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TREE SPECIES TO GROW IN THE SOUTH UMPQUA DRAINAGE

by

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Mixed-conifer forests occupy about 6,000 square miles of southwestern Oregon. These forests are characterized by a mixture of Douglas-fir, sugar pine, ponderosa pine, and other species, with Douglas-fir the most abundant. This paper reports the results of a study comparing the site index of Douglas-fir, sugar pine, and ponderosa pine in the South Umpqua drainage above Elk Creek and gives preliminary recommendations concerning choice of species to grow.

Clear cutting, a common method of harvesting old-growth forests in this area, is usually followed by artificial regeneration. Consequently, composition of the new stand can be partially controlled.

Sugar and ponderosa pines have frequently been favored for restocking because:

1. Artificial regeneration with the pines usually has been more successful than with Douglas-fir.

2. Observations of faster growing individual trees suggest they will outgrow and outproduce Douglas-fir in many environments.

3. In the past, stumpage prices in Forest Service timber sales have been highest for sugar pine, intermediate for ponderosa pine, and lowest for Douglas-fir.

But some environments appear more suitable, ecologically, for Douglas-fir. In this locality the pines become scarce at elevations above 4,000 feet where Douglas-fir thrives. Furthermore, white pine blister rust must be controlled wherever sugar pine is grown. Sugar pine should be grown only in relatively compact units of large size to minimize costs of blister rust control.

Successful seeding and planting of sugar pine in recent years has created the immediate problem of identifying and blocking out the areas that should be devoted to its management. The problem is especially urgent in the South Umpqua drainage, which contains some of the best pine environments.

THE STUDY

A study was made in the South Umpqua drainage above Elk Creek to provide guides for identifying areas on which Douglas-fir, sugar pine, or ponderosa pine should be the favored species in management. First consideration was given to identifying areas that should be managed for sugar pine and Douglas-fir. Information on ponderosa pine was collected when it was readily available.

Ponderosa and sugar pine usually occur as scattered trees in the mixed-conifer forests. Consequently, direct comparison of yields for the three species is not possible at this time. In this study, site index[1/] was used as the best available means for comparing relative productivity of the three species on each plot.

1/ Douglas-fir: McArdle, Richard E., and Meyer, Walter H. The yield of Douglas fir in the Pacific Northwest. U.S. Dept. Agr. Tech. Bul. 201, 64 pp., illus. 1930.

Ponderosa pine: Meyer, Walter H. Yield of even-aged stands of ponderosa pine. U.S. Dept. Agr. Tech. Bul. 630, 60 pp., illus. 1938.

Sugar pine: Dunning, Duncan. A site classification for the mixed conifer selection forests of the Sierra Nevada. U.S. Forest Serv. Calif. Forest & Range Expt. Sta. Res. Note 28, 21 pp., illus. 1942.

Field crews measured age and height of three to five dominant trees for each of the three species present on 61 temporary plots in the South Umpqua drainage. Slope, elevation, and aspect were also recorded. Douglas-fir and sugar pine occurred together on 51 plots, and Douglas-fir and ponderosa pine occurred in combination on 17 plots.

Some plots extended for several hundred feet along a contour and varied considerably in topography and soils. The plots were stratified by elevation and aspect. They were well distributed from 1,300 to 4,100 feet in elevation. Approximately one-half were on northerly and one-half on southerly aspects.

RESULTS

The site indexes for sugar pine and ponderosa pine were found to be correlated with Douglas-fir site index and elevation. No other relationships between site index and site factors were found.

