OREGON
WINEGROWERS
ASSOCIATION
P.O. Box 2134 Salem, Oregon 97301

July 30, 1982

Director
Bureau of Alcohol, Tobacco and Firearms
P.O. Box 385
Washington, D.C. 20044
Attn: Chief, Regulations and Procedures Division

Dear Sir:

In accordance with the procedures delineated in 27 CFR, Section 4.25a(c)(2), the Oregon Winegrowers Association hereby petitions the BATF to establish a viticultural area within the State of Oregon to be known as "Willamette Valley". The Oregon Winegrowers Association is a non-for-profit organization of wineries and vineyard owners, and it submits this petition on behalf of Oregon's winegrape industry.

It will be the task of this petition to show that "Willamette Valley" is the nationally known name refering to this area, that historical and current evidence support the proposed boundaries of this area, and that certain geographic features distinguish this viticultural area from its surrounds. The "Willamette Valley" is part of the Willamette River basin, surrounded on three sides by mountains. The watershed is shown in a map that is Plate II - 2 - 2 of Oregon's Long-Range Requirements for Water, State Water Resources Board, 1969. If we journey figuratively from the valley floor into the foothills and to the mountains, at some point we pass the "limit of viticulture". The limit of viticulture proposed in this petition is in some ways arbitrary due to the size of this homogeneous area, the relative inexperience of Willamette Valley viticulture in trying out extreme sites and the inherent inexactitude of climatological and soil data. However, it is the intention of the Oregon Winegrowers Association to define this area as broadly as geographical data and viticultural experience will allow, so as not to stifle experimentation in new sites. We will leave to future generations of winegrowers the definition of smaller "subregions" within the Willamette Valley which could have much stricter requirements.

"(a) Evidence that the name of the viticultural area is locally and/or nationally known as referring to the area specified in the petition":

The name "Willamette Valley" is known internationally as the valley of the Willamette River, located in northwestern Oregon. Le Grand Livre du Vin, Edita Lausanne, 1969 states: "Oregon, between Washington and California, has several small vineyards of Johannisberg [sic] Riesling, Traminer and Pinot Noir growing in the Willamette Valley south of Portland." The Atlas of Oregon, University of Oregon Books, 1976 uses "Willamette Valley" as one of nine physiographic regions in the state and indicates that "...it is a broad alluvial plain, 160 miles long and up to 65 miles broad." The "Willamette Valley" is also named as one of ten climatic regions in the state. It is the standard name used in all historical, geographical, geological, climatological and agricultural texts to refer to this plain and the adjacent foothills. Its boundaries are generally considered the Coast Range mountains to the west, the Calapooya Mountains to the south, the Cascade Mountains to the east and the Columbia River to the north. Obviously, even a non-technical person differentiates between what he thinks is "Willamette Valley" and what is "Cascade Mountains" - but where to draw a line between the two could vary, depending on its purpose.

"(b) Historical or current evidence that the boundaries of the viticultural area are as specified in the petition":

Again, we find corroboration of the general boundaries of this valley, though no exact duplication of our attempt to specify a "limit of viticulture". The northward flowing Willamette River was first discovered by Europeans on October 29, 1792 by Lieutenant Broughton of the Vancouver Expedition who named it the River Manning. On their way home in 1806, Lewis and Clark were shown the mouth of the river by Indians - they named it Multnomah. "Wal-lamt", an Indian word of unknown meaning, designated a place on the Willamette River near Oregon City. Using various spellings - "Wilarmet", "Wallamut", "Willamett" - the name was first applied to the upper portion of the river. In 1841, Charles Wilkes used "Willamette" throughout his report, U.S. Exploring Expedition, and his usage became the standard. Members of John Jacob Astor's Pacific Fur Company explored, in 1812, "the Garden of the Columbia" (Willamette Valley) finding plentiful game and the McKenzie River, a tributary at the southern end. Farming in the valley began in 1828 when retired, French Canadian employees of the Hudson's Bay Company settled on French Prairie north of Salem. The 1840's saw the opening of the Oregon Trail, with much in-migration throughout the northern part of the valley and scattered settlement in the south. Free land given to settlers by the Oregon Provisional and the U.S. Governments up to 1855 resulted in most of the valuable, i.e. cultivable, land being claimed. A map of these claims (Atlas of Oregon, p. 8) is remarkably close to the boundaries for the viticultural area proposed in this petition.

Leon Adams in The Wines of America (McGraw-Hill, 1978) states: "Among the settlers who came to the territory in wagon trains over the Oregon Trail in the middle of the last century were some who brought vine cuttings and began producing wine in the Willamette Valley south of Portland." He reports that in the 1880 special national census of winegrowing, two Willamette Valley counties, Clackamas and Marion, were reported producing 1900 gallons.

Although Prohibition did not completely destroy the labrusca-based wine industry, only two of the several dozen original wineries remained in 1965 when David Lett planted the Valley's first vinifera vineyard in five decades. "Willamette Valley" was first used as an appellation of origin on an approved wine label by Mr. Lett in 1971. Development of viticulture in the Valley since 1965 has been rapid, conservative in site selection, and remarkably quick to earn international praise. By 1981, bearing and non-bearing vineyards were estimated at 1550 acres by Stanley D. Miles in the Oregon Winegrape Acreage Survey.

During the period 1972 - 1976, the Oregon wine industry developed a set of label regulations for wines produced or bottled in Oregon. These regulations were adopted by the Oregon Liquor Control Commission, becoming effective January 1, 1977. In addition to various strict controls on naming wines, an appellation of origin was required on every wine label with 100% of the grapes for that wine having to come from the appellation area named. During this period, the BATF was attempting to define appellations of origin using political boundaries, so the Oregon regulation used county lines to define three appellations of origin within the state. The Willamette Valley was defined as all portions of Benton, Clackamas, Lane, Linn, Marion, Multnomah, Polk, Yamhill and Washington Counties. These county lines come close to describing the Willamette River watershed, but they include much foothill and mountain land, particularly in the east, that is not suitable for cultivation.

The area within the limit we will propose is over 3.3 million acres. With only 1550 of those acres in vines, it is obvious that simply locating all the vineyards will not help much in defining the limits we seek. However, the four-part General Soil Map contained in Appendix I - 2 of Oregon's Long-Range Requirements for Water (op. cit.) which ranks all the soils in the Willamette basin (except those in National Forest) on their irrigation suitablity, based on soil type and and slope offers some useful evidence in setting our limit. Similarly, LANDSAT satellite photos differentiating forest from agricultural and urban uses, summarized in a map on page 23, Atlas of Oregon, describes in general terms, a contemporary limit of agriculture. These two maps delineate where man can reliably grow his crops (which in the Willamette Valley are as various as anywhere in the world, including fruits, nuts, berries, grain, grass seed, vegetables and nursery stock.) Although these maps show the current expanse of agricultural endeavor, they are in a way a summary of 150 years of experimentation by Willamette Valley farmers. As the valley floor was increasingly populated, farmers were forced to till surrounding foothills. That they have rarely continued farm operations higher than 1000 feet above sea level, gives us a solid basis for setting our limit of viticulture. Afterall, growing grapes has much the same requirements as other horticultural crops. Although the three million plus acres of the Willamette Valley are planted in a wide variety of crops, it is historical and economic factors that have limited the grapevine in that area, not climate and soil suitability. It may well be shown, 50 years in the future, that specific parts of this vast valley produce better wines, ripen certain varieties more reliably, or have a marketing advantage over other areas. At this time, however, there is no reasonable way to exclude from the Willamette Valley appellation any portion of that valley that can be used for horticultural crops.

"(c) Evidence relating to the geographical features (climate, soil, elevation, physical features, etc.) which distinguish the viticultural features of the proposed area from surrounding areas":

The floor of the Willamette Valley is a broad, gently sloping, alluvial plain. The partially forested Salem, Eola and Dundee Hills, Chehalem Mountains and numerous buttes rise 350 to 1200 feet above the valley floor. It is largely on the southerly slopes of these outcroppings and in the foothills of the Coast Range that current plantings of vinifera grapes are located. The lowest are planted on bench-lands scarcely above the valley floor, while the highest are near the 1000 foot level.

As was stated in section (a) above, the Willamette Valley is bounded on three sides by mountains. Though these mountains generally define the valley, these features do not help delineate our limit of viticulture. This is because the crestlines are, in all cases, beyond the long-standing limit of cultivation. Our limit of viticulture must be found instead somewhere in the foothills of these mountains. It is important to realize, however, that the mountains give the Willamette Valley its unique and homogeneous climate. The Coast Range on the west keeps out much of the 100 inches of rain that falls annually on the coast, while holding in much of the summer heat. The Cascade Mountains to the east of the valley also form a precipitation and temperature barrier. The Valley has an average 40 inches of rain annually, whereas east of the Cascades receives less than 10 inches. Valley temperatures are mild, averaging 40°F in the winter, 68° in summer. Eastern Oregon temperatures are more extreme, 28° in winter, 75° in summer. The Calapooya Mountains separate the Willamette Valley from the Umpqua Valley to the south. Through the climates of the two valleys are similar, the Umpqua Valley is higher and more sheltered from the ocean, and thus is drier, colder in winter and warmer in summer. The only feature we will use to delineate the viticultural area boundary is that at the north end of the valley - the Columbia River. It is the most accepted division, being also the Oregon State line, even though from a geographic standpoint, it is not the actual limit of the Willamette Valley climate and soils.

To understand climatogical features, we can use Warren Aney's "Wine-Grape Adaptation to Oregon Climates" in the Proceedings of the Oregon Horticultural Society, 1974. In that paper, Mr. Aney analyzes four limiting climatological factors: The first, winter severity, is not an important factor in the Willamette Valley, since the 20-year minimum temperature is between -1°F and 4° in all parts of the valley. Summer heat was differentiated by use of Winkler's heat summation index (April - October degree days over 50°F) which ranged from 1765 in the foothills of the coast Range to 2380 in Portland, all clearly Region I by California standards. Aney used Thornthwaite's Potential Evapotranspiration Index (PET) (April - October only) to compare climates in terms of plant response to temperature and day length. The PET index varied little in the Willamette Valley - 24.2 in the center of the valley floor, 22.3 in the Coast Range foothills. Growing season was studied in terms of days between 32°F frosts. Generally the valley has over a 200-day growing season, though a few climatological stations located in frost pockets on the valley floor have seasons as short as 165 days. Portland, by comparison, is shown having 279 days between frosts.

Mr. Aney overlaid maps of these four limiting factors to arrive at a composite map of "Areas Suitable for Wine-Grape Growing in Oregon". The climate of the Willamette Valley was rated as "optimal" or "close behind" (ratings of 8,7 and 6 on a scale of 1 - 8). The delineation of climate score 6 draws an outline around the Willamette Valley very close to our proposed limit of viticulture. Obviously, as we proceed from the Willamette Valley floor into the foothills surrounding it, insufficient summer heat, lack of plant response, and a shortened growing season all prevent normal horticulture. Winter kill would be an additional problem in the Cascade Mountains.

Precipitation was not included in the study by Mr. Aney. In spite of its rainy reputation, the Willamette Valley has a mediterranean precipitation pattern with an average of 7 inches of rain in December and January, but less than ½ inch in July and August. A map of the "Number of days with more than 12.5mm [½ inch] of precipitation" in the Atlas of Oregon, p. 133 clearly outlines a Willamette Valley remarkably similar to our proposed viticultural area. It is shown having 30 - 40 such damp days per year.

There are two basic types of soil in the Willamette Valley: Soils of the floodplains and terraces are dominated by Mollisols, dark-colored, friable, organic-rich, slightly acid, silty-loams. Poorly drained soils are common because of subsurface clay horizons. The upland soils are primarily Ultisols, strongly weathered, highly variable, well-drained,moderately acid, usually red, clay-loams. Both of these soil types are "Xeric", that is developed in winter-wet, summer-dry climates. A map of Oregon soils on page 125 of the Atlas of Oregon clearly differentiates these valley soils from the Inceptisols of the higher mountain foothills - the mountain soils result from steeper slopes, dense coniferous vegetation and heavier winter precipitation. The limit of the valley soils shown in that map is virtually identical to the proposed limit of viticulture, except as those soils extend along the Columbia River in the north and spill over into the Umpqua River basin at the south end.

Soils are also classified according to land capability from Class I (most suitable for cultivated crops) to Class VIII (land not suitable for cultivation grazing or forestry). The map on page 127 of the Atlas of Oregon shows our proposed viticultural area to be made up of the cultivable soil classes. In fact, the line separating those four classes from the four uncultivable classes makes a line around the Willamette Valley which again closely parallels our limit of viticulture.

Natural vegetation is another geographic factor to be considered. The Atlas of the Pacific Northwest, Oregon State University, 1973 has a map on page 56 which clearly separates the "Willamette Prairie-Forest Type" from the surrounding "Western Hemlock Type" of the Coast Range and western slope of the Cascades. The "Willamette Prairie-Forest Type" is "confined to the alluvial bottomland and adjacent slopes of the Willamette Valley [and] is ... a complex mosaic of forest, woodland, open savanna with grassland understory, and prairie. Most of the original vegetation has been altered by agricultural and residential activities...." We find in the differentiation of this vegetation type more evidence to support our proposed limit of viticulture.

Turning to elevation, we find the floor of the Willamette Valley to vary in elevation from 400 feet near Eugene to near sea-level where the Willamette flows into the Columbia River near Portland. The Coast Range crestline averages 1500 feet, with its highest point, Marys Peak, 4096 feet. The Cascades average 3000-5000 feet; Mount Hood rises to 11,240 feet. The Calapooya Divide is as low as 800 feet near Cottage Grove, but rises to 5000 feet where it intersects the Cascade crest. The cross-section maps on page 112 of the Atlas of Oregon show slices at the widest and narrowest parts of the valley. As a general rule, the valley floor and foothills slope gradually up to the 1000 foot level. The slopes then become steeper, less hospitable to horticulture. When we outline the 1000 foot contour line (see enclosed USGS maps) around the Willamette River watershed, we find that line coinciding with the several other geographically differentiating factors studied in this section.

By way of summary, then, the Willamette Valley of our proposed viticultural area:
- is within the watershed of the Willamette River.
- is primarily agricultural and residential in use.
- has as its northern boundary the Columbia River.
- has a remarkably homogeneous climate, differentiated from its surrounds by mountains to the west, south, and east.
- has "Xeric" soils in land capability classes I - IV, and mixed native vegetation.
- consists of a broad alluvial plain, several outcropping bedrock hills and buttes, and the gently sloping, cultivable, non-forested, lower foothills of the surrounding mountains generally up to the 1000 foot level.

"(d) A description of the specific boundaries of the viticultural area, based on features which can be found on United States Geological Survey (USGS) maps of the largest applicable scale." We will use the 1000 foot contour line as the basic boundary of the Willamette Valley viticultural area. There are places on the north, west and south boundaries where the limit of the Willamette River watershed is below that elevation. There we will make use of political boundaries, township lines or abstract lines between two defined points to approximate the limit of the watershed. Additionally, in the Cascade foothills, there are several long, steep-walled valleys right at the 1000 foot elevation. We have chosen to exclude these from the viticultural area since no cultivable land is involved. Lastly, in the Cascade foothills just north of Sweethome and particularly between the North Santiam and Sandy Rivers, there are sizeable tracts of good, cultivable land on ridges above the 1000 foot contour. Though these areas are likely too cold and wet for most vinifera varieties, French hybrid varieties could easily be grown in these locations. Township lines seem to best approximate the extent of irrigible land in these areas.

