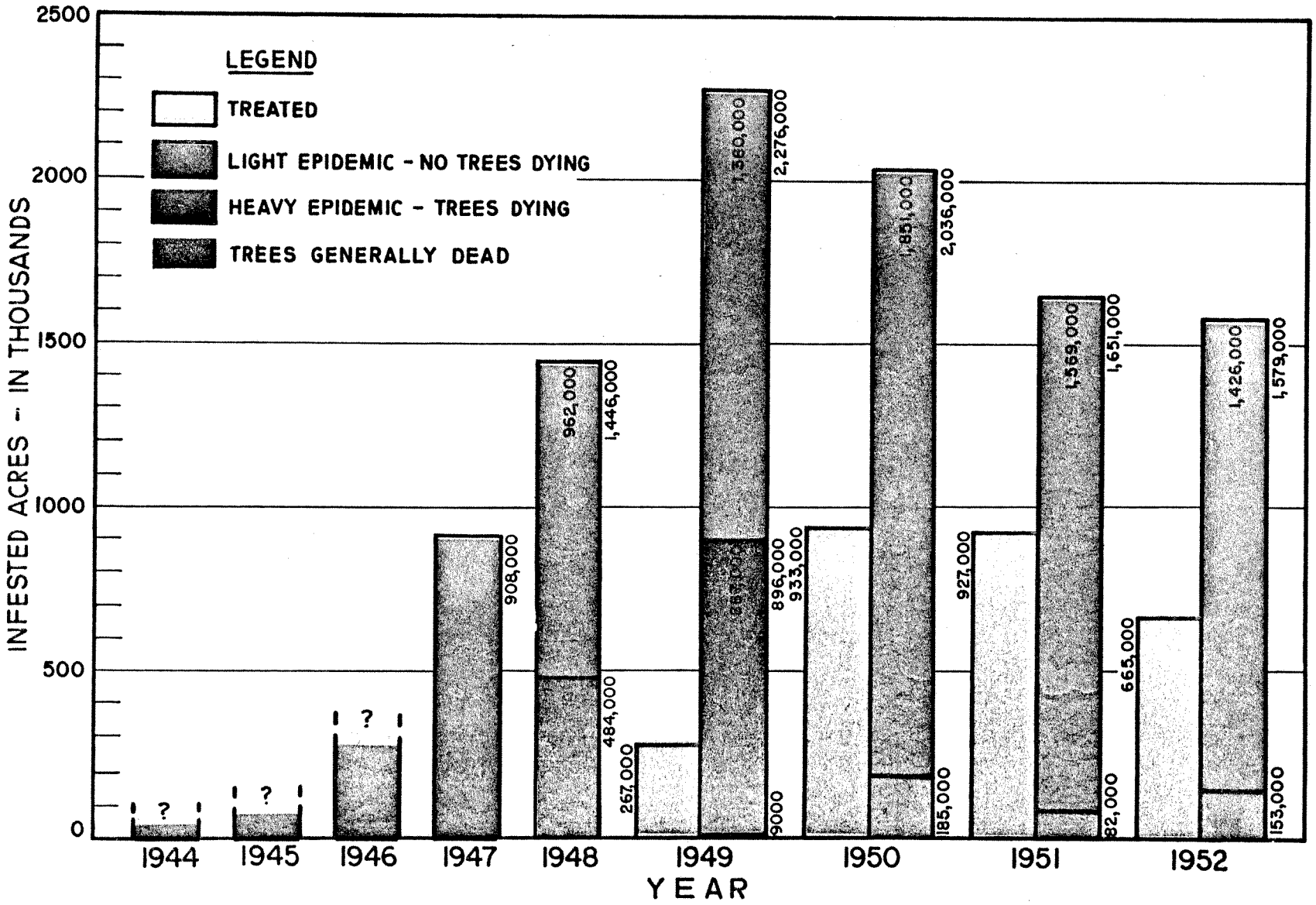

TABLE 1. SUMMARY OF 1952 SPRUCE BUDWORM EPIDEMIC INFESTATIONS BY INTENSITIES 1/

AREA AND UNIT	INTENSITY OF INFESTATION							
	Light		Moderate		Heavy		Total	
	Acres	%	Acres	%	Acres	%	Acres	%
WESTERN OREGON								
(1) Santiam	1,440	12.5	6,240	54.2	3,840	33.3	11,520	100
(2) Browder Creek	5,920	100.0					5,920	100
(3) Carpenter Mt.	2,240	82.4	480	17.6			2,720	100
(4) Mink Lake					3,680	100.0	3,680	100
Total	9,600	40.3	6,720	28.2	7,520	31.5	23,840	100
BLUE MOUNTAINS-OREGON								
(5) Ochoco	107,840	39.5	165,440	60.5			273,280	100
(6) Aldrich Mt.	5,120	100.0					5,120	100
(7) Malheur	37,920	19.0	116,320	58.2	45,600	22.8	199,840	100
(8) Susanville	21,600	87.1	3,200	12.9			24,800	100
(9) Dale			32,800	79.5	8,480	20.5	41,280	100
(10) Starkey	44,320	18.9	180,000	76.7	10,400	4.4	234,720	100
(11) La Grande	71,200	84.4	13,120	15.6			84,320	100
(12) Powder River	480	1.5	30,720	98.5			31,200	100
(13) Eagle Creek	12,960	27.9	32,000	69.0	1,440	3.1	46,400	100
(14) Moss Spring			26,880	100.0			26,880	100
(15) Joseph	10,080	8.8	99,360	86.5	5,440	4.7	114,880	100
(16) Snake	12,160	6.3	159,200	82.9	20,640	10.8	192,000	100
(17) Chesnimnus			60,320	64.8	32,800	35.2	93,120	100
(18) Whiskey Creek	15,520	100.0					15,520	100
(19) Troy	9,760	40.1	12,480	51.3	2,080	8.6	24,320	100
Total	348,960	27.3	931,840	66.2	126,880	6.5	1,407,680	100
TOTAL FOR OREGON	358,560	25.0	938,560	65.6	134,400	9.4	1,431,520	100
BLUE MOUNTAINS-WASHINGTON								
(20) Saddle Mt.	6,880	5.8	99,520	83.7	12,480	10.5	118,880	100
(21) Tucannon	4,880	100.0					4,880	100
(22) Wolf Creek			3,520	100.0			3,520	100
Total	11,680	9.2	103,040	81.0	12,480	9.8	127,200	100
EASTERN WASHINGTON CASCADES								
(23) Wenatchee	6,080	30.6	7,360	37.1	6,400	32.3	19,840	100
TOTAL FOR WASHINGTON	17,760	12.1	110,400	75.1	18,880	12.8	147,040	100
GRAND TOTAL	376,320	23.8	1,048,960	66.5	153,280	9.7	1,578,560	100

1/ Does not include 665,000 acres sprayed in 1952.

