



OUTBREAKS OF MOUNTAIN PINE BEETLE IN LODGEPOLE PINE FORESTS -- 1945 to 1975

Nicholas L. Crookston, Ronald W. Stark, David L. Adams



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TABLE OF CONTENTS

	Page
Introduction	1
Methods	1
Discussion	2
References Cited	4
Appendix – References to the Historical Map	
Northern Region – published	5
Northern Region – unpublished	6
Pacific Northwest Region – unpublished	6
Intermountain Region – unpublished	7

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ABSTRACT

The locations of mountain pine beetle, *Dendroctonus ponderosae* Hopkins (Coleoptera:Scolytidae), infestations in lodgepole pine (*Pinus contorta* Dougl.) forests between 1945 and 1975 are mapped. The intervals between infestations at selected locations from 1910 to 1975 were tabulated and found to vary between 6 and 64 years.

INTRODUCTION

The mountain pine beetle, *Dendroctonus ponderosae* Hopkins (Coleoptera: Scolytidae), frequently becomes a pest of considerable economic importance throughout the range of lodgepole pine (*Pinus contorta* Dougl.). Historical records and observations indicate that certain geographic areas are subject to repeated outbreaks of mountain pine beetle and thus possess characteristics conducive to population increase. However, a comprehensive historical analysis that would prove this hypothesis has not previously been made.

Outbreaks of the mountain pine beetle in lodgepole pine forests have been reported throughout the western United States since the early 1900s. The first major recorded outbreak in the Pacific Northwest occurred in 1908 near Joseph, Oregon, on the Wallowa National Forest (Burke 1946, Craighead et al. 1931, Dolph undated). The first reported infestation in the northern Rocky Mountains (1909) occurred in Flathead County, Montana (Evenden 1944). The Beaverhead National Forest, southwestern Montana, experienced its first reported outbreak in 1911 on the west side of Big Hole Basin (Evenden and Gibson 1940). Thorne (1935) cited evidence of infestations that occurred in the Horse Creek area, Utah, during the last decade of the 18th century.

Since the 1920s many outbreaks have been recorded. In terms of reported tree mortality levels, few have had the significance of the reinfestation of the Big Hole Basin

region during the late 1920s and the 1930s (Evenden 1925; Evenden and Gibson 1940). In 1940, Gibson (1943) made a final measurement of the tree mortality on the Beaverhead National Forest at Battlefield, Montana. His sample area covered a dense stand of nearly pure lodgepole pine of diverse diameters and maturity, and represented a large area varying in elevation from 6900 ft (2100 m) to 7599 ft (2300 m). He found that 74 percent of the trees 6 inches (15 cm) and greater in diameter at breast height (dbh) were killed as a direct result of the infestation.

During the 1940s, infestations reportedly occurred on the Deschutes National Forest, Oregon (Dolph undated), the Caribou (including two Idaho districts formerly part of the Cache NF) and Targhee National Forests, Idaho, and the Teton and Bridger (now called the Bridger-Teton) National Forests, Wyoming (Godden 1946).

Records of outbreaks that have occurred since about 1945 were compiled and are presented on the enclosed map. Infestation boundaries were obtained from Forest Service aerial detection survey sketch maps and many ground reconnaissance and biological evaluation survey reports.

METHODS

Sketch map techniques varied among the four Forest Service regions included in the mapped area. Generally, the national forests, Indian reservations and parcels of

state land were observed by Forest Service personnel from low-flying light aircraft. The infested lands were indicated by sketching the boundaries of the infestation on a map and noting the host species and causal insect. Questionable areas were usually visited by ground crews.

We transcribed infestation boundary locations from the sketch maps to 1:500,000 USDI Geological Survey state topographic maps. The decade in which the infestation occurred was recorded by color code. Several unpublished reports were reviewed and the defined infestation boundaries were incorporated on the state topographic maps. The data base for each Forest Service region is discussed below.

Pacific Northwest Region

The Pacific Northwest Region of the Forest Service is comprised of Oregon and Washington. The historical map for these states was compiled from systematic aerial survey records (1947 to 1975) and four unpublished reports (Appendix A).