The site index relationships are expressed by the following equations (fig. 1):

$$Y_1 = 13.2 + 0.952\,X_2 - 0.0100\,X_1X_2$$

$$Y_2 = 23.1 - 0.0074\,X_1X_2$$

where Y_1 = site index sugar pine - site index Douglas-fir

Y_2 = site index ponderosa pine - site index Douglas-fir

X_1 = site index Douglas-fir

$X_2 = \frac{\text{elevation in feet}}{100}$

Generally, site indexes for the two pine species exceed site index for Douglas-fir at lower elevations and where site index for Douglas-fir is also relatively low. For example, at an elevation of 2,000 feet, sugar pine site index is higher wherever Douglas-fir site index is below 161. At an elevation of 4,500 feet, in contrast, sugar pine site index is superior only when Douglas-fir site index is less than 124.

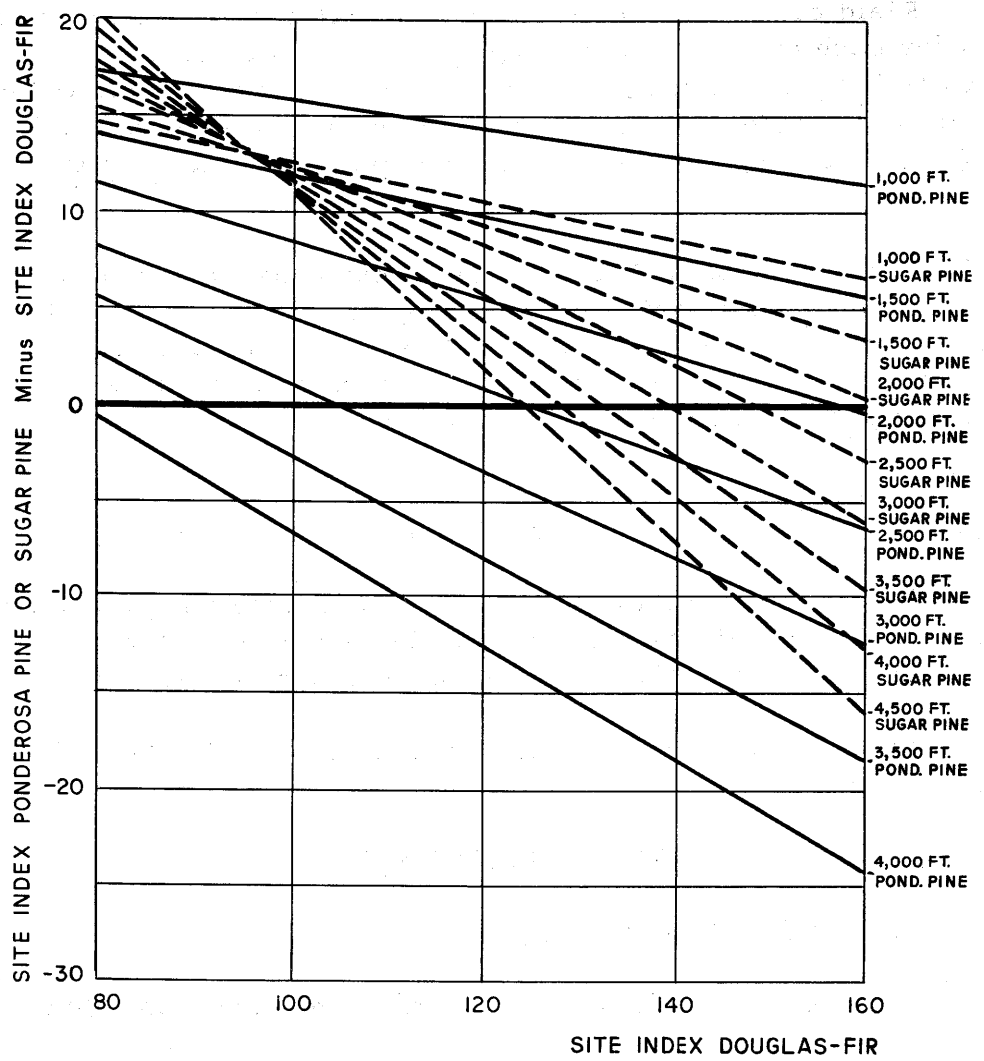

Figure 1.--Relationship of sugar pine and ponderosa pine site indexes to Douglas-fir site index and to elevation.