TABLE 2. SUMMARY OF 1952 SPRUCE BUDWORM EPIDEMIC INFESTATIONS BY OWNERSHIPS 1/

AREA AND UNIT	OWNERSHIP CLASSES: Forest Service 2/ Acres	%	Indian Service Acres	%	State, Priv. and Other Acres	%	Total Acres	%
WESTERN OREGON								
(1) Santiam	10,750	93.3			770	6.7	11,520	100
(2) Browder Creek	5,920	100.0					5,920	100
(3) Carpenter Mt.	2,720	100.0					2,720	100
(4) Mink Lake	3,680	100.0					3,680	100
Total	23,070	96.8			770	3.2	23,840	100
BLUE MOUNTAINS-OREGON								
(5) Ochoco	230,640	84.4			42,640	15.6	273,280	100
(6) Aldrich Mt.	4,820	94.1			300	5.9	5,120	100
(7) Malheur	119,410	60.0			80,430	40.0	199,840	100
(8) Susanville	22,160	89.4			2,640	10.6	24,800	100
(9) Dale	39,860	96.6			1,420	3.4	41,280	100
(10) Starkey	174,030	74.1	19,840	8.5	40,850	17.4	234,720	100
(11) La Grande	60,770	72.1			23,550	27.9	84,320	100
(12) Powder River	19,280	61.8			11,920	38.2	31,200	100
(13) Eagle Creek	45,760	98.6			640	1.4	46,400	100
(14) Moss Spring	26,720	99.4			160	0.6	26,880	100
(15) Joseph	97,360	84.7			17,520	15.3	114,880	100
(16) Snake	189,810	98.9			2,190	1.1	192,000	100
(17) Chesnimnus	89,280	95.9			3,840	4.1	93,120	100
(18) Whiskey Creek					15,520	100.0	15,520	100
(19) Troy	24,320	100.0					24,320	100
Total	1,144,220	81.3	19,840	1.4	243,620	17.3	1,407,680	100
TOTAL FOR OREGON	1,167,290	81.5	19,840	1.4	244,490	17.1	1,431,520	100
BLUE MOUNTAINS-WASHINGTON								
(20) Saddle Mt.	112,920	95.0			5,960	5.0	118,880	100
(21) Tucannon	4,800	100.0					4,800	100
(22) Wolf Creek	2,240	63.6			1,280	36.4	3,520	100
Total	119,960	94.3			7,240	5.7	127,200	100
EASTERN WASHINGTON CASCADES								
(23) Wenatchee	13,920	70.2			5,920	29.8	19,840	100
TOTAL FOR WASHINGTON	133,880	91.0			13,160	9.0	147,040	100
GRAND TOTAL	1,301,170	82.4	19,840	1.3	257,550	16.3	1,578,560	100

1/ Does not include 665,000 acres sprayed in 1952. 2/ Includes Public Domain lands.

1952 Spruce Budworm Conditions by Areas and Units

The results of the 1952 spruce budworm survey are discussed by areas and numbered units as designated in Tables 1 and 2 and on the infestation map in the Appendix.

Western Oregon Area

In an effort to keep the budworm population at the lowest possible level and thereby protect the high value Douglas-fir timber of western Oregon, all epidemic centers of the budworm on this area have been treated in the year following detection. Sizeable buffer zones also have been treated in anticipation of a spread of the infestation not detectable in the surveys. A summary of the recorded infestations and the control operations to date is as follows:

Year of Survey	Epidemic Acreage Recorded by Surveys	Year of Treatment	Acreages Treated (Includes Buffer Zones)
1948	86,200 Acres	1949	160,230 Acres
1949	88,640 "	1950	119,730 "
1950	96,405 "	1951	161,919 "
1951	56,960 "	1952	78,573 "
1952	23,840 "		

The 1952 aerial spraying project in western Oregon was confined to the South Fork of the McKenzie River drainage where 78,573 acres were treated. The control of the budworm was excellent, ranging from 98.1 to 98.5 percent by blocks and averaging 98.4 percent for the project.

Ground sampling for incipient spruce budworm infestations in western Oregon in 1952 was conducted on a smaller scale than in previous years (Tables 4 and 6). A total of 1,130 sample plots was examined in 140 man-days. The budworm was found on 49 plots (4.3%) and absent on 1,081 plots (95.7%)

Four small centers of spruce budworm epidemic infestation totalling 23,840 acres were recorded in 1952 in western Oregon. These centers, all of which are on the Willamette National Forest, are discussed below. In line with project priorities already established, it is recommended that these centers receive first consideration in control plans for 1953.

1. Santiam Unit - The survey recorded a total of 11,520 acres of epidemic infestation located in the North Santiam River drainage. This center contains 1,440 acres (12.5%) of light infestation, 6,240 acres (54.2%) of moderate infestation, and 3,840 acres (33.3%) of heavy infestation. The ownership is 10,750 acres (93.3%) federal, and 770 acres (6.7%) private, state and other.

It is felt that control plans for this unit in 1953 should consider the inclusion of a considerably larger acreage than that recorded by the aerial survey because the ground survey revealed incipient budworm infestations in the North Santiam River drainage as far north as Minto Mountain and in the South Santiam River drainage as far west as Sheep Creek. These potential centers of epidemic infestation should be treated while defoliation still is relatively light. A satisfactory blocking out of this area in 1953 should prevent the necessity of spraying several scattered blocks in subsequent years.

2. Browder Creek Unit - Two small centers of light infestation totalling 5,920 acres, all in federal ownership, in the Browder Creek and Smith River drainages were evident in 1952. Both centers are on areas that were sprayed in 1951, but for some unexplained reason have become reinfested. They should be resprayed while of small size and of light intensity to prevent additional spread.

3. Carpenter Mountain Unit - One center of epidemic infestation of 2,720 acres southeast of Carpenter Mountain in the Smith River drainage was recorded in 1952. Some 2,240 acres (82.4%) are of light epidemic infestation and 480 acres (17.6%) are of moderate infestation. Ownership is 100 percent federal. While this center is in a block treated in 1950, it is felt that it was not adequately sprayed because the pilot assigned to the block was killed on Carpenter Mountain before the spraying was completed. This center should be resprayed in 1953 while it is still of small size.

4. Mink Lake Unit - The survey recorded one center of heavy epidemic infestation near Mink Lake in the Elk Creek drainage totalling 3,680 acres and 100 percent in federal ownership. This is a small and agressive outbreak southeast of the boundary of the 1952 control project. It should be controlled before it becomes larger.

Eastern Oregon Cascades Area

No epidemic centers of spruce budworm infestation were observed in 1952 on the eastern Oregon Cascades Area, which includes all timberlands on the eastern slopes of the Cascade Mountains in Oregon. This marks the first year since 1948 that extensive areas of budworm defoliation have not been present. Appreciable killing by the spruce budworm has been largely prevented by the several control projects conducted since 1949. In spite of the present very favorable situation the budworm can still be found in considerable numbers on most parts of the area. Thus it is especially important that a close check be maintained to guard against a possible recurrence of the outbreak.