Enclosed are three USGS maps scaled 1:250,000 entitled
(1) "Vancouver", Location Diagram NL 10-8
(2) "Salem", Location Diagram NL 10-11
(3) "Roseburg", Location Diagram NL 10-2

In the description that follows, the mileages indicated are approximate and are given only to facilitate locating the required points on the maps.

The Willamette Valley viticultural area is located in the northwest part of the State of Oregon. From the beginning point at the intersection of the

Columbia/Multnomah County line and the Oregon/Washington State line in Township T3N/R2W, the boundary follows the Columbia/Multnomah County line 8½ miles west to its intersection with the Washington/Multnomah County line;

(1) Thence south along the Washington/Multnomah County line one mile to its intersection with the 1000 foot contour line;

(2) Thence along that contour line, first east into Multnomah County, but shortly west into Washington County, to a point on that contour line exactly ½ mile north of "Tophill" in Township T3N/R4W;

(3) Thence due west ½ mile, returning to the 1000 foot contour line;

(4) Thence along that contour line in a generally southerly direction, into Yamhill County, to its intersection with the Yamhill/Tillamook County line;

(5) Thence west along that County line ½ mile to the 1000 foot contour line;

(6) Thence along that contour line in a westward direction to the boundary of the Siuslaw National Forest;

(7) Thence south along that boundary 5 miles to its intersection with the Polk/Yamhill County line;

(8) Thence south along the Polk County line 2½ miles, returning to the 1000 foot contour line;

(9) Thence along that contour line into Polk County and eventually into Benton County to its intersection with the western boundary of Benton County;

(10) Thence along the Benton County line south 9½ miles to boundary of the Siuslaw National Forest;

(11) Thence east 6 miles and south 1¼ miles along that boundary to the boundary of the City of Corvallis Watershed;

(12) Thence east and south along the Watershed boundary 6 miles, returning to the boundary of the Siuslaw National Forest;

(13) Thence south and west along the Forest boundary 2 miles, back to the 1000 foot contour line;

(14) Thence south along that contour line into Lane County to the T17S/T18S township line;

(15) Thence east along the T17S/T18S line 4½ miles to the R6W/R7W line;

(16) Thence south along the R6W/R7W line 2½ miles to the 1000 foot contour;

(17) Thence southwest along that contour line to the R5W/R6W line;

(18) Thence south 1¼ miles along the R5W/R6W line to its point of intersection with the T18S/T19S line;

(19) Thence southeast 8½ miles along an imaginary line to the intersection of township lines R4W/R5W and T19S/T20S;

(20) Thence east along the the T19S/T20S line 1½ miles to the 1000 foot contour line;

(21) Thence north, eventually south again along the 1000 foot contour line to the Douglas/Lane County line;

(22) Thence south along that County line 1¼ miles, returning to the 1000 foot contour line;

(23) Thence east, then north along that contour line to its intersection with the R1W/R1E township line;

(24) Thence north along the R1W/R1E line 3/4 mile, returning to the 1000 foot contour;

(25) Thence west along that contour line returning to the R1W/R1E line;

(26) Thence north along the R1W/R1E line 1½ miles to the 1000 foot contour;

(27) Thence west along that contour line back to the R1W/R1E line;

(28) Thence north along the R1W/R1E line ½ mile to the 1000 foot contour;

(29) Thence along that contour line, up the McKenzie River valley, to the R2E/R3E township line;

(30) Thence north along the R2E/R3E line ¼ mile, back to the 1000 foot contour line;

(31) Thence along that contour line, first west, then generally north, into Linn County, up the Calapooia River valley into township T14S/R1E, to the T14S/T15S township line;

(32) Thence east along the T14S/T15S line 2 miles back to the 1000 foot

contour line;

(33) Thence along that contour line to the R1E/R1W line;

(34) Thence north along the R1E/R1W line ½ mile back to the 1000 foot contour line;

(35) Thence northwest along that contour line, then back to the R1E/R1W line;

(36) Thence north along the R1E/R1W line 5½ miles to the T12S/T13S township line;

(37) Thence west along the T12S/T13S line 4 miles to the 1000 foot contour;

(38) Thence north along that contour line into the North Santiam River valley to the R3E/R4E line;

(39) Thence north along the R3E/R4E ½ mile, into Marion County, to the 1000 foot contour line;

(40) Thence west along that contour line to the R1E/R2E township line;

(41) Thence north 2 miles to the boundary of Silver Falls State Park;

(42) Thence along that Park boundary, starting west, returning to the R1E/R2E township line;

(43) Thence north along the R1E/R2E line 8 miles to the T6S/T7S line;

(44) Thence east along the T6S/T7S line 6 miles into Clackamas County to the R2E/R3E line;

(45) Thence north along the R2E/R3E line 6 miles to the T5S/T6S line;

(46) Thence northeast 8½ miles along an imaginary line to the intersection of township lines T4S/T5S and R3E/R4E;

(47) Thence east 6 miles along T4S/T5S to the R4E/R5E line;

(48) Thence north 6 miles along the R4E/R5E line to the T3S/T4S line;

(49) Thence east along the T3S/T4S line 6 miles to the R5E/R6E line;

(50) Thence north along the R5E/R6E line 10½ miles, across the Sandy River, to the boundary of the Mt. Hood National Forest;

(51) Thence west and north along that Forest boundary 5 miles, across Bull Run River to the 1000 foot contour line;

(52) Thence north along that contour line, into Multnomah County to the R4E/R5E township line;

(53) Thence north along the R4E/R5E line and its imaginary extension into the center of the Columbia River, to the Oregon State boundary line;

(54) Thence, if you are not blind by this point in the description, west along the Oregon State line, some 34 miles to the point of beginning.

We estimate that the area enclosed by this line is some 3.3 million acres.

A footnote to this description is that from a geographical standpoint, the same soils, landforms, climate, and land uses cross into Washington State in the western part of Clark County and the southern tip of Cowlitz County. There is, in fact, one commercial vineyard in Clark County at this time. The Atlas of the Pacific Northwest shows this portion of Washington included in the Willamette Valley on a map of Landform Regions on page 34. The Vegetation map on page 56 and the Soils map on page 60 do so, too. However, we have been unable to find any historical or current non-geographic use of the term "Willamette Valley" which includes that part of Washington.

We recommend that the BATF resolve what viticultural area designation should be applied to this area of Washington prior to final action on this Willamette Valley petition. Since all geographic data points to including it in the Willamette Valley designation, we would welcome such action, in spite of the lack of evidence supporting its traditional inclusion.

A last point should be made about our petition. Any description of such a large area must be greatly generalized. Our attempt has been to include all existing or potential vineyard sites. If any such sites come to light during the evaluation of this petition, we would urge they be included in the final description of the viticultural area.

Thank-you for the opportunity to submit this petition.

Sincerely,

David B. Adelsheim
Chairman, Appellation Committee
Oregon Winegrowers Association

Please address correspondance concerning this petition to:

David B. Adelsheim
Adelsheim Vineyard
[redacted]
Newberg, Oregon 97132

OREGON WINEGROWERS ASSOCIATION
P.O. Box 2134 Salem, Oregon 97301

January 19, 1983

Mr. James Ficaretta
Research & Regulations Branch
Bureau of Alcohol, Tobacco & Firearms
Department of the Treasury
Washington, D.C. 20226

Dear Mr. Ficaretta:

Enclosed you will find the various materials you requested by phone to support our July 30, 1982 petition for approval of the proposed viticultural area, "Willamette Valley".

Petition Reference	Source
p.2, 1st paragraph	Atlas of Oregon, p. 8, Donation Land Acts
p.2, 3rd paragraph	Oregon Winegrape Acreage Survey by Stanley Mills
p.2, 5th paragraph	General Soil Map of the Willamette Drainage Basin, 4 sheets from Appendix I - 2, Oregon's Long-Range Requirements for Water
p.3, 1st paragraph	Atlas of Oregon, p. 23, LANDSAT Land Use Map
p.3, 4th paragraph	"Wine-Grape Adaptation to Oregon Climates" by Warren Aney in the Proceedings of the Oregon Horticultural Society, 1974. Recent letter on same subject by Mr. Aney
p.4, 3rd paragraph	Atlas of Oregon, p. 133, Precipitation Frequency
p.4, 5th paragraph	Atlas of Oregon, p. 127, Land Capability Classification
p.4, 6th paragraph	Atlas of the Pacific Northwest, p. 56, Vegetation
p.7, 2nd paragraph	Atlas of the Pacific Northwest, p. 34, Landform Regions
p.7, 2nd paragraph	Atlas of the Pacific Northwest, p. 60, Soils

I have been unable to find a map of the existing vineyards in the Willamette Valley. I have, however, included a recent mailing list of known grape growers in Oregon, which was used to compile the Oregon Winegrape Acreage Survey. Those counties not in the Willamette Valley have been crossed out. To produce a map from those names would require a lengthy phonecall to each to ascertain each vineyard location, a project we do not have the resources to currently carryout. And, in any case, that would still only show where people thus far have decided to try growing grapes. It would provide no further information about where grapes could grow, which is the real object of our petition.

Please excuse the tardiness of this response, and do not hesitate to ask for other materials that could make your task in our behalf easier.

Sincerely,

David B. Adelsheim
Adelsheim Vineyard
Route 1, Box 129D
Newberg, OR 97132

Atlas of Oregon, p. 8.

DONATION LAND ACTS

The Federal Government began disposing of land in the public domain during the earliest days of the Republic. In 1785 the United States Land Office Survey began a survey of the territory lying north and west of the Ohio River in order to identify the lands to be sold to settlers. By 1822 arguments were presented to Congress for free grants of land specifically to settlers of the Oregon country. The Preemption Act of 1830 gave settlers uncontested rights to purchase 160 acres (65 hectares) at minimum government prices if they had been settled and occupied in advance of the first federal land survey.

In 1838, Senator Linn of Missouri began his annual crusade to grant settlers of the Oregon country a full section of land (259 ha). Linn's bill was passed by the Senate in 1843, but failed in the House, even though Florida settlers had been granted 160 acres free the year before to compensate them for settling in a "dangerous frontier area."

When the Provisional Government at Champoeg adopted the Organic Act of 1843, members incorporated a provision allowing any male to claim 640 acres free. The claims were to be designated "by natural boundaries, or by marks at the corners" and to be "in square or oblong form, according to the natural situation of the premises." The Donation Act of 1850 was passed, after Oregon had become a territory in order to confirm existing claims and to define the terms of later ones. It was not much stricter with regard to boundaries. Under the terms of this act married couples who arrived prior to December, 1850, received 640 acres and single males were granted 320 acres. Later arrivals were allowed 320 acres if married, 160 otherwise until December 1853. This limit was extended to 1855, when all free granting was ended.

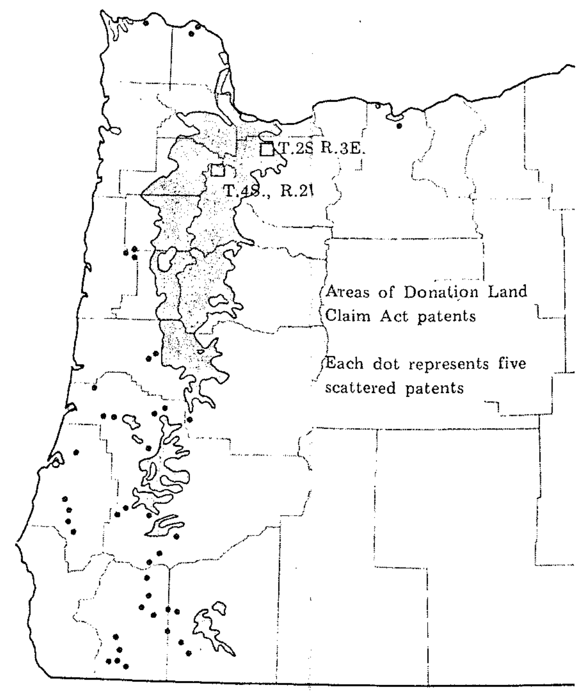
The results of such claims were obvious on any cadastral map. The boundaries of the earliest claims, while almost universally straight lines, conformed much more to natural features than to the cardinal directions. The land taken up before 1850 is therefore marked by irregularity of shape and direction; such properties are illustrated in the upper township and in the southern part of the lower township shown on this page.

The second layer of settlement is more regular. It represents the large body of land taken up between 1850 and 1855 under the second portion of the Donation Act. These claims formed squares or rectangles oriented to the points of the compass as in sections 59 and 60 of the lower township. Most of the valuable land in the western valleys of Oregon was claimed by right of settlement by 1855, as shown on the accompanying map of Donation Claims.

The third layer of settlement is illustrated by the square sections of the township and range land survey. The change in settlement patterns imposed by the survey is particularly obvious where the survey was superimposed on the earlier claims. The northern part of T2S R3E was largely unclaimed before 1855 and is dominated by the square sections of the township and range system numbered 1 to 36. The southern part is dominated by Donation Claims, which are identified by numbers larger than 36. Note the small pieces of sections 19 to 36 that were not taken up by Donation Land Claims.

The Oregon Donation Act land grants, though small compared to Spanish grants in California and the Southwest, were large by American standards, and highly unusual in being free. Free land in Oregon was rationalized on the basis of the cost to settlers of travelling across the continent and on the desirability of settling this faraway region separated from the American heartland by hundreds of miles of slow overland travel or by thousands of miles of sailing.

The practical effect of large free grants on Oregon settlement is



DISTRIBUTION OF DOMTION LAND CLAIMS

Simplified from map 1, page34, in dissertation of Harlow Head referenced blow.

ment boom of the 1850's. Territoal population went from under 13,000 in 1850 to over 35,000 in 153 and to more than 52,000 in 1860. On the other hand, after 185!Oregon settlers were permitted to buy their lands at $1.25 per acre.fter a single year of occupancy. Even in 1860, the opportunity to prchase 640 acres for only $800 must have been almost as great a ire as free land, particularly to prospective farmers who could affol the costly trip overland. It is probable that Oregon would havebeen settled almost as rapidly without the benefit of the DonatiorAct, but the settlement pattern might have been different and the clastral map would certainly not have been the same.

Bibliography

Barquist, James. *The Oregon Dontion Act and the National Land Policy*. Oregon Historical Quartely, Vol. 58, No. 1, March, 1957, pp. 17-35.

