Average Dry-Season Precipitation in Southwest Oregon, May Through September

During the hot, dry summer, a major factor affecting the reforestation potential of seedling site data in southwest Oregon is the availability of soil moisture. Soil moisture will be lost at an increasing rate as dry season progresses. Therefore, the amount of precipitation received during the summer (when evapotranspiration demands are the greatest) is extremely important in determining survival. This precipitation periodically replenishes the soil moisture supply in the vicinity of the roots of newly planted seedlings.

This map of the average dry-season precipitation for southwest Oregon should aid in the planning of reforestation activities and assessing reforestation risk. Dry-season precipitation is defined as that occurring between May 1 and September 30. During this period, potential evapotranspiration exceeds precipitation throughout the interior valleys of southwest Oregon (Johndro, 1963).

Source of data
We collected data from 62 precipitation stations with monthly precipitation records and adjusted the data using the five southern counties of Coos, Curry, Douglas, Jackson, and Josephine (figure 1). The National Weather Service provided data for three stations, but we estimated data for a few stations from the USDA Forest Service. We estimated dry-season precipitation for another 21 stations where only average annual precipitation was known. We obtained this estimate by multiplying the percent of the annual precipitation occurring during the dry season, based on monthly precipitation records, by the average annual precipitation of the site (Froehlich et al., 1982).

We used data for those supplementary stations on average gauge and screen gauge stations. Sources for these data include the Water Resources Department of the State of Oregon, the USDA Forest Service, and the USDA Soil Conservation Service. We used data for the period 1960-1980 to develop the map. These statistics included those that had at least 10 years of record to enable the long term trends of precipitation. Using these results, we calculated data from stations with shorter periods of record to a common 20-year period.

Preparation of the map
We plotted dry-season precipitation data on a 1:50,000 scale topographic map and divided the region into zones of similar precipitation patterns. We generated this linear regression to determine the variables influencing precipitation distribution within each zone. Elevations were the only variables that were significantly correlated with precipitation. We then contoured zones with similar regression coefficients until only six remained (figure 2). The remaining zones had different mean rates of precipitation or different rates of precipitation increase with elevation (table 1).

Once the geographic (mean-reduced) distribution of precipitation within zones was established, we produced those independent draft maps. We did not explicitly reduce initial to elevational bands, but we mathematically divided them, based on drainage orientation, location of prominent ridges, and potential of rainfall, and then reduced this map into a few prominent ridges. Finally, we merged these maps into the present one.

Characteristics of dry-season precipitation
Dry-season precipitation is approximately 12.4 percent of the average annual precipitation across southwest Oregon. Of the five dry-season months, May is the woman followed by September, June, August, and July is the driest. The proportion of dry-season precipitation occurring in each season is higher than in the annual rainfall (table 1). This may reflect more thunderstorm activity locally, particularly for the mountainous regions.

Late-summer precipitation also tends to come from convective storms (less responsive to orographic influence than frontal storms). This is reflected in the lower correlations of dry-season precipitation with elevation than the average annual precipitation. The driest point in southeast Oregon is small isolated areas near Copper and Williams (1,415, R. 4W., and T. 39S., R. 3W., respectively).

Summary
Dry-season precipitation in southwest Oregon during the five summer months of May through September is only about one-seventh of the average annual precipitation. Differences exist among zones in the proportion of the annual precipitation occurring during the dry season, with proportionally more occurring in the eastern zones. Dry-season precipitation is lowest in the interior valleys, the Rogue River valleys and, approximately two-thirds to three-quarters of the dry season rainfall as similar elevations in the Umpqua Valley. The variations in dry-season precipitation across southwest Oregon are correlated with the constancy of potential evapotranspiration, making it a useful predictor of the region's dry season climate.

<table>
<thead>
<tr>
<th>Table 1: Characteristics of precipitation zones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Rogue Basin</td>
</tr>
<tr>
<td>Umpqua Basin</td>
</tr>
</tbody>
</table>

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This publication was prepared by Daniel M. Mays, Extension watershed specialist, and Dr. Ari A. Froehlich, professor of forest hydrology, Department of Forest Resources, Oregon State University, Corvallis, Oregon. Additional support was provided by the USDA Forest Service, Agricultural Experiment Station, and the Oregon Water Resources Research Institute, University of Oregon, Eugene. This information was produced through a cooperative program of Oregon State University, the U.S. Department of Agriculture, and other agencies that broaden data. Cartographic assistance was provided by the Cartographic Services Department, Extension Service, Oregon State University.

Average Dry-Season Precipitation in Southeast Oregon, May Through September

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Average Dry-Season Precipitation in Southwest Oregon, May Through September

During the hot, dry summer, a major factor affecting the reforestation potential of southwestern Oregon is the availability of soil moisture. Soil moisture will be low enough to limit growth on areas of low precipitation.

