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SOME ESTIMATES OF GROWTH AND MORTALITY FROM THE
MALHEUR NATIONAL FOREST IN EASTERN OREGON

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During 1955-56 an inventory was made of forested land in the Middle Fork Working Circle of the Malheur National Forest to provide information necessary for calculation of the allowable cut and for other management purposes. The growth and mortality estimates in the following report were obtained from this inventory. Although the estimates apply directly to the Middle Fork Working Circle, they may also be useful to foresters working in stands of similar types and condition classes in nearby areas.

The Middle Fork Working Circle (fig. 1) lies wholly within Grant County and is the most northerly working circle in the Malheur National Forest. It has a commercial forest area of 232,000 acres, with sawtimber stands on 86 percent (199,000 acres) of this area. The working circle contains a sawtimber volume, in trees 11.0 inches and larger, of 1,800 million board-feet, Scribner rule. Ponderosa pine is the dominant species, comprising 44 percent of the total volume. Other species include Douglas-fir with 20 percent of the volume; white fir, 16 percent; western larch, 13 percent; and Engelmann spruce and lodgepole pine, 7 percent.

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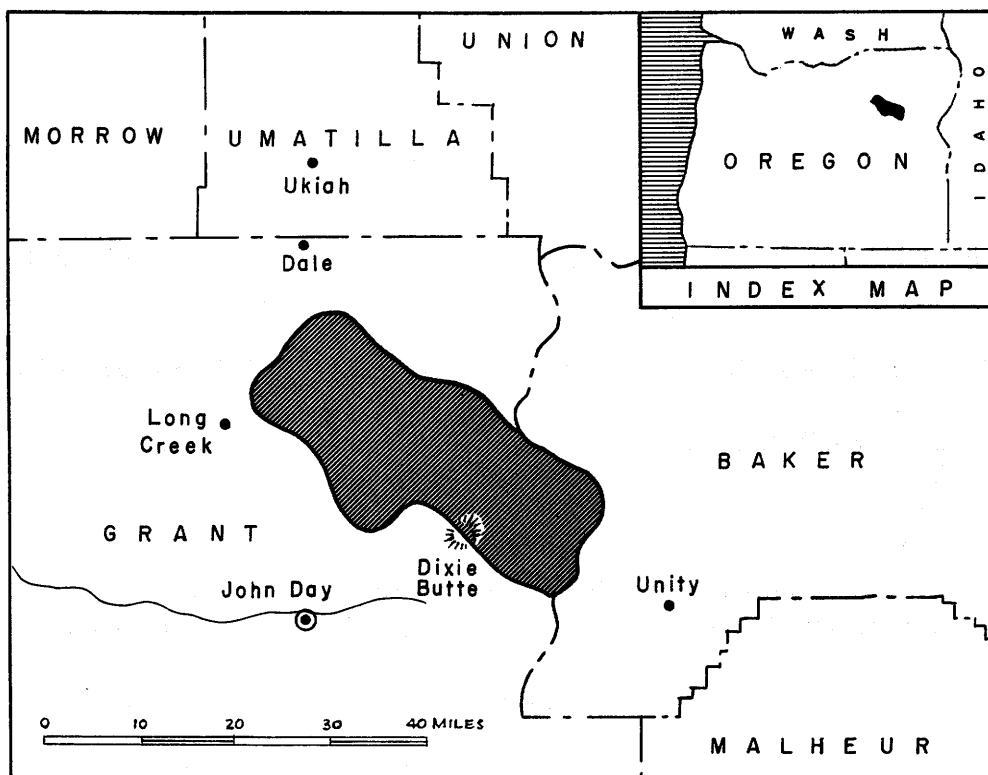


Figure 1. -- Middle Fork Working Circle of the Malheur National Forest.

Within the working circle, forest types range from ponderosa pine at the lower elevations to Douglas-fir, white fir, western larch, lodgepole pine, and Engelmann spruce at the higher elevations. Since the number of observations taken in some types was insufficient for analysis, all types were grouped into two classes. Ponderosa pine, which occurred on 51 percent of the area, was kept as a distinct type. All other types were combined into one group, designated as "other" types. By area, "other" types consists of 37 percent Douglas-fir, 33 percent white fir, 20 percent western larch, 6 percent Engelmann spruce, and 4 percent lodgepole pine.

DEFINITIONS

Estimates for gross growth, mortality, and net growth are given in this report. Some definitions may be helpful in interpreting these statistics.

Gross Growth

As used in this report, gross growth is the increment of sound wood in sound, live trees during a given period. In calculating gross growth, adjustments are made for the increase of cull volume in sound, live trees, and for the loss in volume of sound, live trees passing into a cull status. This varies from the definition accepted by the Society of American Foresters (Forestry Terminology, 1958), in which there is no adjustment for losses from deterioration.

Mortality

The volume of sound wood in sound, live trees that died during a given period.

Net Growth

Gross growth less mortality.

Sound, Live Tree

A live tree of commercial species having at least 25 percent of its gross board-foot volume free from rot or defect.