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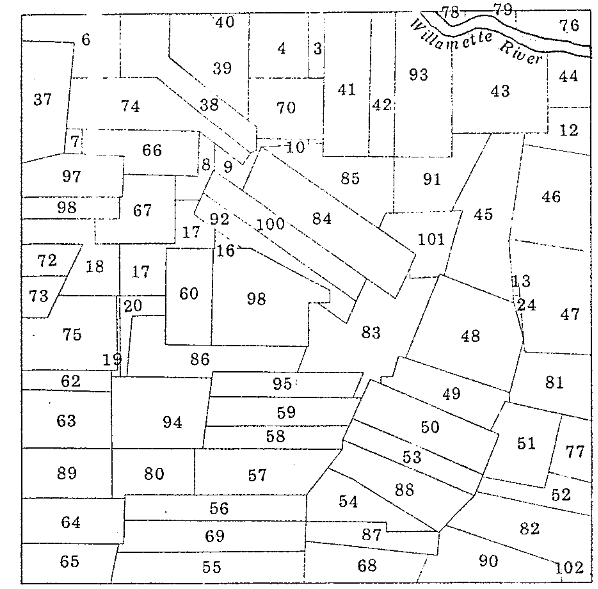
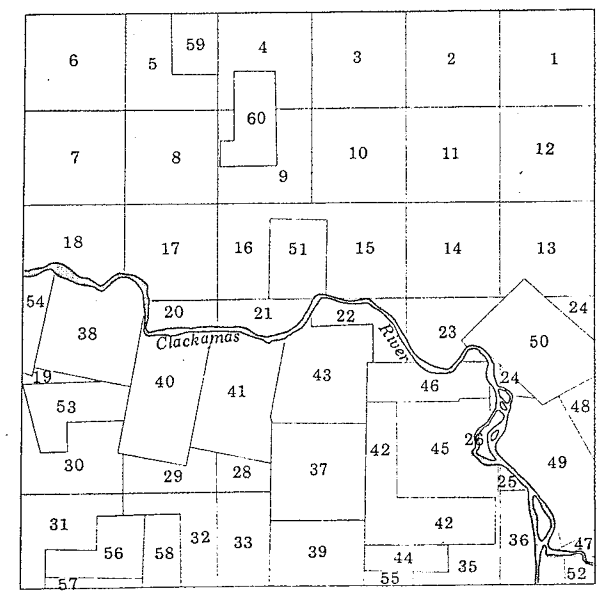


Surveyed Lines T.4S., R.2W., Willamette Meridian

Source: U.S. Geological Survey 1:24,000 scale quadrangles St. Paul, Woodburn, Newberg, and Sherwood.



Surveyed Lines T.2S., R.3E., Willamette Meridian

Source: U.S. Geological Survey 1:62,500 scale quadrangle Sandy.

EXTENSION SERVICE Oregon State University Corvallis, Oregon 97331

May 12, 1982

TO: Oregon Winegrape Growers and Other Interested Parties

FROM: Stanley D. Miles, Extension Economist

SUBJECT: 1981 Survey of Winegrape Acres in Oregon

Attached is a report summarizing the 1981 acreage survey. Thanks to those of you that provided the data. I realize that we didn't get questionnaires returned from all grape growers but feel that at least 80% of the acreage is included. If you know of a vineyard(s) that is not included in the report, please send me the name and address. We may make a similar survey again.

This project proved to be interesting to me, and I trust it is of interest to you. The wine business in Oregon is gradually expanding, with stories about new operations and plantings. It is in the best interest of all concerned to keep tabs on the industry's growth.

The report should be self-explanatory, but please let me know if there are any questions.

Oregon Winegrape Acreage Survey
by Stanley D. Miles*

1981 Survey

In the summer of 1981, the Viticulture Survey Committee of the Table Wine Research Advisory Board wrote a letter to the Extension Service asking for help in making a survey to determine the acreages, by variety, of winegrapes in Oregon. A survey form was developed and mailing lists of grape growers were acquired. In November, 1981 the survey form was mailed to those on the mailing lists. In January, 1982, a follow-up request was sent to those that had not responded. In addition, personal contacts were made to gather acreage data from non-respondents.

While we know that not all grape growers responded to the survey, it is thought that data in this report includes 80 percent or more of Oregon's winegrape acres. Anyone reading this who was not included or knows of other vineyards is encouraged to send us names and addresses.

Contents

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*Extension Economist, Oregon State University, Corvallis, Oregon.

Victor Kreimeyer and Rodger Kohnert were very helpful in completing this survey.

Table I
Acres of Oregon Winegrapes

Variety	Bearing (acres)	Nonbearing (acres)	Total
Pinot Noir	241.1	162.7	403.8
White Riesling	176.7	89.4	266.1
Chardonnay	151.9	120.5	272.4
Cabernet Sauvignon	40.0	23.4	63.4
Gewurztraminer	42.5	51.8	94.3
Gamay Beaujolais	13.8	4.6	18.4
Merlot	7.3	3.0	10.3
Sauvignon Blanc	8.3	3.6	11.9
Muller Thurgau	2.2	14.3	16.5
Zinfandel	1.2	---	1.2
Pinot Gris	1.7	27.0	28.7
Miscellaneous Red	1.1	6.5	7.6
Miscellaneous White	17.7	6.7	24.4
Other 1/	12.6	5.9	18.5
Total acres	718.1	519.4	1,237.5

1/ Varieties not specified.

Table II
Size of Vineyard Operations
Oregon

Size of acreages	Bearing		Nonbearing		All	
	total vineyards	total acres	total vineyards	total acres	total vineyards	total acres
0 - 5.0	43	93.1	59	154.3	52	122.8
5.1 - 10.0	14	117.4	17	125.9	23	179.0
10.1 - 15.0	8	97.6	11	143.0	14	175.3
15.1 - 20.0	5	84.3	1	19.0	10	177.8
20.1 - 25.0	5	110.6	2	41.7	6	132.1
25.1 - 30.0	2	57.1	---	---	7	197.2
30.1 & over	3	158.0	1	35.5	5	254.8
Total	80	718.1	91	519.4	117	1,239.0*

*Some totals may not be the same due to rounding.

Number of Respondents

There were 80 grape growers reporting bearing vineyards and 91 reporting nonbearing vineyards. Most of those with bearing acres reported some nonbearing acres but many with nonbearing acres appeared to be just getting into the business.

Vineyard operations in Oregon are quite small. Of the 80 reporting bearing acreages only 3 operations had 30 or more acres. Fifty-seven or 71 percent of the 80 operations had 10 acres or less.

Of the 91 operations reporting nonbearing acres, almost all (87) had 15 acres or less. In most cases, however, these grapegrowers also have bearing vineyards.

Table III
Oregon Winegrape Acreage
Bearing
1981

Variety \ County	Benton	Clackamas	Douglas	Jackson	Josephine	Lane	Linn	Marion	Polk	Washington	Yamhill	Other ounties	Total
Pinot Noir	2.1	.5	15.4	2.8	7.5	1.0	17.5	13.5	6.8	51.2	121.8	1.0	241.1
White Riesling	4.2	.5	32.3	.8	2.0	4.0	4.3	6.5	2.2	54.2	64.9	.8	176.7
Chardonnay	1.4	.3	8.9	14.2	.2	5.0	.3	6.0	2.8	28.3	84.5	-	151.9
Cabernet Sauv	1.4	-	11.3	20.1	1.2	3.5	.3	-	-	-	2.2	-	40.0
Gewurztraminer	.5	-	9.7	2.0	3.0	3.5	.7	-	-	14.5	8.6	-	42.5
Gamay Beaujolais	-	-	2.5	3.2	1.0	-	-	3.0	.8	-	3.3	-	13.8
Merlot	-	-	-	3.5	.5	-	-	-	-	-	3.3	-	7.3
Sauvignon Blanc	-	-	5.0	.6	-	-	-	-	-	1.0	1.7	-	8.3
Muller Thurgau	-	-	-	-	-	-	.2	-	-	.7	1.3	-	2.2
Zinfandel	-	-	1.2	-	-	-	-	-	-	-	-	-	1.2
Pinot Gris	-	-	-	-	-	-	-	-	-	1.0	.7	-	1.7
Miscellaneous Red	-	-	-	-	-	.1	-	-	-	-	1.0	-	1.1
Miscellaneous White	.1	.2	5.0	.7	-	1.2	.5	-	2.0	5.6	2.4	-	17.7
Other 1/	1.3	5.0	-	3.0	-	-	-	-	-	1.0	1.3	1.0	12.6
Total	11.0	6.5	91.3	50.9	15.4	18.3	23.8	29.0	14.6	157.5	297.0	2.8	718.1

1/ No specific description given.

Table IV
Oregon Winegrape Acreage
Nonbearing
1981

Variety \ County	Benton	Clackamas	Douglas	Jackson	Josephine	Lane	Linn	Marion	Morrow	Polk	Washington	Yamhill	Other Counties	Total
Pinot Noir	5.1	3.1	12.0	2.0	15.4	13.5	4.0	5.5	-	19.1	41.3	41.7	-	162.7
White Riesling	7.6	1.3	10.5	-	3.0	19.9	.5	5.0	1.5	.7	9.4	30.0	-	89.4
Chardonnay	1.0	2.0	13.0	2.9	7.3	4.5	3.0	4.7	-	16.8	26.6	38.7	-	120.5
Cabernet Sauv	3.8	-	.1	.7	1.8	4.0	6.0	.5	1.5	1.5	1.5	.7	.5	23.4
Gewurztraminer	1.0	-	5.6	1.2	6.6	12.4	7.5	1.5	1.4	7.0	7.5	.1	-	51.8
Gamay Beaujolais	-	2.0	-	-	1.8	-	-	-	-	-	.5	.3	-	4.6
Merlot	.5	-	-	.4	.3	-	-	-	1.3	-	-	.5	-	3.0
Sauvignon Blanc	-	-	-	1.2	-	-	-	.3	1.5	-	-	.6	-	3.6
Muller Thurgau	-	-	-	-	2.0	-	-	.5	-	-	1.0	10.8	-	14.3
Zinfandel	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pinot Gris	-	-	-	-	-	-	-	-	-	-	-	27.0	-	27.0
Miscellaneous Red	-	-	-	-	-	-	-	-	-	-	-	6.5	-	6.5
Miscellaneous White	.1	.2	-	-	2.0	.2	-	.1	1.3	.5	.5	1.8	-	6.7
Other 1/	.5	1.3	.3	.8	-	-	-	-	-	-	.3	2.5	1.0	5.9
Total	19.6	9.9	41.5	9.2	40.2	54.5	21.0	18.1	8.5	45.6	88.6	161.2	1.5	519.4

1/ No specific description given.

Table V

Oregon
Total Grape Acreage

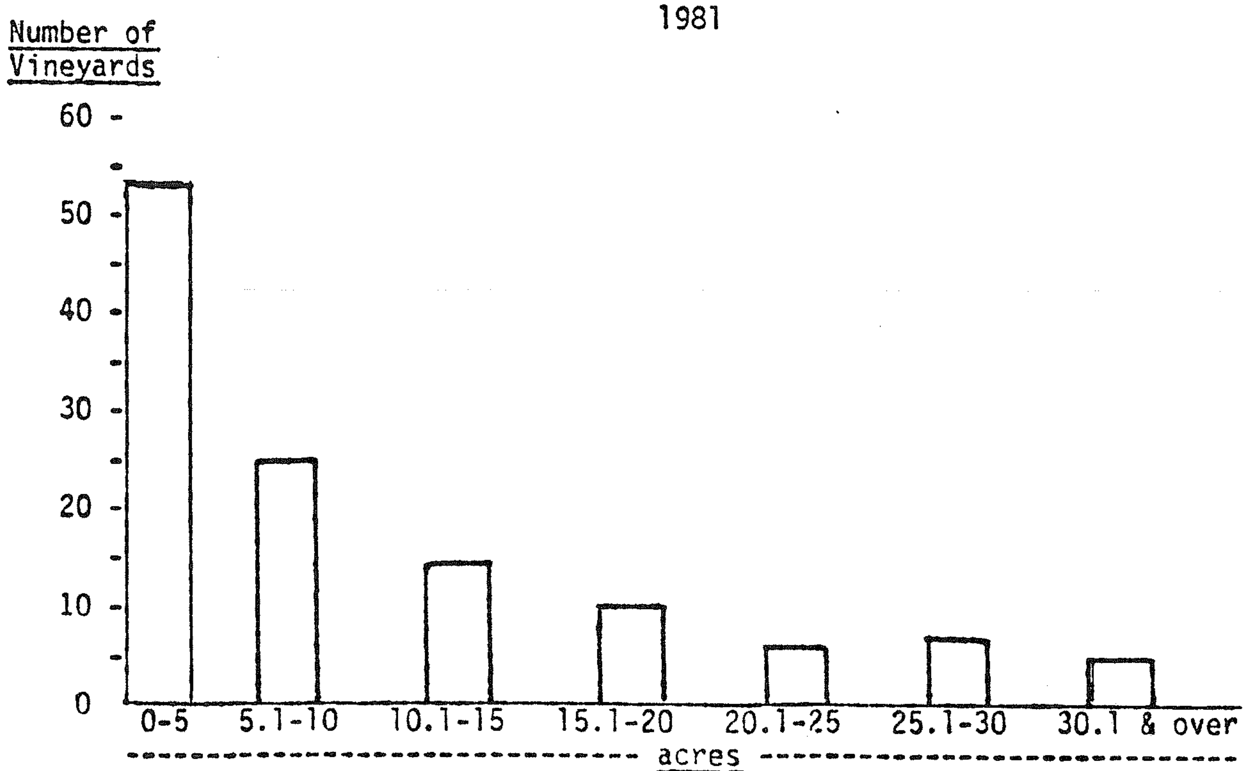
Number of Vineyards

1981

Size of Acreage \ County	Benton	Clackamas	Douglas	Jackson	Josephine	Lane	Linn	Marion	Polk	Washington	Yamhill	Other Counties	Total farms	Total acres
--- acres ---														
0 - 5.0	4	9	6	3	7	2	-	1	4	9	4	3	52	122.8
5.1 - 10.0	-	-	2	1	2	5	-	2	1	2	8	-	23	179.0
10.1 - 15.0	-	-	2	-	1	-	1	1	-	4	5	-	14	175.3
15.1 - 20.0	1	-	1	1	1	-	-	1	-	3	2	-	10	177.8
20.1 - 25.0	-	-	-	-	-	-	-	-	-	2	4	-	6	132.1
25.1 - 30.0	-	-	2	1	-	1	1	-	-	-	2	-	7	197.2
30.1 & over	-	-	-	-	-	-	-	-	1	1	3	-	5	254.8
Total	5	9	13	6	11	8	2	5	6	21	28	3	117	1,239.0

Size Distribution

1981



Acres Reported

Survey respondents reported 718 acres of bearing vineyards. Pinot Noir was the primary variety grown with 241 acres. The three main varieties were Pinot Noir, White Riesling, and Chardonnay with a combined acreage of 570 acres or almost 80 percent of the total.

There were 519 nonbearing vineyard acres reported. The same three varieties (as reported above) were dominant. Over 70 percent of the nonbearing acres were in these three varieties: Pinot Noir, White Riesling, and Chardonnay. Yamhill County growers reported more grape acres, both bearing and nonbearing, than any other county. Washington County was second; in fact, between the two counties, they had 455 acres or 63 percent of the bearing acreage and about half of the nonbearing acres.