Similarly, at elevations of 2,000 feet ponderosa pine site index exceeds Douglas-fir when Douglas-fir site index is less than 156. When the elevation is increased to 3,500 feet, however, ponderosa pine is only superior where Douglas-fir site index is under 89 (fig. 1).

Comparing the regressions for sugar pine and ponderosa pine indicates that ponderosa pine generally has a higher site index than sugar pine at elevations below approximately 1,500 feet.

DISCUSSION AND CONCLUSIONS

A detailed Forest Service soil survey, conducted in the South Umpqua drainage after this study was completed, shows that only slight differences in topography can cause relatively great variation in soils. This, in turn, strongly influences tree growth. It now appears that soil properties, depth in particular, may have a greater influence on tree growth than any other site factor within the elevational zone occupied by mixed conifers in the drainage. Preliminary measurements by the soil surveyors indicate that site index relationships between ponderosa pine, sugar pine, and Douglas-fir may have a high correlation with soil type.

Although comparative site indexes are a measure of relative productivity, which species to favor in management in the South Umpqua drainage depends on many other factors. Other considerations are the silvical requirements of the species and the integration of these requirements with the soil and other site factors, comparative yields, length of rotation, expense of producing crops, and comparative value of the products.

However, until better information is available the site index relationships reported under "Results" are useful as an aid in making preliminary recommendations.

The South Umpqua drainage is an exceptionally favorable area for sugar pine production. Because of generally high sites and low populations of ribes, the cost of blister rust control per unit of wood production should be near minimum. Blister rust control will still be essential, however. Costs can be minimized by growing sugar pine in extensive blocks and in pure or nearly pure stands. Sugar pine should be favored on all suitable sites.

It is sometimes difficult to control blister rust infection in natural cold-air drainageways. Rust spores may remain viable and travel comparatively long distances in the humid night air in these drainageways. Blister rust control costs may be reduced if such areas within the sugar pine zone are devoted to other species.

The poorest sites will produce relatively small volumes of wood; consequently, the cost of blister rust control will be relatively high per unit of wood produced. Therefore, sugar pine should not be grown at the lower site indexes. Until more specific data is available, Douglas-fir site index of 100 may be arbitrarily chosen as the lower limit for sugar pine.

Some areas of gentle slope in the South Umpqua drainage have exceptionally heavy, poorly drained soils. Observations by many foresters and soil surveyors indicate that ponderosa pine is the only timber species that prospers on these soils.

The pines become infrequent at elevations above 4,000 feet, and site index is commonly higher for Douglas-fir. The scarcity of pines is interpreted to mean that some elements of the environment may be risky for pines.

On the basis of this analysis, the following recommendations are made for use until more precise information is available (fig. 2):

Sugar pine should be favored at elevations from 1,500 to 4,000 feet if Douglas-fir site index is over 100, except for (1) some portions of the 2,000- to 4,000-foot elevational zone where Douglas-fir site index exceeds 128 and (2) cold-air drainage paths where risk of long-distance blister rust infection is extreme.

Ponderosa pine should be favored (1) at elevations below 1,500 feet, (2) at elevations from 1,500 to about 3,500 feet, if Douglas-fir site index is less than 100, (3) instead of sugar pine in cold-air drainage paths at lower elevations, and (4) on areas of gentle slope with heavy, poorly drained soils (not shown in figure 2).

Douglas-fir should be favored (1) at elevations above 4,000 feet, (2) at elevations from about 3,500 to 4,000 feet if Douglas-fir site index is under 100, (3) some portions of the 2,000- to 4,000-foot elevational zone where Douglas-fir site index exceeds 128, and (4) instead of sugar pine in cold-air drainage paths at upper elevations.