Therefore, the availability of precipitation during the dry season, when evapotranspiration demands are greatest, is extremely important to seedling survival. This period is particularly important in the planning of reforestation activities and assessing reforestation potential. Dry-season precipitation is defined as that occurring during the warmest 4-month period, between May 1 and September 30.

Preparation of the map

We plotted dry-season precipitation data on a 1:500,000-scale topographic map and divided the regions into zones of similar precipitation patterns. We linearized regression to determine the percent of the potential evapotranspiration occurring in all dry-season months.

Characteristics of dry-season precipitation

Dry-season precipitation is approximately 12.4 percent of the average annual precipitation across southwest Oregon. Of the five dry season months, May is the wettest, followed by September, June, and August. July is the driest. The proportion of dry-season precipitation occurring in all dry season months is higher in the coastal zones (table 1) than in the upland areas.

Late-summer precipitation also tends to come from convective storms (less responsive to topographic influence) than those found in the spring or summer. This is reflected in the lower correlation of dry-season precipitation with elevation than the average annual precipitation.

Summary

Dry-season precipitation in southwestern Oregon during the five warmer months of May through September is only about one-seventh of the average annual precipitation. Differences exist among zones in the proportion of the annual precipitation occurring during the dry season, with proportionately more occurring in the coastal zones.

Dry-season precipitation is lowest in the interior valleys, the Rogue River valley experiences approximately two-thirds as much dry-season rainfall as similar elevations in the Umpqua Valley. The variations in dry-season precipitation across southwest Oregon can be attributed to the concomitant potential evapotranspiration, making it a useful predictor of the region's dry-season climate.

Table 1. Characteristics of precipitation zones

<table>
<thead>
<tr>
<th>Zone</th>
<th>Mean May-Sept. Precip. (inches)</th>
<th>May-Sept. Percent of Mean</th>
<th>May-Sept. Approximate Increase in Precip. (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rogue Basin</td>
<td>6.4</td>
<td>0.4</td>
<td>0.942</td>
</tr>
<tr>
<td>Umpqua Basin</td>
<td>8.6</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

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Average Dry-Season Precipitation in Southwest Oregon

Maps of dry-season precipitation areas were produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. This publication was provided by the Cordell Commission, Director, and the Oregon State University Extension Service. The Oregon State University Extension Service offers educational programs, activities, and materials without discrimination on the basis of age, color, disability, gender, gender expression, gender identity, genetic information, national origin, race, religion, sex, sexual orientation, or veteran status. Oregon State University Extension Service Extension's programs and activities comply with Title VI of the Civil Rights Act of 1964, the Equal Opportunity Act of 1972, and applicable sections of the Americans with Disabilities Act. For more information, contact your local county Extension office or visit osu.edu/diversity.
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This map of the average dry-season precipitation for southwest Oregon should aid in the planning of reforestation activities and informing reforestation risk. Dry-season precipitation is defined as the occurrence between May 1 and September 30. During this period, potential evapotranspiration exceeds precipitation throughout the interior valleys of southwest Oregon (Johnsgard, 1963).

Both areas receive an average of only 3 inches of precipitation during the dry season and are in the rainshadow of high mountains. Precipitation increases rapidly with elevation, particularly around Copper. The interior of the Rogue Valley receives less dry-season precipitation than the Umpqua Valley. The difference becomes greater with elevation. Green Pass (950 feet) and Medford (1,360 feet) receive 3.1 and 3.0 inches, respectively, of dry-season precipitation, while Roseburg (460 feet) receives 4.1 inches. At elevations around 3,500 feet, the Rogue Valley receives 2.4 inches less precipitation than the Umpqua Valley.

The western Siskiyou Mountains are estimated to receive the greatest amount of dry-season precipitation; however, these estimates are based largely on proportional estimates of the average annual precipitation.

Interpretation
Evapotranspiration demand. Differences in dry-season precipitation across southwest Oregon are only one component of the water balance of any given site. The available moisture-storage capacity of soil is another critical, site-specific factor. Both factors combined to decrease the supply side of the water balance that determines the dry-season precipitation demands of the long, hot summer.

We estimated dry-season precipitation for each of 21 stations where only average annual precipitation was known. We obtained this estimate by multiplying the percent of the annual precipitation occurring during the dry season, based on monthly precipitation records, by the average annual precipitation of the site (Johnsgard et al., 1982).

We based data on these supplemental stations on average gauge station records. Sources for these data include the Waters Resources Department of the State of Oregon, the USDA Forest Service, and the USDG GeoSurvey. We used data for the period 1960-1983 to develop the map. Those stations that had less than 20 years of record were used to establish the long term trend of precipitation. Using these records, we selected data from stations with shorter periods of record to a common 20-year time scale.