Table VI
Winegrape Yields & Prices
1981

Variety	Average Yield	Prices Reported in $/ton		
		Weighted Average	High	Low
Pinot Noir	1.41	573	800	361
White Riesling	2.33	592	900	280
Chardonnay	1.65	726	930	600
Gewurztraminer	1.87	668	800	540
Cabernet Sauvignon	2.31	612	700	500

Prices & Yields

While the acreages by variety were quite complete on the survey forms, the yield and price data was not complete. We did, however, tabulate yield and price information from the forms that provided this data. The above table summarizes this information.

In reviewing this, remember the data was not complete and no standards were used as to quality. Sugar content of course affects price, and bunch rot and/or materials other than grapes (M.O.G.) affect both price and yield.

The yields appear to be quite low. Things affecting this might be the particular year, many of the vineyards may be young and not in full production, yield may in fact be low and this is a problem, or a combination of the things mentioned.

Vineyard Respondents

Benton County

Alpine Vineyards
Mary's Peak Vineyard
McClain's Vineyard
Natural High Farms
Spielhof Vineyards

Clackamas County

Big Fir Winery
Joplin, Carl & Olga
Kellar's Cellar
Ladd Hill Vineyard
Milliren, Steve
Needy Vineyards
North Willamette
  Experiment Station
Pinot Submarine
Walman, Don
Wasson, Jim

Douglas County

Anderson Vineyard
Ber-Mar Vineyards
Doerner, Douglas
Elkton Vineyards
Gates' Elgarose Vinery
Henry Vineyard
Hillcrest Vineyard
Red Hill Vineyard, Feren
Red Hill Vineyard, Howell
Sims Vineyard
South Umpqua Vineyard
Vinedo Vineyard
Vinorch Vineyard

Jackson County

Dunbar Orchards
Evans Valley Vineyard
Gebhard Orchards
Hummingbird Hill Vineyard
Layne Vineyard
Ousterhout, John
Valley View Vineyard

Josephine County

Dively, Edna Milar
Feehely's Foothill Farm, Inc.
Ferrell, Don
Gerber, Ted
Great Oak Vineyard
Helen's Vineyard
Lakeshore Vineyard
Oregon Caves Winery
Pair-A-Dice Vineyard
Rockydale Vineyards
Siskiyou Vineyards Company

Lane County

Forgeron Vineyards
Hinman Farms
McIntire, Pauline
McKenzie River Vineyard
Peaceful Valley Vineyard
Schalvichris Vineyards
Smith, David
Wipper, Florian
Wright, W. A.

Linn County

Markheim Vineyards
Meadow's Vineyard

Marion County

Porter's Vineyard
Silver Falls Vineyard
Skyline Vineyard
Sunnyside Vineyards
Wahl Vineyard

Polk County

Ashford, Jason
Bethel Heights Vineyard
Cooper Hollow Vineyard
Feltz, James H.
Glenn Creek Vineyard
Spring Valley Vineyard

Washington County

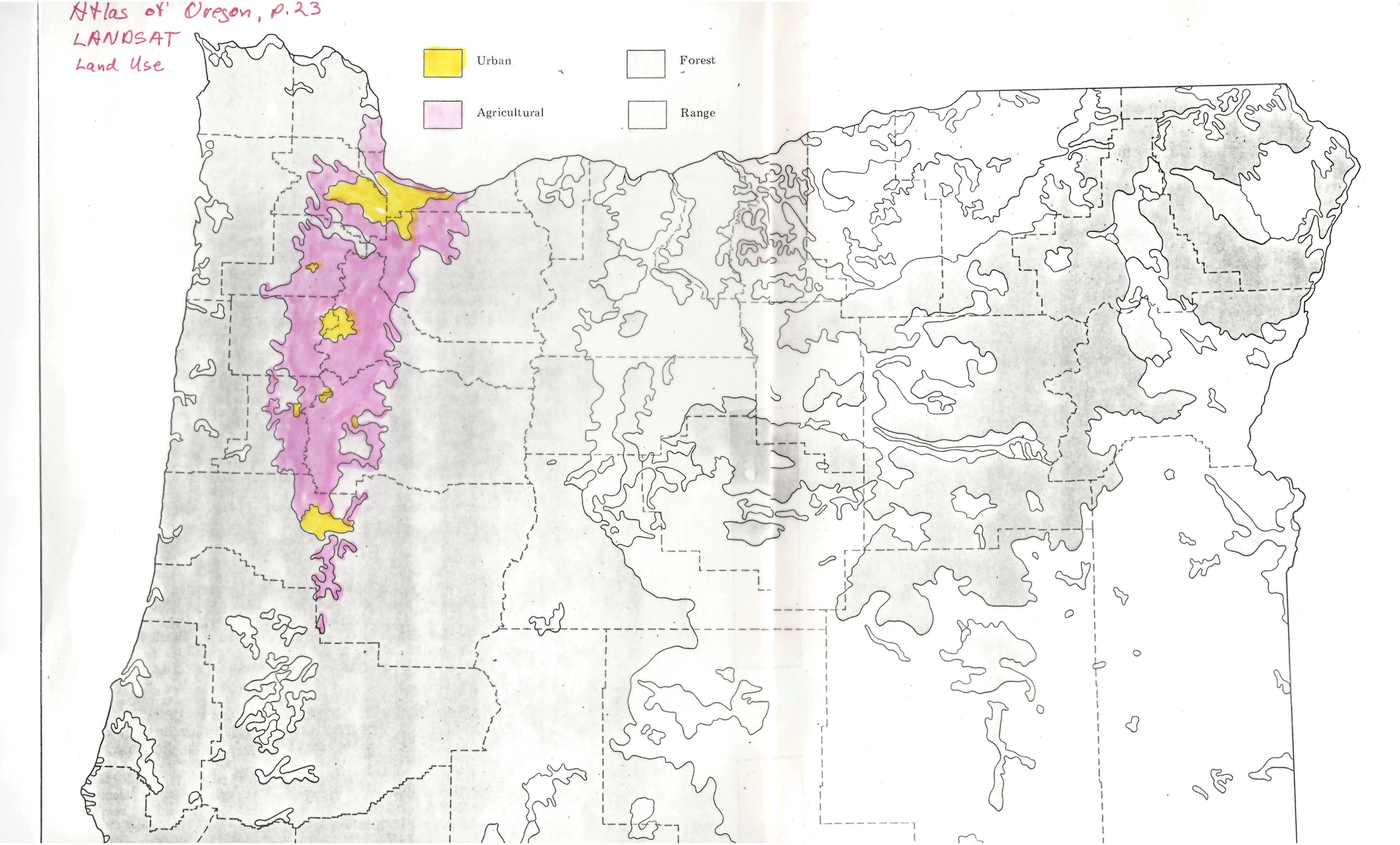
Choban, Paul
Christensen, Mel
Cotes des Coulombe Vineyard
Dion Vineyard
Five Mountains Vineyard
Heesacker Vineyards
Ladd Hill Vineyard
Laurel Hill Vineyard
Leyden Vineyards
Mt. Cooper Vineyard
Mulhausen Vineyards
Old Pumpkin Ridge
Perrault Vineyard
Reuter Hill Vineyard
Ritter, Milton
Shafer Vineyards
Sunset Vineyards
Tualatin Vineyard
Van Shepen Vineyards
Windhill Vineyards
Wirtz Vineyards

Other Counties

Crippen Family Orchard	-	Hood River
Bangsund Vineyards	-	Wasco
La Casa de vin Vineyard	-	Morrow
McNesney Vineyard	-	Morrow

Yamhill County

Adams Vineyard
Adelsheim Vineyards
Amity Vineyards
Cambus Bellus Vineyard
Cattrall, Bill
Chardonnay Oaks Vineyard
Chateau Benoit
Chehalem Vineyards
Dundee Hills' Vineyard
Durant Vineyards
Elk Cove Vinery
Eola Hills Vineyard
Erath Vineyards
Eyrie Vineyards
Hyland Vineyards, Inc.
Jensen, Fred
Kirschwold Vineyard
Knudsen Vineyards
Marval Vineyards
McDaniel Vineyards
Red Hills Vineyard
Rich, John
Saucy Vineyards
Sokol Blosser Vineyard
Stewart, John
Stonehedge Vineyard
Teppola, Mark W.
Wynate Vineyards


Atlas of Oregon, p. 23
LANDSAT
Land Use
Urban
Forest
Agricultural
Range

eties of wine grapes were chosen and started bearing in 1972. Wines made from those plantings in 1972 and 1973 are presently undergoing taste sampling and aging.

In an effort to match the proper grape with the location and climatic conditions, the wine industry has worked closely with the University on a phenologic study. Eighteen growing sites were chosen. Each site is planted with five plants of 22 different varieties. Spacing, training and cultural techniques are controlled. Wines will be made from these grapes and evaluated.

Last year the various operating committees of the growers were unified into a state organization of the Winegrowers Council of Oregon. Many projects are currently underway within this professional organization.

For example, land use planning is of great concern to winegrowers. Information on the wine industry has been distributed to county planning commissions.

When the Washington County Comprehensive Framework Plan was recently adopted, County Commissioners flatly set a 350 foot elevation limitation to General Farm Use. That meant that no land above 350 feet can be placed in that zone classification. Several growers appeared at a hearing to protest the adoption of the ordinance; commissioners were interested in the proposed use of these lands for wine grapes and offered to review the zoning.

Other counties are similarly being informed and it is, of course, strongly urged that winegrowing be given consideration in future land use zoning.

Growers are very actively involved in viticultural research outside University facilities as well. With the present lack of funds for academic research, growers are conducting a variety of detailed studies. Many of their concerns are similar to those encountered by all agriculture.

Temperatures are being recorded to establish heat summations and frost levels throughout the growing areas. This data will be helpful in making recommendations for training systems of vines as well as determining which varieties to grow.

Plant spacing is an important variable to yields and sugar levels. Various spacings are being tried by growers hoping to arrive at optimum standards. The wide variety of spacings can be seen through comparison of California and European vineyards.

Pest and bird control problems are shared by other Oregon farmers. Members are trying to derive several means to rid themselves of these problems: certain electronic devices, cannon shots, netting—even mystical grape potions have been tried to arrive at solutions suitable to grapes.

Harvest data is collected annually from the mature vineyards listing yields, sugar and acid levels for each grape variety.

These are a few of the many projects intended to aid the growth and success of the industry.

Winegrowers have been actively informing the public on the progress of the industry through a series of very successful educational vineyard tours. The tours were designed to demonstrate the various vineyard operations. For instance, during the harvest tour people picked grapes, observed the crushing and pressing processes.

The amounts of wines now produced in Oregon have grown correspondingly with the acreage planted. From the first few hundred gallons only ten years ago, there are now seven bonded wineries producing well over 20,000 gallons of wine from vinifera grapes. The increased amounts of produced wines have brought out another series of problems relating to winemaking and again different from those of California.

While the cool climate and slower maturation combine to produce superior wines, the same elements may in some years result in wines with a higher than desirable acid level.

Again, the problem is similar to the European; California's trouble area

is developing sufficient acidity. The high-acid problem has been solved in Europe through the use of several techniques. Winegrowers are currently reviewing these procedures. The University is involved to a limited extent experimenting with special yeast cultures to lower acidity.

To insure the quality of Oregon wines, once grown, processed and bottled, growers have drafted amendments to the OLCC standards of labeling. The proposed amendments generally restrict the dilution of, or additions to wines. These amendments will be presented to OLCC Board for adoption. It is the consistent effort of the industry to produce quality wines.

I hope this rather brief, broad description of the Oregon wine industry has given you a better perspective of its present status and, hopefully, an insight into the industry's future.

Wine-Grape Adaptation to Oregon Climates

Warren W. Aney
Systems Ecologist, Portland

Plant adaptation to a temperate environment is largely determined by four basic limiting factors: Winter severity, summer heat (ensolation), growing season length, and precipitation. Wine grape adaptation to Oregon's environments was studied in terms of all these factors except precipitation.

Methods

Winter severity was described in terms of the lowest winter temperature expected to occur in a typical 20-year period. Minimum temperatures in European winegrowing regions range from relatively mild, such as 9°F in Bordeaux, France (in 41 years of record) to relatively severe, such as -18°F in Eger near Tokay, Hungary (in 50 years of record).

Well-matured vinifera vines can tolerate winter temperatures down to 0°F for short periods. Vine damage and loss of some fruit production occurs at temperatures below zero. Severe damage to unprotected vines usually occurs when temperatures drop below -10°F, becoming serious or fatal at temperatures below -20° or -25°F. See Tukey and Clore (1972).

Ensolation, or summer heat, was studied in terms of two distinct indexes: Dr. A. J. Winkler's heat summation index was developed to describe summer heat in terms of degree-days (base 50°F, April through October); Thornthwaite's potential evapotranspiration index was developed to compare climates in terms of plant response to temperature and day length (it has a compensation for latitude differences, which Winkler's index lacks.) In this paper, the potential evapotranspiration (PET) index is totalled for only the months of April through October so it will roughly correspond to only the growing season.

In European wine regions, Winkler's heat summation index varies from around 1,700 degree-days on the German Rhine to over 4,000 degree-days in Sicily and southern Italy. Winkler felt that an index of under 2,500 degree-days was optimum for French and German wine grape varieties grown in California (Winkler, 1962).

Thornthwaite's PET index (April through October) varies from around 23 on the Rhine to well over 27 in the warmer areas. Other research indicates a PET index below 21 is insufficient for satisfactory development of even the earliest varieties (Aney, unpublished).

Growing season was studied in terms of days between 32°F frosts. Generally, vinifera grape varieties require at least 150 days to ripen, preferably over 180 (Tukey and Clore, 1972).

Results

Climatic data for Oregon was summarized in terms of these four indicators: Minimum winter temperatures (20 year expectation), Winkler's heat summation index, Thornthwaite's PET index (April through October), and length of growing season (between 32° frosts.) Requirements for successful vinifera grape growing were determined in terms of known grape vine physiological requirements and the climatic conditions experienced in other successful winegrowing regions (principally European).

Minimum winter temperatures in Oregon vary from well above zero to as low as -50°F. Distribution of expected 20-year minimums are portrayed in Figure 1. Minimum temperatures of -25° and colder seem to preclude vinifera grape growing in all of Oregon east of the Cascades except for a limited portion of the Columbia Basin, part of the Klamath Basin, and part of the Grande Ronde Valley. Winter protection may still be necessary in these areas, since nowhere is the expected 20-year minimum higher than -10°F.

In western Oregon the 20-year minimum is generally above -10°F, with minimums of 0°F and higher expected for areas around Roseburg, Leaburg, the northern Willamette Valley, and the entire coast.

Heat summation indexes can be as high as 3,400 degree-days in Oregon. Many areas show heat summation above the rather arbitrary 1,800 degree-days minimum for successful winegrowing (see Figure 2).

Eastern Oregon areas around The Dalles, Umatilla, and Huntington have heat summation indexes over 3,000 degree-days. In western Oregon the interior valleys (Willamette, Umpqua and Rogue) show heat summation indexes between 1,800 and 2,700 degree-days.