The record of the epidemic infestations and the control operations on this area is as follows:

Year of Survey	Epidemic Acreage Recorded by Surveys	Year of Treatment	Acreages Treated (Includes Buffer Zones)
1948	102,790 Acres	1949	106,000 Acres
1949	39,990 "	1950	40,338 "
1950	104,460 "	1951	160,554 "
1951	77,440 "	1952	70,415 "
1952	none		

During the 1952 control project a total of 70,415 acres was treated on the Mt. Hood National Forest and the Warm Springs Indian Reservation. Of this total, 33,150 acres were treated in the Beaver Creek height of spraying experiment and 37,265 acres were treated in the usual manner. The range of budworm mortality was from 85.5 to 100 percent on individual blocks, with an average kill of 98.2 percent for the project.

The ground survey to follow incipient infestations of the budworm on this area in 1952 was confined to sampling the eastern portion of the Mt. Hood National Forest. A total of 35 plots was examined in 4 man-days. The budworm was present on 10 plots (28.6%) and absent on 25 plots (71.4%).

Although no spruce budworm control measures will be needed on the eastern Oregon Cascades Area in 1953, it should be re-emphasized that the entire area should be carefully watched. A buildup of the budworm population to epidemic proportions could recur at any time. Such a buildup would again threaten the fir stands of the area as well as those in western Oregon.

Blue Mountains - Oregon Area

As in previous years, the Blue Mountains Area of Oregon in 1952 was found to contain the largest acreage of epidemic infestations of the budworm. The recorded development of the outbreak and a summary of the control operations on this area are as follows:

Year of Survey	Epidemic Acreage Recorded by Surveys	Year of Treatment	Acreage Treated (Includes Buffer Zones)
1947	665,000 Acres		
1948	1,117,000 "		
1949	1,939,000 "	1950	747,781 Acres
1950	1,515,000 "	1951	479,164 "
1951	1,329,480 "	1952	371,511 "
1952	1,407,680 "		

In 1952, control operations in the Blue Mountains of Oregon were conducted on the following units:

Control Unit	Acreage Treated	Range of Mortality by Blocks	Average Mortality
Waterman	37,443	98.5 - - 99.9%	99.3%
Day Ridge	50,874	97.8 - 100.0"	99.3"
Minam	60,608	92.3 - 100.0"	98.6"
West Elgin	90,700	90.2 - 100.0"	97.0"
East Elgin	131,886	97.4 - 100.0"	99.4"

In spite of the high average kill of the budworm on this area during the 1952 control project, as indicated above, it is felt that the general effectiveness of the aerial spraying operations was less than that obtained in previous projects. The pilots in general flew higher. There was an increased number of skips. Consequently more respraying had to be done. More spotty kills were found than previously. This was especially true on the Minam and East Elgin units where insufficient planes were available to treat the spray blocks as they were released for spraying.

Since the spruce budworm is known to be present practically everywhere that fir and Douglas-fir occur in the Blue Mountains, no comprehensive ground surveys have been made to record incipient infestations. No organized ground survey for this purpose was conducted in 1952.

The status of the budworm in the Blue Mountains area of Oregon by units is as follows:

5. Ochoco Unit - The total acreage of budworm epidemic infestation on and adjacent to the Ochoco National Forest has shown a marked increase since the last survey. In 1951 there were 85,760 acres of epidemic infestation as compared with 273,280 acres in 1952. The current infestation is classified as: 107,840 acres (39.5%) light and 165,440 acres (60.5%) moderate. The ownership in the 1952 infestation is 230,640 acres (84.4%) federal and 42,640 acres (15.6%) private, state or other.

The need for control on this unit remains relatively low. Some of the larger trees have been weakened by defoliation and the smaller trees are being deformed as a result of top killing. However, defoliation has not yet reached tree killing intensity; there is no currently abnormal killing of the weakened trees by bark beetles; there is very little threat of spread either to sprayed areas or to new areas; and the fluctuating trend of infestation on the area indicates that the outbreak may subside naturally without causing appreciable damage.

6. Aldrich Mountain Unit - The 1952 survey recorded an area of 5,120 acres of light budworm epidemic infestation in the Aldrich Mountains on the Malheur National Forest, of which 4,820 acres (94.1%) are in federal ownership and 300 acres (5.9%) in other ownership.

This is the first record of a budworm outbreak in this portion of the forest and as yet there is little need for control. Defoliation is all in the light category. There has been no appreciable weakening of the affected trees, and no killing. There is no abnormal activity of bark beetles in the fir stands on and near this unit.

7. Malheur Unit - As in previous years, the spruce budworm was recorded in epidemic proportions on the Long Creek District of the Malheur National Forest in 1952. Infestations totalling 199,840 acres, recorded in 1952, were classified as: 37,920 acres (19.0%) light, 116,320 acres (58.2%) moderate and 45,600 acres (22.8%) heavy. Of the total, 119,410 acres (60.0%) are in federal ownership and 80,430 acres (40.0%)are in other ownerships.

In 1951 it was the feeling that the budworm situation on the Malheur unit was generally improved over that of the previous year. However, the picture in 1952 is quite the opposite because the total infested acreage has increased and the infestation has intensified until now it is largely in the moderate and heavy categories. On the basis of the degree of infestation a considerable part of this unit now warrants control. As yet there are no unusual concentrations of bark beetles on or near this unit, but much of the fir timber has been weakened to the point that it is subject to imminent killing both by the budworm and by barkbeetles. The most favorable circumstances in this unit are, that in the past, the infestation has tended to fluctuate from year to year. Also, the Malheur unit is relatively isolated from treated units; thus it is not a likely source of reinfestation.

8. Susanville Unit - This unit, located mostly on the Whitman National Forest, was found to be slightly larger in 1952 than it was in 1951. A total of 24,800 acres of epidemic infestation was recorded in 1952, of which, 21,600 acres (87.1%) were classified as light epidemic and 3,200 acres (12.9%) as moderate infestation. Of the total, 22,160 acres (89.4%) are in federal ownership and 2,640 acres (10.6%) are in other ownerships.

Infestation on this unit remains generally light. None has reached killing intensity. There is no abnormal activity of the Douglas-fir bark beetle. From the operational standpoint, control on the Susanville unit should be considered in conjunction with that on the Malheur unit.

9. Dale Unit - Epidemic infestations of the spruce budworm totalling 41,280 acres were recorded in the North Fork of the John Day River

drainage on the Whitman National Forest in 1952. This infestation was classified as: 32,800 acres (79.5%) moderate and 8,480 acres (20.5%) heavy, with 39,860 acres (96.6%) in federal ownership and 1,420 acres (3.4%) in other ownerships.

In 1952 the extent of infestation on the Dale unit increased 17,760 acres as compared with conditions in 1951. The intensity of infestation increased on all portions of the unit. A considerable amount of the timber can be expected to be killed in the immediate future, if the outbreak continues to develop. Some of the heaviest infestation lies immediately adjacent to treated areas, thus creating a threat of reinfestation. As yet, bark beetles are not abnormally active, but many trees have been weakened to the point that they are highly susceptible to attack. It is evident that the Dale unit should be given high priority in control plans for 1953.