Northern Region

Only part of the Northern Region – western Montana, northern Idaho and part of Yellowstone National Park, Wyoming – is included in the historical map. The data base for this region is comprised solely of written reports (Appendix A) and recent (1972 to 1975) aerial sketch maps. To supplement these data, an unpublished map prepared by Tunnock (1966) was used to delineate areas infested prior to 1945. His map is based on unpublished reports written by members of the now-disbanded Bureau of Entomology and Plant Quarantine Laboratory, Coeur d'Alene, Idaho (Appendix A).

Intermountain Region

The mapped part of the Intermountain Region includes southern Idaho, northern Utah and western Wyoming. The data base includes written reports of infestations detected by ground surveys done before the mid-1950s. Data from aerial reconnaissance surveys presented in unpublished reports were used for the years 1955 to 1964 (Appendix A). Data for subsequent years were obtained from aerial survey sketch maps which had been stored on color microfilm.

Rocky Mountain Region

Only the Shoshone National Forest, Wyoming, was included in the historical map. Data regarding infestations on this forest were provided by personnel of the Forest Supervisor's Office at Cody, Wyoming, and the Rocky Mountain Regional Office at Denver, Colorado. The information was based on aerial sketch maps that date back to 1968.

Final Preparation

Infestation boundaries were transferred free-hand from the state topographic maps to a 1:1.9 million scale

base map for the historical map. The large change in scale necessitated generalization of boundaries and some omissions. Areas infested at least twice were indicated by a darkening of the color illustrating the area of infestation. Small areas were indicated by point symbols.

Deciding the period of reinfestation often became subjective. An area was classified reinfested when it had been reported infested, had a significant drop in tree mortality rates, and then had a resurgence of beetle activity.

DISCUSSION

The historical map was drawn from many sources of varying scale and detail and thus subject to the following limitations:

1) Aerial survey data were not always verified on the ground as to host, location or insect. This problem was most pronounced in the Cascade Mountains of central Washington, where the host type may have been western white pine rather than lodgepole pine.

2) Lodgepole pine grows with ponderosa pine in many parts of the mapped regions. Since both hosts were often infested concurrently, judgments were made as to the host type. These decisions were not always substantiated by consulting type maps, and aerial observers some times made conflicting decisions between years.

3) Aerial survey techniques varied among regions and observers. This variation frequently resulted in a given marginal infestation being included by one observer, while it might have been omitted by another. Sometimes infestations consisting of many scattered groups of killed trees were mapped as a single infestation by one observer, while another observer might have mapped each small group of infested trees separately.

4) Only major infestations were recorded during the early years and the boundaries are suspect, as they were often established by simply drawing an inclusive circle around a few known points.

5) Data concerning the intensity of tree mortality were not included.

In spite of the inaccuracies and limitations inherent in the historical map, it does provide specific and useful information. The locations of major mountain pine beetle infestations in lodgepole pine forests over time are available at a glance and provide an indication of general hazard zones to the forest managers.

The length of time between infestations varied considerably from area to area. The recurrence rates of infestation at a few locations in the western United States

Table 1. Approximate intervals between mountain pine beetle outbreaks at selected locations, 1910 to 1975.

Area	Year	Number of years between outbreaks	Source
Big Hole, Montana	1911		Evenden 1925
	1930	19	Evenden and Gibson 1940
Thompson River, Montana	1949		Terrell 1949
	1975	26	McGregor et al. 1975
Targhee National Forest, Idaho	1949		Terrell 1950
	1967	18	Klein 1968
Uinta Mountains, Utah	1943		Woods 1943
	1953	10	Anonymous 1953
	1959	6	Washburn and Knopf 1959
	1973	14	Personal observation
Blue Mountains, Oregon	1910		Craighead et al. 1931; Burke 1946; Dolph undated
	1974	64	Aerial survey maps, USDA Forest Service, Portland, Oregon

are summarized in Table 1. The infestations seem to have occurred every 20 to 25 years in the Thompson River Basin, Montana, and the Targhee National Forest, Idaho. Epidemic populations have been nearly continuous in the Uinta Mountains, Utah. There was an interval of more than 60 years between major infestations in the Blue Mountains, northeastern Oregon.

The reasons for this variation in intervals between infestations are unknown; however, controlling factors may include such stand parameters as average phloem thickness, age and basal area, and such site factors as elevation and latitude. Variables intrinsic to the insect population are also undoubtedly involved.