Potential evapotranspiration (PET) indexes for the months of April through October can be as high as 28.6 in Oregon (Huntington). If 21.0 is established as the acceptable minimum for vinifera grapes, then the delineated Oregon areas are as shown in Figure 3.

Highest PET indexes occur along the Columbia and Snake Rivers near Arlington and Huntington. Adequate PET indexes occur in the valleys of all major river systems except along the coast.

Growing season length varies from 0 to 300 days in Oregon. Figure 4 shows growing season patterns for 150 days and longer. Most of Oregon west of the Cascades has at least a 150-day growing season; it is over 200 days in the Umpqua and Willamette valleys and along the coast.

In Oregon east of the Cascades a 150-day or longer growing season exists along the Columbia River and in the Huntington-Ontario area. Only around The Dalles is the season at least 200 days long.

Optimum climates for Oregon wine grape growing were determined by superimposing these four climate factors and scoring the resulting climatic combinations. Certain areas were eliminated where clearly unacceptable combinations of factors exist, such as a combination of short growing season and cool summers. Certain other areas showed clearly optimal combinations of factors, such as mild winters, long growing season, and moderate summer heat. Figure 5 shows those areas where acceptable combinations of climatic factors occur.

According to this evaluation, the optimal areas are found west of the Cascades: Roseburg, Leaburg, Salem, Dundee, and Hillsboro-Portland areas scored highest. The rest of the central Willamette Valley was close behind, followed by the Medford-Grants Pass area and the middle Umpqua Valley.

Oregon east of the Cascades suffers from winter severity. The best areas are near The Dalles and in Umatilla County.

Summer heat for Oregon winegrowing areas is shown in Figure 6. The hottest areas (coded "W") are located around The Dalles, Umatilla and Huntington. All these areas have severe winters, particularly Huntington.

Slightly less warm areas (coded "X") are located in the Echo, Vale-Ontario, and Medford areas. Except for Medford, all have severe winters.

More moderate summers are found in areas (coded "Y") located in the Heppner, Hood River, Grants Pass, Roseburg, Oakridge, Albany, Dundee, and Portland-Hillsboro surroundings. Winters are moderate to mild except east of the Cascades. Cool summer areas (coded "Z") are located in the remainder of the central Willamette and Umpqua valleys.

Discussion

Discussion of these results centers around the potential effects of winter cold and summer ensolation. As described above, Oregon east of the Cascades is limited primarily by severe winters. Vinifera vines do survive in several locations such as along Mill Creek near The Dalles, at Maryhill across the Columbia River from Biggs, and near Homestead on the Snake River. But winter damage can and does occur, reducing the harvest, damaging the canes, and even killing the vines. Winter protection, particularly of young vines, seems to be indicated to insure commercial success.

In terms of summer heat, the cool areas of Oregon (coded "Z") compare to such European regions as Champagne and the Mosel. The moderately warm areas (coded "Y") compare to such regions as Alsace and Burgundy.

But the hottest summer areas (coded "X" and "W") are mostly in Oregon east of the Cascades where the winters are quite severe. Traditional wine-growing regions with severe winters and hot summers are located in central and eastern Europe. The overall climate in southern Russia, the Caucasus, the Crimea, Moldavia, and parts of Hungary corresponds most closely to these areas in Oregon. See Tables 1 and 2.

Nowhere in Oregon does the combination of warm summers and mild winters exist such as is found in the classic European regions of Bordeaux and Chianti. Certain areas have the summer warmth but their winters are much more severe.

In using these maps, two related points should be kept in mind:

1. Because of the effect of topological features on climate, there will be localized areas which exhibit a climatic pattern substantially different from that shown for the overall area in which these localized climatic patterns ("micro-climates") are included.

2. Graphical smoothing has necessarily eliminated some of the small-scale climatic intricacies. Areas near a critical boundary should therefore receive careful scrutiny to ascertain their true climatic characteristics.

Also, any potential or actual grower should be well aware of the critical importance of non-climatic factors such as soil type, air and water drainage, exposure and slope. A discussion of such site factors is beyond the scope of this paper.

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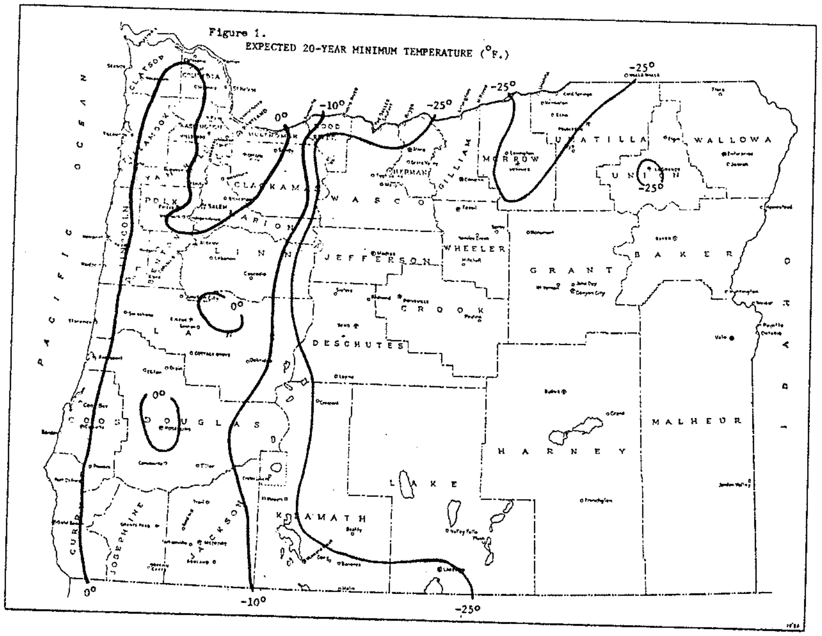

Figure 1. EXPECTED 20-YEAR MINIMUM TEMPERATURE (°F.)

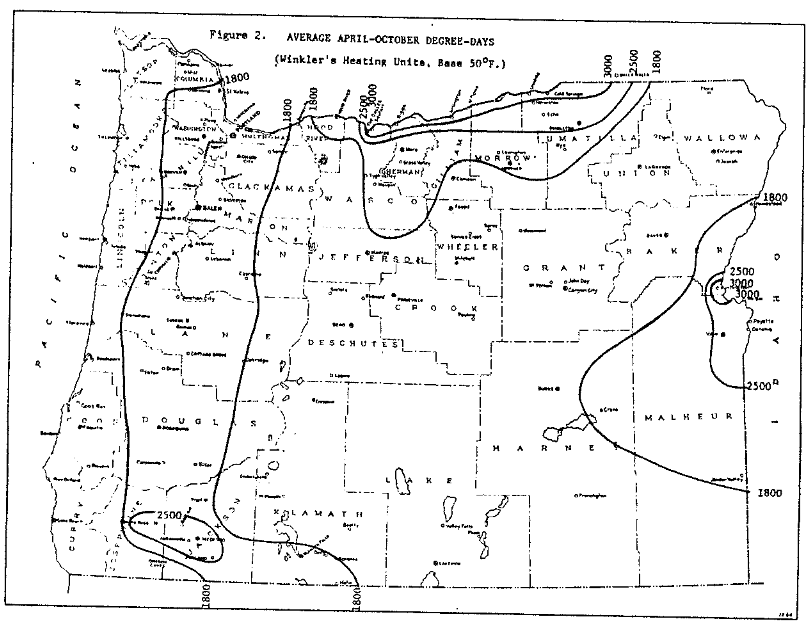

Figure 2. AVERAGE APRIL-OCTOBER DEGREE-DAYS (Winkler's Heating Units, Base 50°F.)

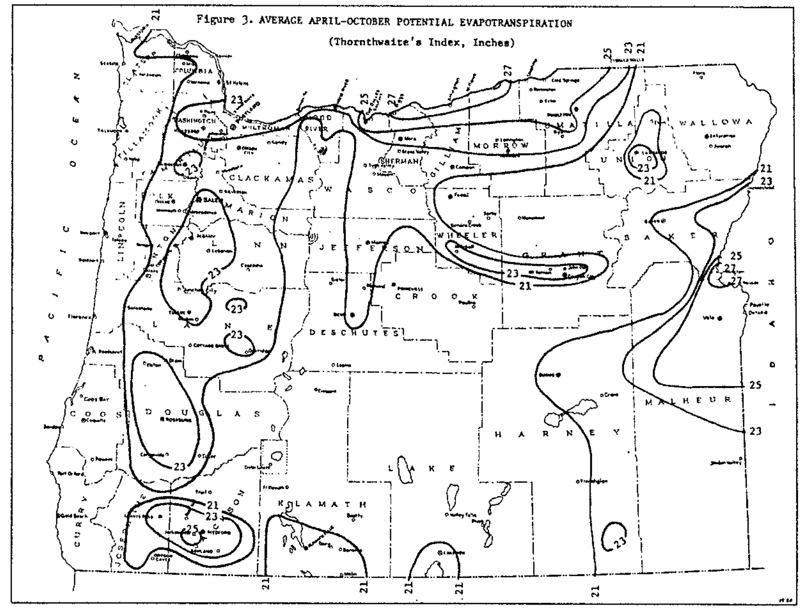

Figure 3. AVERAGE APRIL-OCTOBER POTENTIAL EVAPOTRANSPIRATION (Thornthwaite's Index, Inches)

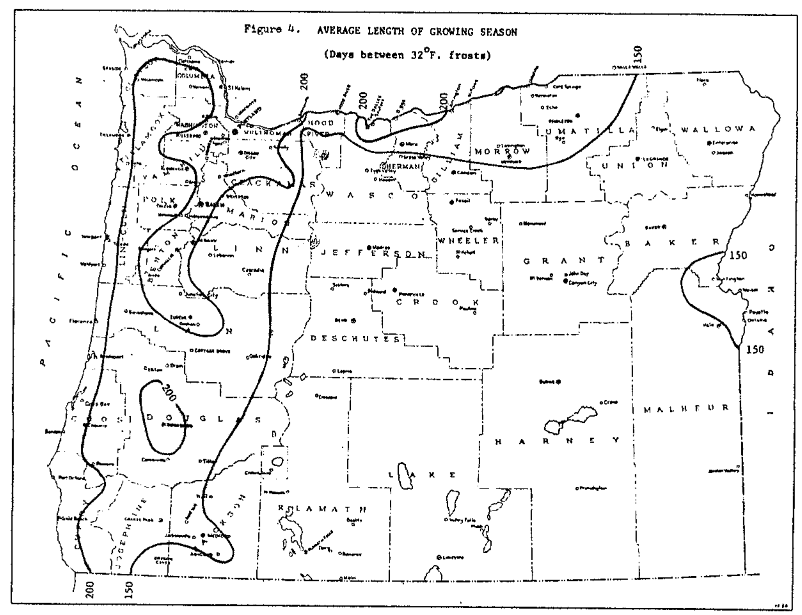

Figure 4. AVERAGE LENGTH OF GROWING SEASON (Days between 32°F. frosts)

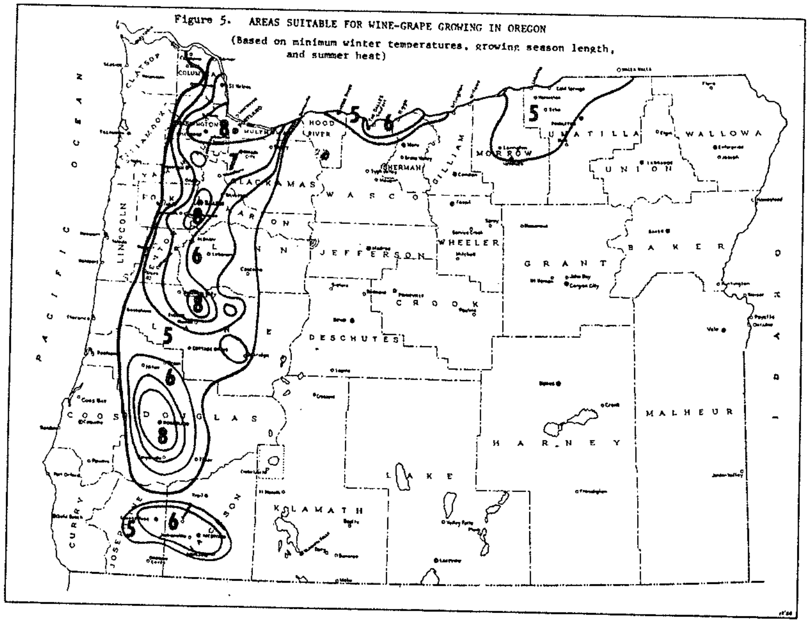

Figure 5. AREAS SUITABLE FOR WINE-GRAPE GROWING IN OREGON (Based on minimum winter temperatures, growing season length, and summer heat)

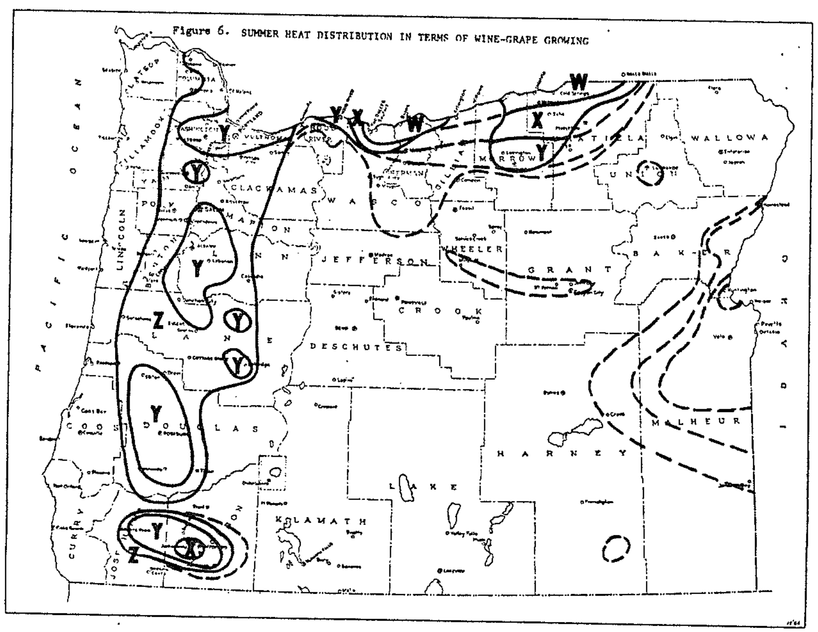

Figure 6. SUMMER HEAT DISTRIBUTION IN TERMS OF WINE-GRAPE GROWING

Table 1. Climatological Summaries for Selected Oregon Locations

County	Station	20-Year Minimum Temperature	Growing Season Length	Apr-Oct PET Index	Apr-Oct Degree-Days Index	Climatic Score	Summer Heat Code
Baker	Huntington		170 days	28.6	3434	4	W
Benton	Corvallis		202	23.1	2193	7	Y
Douglas	Roseburg	4°F.	232	23.2	2381	8	Y
Hood River	Hood R. Exp. Sta.	-20	165	23.2	2002	5	Y
Jackson	Medford	-1	178	25.0	2705	6	X
Lane	Eugene	-1	204	22.8	1991	6/7	Y/Z
Linn	Albany	-1	227	24.2	2171	7	Y
Malheur	Adrian	-33	148	26.4	2775	3	X
	Vale	-28	141	25.3	2623	3	X
Marion	Salem	0	197	23.2	2050	7/8	Y
Multnomah	Portland	4	279	23.2	2380	8	Y
Polk	Dallas	-3	165	22.4	1852	5/6	Z
Umatilla	Milton-Freewater	-21	194	26.6	3006	5	W
	Umatilla		188	26.7	3265	5	W
Wasco	The Dalles	-22	204	26.6	3014	6	W
Washington	Forest Grove	-1	175	23.4	2102	6/7	Y
Yamhill	Cherry Grove	-1	209	22.3	1765	6	Z
	McMinnville		165	23.2	1979	6/7	Y/Z