10. Starkey Unit - The 1952 survey recorded a total of 234,720 acres of epidemic budworm infestation on the Starkey Unit, largely on the Umatilla National Forest. This infestation consisted of 44,320 acres (18.9%) light, 180,000 acres (76.7%) moderate and 10,400 acres (4.4%) heavy infestation. The ownership is 174,030 acres (74.1%) national forest, 19,840 acres (8.5%) Indian and 40,850 acres (17.4%) private, state or others.

The present infestation is about 20,000 acres larger than that recorded for the same general area in 1951. The greatest change is in the amount of moderate infestation which comprised 26 percent of the total in 1951 and 77 percent in 1952. Heavy infestation, now present on 4 percent of the unit, was absent in 1951. Budworm infestation on the Starkey Unit still is generally below tree killing intensity. Recurrent defoliation is gradually weakening the trees and subjecting the larger Douglas-firs to probable attack by the Douglas-fir beetle, but as yet there has been no abnormal killing by this insect. The main hazard lies in the strong upward trend of infestation and the likelihood of spread to adjoining treated areas. It is on this basis that control should be considered for 1953.

11. La Grande Unit - Epidemic infestations totalling 84,320 acres were recorded in 1952 on the La Grande Unit. These infestations were classed as: 71,200 acres (84.4%) light and 13,120 acres (15.6%) moderate. Some 60,770 acres (72.1%) are in federal ownership and 23,550 acres (27.9%) are in other ownerships. Compared to 1951, the current infestation is 43,200 acres larger and harbors moderate infestations which were absent in the previous year. Some 7,840 acres (mostly private, state, and other ownerships) which were experimentally treated during 1951, to test the value of $\frac{1}{4}$ and $\frac{1}{2}$ pound dosages of DDT, were found to be reinfested and have been included in the current acreage of infestation.

Infestation on the untreated portions of the La Grande unit are generally well below tree killing intensity. There is no heavy infestation. The arguments in favor of spraying are to protect adjoining sprayed areas, to prevent possible killing by bark beetles which as yet are not abnormally abundant, and to protect watershed values. Operationally, there are advantages in considering this unit jointly with the Starkey unit.

12. Powder River Unit - In contrast to the 6,080 acres of light epidemic budworm infestation in scattered blocks in the Powder River drainage on the Whitman National Forest recorded in 1951, the 1952 survey revealed a total of 31,200 acres of epidemic infestation classified as: 480 acres (1.5%) light and 30,720 acres (98.5%) moderate. Of the total, 19,280 acres (61.8%) in federal ownership and 11,920 acres (38.2%) in other ownerships.

As shown on the infestation map, most of the 1952 outbreak is located in one large block of moderate epidemic infestation in the watershed of the city of Baker, Oregon. Although previous ground surveys have shown the budworm to be present in small numbers in this watershed, there was little evidence until this year that the outbreak would reach serious epidemic proportions. This sudden flare-up of the spruce budworm in this important watershed is considered to be serious enough to warrant consideration for control in 1953 even though the infestation has not reached tree killing intensity. As yet there is no abnormal activity of bark beetles on or near this unit.

13. Eagle Creek Unit - The 1952 survey recorded a total of 46,400 acres of epidemic budworm infestations in the Eagle Creek drainage on the Whitman National Forest. This outbreak was classified as: 12,960 acres (27.9%) light, 32,000 acres (69.0%) moderate and 1,440 acres (3.1%) heavy infestation. The ownership is 45,760 acres (98.6%) federal and 640 acres (1.4%) other.

The current outbreak is 21,440 acres larger than in 1951 and there has been a considerable increase in intensity. Ground observations indicate a rather drastic weakening of the trees as a result of repeated defoliations. Thus there is a threat of killing by bark beetles, although no abnormal killing of this type has yet occurred. In general it is felt that the arguments against control outweigh those in favor at this time. There is a minimum of heavy defoliation; the likelihood of spread is slight; the timber values are low; and the unit is very difficult to fly.

14. Moss Springs Unit - In 1951 an epidemic infestation totalling 70,880 acres was recorded in the Minam River drainage of the Wallowa National Forest which was called the Minam Unit. Part of this infestation, plus a buffer zone, totalling 63,033 acres was recommended

for treatment during the 1952 control project. Part of the Minam unit, now designated the Moss Springs Unit, was eliminated on the basis of low values and difficulty of spraying. The 1952 survey recorded an epidemic infestation of moderate intensity, covering 26,880 acres with 99.4 percent in federal ownership on the Moss Springs unit. It was noted that this infestation is in the same general area but the intensity of the defoliation is less severe than in 1951. Several spots of heavy infestation were recorded in 1951 but only moderate defoliation was evident in 1952. Thus the present need for control is less than it was in 1951.

15. Joseph Unit - Epidemic infestations of the spruce budworm in the Joseph Unit on the Wallowa National Forest have been present for several years without causing any material damage. In 1951 light epidemic infestations were found on 106,240 acres. In 1952, an increase of 8,640 acres and an upward trend in the intensity of the outbreak were recorded. The 1952 survey revealed a total of 114,880 acres of infestation, of which, 10,080 acres (8.8%) were light, 99,360 acres (86.5%) were heavy and 5,440 acres (4.7%) were heavy. The ownership is 97,360 acres (84.7%) federal and 17,520 acres (15.3%) other. Since timber values in the Joseph unit are generally low and there is little danger of spread of the budworm to other areas, no control measures have been recommended in the past and none are considered essential in 1953.

16. Snake Unit - Like the outbreak in the Joseph Unit, the budworm infestation in the Snake River drainage on the Wallowa National Forest has been present for several years without causing any appreciable loss of timber. The 1952 survey revealed a total of 192,000 acres of epidemic infestations in the Snake unit which were classed as: 12,160 acres (6.3%) light, 159,200 acres (82.9%) moderate and 20,640 acres (10.8%) heavy. Ownership of the infested acreage is 189,810 acres (98.9%) federal and 2,190 acres (1.1%) other. Because of low timber values and the isolation of the unit, control of this infestation has not been considered in the past and need not be considered in 1953.

17. Chesnimnus Unit - This unit, located in the northeastern portion of the Wallowa National Forest, was found to contain 93,120 acres of epidemic budworm infestation in 1952. This infestation was classified as 60,320 acres (64.8%) moderate and 32,800 acres (35.2%) heavy. Ownership is 95.9 percent federal and 4.1 percent other. Compared to the outbreak in 1951, an increase of 6,560 acres occurred in 1952. Also there was a marked increase in the intensity of infestation. This unit now contains a greater percentage of heavy budworm infestation than any other unit in Oregon and Washington.

The budworm outbreak on the Chesnimnus unit has reached the point where control should be undertaken if heavy killing is to be avoided. The decision whether to control or not control hinges largely on the values to be protected.