Cull Tree

A live tree of commercial species having less than 25 percent of its gross volume free from rot or defect. Cull trees are considered to have zero merchantable volume.

Forest Type

The species with the greatest sawtimber volume determines forest type.

Sawtimber Stand

A stand having a minimum net volume per acre in sawtimber trees of 1,388 board-feet, Scribner rule (1,500 board-feet, International 1/4-inch rule).

GROWTH AND MORTALITY ESTIMATES

In the Middle Fork Working Circle, gross growth of "other" types was generally greater than that of ponderosa pine (fig. 2).

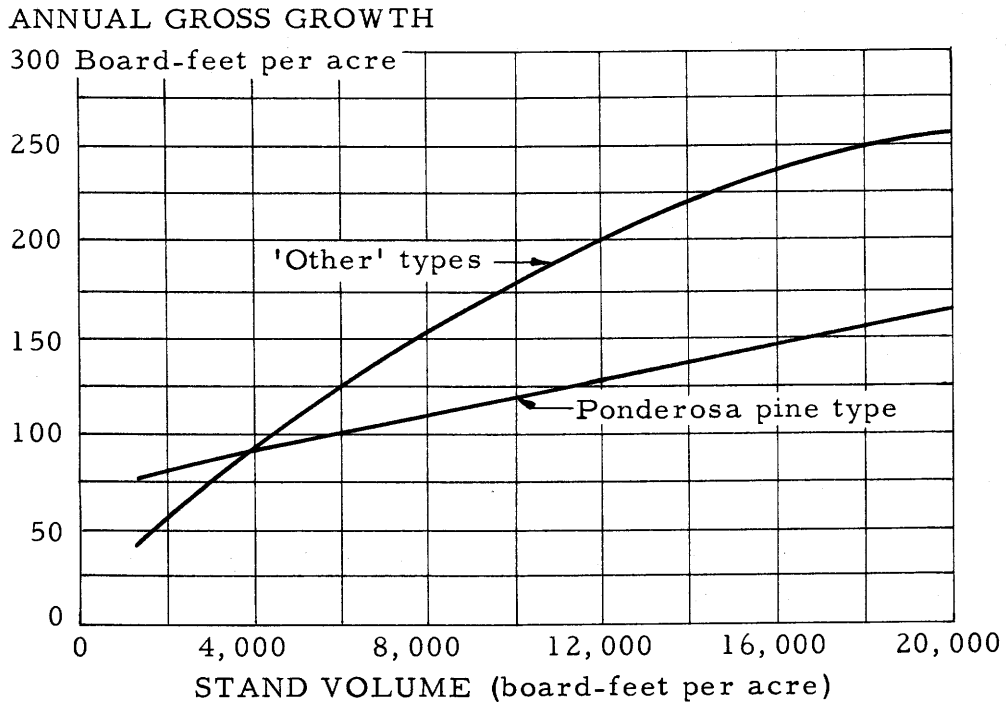


Figure 2. --Average annual gross growth per acre in saw-timber stands, Middle Fork Working Circle.

This seems reasonable, as "other" types grow mostly at higher elevations under more favorable moisture conditions and on sites with a greater capacity for wood production. "Other" types average 36.3 board-feet per acre more gross growth than the ponderosa pine type (table 1). A slightly higher mortality for the "other" types offsets the initial difference somewhat, however, and in terms of net growth "other" types grow 30.4 board-feet per acre more than the ponderosa pine type.

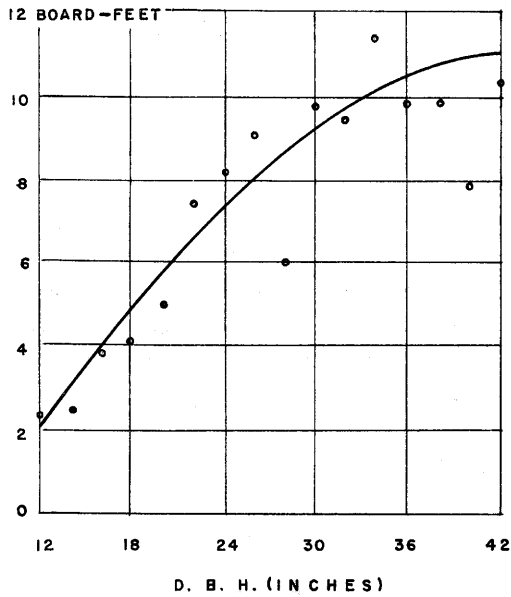
Table 1.--Estimates of average annual growth and mortality
per acre in the Middle Fork Working Circle,
Malheur National Forest
(Scribner rule)

Type	Gross growth		Mortality		Net growth	
	Vol- ume	Standard error	Vol- ume	Standard error	Vol- ume	Standard error
	<u>Bd.-ft.</u>		<u>Bd.-ft.</u>		<u>Bd.-ft.</u>	
All types	132.5	6.2	38.0	7.2	94.5	4.3
Ponderosa pine	112.9	8.7	34.8	8.6	78.1	7.3
"Other" types	149.2	8.6	40.7	11.2	108.5	4.8