Table 2. Climatological Summaries for Selected European Locations

Country	Station	20-Year Minimum Temperature	Growing Length Season	Apr-Oct PET Index	Apr-Oct Degree-Days Index	Climatic Score	Summer Heat Code
Germany	Geisenheim			23.6	1750	4-7	Y
	Trier			23.2	1634	4-7	Y/Z
	Frankfurt	-7°F.[a]			1925	6-7	Z
France	Strasbourg	-8		23.5	1801	6-7	Y/Z
	Auxerre	-1[b]			1850	5-7	Z
	Dijon	-8		23.8	2025	6-7	Y
	Beaune				2400	6-7	Y
	Bordeaux	9		25.0	2817	8	X
Hungary	Miskolc			25.3	2274	5-6	Y
	Eger	-18[a]				5-6	Y
USSR	Krasnodar			27.2	2954	5-6	W/X
	Odessa	-13[c]		25.7	2568	5-6	X

[a] In 50 years of record
[b] In 17 years of record
[c] In 28 years of record

Appendix. Computational Techniques

Methods used for computing expected 20-year minimum temperatures are given in Volume 1B of the Pacific Northwest River Basins Commission Climatological Handbook, from which these data were obtained. Growing season length was computed by Johnsgard (1963) as the number of days between the average dates of the last and first seasonal occurrences of 32°F. He also computed monthly PET data for all the Oregon stations used. For other stations, the following formula of Thornthwaite's was used to compute April through October PET (in inches):

$$PET = 0.63 \sum_{apr}^{oct} F_i (10t_i/T)^a$$

where t_i = mean temperature (°C) of month i;
F_i = latitude factor for month i (see below);

$$T = \sum_{1}^{12} (t_i/5)^{1.514}$$

$$a = 6.75x10^{-7}T^3 - 7.71x10^{-5}T^2 + 1.792x10^{-2}T + 0.49239$$

Table of Latitude Factors

Latitude	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
40°	.84	.83	1.03	1.11	1.24	1.25	1.27	1.18	1.04	.96	.83	.81
45°	.80	.81	1.02	1.13	1.28	1.29	1.31	1.21	1.04	.94	.79	.75
50°	.74	.78	1.02	1.15	1.33	1.36	1.37	1.25	1.06	.92	.76	.70

Winkler's heat summation index was computed in degree-days, base 50°F, April through October by:

$$DD = \sum_{apr}^{oct} \begin{cases} (t_i-50)d_i & \text{if } t_i > 50° F \\ 0 & \text{if } t_i < 50°F \end{cases}$$

where d_i = no. of days in month i.

The climatic score used in deriving the wine grape growing suitability map in Figure 5 was computed for a given area by:

Climatic score = m + g + p + h

where m = 20-year minimum temperature score, i.e.,
0 if temperature <-25°F
1 if temperature -10° to -25°
2 if temperature 0° to -10°
3 if temperature > 0°

g = growing season length score, i.e.
0 if length < 150 days
1 if length 150 - 200 days
2 if length > 200 days

p = Apr-Oct PET index score, i.e.
0 if index < 21.0
1 if index 21.0 to 22.9
2 if index > 23.0

h = heat summation index score, i.e.,
0 if degree-days < 1800
1 if degree-days > 1800

The method used in obtaining a code for summer heat is shown in Table A-1.

Table A-1. Summer Heat Codes for Oregon.

Type of Summer	Heat Code	April-October PET Index	Heat Summation Index
Hot	W	25 or higher	3000 or higher
Warm	X	25 to 27	1800 to 3000
Moderate	Y	23 to 25	1800 to 3000
Cool	Z	21 to 23	1800 to 2500

The Adaptability of Vinifera Winegrapes to the Climate of the Willamette Valley

Gary L. Fuqua
Newberg

I Introduction

The ultimate test of the adaptability of **vitis vinifera** to a climatological region is the quality of the wine produced. Although European wine grapes were grown in the Willamette Valley in the early 1900's, it has only been within the last eight years that there has been a renewed interest in growing wine grapes in the Willamette Valley. Thus, the process of determining quality levels is being reestablished and will take many years to accomplish.

In the interim the best method of determining potential adaptability is to compare the climate of the Willamette Valley with established fine wine-growing regions of the world to gain insight into the probable success of growing wine grapes in this climate and also to aid in varietal selection.

I will explore three topics today:

(1) The first topic considers the minimum climatological requirements for growing vinifera wine grapes. Much of this information came from an article published in an Australian journal by J. A. Prescott.

(2) Secondly, I will dicuss the general temperature and precipitation patterns of the Willamette Valley, comparing these climatological variables with Prescott's criteria.

(3) Third, I will compare the temperature and precipitation patterns of the Willamette Valley with those of fine wine-growing regions of France in order to simplify varietal selection.

II Minimum Requirements

What are the minimum requirements for satisfactorily growing vinifera wine grapes? Prescott discusses five criteria: heating units, length of growing season, maximum temperatures during the growing season, winter temperatures, and rainfall.

A. **Heating units**—defined as the sum of average daily temperatures above 50° during the growing season. In order to ripen the coolest climate varieties, between 1,600-1,800 heating units are required. This is approximately the total received by the Rhine and Moselle valleys of Germany. There are exceptions to this rule, however. For example, in some areas of southern England with less than 1,500 heating units there are vinifera vineyards.

B. **Length of the growing season**—There must be a period of more than five and one-half months where the average daily temperature is above 50°. The 50° limit is used because this is the approximate temperature at which the grapevine will emerge from dormancy in the spring and return to dormancy in the fall.

C. **Maximum temperatures during the summer months**—Prescott indicates that the mean temperature of the warmest month during the growing season must be at least 66°.

D. **Minimum winter temperatures**—The vinifera plant becomes subject to winter kill unless protected (buried) at temperatures between 0° and 5° above zero. This will vary from variety to variety. Prescott uses a minimum average temperature for the coldest month of 30° to define his limits.

E. **Precipitation**—Prescott states that an area cannot have more than 30 inches of rainfall or in some cases, up to 40 inches, but these latter areas will be very susceptible to fungus disease. This criterion does not hold for the Willamette Valley because of the precipitation pattern. Only about 30 percent of Willamette Valley yearly rainfall of between 35 and 60 inches falls during the months of April through October. Thus, rainfall during this period is only 10 to 15 inches, which is less than rainfall in most vineyard areas of France and Germany during comparable months.

III The Willamette Valley

Using the above minimum criteria for growing vinifera wine grapes, where on the climatological scale does the Willamette Valley fall?

A. **Heating units**—The Willamette Valley has numerous microclimates depending on location. The valley floor stations have between 1,900 and 2,100 heating units. Temperatures on the valley floor tend to be warmer during the day and cooler at night than temperatures at stations off the valley floor or near a body of water—for example, Portland Airport. The station with the highest heating units is Customs House in downtown Portland with 2,500. This high summation is due to warm nighttime temperatures at this location combined with daytime highs that are cooler than such places as Salem and Eugene, but not enough cooler to offset the warm nighttime temperatures. Unfortunately, there is very little data for hillsides where vineyards are located. However, I have estimated that at my vineyard, which is between 520 and 735 feet on a south slope in the Dundee Hills, the average number of heating units for the growing season is between 2,100 and 2,300. Daytime highs are 1° to 3° cooler than the valley floor, but nighttime lows run 4° to 6° above those on the valley floor. As a result, the Dundee Hills have a greater number of heating units than Salem which has about 2,050 over the growing season. Based on heating unit criteria, the Willamette Valley is above the 1,600 to 1,800 cited by Prescott as a minimum. An example of location in the Willamette Valley which is near that minimum is Cherry Grove, in Washington County, southeast of Hillsboro, at 900 feet. This station has an average of 1,750 heating units during the growing season.

B. **Length of Growing Season**—The growing season was defined as the length of time during the year when the average daily temperature is 50° or above. Most Willamette Valley stations have a period between six and six and one-half months of 50° average daily temperature. The station with the longest growing season is downtown Portland station with seven months. Thus, the Willamette Valley also meets Prescott's growing season criteria.

C. **Maximum Temperatures During the Summer Months**—As you will recall, Prescott stated that the warmest month of the year must have an average temperature of at least 66°. In July, which is the warmest month in the Willamette Valley, average temperatures are as follows:

Portland	67.1
Salem	66.1
Eugene	66.5
Cherry Grove	65.0

Only Cherry Grove, among these four, has an average temperature in July below 66°.

D. **Winter Temperature**—Prescott uses an average temperature of 30° during the coldest month of the year or 0° to 5° as a minimum without pro-

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Methods. I've chosen to use expected 20-year minimum temperatures, frost-free days and April-October degree days as defining climatological variables. These variables were mapped (see enclosed maps).

Since federal regulations appear to require boundaries that can be found on a U.S. Geological Survey (USGS) map, I also included elevation as a variable although I haven't yet mapped this variable. Annual precipitation is also included to round out area descriptions but it is not used as a defining variable.

My 1974 paper also used 20-year minimum temperatures and frost-free days in the same way that I am now using them. But instead of degree-days, I originally used a potential evapotranspiration index because it corrects for latitudinal differences in day length (which a degree-days type index does not do). But in this application I decided to use degree-days for a number of important reasons:

- A degree-days index is more easily understood by more persons and is more commonly used in American viticultural literature (e.g., Winkler).

- There are several ways for calculating or measuring potential evapotranspiration, each of which can produce different answers with varying accuracy and precision (I used Thornthwaite's index in my 1974 paper because it is one of the oldest and most widely used methods, but it is not the most accurate; the data you sent me is from another method and gives slightly different results than Thornthwaite's index).

- For this study, degree-days is nearly as informative as potential evapotranspiration since there are no great differences in latitude and day-length in the Pacific Northwest, i.e., we are talking about a maximum difference of 7° latitude or about 3% more daylight in the longest day of the year. But degree-days would not work well for comparing Napa Valley (38° latitude) with the Mosel (50°) where there is 11% more daylight in the longest day.

- Potential evapotranspiration indexes are difficult to calculate without a computer.

Results. These environmental variables define the Pacific Northwest's major viticultural regions and subregions as described below. The Cascades Mountain Range divides the Pacific Northwest into two major climatological influences---a moderate, moist coastal areawhere lack of summer ripening heat is the factor determining where vinifera grapes can be successfully grown; and a more severe, dry interior where frost and winter cold are the determining factors. So vinifera grapes can be and are being grown successfully in a number of areas which I define and describe as follows (see also the enclosed map of viticultural areas):

a. Pacific Border[a] region. Characterized by long, cool to moderate summers and mild, wet winters. Vinifera grapes can be and are being grown in those interior valleys of western Oregon where the growing season is at least 160 days long with at least 1800 degree-days of April-October heat.

1. Willamette subregion - from Vancouver, Washington on the north to Cottage Grove, Oregon on the south.
   - elevation not greater than 230 m (750 ft)
   - expected 20-year minimum temperature not lower than -20°C (-4°F)
   - growing season of at least 160 days
   - at least 1800 degree-days

2. Umpqua subregion - that part of the Umpqua basin above Elkton[b]
   - elevation not greater than 300 m (1000 ft)
   - expected 20-year minimum temperature not lower than -20°C (-4°F)
   - growing season at least 180 days long
   - at least 2000 degree-days

3. Siskiyou subregion - that part of the Rogue basin above the confluence of the Illinois River[b]
   - elevation not greater than 600 m (2000 ft)
   - expected 20-year minimum temperature not lower than -20°C (-4°F)
   - growing season at least 160 days long
   - at least 2000 degree-days

b. Columbia Basin[a] region. Characterized by low precipitation, hot summers and cold winters. This is that part of the Columbia River drainage east of the Cascades with a frost-free season of at least 160 days.

1. Celilo subregion - along both banks of the Columbia River from Hood River on the west to Arlington[b] on the east.
   - elevation not greater than 150 m (500 ft)
   - expected 20-year minimum no lower than -33°C (-27°F)
   - growing season at least 160 days
   - at least 2000 degree-days

2. Umatilla-Yakima subregion - from Arlington[b] on the Columbia up the Columbia and Yakima valleys to Yakima[b]
   - elevation not greater than 300 m (1000 ft)
   - expected 20-year minimum no lower than -32°C (-26°F)
   - growing season at least 170 days
   - at least 2400 degree-days

3. Wenatchee subregion - Columbia River valley from Wanapum Dam[b] upriver to Wenatchee and Ephrata
   - elevation not greater than 400 m (1300 ft)
   - expected 20-year minimum no lower than -32°C (-26°F)
   - growing season at least 180 days
   - at least 2400 degree-days

4. Nez Perce subregion - Snake River valley from Lower Granite Dam[b] upriver to the Grande Ronde River[b]
   - elevation not greater than 300 m (1000 ft)
   - expected 20-year minimum temperature no lower than -32°C (-26°F)
   - growing season at least 160 days
   - at least 2400 degree-days

c. Okanogan valley - from Oroville[b] north into British Columbia (where it becomes the Okanagan valley)

- elevation no greater than 400 m (1300 ft)
- expected 20-year minimum temperature -32°C (-26°F)
- frost-free season at least 160 days
- at least 2400 degree-days

d. Upper Snake River - from Huntington, Oregon upriver to Boise[b]

- elevation no greater than 900 m (3000 ft)
- expected 20-year minimum temperature -33°C (-27°F)
- frost-free season at least 140 days
- at least 2400 degree-days

Discussion. As I mentioned earlier, *vinifera* grapes are grown successfully in all these areas but there are a lot of questions about the limits and extent of these areas that will only be answered through trial and experience. For instance, the 750 ft maximum elevation has been well established for most of the Willamette valley but there has not been enough experience to make this kind of firm conclusion for the Rogue River valley (Siskiyou subregion). Also, there is insufficient climatological information and viticultural experience to adequately predict the suitability of the area along the Columbia River between John Day Dam and Boardman (between the Celilo and Umatilla-Yakima subregions). Lack of such information is also a problem for the Columbia River valley above the mouth of the Yakima River and the Snake River valley below Lewiston.

Some areas such as the Upper Snake are so marginal in one or more climatic factors that it is possible only carefully selected spots with optimal local climates can be reasonable expected to produce dependable viticultural reults. Finally, the very high degree-days reported for some Columbia Basin stations suggests too much summer heat may be a factor to consider in some areas right along the Columbia River (Umatilla-McNary locality with 3265 degree-days, Paterson station with 3411, Priest Rapids Dam with 3680 and Wahluke station with 3920).