18. Whiskey Creek Unit - A new center of light epidemic infestation totalling 15,520 acres, all in private ownership, was recorded in 1952 in the Whiskey Creek drainage northeast of the town of Wallowa, Oregon. This center joins the Day Ridge Unit of the 1952 control project. In view of the present relatively light infestation there is no immediate need for control.

19. Troy Unit - This unit consists of 24,320 acres of spruce budworm epidemic infestations extending north of the Wenaha River to the Oregon-Washington state line. It is continuous with the Saddle Mountain Unit in Washington. The infestation is classified as: 9,760 acres (40.1%) light, 12,480 acres (51.3%) moderate, and 2,080 acres (8.6%) heavy. It is 100 percent in federal ownership. Fairly high timber values exist; however, the Douglas-fir beetle became epidemic in these stands in 1951 and is continuing its activities in the budworm-weakened trees. A decision as to what can be done about the Douglas-fir beetle is essential before proceeding further with plans for controlling the budworm. Meanwhile the budworm is on the increase, although it has not yet reached general tree killing intensity.

Blue Mountains - Washington Area

From 1947, when the initial detection survey was made in this area, until the start of control operations in 1950 the acreage and intensity of budworm infestations on this area increased each year. Control operations were scheduled on a priority basis, with first consideration given to areas where tree-killing from budworm defoliations was imminent. Considerable progress has been made in preventing the loss of timber by the budworm. Unfortunately, the accomplishments of these operations have been partially nullified by a widespread epidemic of the Douglas-fir beetle. This bark beetle, which became epidemic in 1951, is now killing the larger Douglas-fir trees weakened by repeated budworm defoliations in wholesale numbers both inside and outside of the treated areas. Further large-scale aerial spraying operations to control budworm infestations depend upon what can be done about the Douglas-fir beetle.

A record of the budworm infestations and the control operations in this area is as follows:

Year of Survey	Epidemic Acreage Recorded by Surveys	Year of Treatment	Acreage Treated (Includes Buffer Zones)
1947	45,000 acres		
1948	126,000 "		
1949	165,000 "	1950	25,853 acres
1950	295,000 "	1951	115,672 "
1951	182,880 "	1952	134,612 "
1952	127,200 "		

In 1952, control operations were conducted on the following units in the Blue Mountains - Washington Area:

Control Unit	Acreage Treated	Range of Mortality by Blocks	Average Mortality
Touchet	37,070	95.2 - 98.9 percent	96.7 percent
Anatone	97,542	81.8 -100.0 percent	95.3 "

Except for a portion of one spray block on the Anatone Unit where a mortality of only 81.8 percent was obtained, the results of the 1952 control operations in this area were good.

The 1952 survey recorded a total of 127,200 acres of epidemic budworm infestations on three units in this area which were classified as: 11,680 acres (9.2%) light, 103,040 acres (81.0%) moderate and 12,480 acres (9.8%) heavy. The ownership is 94.3% (119,960 acres) federal and 5.7% (7,240 acres) other. Since the spruce budworm can be found throughout the unsprayed stands in this area, no organized ground survey to record incipient infestations was made in 1952.

The budworm situation on the three units in the Blue Mountains - Washington Area in 1952 is as follows:

20. Saddle Mountain Unit - Some 118,880 acres of mixed fir, alpine and non-commercial timber types in the Pomeroy District of the Umatilla National Forest were found to be infested by the budworm in 1952. This infestation was classified as: 6,880 acres (5.8%) light, 99,520 acres (83.7%) moderate and 12,480 acres (10.5%) heavy, with 95.0 percent (112,920 acres) in federal ownership.

In 1951, the budworm was recorded on 52,320 acres in this same general area, mostly in stringers of timber. In 1952 the infestation was found to have spread over most of the timbered area of the unit. Severe tree-killing by the Douglas-fir beetle was recorded in practically all canyons of this unit, a fact that necessitates a decision on what to do about the beetle before proceeding with control of the budworm. Timber values are predominantly low. The main threat of the budworm is in spreading to adjoining treated areas, most of which are also heavily infested by the Douglas-fir beetle.

21. Tucannon Unit - The 1952 survey revealed a total of 4,800 acres of light epidemic budworm infestation, all in federal ownership, in the upper Tucannon River drainage of the Umatilla National Forest. Most of the area, on which the current infestation was found, was sprayed during the 1951 control project but for some unexplained reason has become reinfested. It is considered significant that this unit adjoins

the unsprayed Saddle Mt. Unit. This particular sector is in quite rough country. It should be closely watched to determine the extent of spread into other sprayed areas.

22. Wolf Creek Unit - A second spot of spruce budworm epidemic infestation, in stands sprayed during the 1951 project, was recorded during the recent survey. This center, in the Wolf Creek drainage on the Umatilla National Forest, was found to contain 3,520 acres of moderate infestation and was 63.6% (2,240 acres) in federal ownership and 36.4% (1,280 acres) in other ownerships. No explanation is offered at this time for this reinfestation. Like the Tucannon unit, it is near the unsprayed Saddle Mt. unit, and similarly it should be kept under observation during subsequent surveys to detect further spread.

Eastern Washington Cascades Area

Since 1943, portions of the Eastern Washington Cascades area, especially in Chelan and Okanogan Counties, have been subjected to moderate infestations of the spruce budworm which have lasted as long as five years without causing any appreciable loss of timber. Just why these outbreaks have developed and disappeared has not been explained. In 1950 a very aggressive epidemic infestation of the budworm was recorded in the Icicle Creek drainage on the Wenatchee National Forest. Control of this outbreak was undertaken in 1951 in what proved to be the most difficult unit of the entire 1951 project. A record of the budworm infestations since 1947 and the control measures in this area is as follows:

Year of Survey	Epidemic Acreage Recorded by Surveys	Year of Treatment	Acreage Treated (Includes Buffer Zone)
1947	197,600 acres		
1948	(no survey)		
1949	(Surveyed - no infestation)		
1950	25,440 acres	1951	9,420 acres
1951	3,840 "		
1952	19,840 "		

Ground surveys of incipient spruce budworm infestations in this area in 1952 were limited to portions of the Gifford Pinchot, Snoqualmie and Wenatchee National Forests and to portions of Klickitat County. Only 31 plots were examined with the budworm present on 4 plots and absent on 27 plots. Early in the spring of 1952, reports of another budworm epidemic infestation on the Wenatchee National Forest were received from the Supervisor. From these reports and the results of the 1952 survey, an epidemic infestation covering 19,840 acres was found

to be present on the Wenatchee National Forest.

23. Wenatchee Unit - The 1952 infestation on the Wenatchee National Forest was found to be in the Ingalls, Nigger, Shaser and Peshastin Creek drainages. It was classified as: 6,080 acres (12.1%) light, 7,360 acres (37.1%) moderate and 6,400 acres (32.3%) heavy. The ownership is 70.2% (13,920 acres) federal and 29.8% (5,920 acres) other. Any decision as to the control of this outbreak in 1953 will have to consider the timber and other values at stake and the rugged terrain which presents an exceedingly difficult operational control problem. There is a considerable percentage of heavy infestation; however, the known history of budworm outbreaks in this general vicinity indicates that natural control is likely to take over before much tree killing occurs. Therefore, it seems reasonable to postpone spraying in 1953.