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APPENDIX A

REFERENCES TO THE HISTORICAL MAP

These references were used exclusively to compile the historical outbreak map. The listings are by Forest Service Region, published and unpublished.

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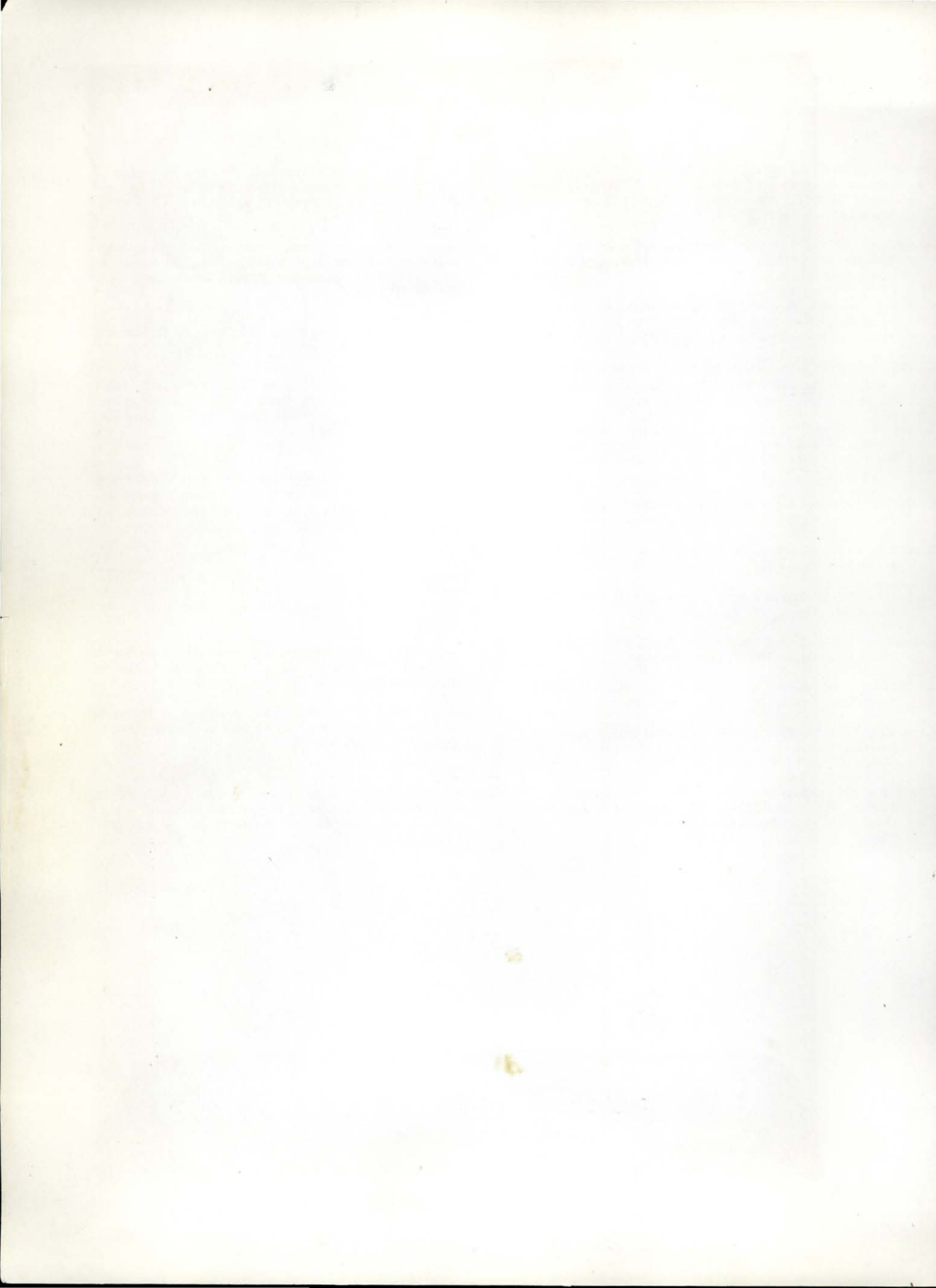
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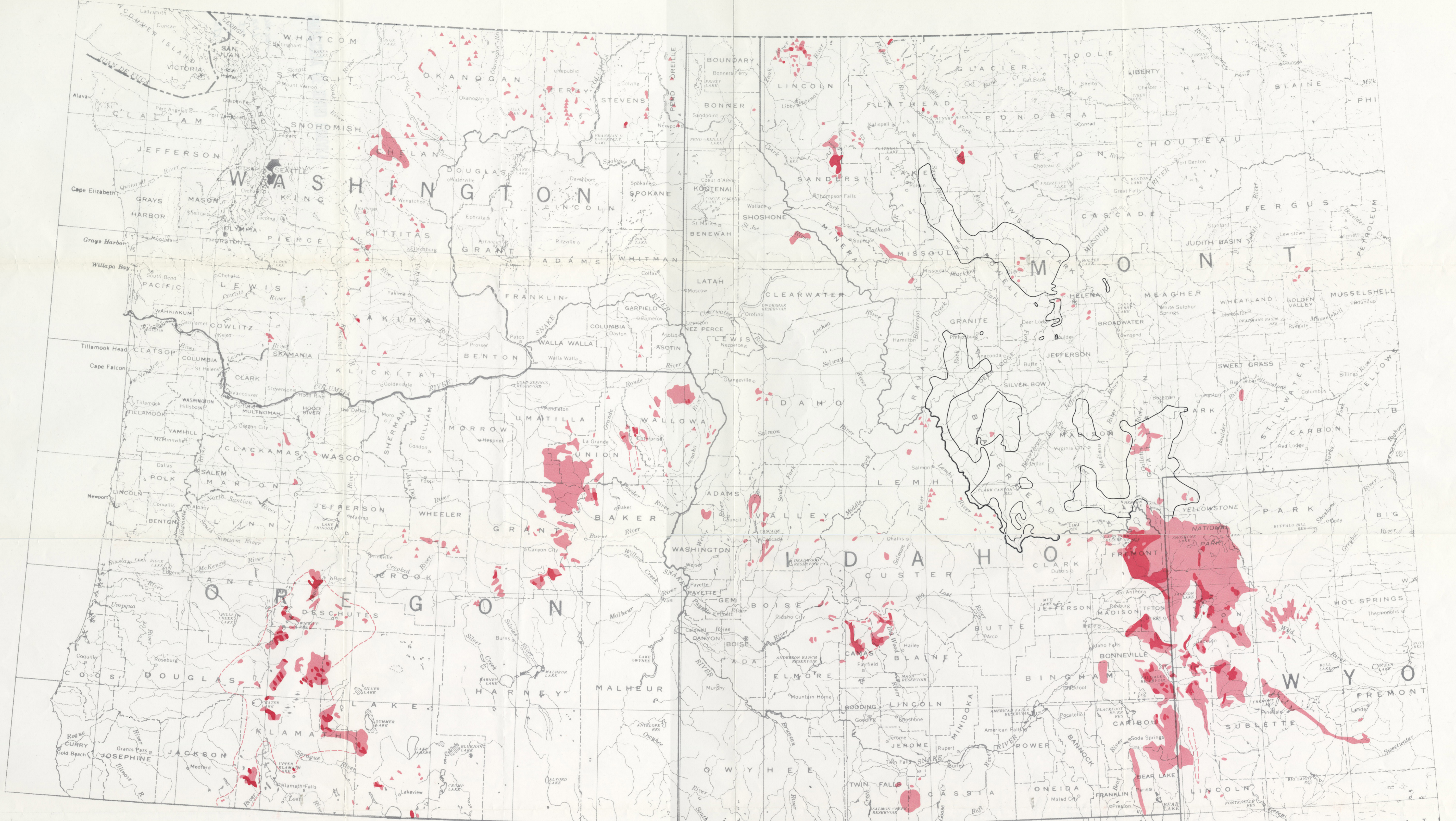
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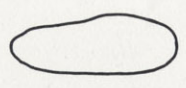




OUTBREAKS OF MOUNTAIN PINE BEETLE IN NORTHWESTERN LODGEPOLE PINE FORESTS -- 1945 to 1975

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LEGEND

-  Areas which harbored more than one recorded infestation.
-  Areas which harbored only one recorded infestation.
-  Very small areas which harbored only one recorded infestation.
-  Numerous small infestations.
-  Areas in Montana delineated by S. Tunnock as being infested prior to 1945.

Scale 1:1,900,000

NOTES

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