The region and subregion names I have chosen are rather tentative and arbitrary at this point, but I did try to use generally accepted and currently used names, favoring Indian related names for the more specific subregions. I believe Willamette and Umpqua are commonly used names by winegrowers in those areas but Siskiyou and Celilo may not be. The latter could be Klickitat-Wasco, the names of two of the principal counties involved (as is the case with Umatilla-Yakima).

I would welcome any additional information or suggestions anyone can provide that will help us in this process. If what you see here is generally acceptable, I'll start refining it and preparing better graphics (for example, I will have to map these areas on standard USGS maps).

Sincerely,

Warren W. Aney

Footnotes:

[a] These names are land form provinces described on page 34ff, Atlas of the Pacific Northwest (Oregon State University Press, 1979)

[b] Geographical limit is not well-defined in terms of viticultural suitability.

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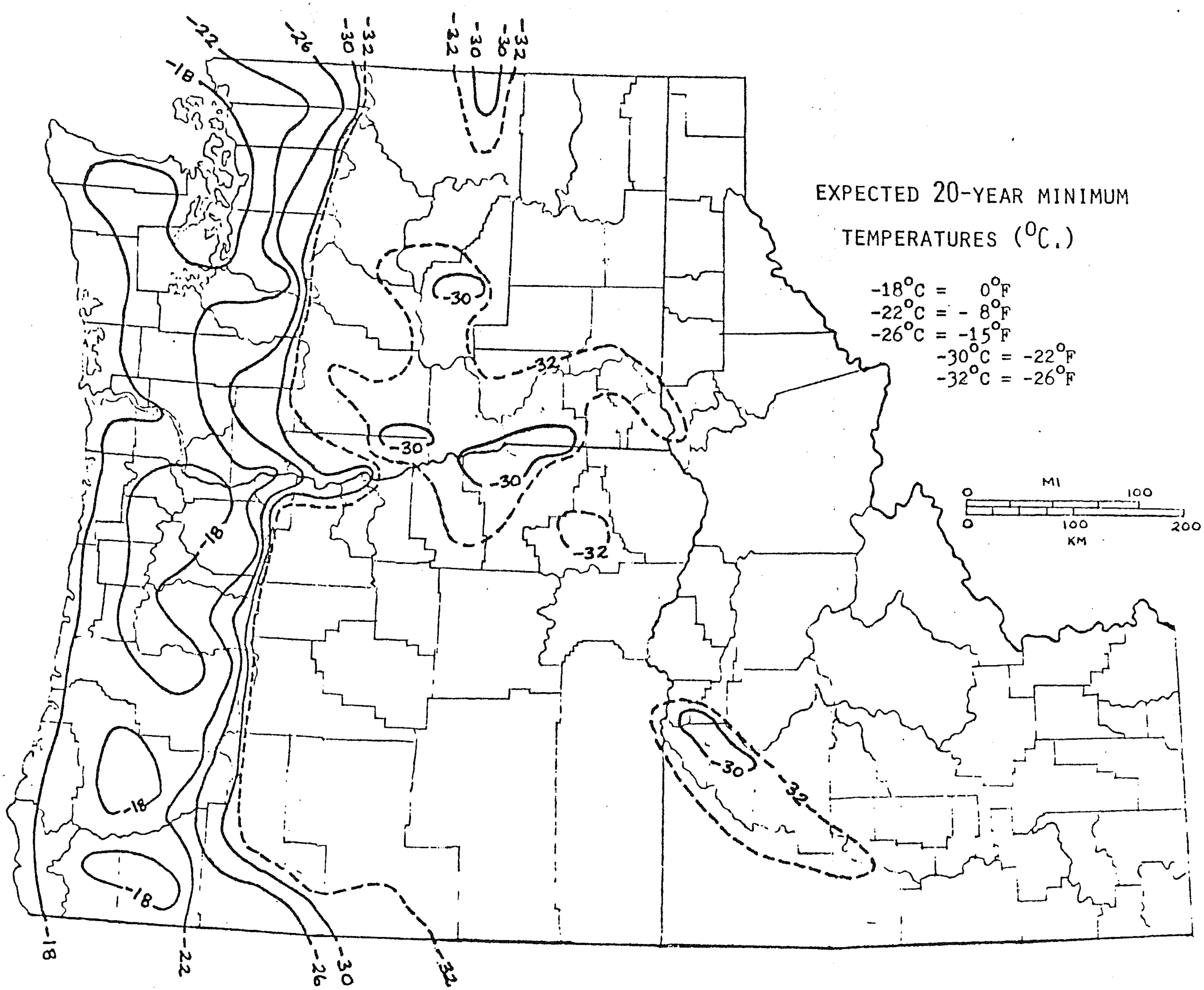
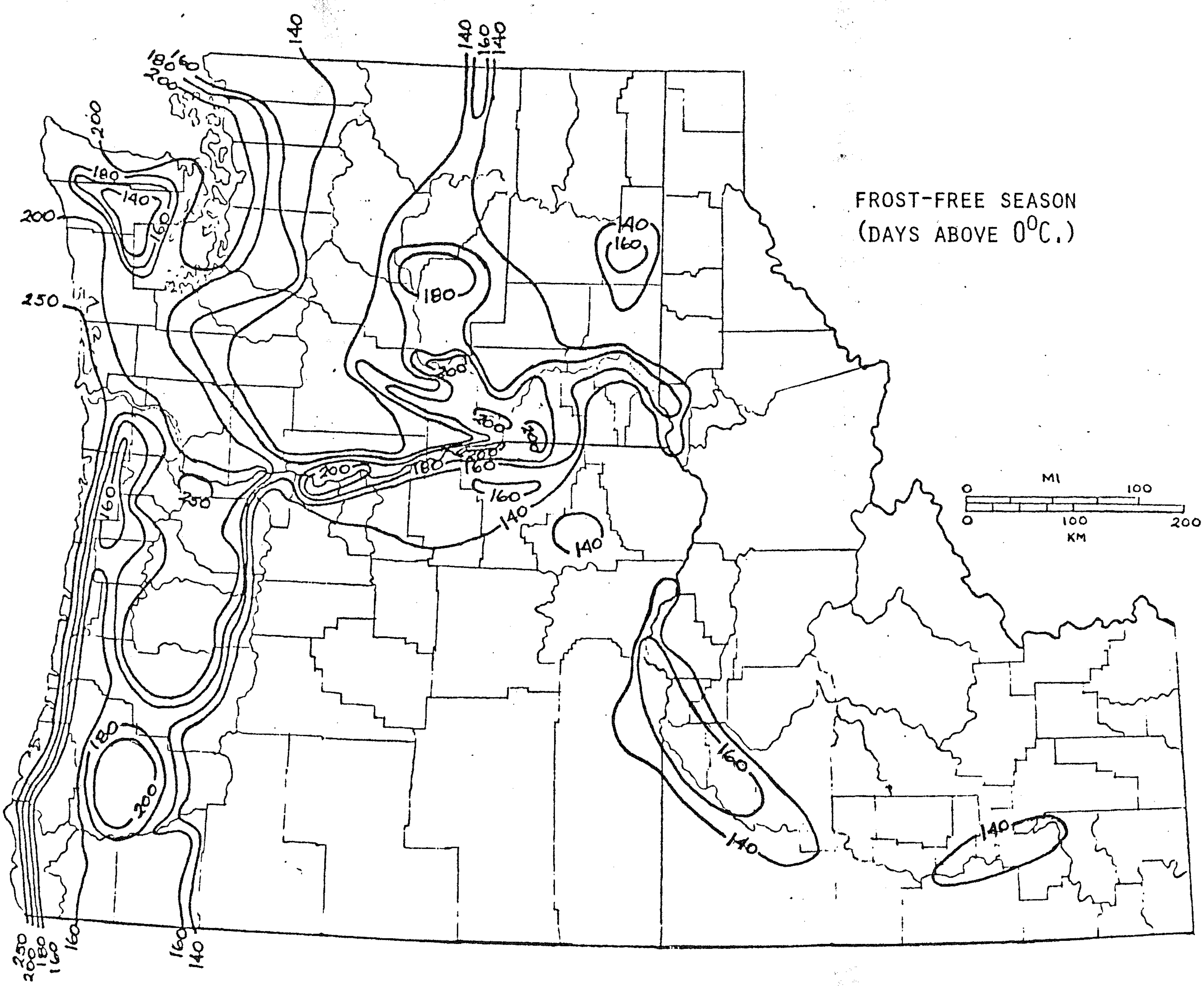
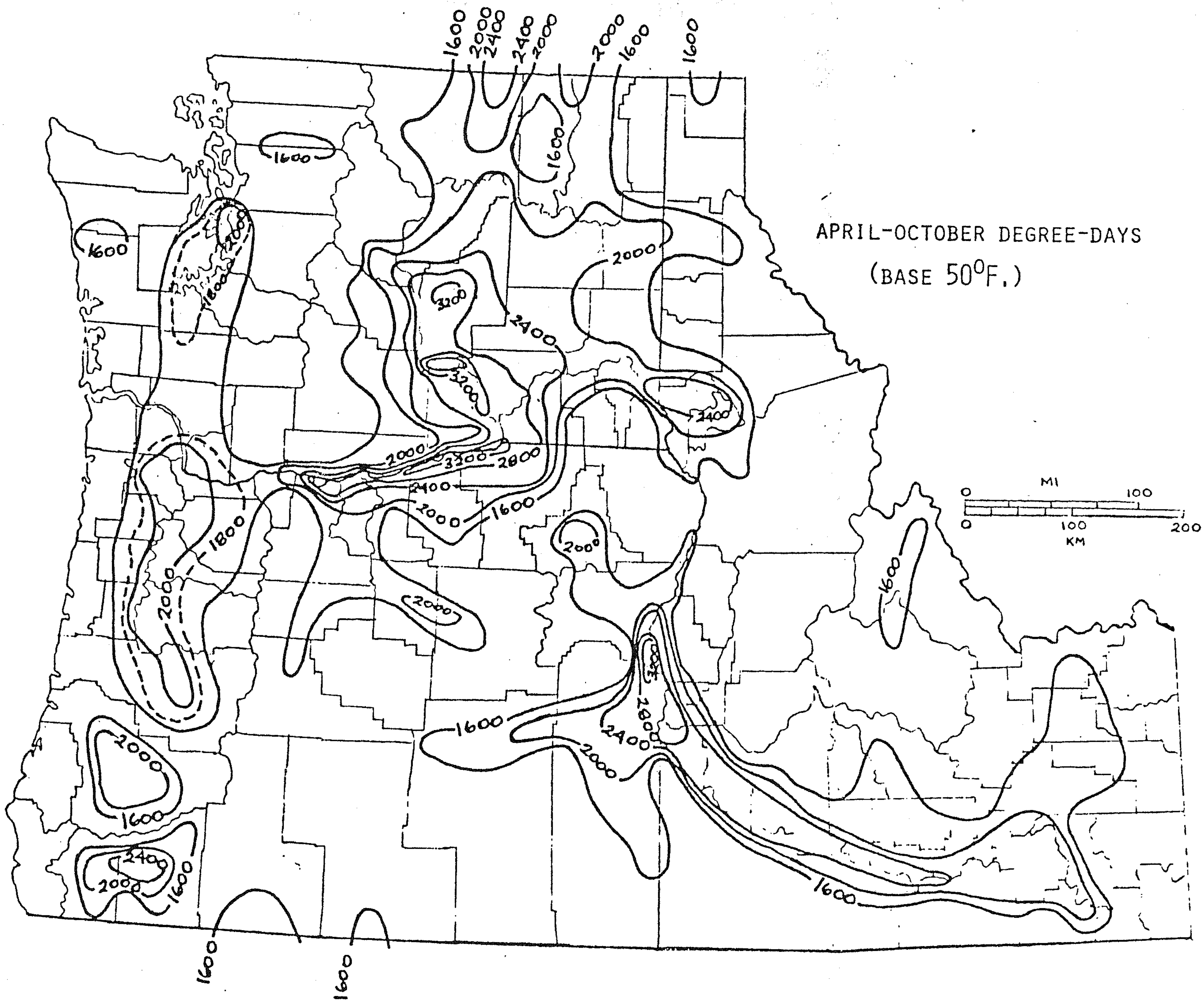
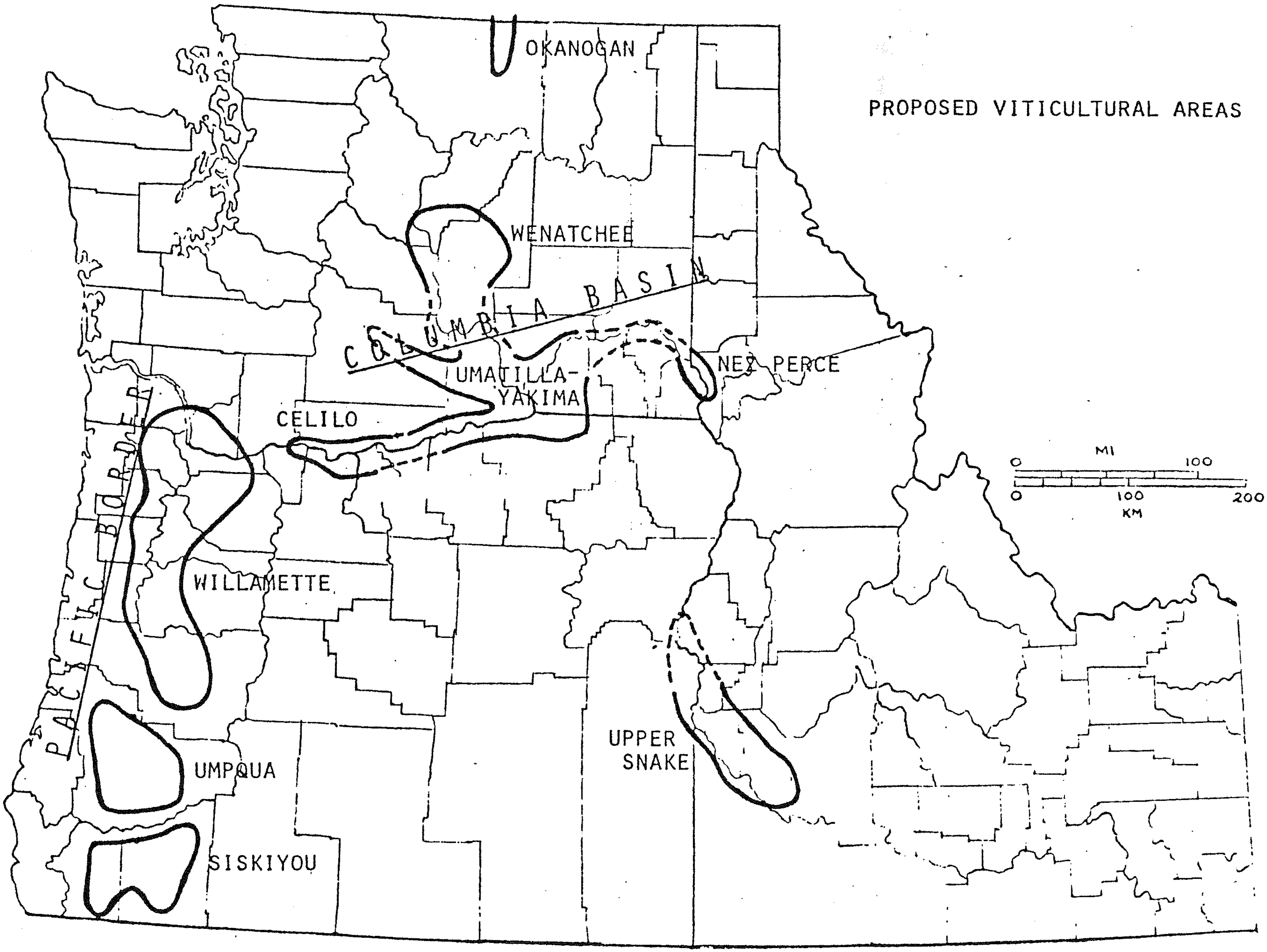