Discussion and Recommendations

Private and public owners and managers of forested lands within the area of spruce budworm epidemic infestations, are now faced with a serious and perplexing situation. On one hand, the aerial spraying projects, covering 2,793,000 acres, have been outstandingly successful in preventing wholesale tree-killing by the spruce budworm, with the program now in what should be its concluding phases. On the other hand, the widespread epidemic of the Douglas-fir beetle in both Oregon and Washington in 1952 calls for a very close scrutiny of all factors entering into the formulation of control plans for 1953. In addition, the strong upswing of budworm infestations in 1952 raises the question of how long it will be necessary to continue spraying against the budworm.

In general, the program developed by the Northwest Forest Pest Action Committee for control of the budworm has been highly successful. Epidemic infestations have been largely eliminated from the western Oregon and Oregon Cascades areas. Infestation has been drastically reduced on extensive sprayed areas in the Blue Mountains and on a small area in northern Washington. Infestation on the treated areas remains generally low. Now the problem is to hold the ground that has been gained and protect the areas still being threatened.

It seems evident that the problem no longer is wholly one of controlling the budworm. On areas suffering heavy losses from the Douglas-fir beetle, control of that insect is necessary before making further heavy expenditures for budworm control. On budworm-infested areas, not yet severely attacked by the Douglas-fir beetle, it may be desirable to spray sooner than heretofore both to control the budworm and to prevent outbreaks of the Douglas-fir beetle.

In view of the present circumstances, the following recommendations are offered for consideration in formulating control plans for 1953:

1. Consideration should first be given to controlling the

four existing centers of epidemic infestation on the Willamette National Forest totalling 23,840 acres.

2. An extensive buffer zone should be drawn around these centers to treat the incipient infestations, known to exist in adjacent stands, in an attempt to knock out the budworm population while it is still of low intensity and to eliminate the need for subsequent spraying projects in overlapping and adjacent blocks.

3. Areas of heavy infestation and those threatening previously controlled areas should be given high priority, except where hopelessly complicated by attacks of the Douglas-fir beetle.

4. It is suggested that the Dale, Starkey, Malheur, Powder River, and Chesnimnus units be seriously considered in plans for control in 1953. The Snake, Joseph, Eagle Creek, Moss Springs, Ochoco, and Wenatchee are the principal units that can logically be excluded from any control plans for 1953. Further study on whether to include or exclude the remaining units may be desirable (See also discussion under individual units).

PART II - OTHER MAJOR FOREST INSECT PROBLEMS

Following the pattern set by previous surveys, data were secured on epidemic infestations of other major forest insect pests in Oregon and Washington in 1952. Table 7 presents a summary of the damage caused by seven species of defoliators and seven species of bark beetles. There may be additional infestations of these or other insects in stands which have not yet been surveyed in 1952; therefore, the present records cannot be considered as final. Records were also taken on the incidence of bear damage, blister rust in western pine stands and needle-cast disease in ponderosa pine stands in the two states.

In this report, a brief summary is given of the major outbreaks of forest insects encountered during the 1952 surveys.

1. Douglas-fir Beetle

The surveys recorded a total of 4,570,130 acres of epidemic infestations of the Douglas-fir beetle in Oregon and Washington in 1952. By states and subregions, this outbreak is divided as follows:

Eastern Washington -	183,360 acres
Western Washington -	275,040 acres
Washington total	458,400 acres
Eastern Oregon -	217,810 acres
Western Oregon -	3,893,920 acres
Oregon total	4,111,730 acres
Grand total	4,570,130 acres

With part of the Douglas-fir region in both states still unsurveyed, these figures probably represent a conservative estimate of the total acreage involved in this unprecedented epidemic.

A combination of factors contributed to the serious situation in Oregon and Washington. In the western part of these two states the impetus for the present epidemic was provided by the severe snow and windstorm damage during the winter of 1949-1950. The epidemic continued unabated in 1952 as a result of the following circumstances, which provided large quantities of favorable breeding material for the beetles: (1) Additional severe windstorms in the winters of 1950 and 1951, (2) the disastrous forest fire season of 1951, and (3) an extended drought period in 1951. In western Washington, the heaviest losses in 1951 were found on the Gifford Pinchot National Forest where 58 centers of epidemic infestations covered 252,480 acres. In western Oregon the heaviest losses in 1951 were on the Millicoma Tree Farm of the Weyerhaeuser Timber Company, Umpqua, Willamette and

Siuslaw National Forests. Immediate salvage, of as much of the dead and dying material as possible, is the only recommendation that can be made for the control of this epidemic.

In eastern Oregon and eastern Washington, particularly in the Blue Mountains area, tremendous populations of the Douglas-fir beetle have built up in trees weakened by repeated defoliations of the spruce budworm. The most serious situation is found on the Umatilla National Forest, where 68 centers of epidemic infestation cover 213,450 acres. In other portions of these subregions, populations of the Douglas-fir beetle have built up partly from windthrown timber and partly as a result of the natural increase exhibited throughout the region. Salvage of the dead and dying trees is recommended.

2. Western Pine Beetle

Extensive group-killing of ponderosa pine by the western pine beetle was reported in 1951 for the first time in 10 years. The 1952 survey recorded even larger outbreaks of this notorious tree-killer. A total of 185 centers of epidemic infestation covering 673,790 acres were recorded in 1952. The largest concentrations were found on the Yakima Indian Reservation (19 centers covering 159,520 acres), the Deschutes National Forest (35 centers involving 128,000 acres), the Warm Springs Indian Reservation (9 centers covering 80,040 acres), the Ochoco National Forest (18 centers covering 78,840 acres) and the Fremont National Forest (39 centers covering 62,500 acres). The situation on the Yakima Indian Reservation is quite alarming. Groups of 40 to 50 trees killed in 1952 were marked on the survey check plots and estimates of the total losses for the year are as high as 200 to 400 trees per section in the heaviest centers of infestation. Immediate salvage of as much of the 1952 loss as possible is strongly recommended. Direct control on the Yakima Indian Reservation is advisable in case comprehensive salvage cannot be attained; however, the Bureau of Indian Affairs has been advised of this serious situation and is rushing plans for salvage operations.

3. Mountain Pine Beetle

Some 270 centers of epidemic outbreaks of the mountain pine beetle in lodgepole pine, western white pine and sugar pine, covering 270,740 acres, were recorded in 1952. The largest concentrations are found on the Wenatchee National Forest (47 centers covering 83,520 acres), the Snoqualmie National Forest (35 centers covering 61,120 acres) and the Deschutes National Forest (11 centers involving 35,600 acres). The largest single outbreak is on the Wanoga Butte area of the latter forest and has been in existence for several years. Because of the threat that this epidemic presented to the extensive lodgepole pine stands in the Deschutes and Klamath basins, salvage of the dead and dying timber was recommended and a small amount of salvage logging was carried out in 1951. Fortunately, this epidemic has not expanded during the past three years but the threat of expansion still exists.