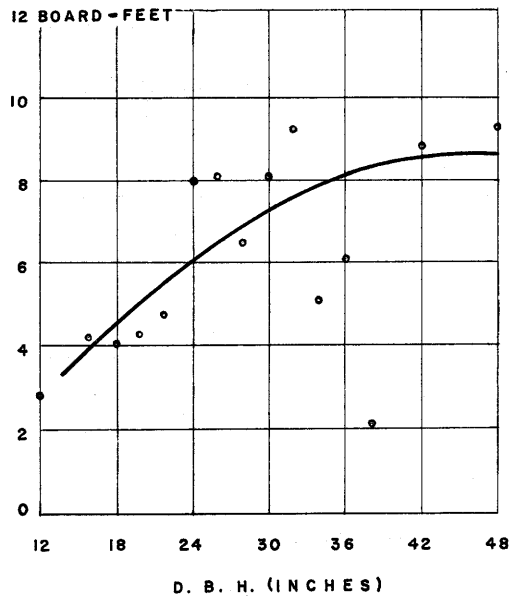
Figure 3 presents curves of average annual gross growth of sawtimber-size trees by diameter classes for four of the principal species in the working circle--ponderosa pine, Douglas-fir, white fir, and western larch. These curves may be of value in selecting trees to cut and leave during partial cuttings and in appraising stands when they are made up of even-size trees.

The curves show a wide range of variation between species. They reflect the inherent growth capacities of each species, site variations, cull increment, and the passing of trees into a cull status. Ponderosa pine, in terms of individual trees and not as a stand of trees, apparently has the greatest potential for growth. This may be due in part to the characteristically open pine stand, where individual trees have less competition than do other species growing under the more crowded stand conditions of the upper-slope types. Also, pine generally is less affected by cull than other species. The effect of cull increment is most apparent for white fir. In the Middle Fork Working Circle, cull increment in white fir becomes sufficiently large at about 20 inches d.b.h. to cause gross growth to decrease.

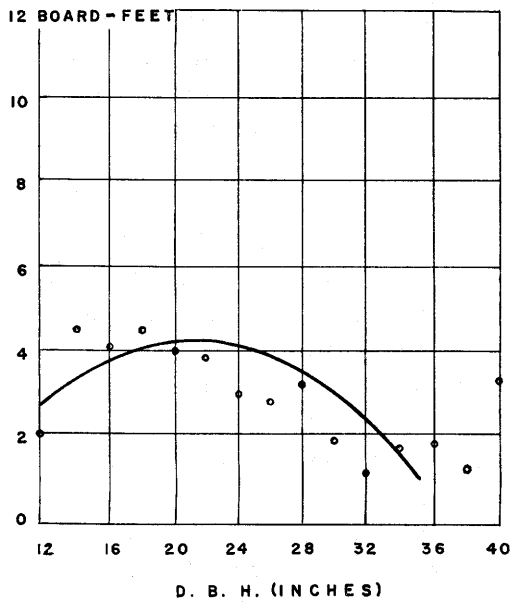
PONDEROSA PINE



DOUGLAS-FIR



WHITE FIR



LARCH

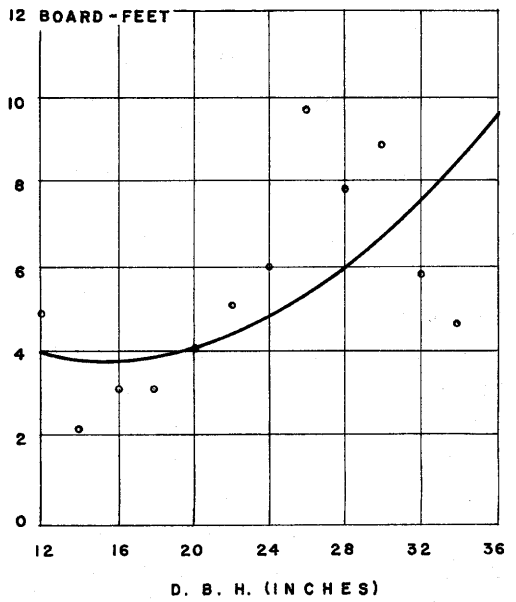


Figure 3. -- Average annual gross growth of sawtimber trees, Middle Fork Working Circle.

SURVEY PROCEDURE

The field information from which these estimates were prepared was obtained from sample plots distributed evenly throughout the working circle at intervals of 0.94 mile. Each plot was half an acre in size--10 chains long by one-half chain wide. Gross growth measurements were taken on a 1/10-acre area within the plot area. Stand volumes were based on the 1/2-acre area.

Increment cores and bark growth correction factors were used to determine the diameter of each sound, live tree 10 years before the inventory. Present and past tree volumes corresponding to present and past tree diameters were taken from local volume tables. The difference between present and past volumes for each tree was taken as the gross growth of that tree. Adjustments for cull increment were built into the local volume tables.

Sawtimber mortality was determined for the entire 1/2-acre area of each plot. All sound sawtimber-size trees believed to have died within the last 5 years were included in the mortality sample. The difficulty of closely estimating time of death makes this a less precise measurement than that of gross growth.