Preparation of the map
We plotted dry-season precipitation data on an 1:500,000 scale topographic map and divided the region into zones of similar precipitation patterns. We linearized the data to determine the variables influencing precipitation distribution within each zone. Elevation was the only variable we assumed was significantly correlated with precipitation. We then combined zones with similar regression coefficients until no distinct zones remained (Figure 2). The remaining zones had either different mean rates of precipitation or different rates of precipitation increase with elevation (Table 1). Since the geographic (mean-based) distribution of precipitation zones within the state, we produced three independent draft maps. We did not rigorously restrict the zones to specific ridges, but we relied upon statistical intervals to delimit areas with relatively constant rates of increase. Finally, we refined the maps to fit the zones into the present.

Characteristics of dry-season precipitation
Dry-season precipitation is approximately 12 percent of the average annual precipitation across southwest Oregon. Of the five dry-season months, May is the woman followed by June, September, and August. July is the driest. The proportion of dry-season precipitation occurring in all areas is greater than in the coastal zone (Figure 1). This may reflect more thunderstorm activity locally, particularly for the mountainous regions.

Late-summer precipitation also tends to come from convective storms (less responsive to oceanic influence) than from frontal storms. This is reflected in the lower correlation of dry-season precipitation with elevation than the average annual precipitation.

The drier zones in southwest Oregon are small isolated areas near Copper and Williams (F. 415, R. 4W, and T. 39S, R. 8W, respectively).

Summary
Dry-season precipitation in southwest Oregon during the five summer months of May through September is only about one seventh of the average annual precipitation. Differences occur among areas in terms of the proportion of the annual precipitation occurring during the dry season, with proportionally more occurring in the eastern zones. Dry-season precipitation is lowest in the interior valley, the Rogue Valley receiving approximately two thirds as much dry-season rainfall as similar elevations in the Umpqua Valley. The variations in dry-season precipitation across southwest Oregon are bordered by the concomity of potential evapotranspiration, making it a useful predictor of the region's dry-season climate.

Table 1. Characteristics of precipitation zones

<table>
<thead>
<tr>
<th>Zone</th>
<th>Mean Dry Season Precipitation, inches</th>
<th>Mean Elev., feet</th>
<th>Mean Rate of Increase, inches/1000 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.25</td>
<td>1050</td>
<td>0.3</td>
</tr>
<tr>
<td>B</td>
<td>2.25</td>
<td>1500</td>
<td>0.5</td>
</tr>
<tr>
<td>C</td>
<td>3.25</td>
<td>2000</td>
<td>0.6</td>
</tr>
<tr>
<td>D</td>
<td>4.25</td>
<td>2500</td>
<td>0.7</td>
</tr>
<tr>
<td>E</td>
<td>5.25</td>
<td>3000</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Figure 1. Location of precipitation gages (Oregon Department of Agriculture, Extension Service). A USDA Forest Service weather station is indicated by the open circle.

Figure 2. Zones of similar precipitation occurring in southwest Oregon.

Figure 3. Dry-season potential evapotranspiration as a function of elevation for the interior valleys of southwest Oregon (source: Johnsgard, 1963).

Figure 4. Cumulative frequency curve of dry-season precipitation variation expressed as a percent of a dry-season precipitation occurring at all locations in southeast Oregon.

Figure 5. Dry-season precipitation and moisture stored in the soil over a longer period of time. Plant areas of lowest rainfall rainfall at the spring, progressing to areas of increasingly higher precipitation. This will give seedlings an opportunity to use less water and become established during the only years a limited amount of dry-season precipitation and moisture stored in the soil. Core of competing vegetation will be particularly critical in areas of low dry-season rainfall. Transmission by competing vegetation will adversely affect the soil balance by accelerating the depletion of moisture stored in the soil and the limited rainfall recharge the surficial soil horizons. Maintenance of early annual growth is particularly important because it can rapidly deplete the soil moisture and above the seedling root zone with greater irrigation, excessive root growth. Dry-season precipitation must result in a zone before the water use more lower in the profile. This also reduces the potential for dry-season precipitation to benefit the seedlings. Securely exposures in low-rainfall areas are more apt to result in the habitat provided by shelterwoods or mechanical methods to assure successful reforestation. Fewer opportunities for reestablishing soil moisture on these sites will result in a soil with a low root density. Potentially, these sites will more likely exhibit reduced performance over a longer portion of the outer than when modeling more dry-season precipitation.
Copies of this map are available from the Bulletin Room, Oregon State University, Corvallis, OR 97331, or from the Southwest Oregon FIR Program, OSU Extension Service, Jackson County Office, 1301 Maple Grove Dr., Medford, OR 97501. Ask for OSU Extension publication EM 8226, and enclose $1.25 plus 25¢ for postage and handling.