Salvage of the currently infested timber in this and in other centers of infestation is the only control recommended at this time.

4. Fir Engraver Beetles

Extensive damage to stands of silver fir in northwestern Washington has been caused by species of fir engraver beetles, particularly Pseudohylesinus sp. Some 43 centers of epidemic infestation covering 162,440 acres in 1952 have been recorded by the surveys; however, additional centers of infestation are known to exist on the unsurveyed Mt. Baker National Forest. The largest concentrations of these beetles were on the Olympic National Forest, where 20 centers involving 143,840 acres were mapped in place. Severe tree-killing by these fir engraver beetles in the upper slope types throughout the region, has been reported by observers and recorded during the surveys. Salvage of the commercially valuable timber is the only control recommended against these beetles.

5. Hemlock Looper

Epidemic outbreaks of the hemlock looper, totalling 12,720 acres, were recorded in Washington during the surveys; however, the large stands of hemlock in northwestern Oregon and southwestern Washington, which could support aggressive outbreaks of this potentially destructive defoliator, have not been surveyed. An epidemic in Clallam County, Washington, which started in 1949, has been given special attention on each year's survey.

In 1952, 40 centers covering 10,720 acres were recorded in this area. It is felt that physiological factors plus defoliation by the hemlock looper are combined in this particular case. At present, the activities of the looper are considered to be non-aggressive but the situation must be kept under close observation. Salvage logging of the dead and weakened timber in this area is progressing rapidly.

A new center of hemlock looper defoliation covering 2,000 acres was recorded in 1952 in Wahkiakum County, Washington. It is suspected that other outbreaks may be present in this general vicinity. This point will be determined as soon as weather permits completion of the survey. Sampling the overwintering looper population in the Wahkiakum area to determine the need for control in 1953 remains to be done this fall.

6. Lodgepole Sawfly

A severe epidemic of a lodgepole sawfly, covering 19,820 acres (7,820 acres on the Willamette National Forest and 12,000 acres on the Deschutes National Forest) was recorded in 1952. Rearings of several thousand cocoons of this insect yielded less than one percent parasitism, which indicates that a large and aggressive population of sawflies will probably be present in this same area in 1953. It is quite likely that defoliation will be severe enough to cause extensive tree killing. Part

of the affected area is quite high in recreational value. The area in general is low in timber values. The terrain is quite favorable for aerial spraying. Spraying of a relatively small portion of the total infested area would protect the recreational values. Such spraying could be handled in conjunction with the budworm spraying on the Willamette National Forest.

PART III - APPENDIX

Acknowledgments

In 1952, three distinct forest insect detection surveys were conducted in Oregon and Washington through the cooperative effort of many individuals and organizations.

A. The Douglas fir beetle reconnaissance survey, which was completed in April, was a cooperative undertaking between the Weyerhaeuser Timber Company, Oregon State Board of Forestry and Bureau of Entomology and Plant Quarantine. Two aerial survey crews were formed. One crew, consisting of Messrs. J. F. Wear, pilot and W. J. Buckhorn, observer for the Bureau, and P. Lauterbach, observer for the Weyerhaeuser Timber Company, surveyed in a Cessna 170 rented by the timber company. The second crew, composed of Messrs. A. Larson, pilot and R. Stevens, observer for the State and K. W. Wright, observer for the Bureau surveyed in a Cessna 170 owned by the State of Oregon.

B. The Douglas fir beetle-blowdown survey, completed in September, was a cooperative undertaking by the U.S. Forest Service, Bureau of Land Management, Bureau of Entomology and Plant Quarantine, Oregon State Board of Forestry, and private timber companies. The roster of personnel cooperating on this project will be recorded in a report covering the findings of the survey.

C. The aerial phase of the 1952 forest insect detection survey (table 3) was a cooperative undertaking between the Oregon State Board of Forestry and the Bureau of Entomology and Plant Quarantine. Oregon was surveyed with the State's Cessna 170, with a crew consisting of Mr. A. Larson, pilot and Mr. A. Lindsten, observer and mapper for the State and Mr. W. J. Buckhorn, observer and mapper for the Bureau. Washington was surveyed with the Bureau's Cessna 170B with a crew consisting of Mr. J. F. Wear, pilot and Mr. W. J. Buckhorn, observer and mapper for the Bureau. Mr. W. K. Coulter, of the Bureau acted as a second observer for part of the survey in northwestern Washington.

The ground checking of the aerial survey findings was done by Messrs. A. Gruba, A. Lindsten and D. Sheridan for the State and W. J. Buckhorn, W. K. Coulter and A. T. Davison for the Bureau.

The spruce budworm ground survey in 1952 was limited in scope, as compared to the survey of 1950 and 1951. A list of the individuals participating in the 1952 survey is given in tables 4 and 5.

The compilation of the survey findings was done by Messrs. A. Gruba, A. Larson and A. Lindsten for the State and W. J. Buckhorn and A. T. Davison for the Bureau. Mr. Gruba prepared the large-scale maps of the 1952 infestations and Mr. Davison prepared the base and overlay sheets for the map in this report.

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TABLE 3. SUMMARY OF 1952 COOPERATIVE AERIAL SURVEY ACTIVITIES-EXCLUSIVE OF SPECIAL DOUGLAS-FIR BEETLE SURVEYS

AREAS AND AGENCY	AIRCRAFT USED	TIMBERED ACRES SURVEYED	AIR MILES FLOWN	MAPPING HOURS	FERRY HOURS	TOTAL SURVEY HOURS
Western Oregon * OSBF & BEPQ	Cessna 170	6,912,000	4,393	38.2	2.4	40.6
Eastern Ore. Cascades OSBF & BEPQ	Cessna 170	6,590,480	2,897	25.2	3.2	28.4
Blue Mountains OSBF & BEPQ	Cessna 170	6,963,975	3,542	30.8	5.8	36.6
Eastern Wash. Cascades BEPQ	Cessna 170B	8,001,109	4,057	33.9	4.8	38.7
Western Wash. * BEPQ	Cessna 170B	6,360,000	2,937	23.7	2.9	26.6
TOTALS - 1952 Survey To Date		34,827,564	17,826	151.8	19.1	170.9
TOTALS - 1951 Survey		49,000,000	27,910	199.2	21.6	220.8
TOTALS - 1950 Survey		48,229,354	26,580	182.1	21.1	203.2
TOTALS - 1949 Survey		49,000,000	22,275	172.4	29.9	202.3

* Because of dense smoke layers, aerial surveys in Western Oregon and Western Washington have not been completed. As soon as visibility improves the remaining areas will be surveyed for forest insect outbreaks.