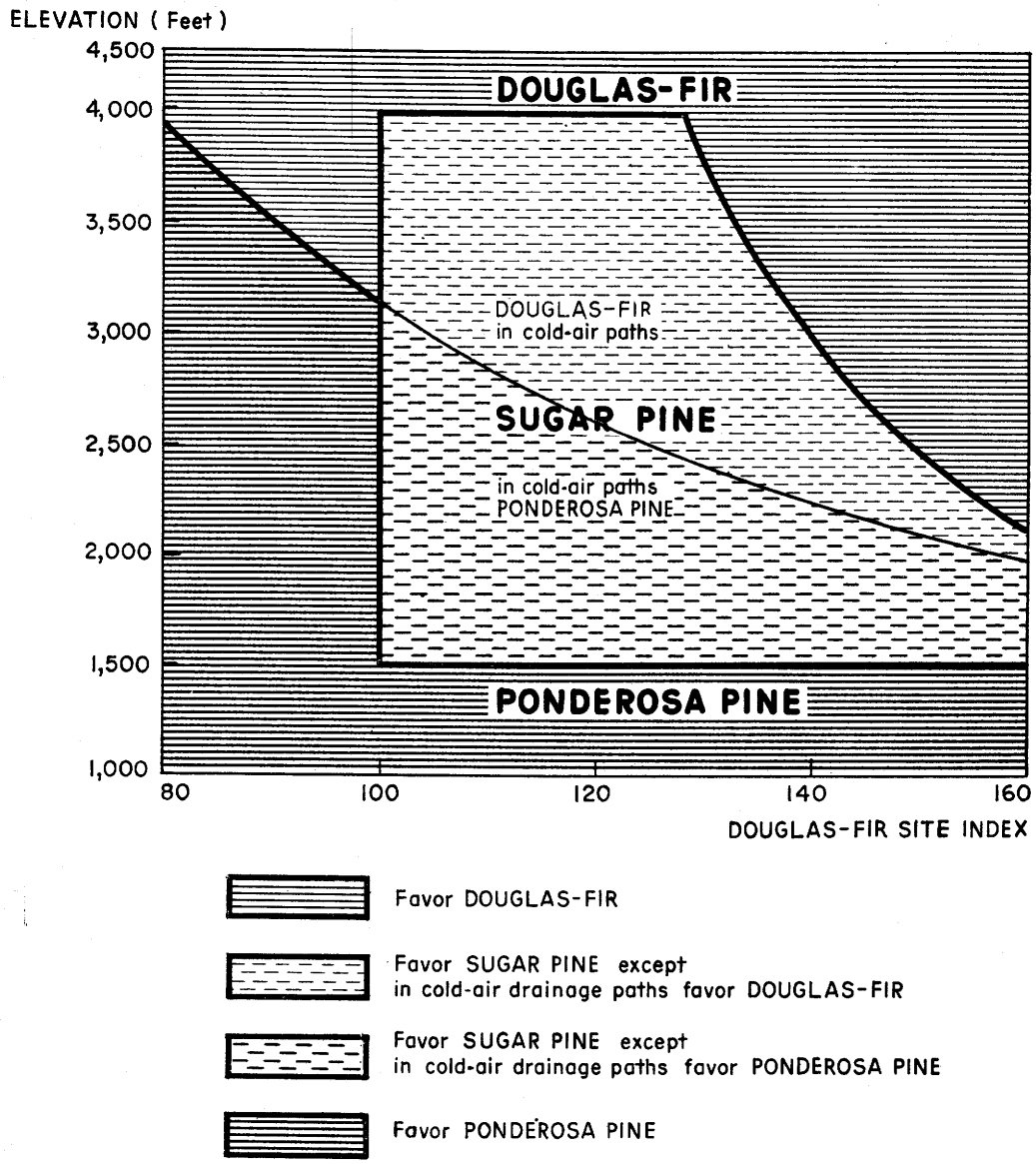

Figure 2.--Recommended species to favor in upper South Umpqua drainage for Douglas-fir site index and elevation combinations.