OSBF - Oregon State Board of Forestry
BEPQ - U. S. Bureau of Entomology and Plant Quarantine

TABLE 4. RESULTS OF COOPERATIVE SPRUCE BUDWORM GROUND SURVEY IN OREGON - 1952

Area	Agency	Observers	Examination Dates	No. Man Days	No. of Check Plots Present	Absent	Total
Benton County	OSBF	Miller, W. Sorg, W.	7/25-7/28	4		20	20
	OSBF	Gruba, T. Sheridan, D.	8/4-8/7	6		44	44
Clackamas County	OSBF	Popham, T. Glasgow, D.	7/18-7/21	4		57	57
Columbia County	OSBF	Popham, T. Glasgow, D. Gruba, T.	7/24-7/30	6		53	53
Coos County	OSBF	Miller, W. Sorg, W.	8/11-8/13	4		55	55
Curry County	OSBF	Miller, W. Sorg, W.	8/11	2		4	4
Douglas County	OSBF	Miller, W. Sorg, W.	7/15-8/14	14		127	127
	Weyerhaeuser Timber Co.	Gehrman, R.M.	8/14-8/21	2		9	9
Jackson County	OSBF	Miller, W. Sorg, W.	8/6-8/8	6		52	52
Josephine County	OSBF	Miller, W. Sorg, W.	8/5-8/9	4		49	49
Lane County	OSBF	Miller, W. Sorg, W.	7/16-7/31	11		71	71
Lincoln County	OSBF	Gruba, T. Sheridan, D.	8/5-8/7	4		29	29
Linn County	OSBF	Popham, T. Glasgow, D.	7/14-7/17	8		48	48
		Miller, W. Sorg, W.	7/31	1		3	3
	Willamette Valley Lbr. Company	Knudson, G.D.	7/23	2		26	26

TABLE 4 (CONTINUED)

Area	Agency	Observers	Examination Dates	No. Man Days	No. of Check Plots Present	Absent	Total
Marion County	OSBF	Popham, T. Glasgow, D.	7/17	2		21	21
	Longview Fiber Co.	Anliker, J.M.	7/9-7/10	2		15	15
Multnomah County	OSBF	Popham, T. Glasgow, D.	7/22	2		8	8
Polk County	Willamette Valley Lbr. Company	Knudson, G.D.	8/18	1		18	18
Tillamook County	OSBF	Popham, T. Glasgow, D.	7/23	1		5	5
Washington County	OSBF	Popham, T. Glasgow, D.	7/23-7/30	6		48	48
Yamhill County	OSBF	Gruba, T. Popham, T.	7/28-8/1	4	2	36	38
Mt. Hood N. F.	BE&PQ	Dobyns, L. Truax, W.	7/22-7/25	8	25	60	85
Rogue River N. F.	BE&PQ	Dobyns, L. Truax, W.	6/19-6/24	6	2	38	40
Siskiyou N.F.	BE&PQ	Dobyns, L. Truax, W.	6/25-6/30	6	0	35	35
Siuslaw N.F.	BE&PQ	Dobyns, L. Truax, W.	7/7-7/11	6	1	42	43
Umpqua N.F.	BE&PQ	Dobyns, L. Truax, W.	7/1-7/3	4	0	20	20
Willamette N.F.	BE&PQ	Dobyns, L. Truax, W.	7/14-7/21	14	19	88	107
		Subtotal		140	49	1081	1130

TABLE 5. RESULTS OF COOPERATIVE SPRUCE BUDWORM GROUND SURVEY IN WASHINGTON - 1952

Area	Agency	Observers	Examination Dates	No. Man Days	No. of Check Plots Present	Absent	Total
Klickitat County	Longview Fiber Co.	Loeb, J.	6/26-6/27	1	8	19	27
Wahkiakum County	Longview Fiber Co.	Robinson, W.L.	6/25	1	0	4	4
Gifford-Pinchot N.F.	BE&PQ	Dobyns, L. Truax, W.	7/28-8/6	8	4	81	85
Snoqualmie N.F.	BE&PQ	Dobyns, L. Truax, W.	8/1-8/8	11	4	76	80
		Subtotal		21	16	180	196
TOTAL FOR ALL AREAS				161	65	1261	1326

TABLE 6. SUMMARY OF SPRUCE BUDWORM GROUND SURVEY CHECK PLOTS ESTABLISHED DURING 4-YEAR PERIOD 1949-1952 SHOWING ANNUAL TRENDS OF THE INFESTATION BY AREAS

Area	Year	Total No. Plots Established	No. Plots Budworm Present	Per Cent of Plots Budworm Present
Blue Mountains	1949	157	116	73.9
	1950	No Ground Survey Conducted		
	1951	No Ground Survey Conducted		
	1952	No Ground Survey Conducted		
Eastern Oregon Cascades	1949	189	73	38.6
	1950	233	108	46.4
	1951	35	14	40.0
	1952	35	10	28.6
Western Oregon	1949	1898	341	18.0
	1950	1977	325	16.4
	1951	1703	116	6.8
	1952	1095	39	3.5
Western Wash.	1949	1172	31	2.6
	1950	1586	37	2.3
	1951	1435	11	0.8
	1952	165	2	1.2
Eastern Wash.	1949	218	111	50.9
	1950	287	70	24.4
	1951	301	20	6.6
	1962	31	4	13.3
Totals	1949	3634	672	18.5
	1950	4083	540	13.2
	1951	3474	161	4.6
	1952	1326	65	4.9

TABLE NO. 7

SUMMARY OF INFESTATION CENTERS MAPPED ON 1952 AERIAL SURVEYS

Insect	Washington		Oregon		Total	
	No. of Centers	Acres	No. of Centers	Acres	No. of Centers	Acres
DEFOLIATORS						
Spruce Budworm	11	147,040	25	1,431,520	36	1,578,560
Hemlock Looper	41	12,720			41	12,720
Lodgepole Sawfly			5	19,820	5	19,820
Lodgepole Needle Miner			2	9,300	2	9,300
Larch Budworm	3	2,080			3	2,080
Pine Budworm	4	480			4	480
Unknown	6	5,600			6	5,600
Subtotal	65	167,920	32	1,460,640	97	1,628,560
BARK BEETLES						
Douglas Fir Beetle	272	458,400	91 1/	4,111,730	363	4,570,130
Western Pine Beetle	45	225,440	140	448,350	185	673,790
Mountain Pine Beetle	200	172,040	70	98,700	270	270,740
Ips sp.	22	9,120	211	82,820	233	91,940
E.Spruce Beetle	1	1,120			1	1,120
Pseudohylesinus sp.	22	145,760	21	16,680	43	162,440
Scolytus sp.	17	12,960			17	12,960
Subtotal	579	1,024,840	533	4,758,280	1,112	5,783,120
GRAND TOTAL	644	1,192,760	565	6,218,920	1,209	7,411,680

1/ The Douglas fir beetle epidemic in western Oregon has been considered as one large center of infestation of 3,893,920 acres, to which has been added the other centers recorded during the season.