EXPECTED 20-YEAR MINIMUM
TEMPERATURES (°C.)
-18°C = 0°F
-22°C = - 8°F
-26°C = -15°F
-30°C = -22°F
-32°C = -26°F
MI
0
100
0
100
200
KM
-18
-22
-26
-30
-32



FROST-FREE SEASON
(DAYS ABOVE 0°C.)
MI
0
100
0
100
200
KM
140
160
180
200
250


APRIL-OCTOBER DEGREE-DAYS
(BASE 50°F.)
MI
0
100
0
100
200
KM
1600
2000
2400
2800
3200
1800


PROPOSED VITICULTURAL AREAS
OKANOGAN
WENATCHEE
COLUMBIA BASIN
NEZ PERCE
UMATILLA-YAKIMA
CELILO
PACIFIC BORDER
WILLAMETTE
UMPQUA
SISKIYOU
UPPER SNAKE
MI
0
100
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100
200
KM

Ancy 15 Fu F

Region	Area	Station	Elevation	Expected 20-yr. Minimum Temp.	Frost-Free Season (0°C)	Degree-Days Apr-Oct (50°F)
PACIFIC BORDER	WILLAMETTE	Albany, Ore.	65m	-18.3°C	227 days	2193
		Cherry Grove, Ore.	274	-18.3	209	1765
		Cottage Grove, Ore.	198	-20.0	161	1866
		Dallas, Ore.	99	-19.4	165	1852
		Estacada, Ore.	126	-17.8	184	1968
		Eugene, Ore.	137	-18.3	204	1991
		Falls City, Ore.	198	-17.8	186	1768
		Forest Grove, Ore.	53	-18.3	175	2102
		Headworks, Ore.	228	-17.8	216	1808
		Leaburg, Ore.	206	-16.7	217	2181
		Portland CO, Ore.	30	-15.6	279	2380
		Salem, Ore.	55	-17.8	197	2050
		Vancouver, Wash.	30	-19.4	233	2352
	UMPQUA	Drain, Ore.	113	-17.8 a/	191	2260
		Riddle, Ore.	213	-19.4 a/	179	2417
		Roseburg, Ore.	146	-15.6	232	2381
	SISKIYOU	Grants Pass, Ore.	282	-16.7 a/	162	2740
		Jacksonville, Ore.	500	-17.2 a/		2047
		Medford, Ore.	401	-18.3	178	2705
COLUMBIA BASIN	CELILO	Arlington, Ore.	107	-32.8	187	3192
		Hood River, Ore.	107	-28.9	165	2002
		The Dalles, Ore.	31	-30.0	204	3014
	UMATILLA-YAKIMA	Hermiston, Ore.	190	-35.0 a/	153	2951
		Milton-Freewater, Ore.	293	-29.4	194	3006
		Umatilla, Ore.	87	-30.6 a/	188	3265
		Hanford, Wash.	236	-32.8 (53) b/	175	3186
		Ice Harbor Dam, Wash.	112	-20.6 (8) b/	194	3170
		Kennewick, Wash.	110	-31.7	187	3118
		Kennewick 10SW, Wash.	457	-27.2 a/	183	2630
		McNary Dam, Wash.	106	-30.0 (11) b/	212	3265
		Pasco, Wash.	185		206	3199
		Paterson, Wash.	115		181	3411
		Priest Rapids Dam, Wash.	140	-23.9 (8) b/	203	3680
		Prosser, Wash.	256	-30.0 a/	157	2427
		Sunnyside, Wash.	228	-31.1	158	2662
		Wahluke, Wash.	127	-30.6 (39) b/	195	3920
		Walla Walla, Wash.	289	-27.8	174	3153
		Walla Walla AP, Wash.	357	-27.8	202	2853
		Yakima, Wash.	323	-31.1	177	2293
	WENATCHEE	Ephrata, Wash.	381	-29.4	186	3220
		Wenatchee, Wash.	193	-30.6	188	2718
		Wenatchee AP, Wash.	375		187	2751
	NEZ PERCE	Lewiston, Ida.	230	-23.9	179	2612
UPPER SNAKE		Huntington, Ore.	655	-26.1 a/	170	3434
		Vale, Ore.	701	-33.3	141	2623
		Boise, Ida.	827	-28.3	174	2558
		Glenns Ferry, Ida.	783	-31.7		2863
		Payette, Ida.	655	-33.3	149	2725
OKANOGAN		Oroville, Wash.	280	-28.3	173	2499

Proposed Parameters for Viticultural Areas in the Pacific Northwest

Viticultural Area		Elevation	Expected 20-year Minimum Temperature	Frost-free Season (Days between 0°C temperatures)	Degree-Days April - October (base 50°F)	Annual Precipitation
PACIFIC BORDER	WILLAMETTE	30-230 m (100-750 ft.)	-16 to -20°C (+3 to -4°F)	160 to 280 days	1800 - 2400	40-60 in.
	UMPQUA	100-300 m (325-1000 ft.)	-16 to -20°C (+3 to -4°F)	180 to 240 days	2000 - 2400	30-50 in.
	SISKIYOU	200-600 m (650-2000 ft.)	-16 to -20°C (+3 to -4°F)	160 to 180 days	2000 - 2900	20-40 in.
COLUMBIA BASIN	CELILO	30-150 m (100-500 ft.)	-29 to -33°C (-20 to -27°F)	160 to 210 days	2000 - 3200	10-30 in.
	UMATILLA - YAKIMA	50-300 m (160-1000 ft.)	-28 to -32°C (-18 to -26°F)	170 to 210 days	2400 - 3900	6-15 in.
	WENATCHEE	180-400 m (600-1300 ft.)	-29 to -32°C (-20 to -26°F)	180 to 200 days	2400 - 3200	8-10 in.
	NEZ PERCE	200-300 m (650 - 1000 ft)	-26 to -32°C (-15 to -26°F)	160 to 180 days	2400 - 3200	10 - 15 in.
UPPER SNAKE		600-900 m (2000-3000 ft)	-26 to -33°C (-15 to -27°F)	140 to 180 days	2400 - 3400	8 - 12 in.
OKANOGAN		250-400 m (800 - 1300 ft.)	-26 to -32°C (-15 to -26°F)	160 to 180 days	2400 - 2800	10 - 15 in.

Note: Values used to define area limits are underlined.

RAIN

Atlas of Oregon p. 133

Oregon has within its borders some of the wettest as well as some of the driest places in the United States, with an average annual precipitation of 3,207 mm at Valsetz, and only 207 mm at Umatilla. Even the driest places have more than 50 days a year with some trace of rain or snow, and most of the state west of the Cascades has more than 120 days of rain each year, or approximately one rainy or snowy day out of three.

Three areas stand out as particularly rainy: the coastal zone in which as many as one day out of two has some precipitation; the Cascades, with about the same number of wet days; and the highlands of Northeastern Oregon. The driest parts of the State are along the Columbia east of The Dalles and in southeastern Oregon, particularly in the lee of the ranges where the number of rainy days drops below 60 in some places.

The second map indicates the frequency of heavier amounts of precipitation, 12.5 mm or more. The coast and parts of the Cascades experience heavy rain on 40 to 60 days, whereas southeastern Oregon has only two or three such days per year. No significant part of eastern Oregon except for the Wallowas has as many as 10 days of heavy rain.

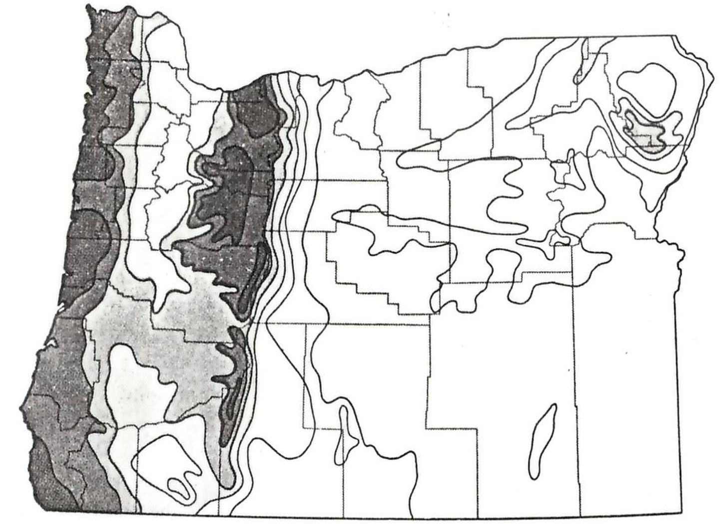
Averages are a handy way of reducing a multitude of measurements to a single number, but a single average does not indicate the great variation of rainfall from year to year. Ten-year and thirty-year running means have been plotted to show this variability at four stations with fairly long records. Ten-year running means consist of the average for a given ten-year period (say 1900-09 inclusive), followed by the average for the next ten-year period (1901-10), and so on. Thirty-year running means are calculated in the same way but for thirty-year periods. The averages shown on the graphs are, in fact, for precipitation seasons from September 1 to August 31 rather than for calendar years. Thus a ten-year mean listed at 1900-10 and labelled on the graph at its mid-year, 1905, is an average for the period September 1, 1900 to August 31, 1910.

The ten-year means indicate an eighteen-year cycle at Astoria with marked fluctuations about the long-term average. Fluctuations in other areas are less cyclic. The Willamette Valley has experienced two rainy periods separated by a long dry spell. The wet decades of the 1870's and 1880's were followed by a long period of below average precipitation which did not end until the 1930's. Since then, there has been an overall rise in the ten-year means, with only a slight decline in the 50's. The increase is particularly notable at Eugene, whose ten-year means have risen almost steadily from a low of 886 mm in the 1927-37 decade to 1,306 mm during 1964-74. The record for The Dalles has some features reminiscent of both the coast and the valley, but is much less variable.

The thirty-year means tell the same story of variable rainfall. A thirty-year mean is normally considered to be an adequate measure of "average" precipitation, but even thirty-year averages can vary greatly: from 923 to 1,151 mm at Eugene and from 325 to 382 mm at The Dalles. Even 100 years is a short time on which to base long-term trends. The records at Portland and at Eugene certainly sug-

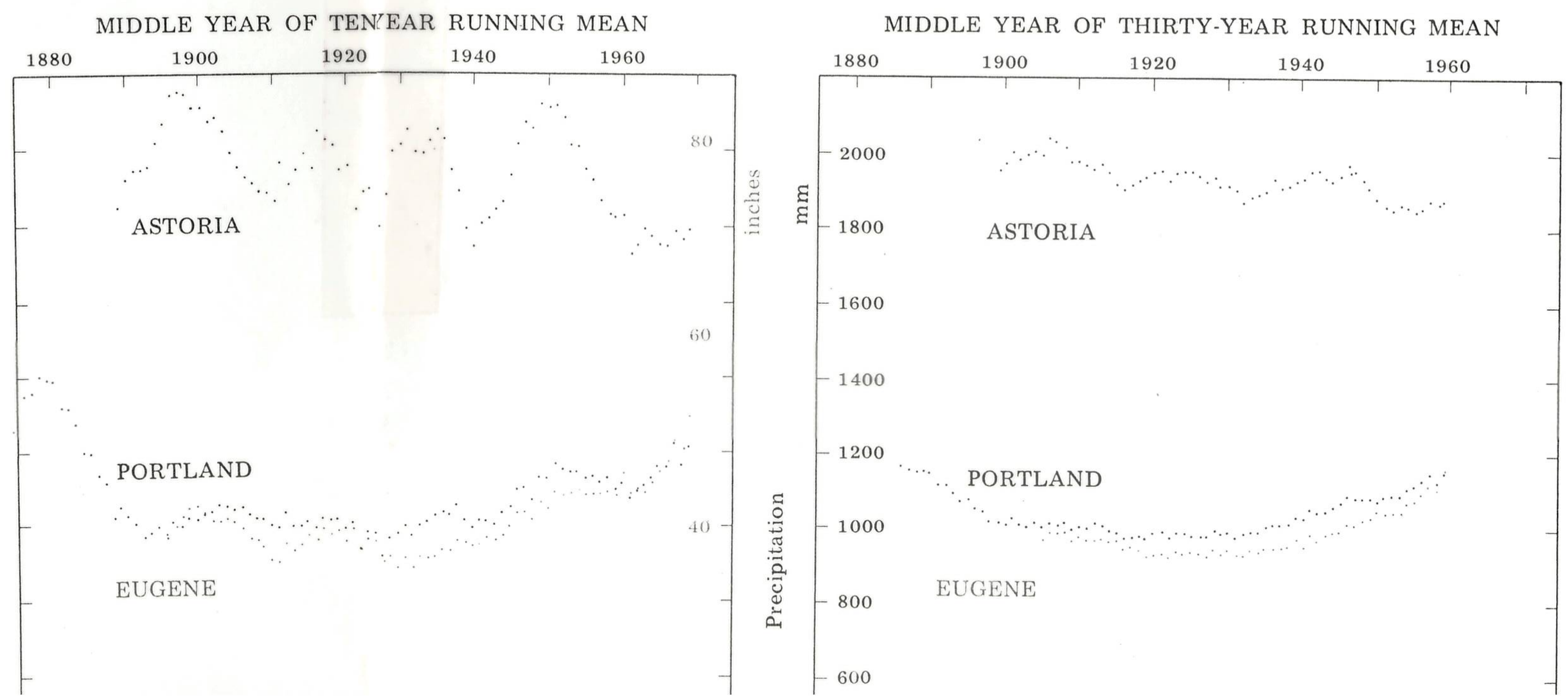
NUMBER OF DAYS WITH SOME PRECIPITATION

Less than 60 days per year
60-80
80-100
100-120
120-140
140-160
160-180
More than 180 days per year



NUMBER OF DAYS WITH MORE THAN 12.5 mm OF PRECIPITATION

Less than 5 days per year
5-10
10-20
20-30
30-40
40-50
More than 50 days per year



Atlas of Oregon, p. 126

LAND CAPABILITY

Land capability refers to the ability of a given piece of land to sustain vegetation, whether it be cultivated crops, planted grasses, unimproved pasture or forest. The factors that affect land capability are chiefly physical, but the very fact that some land needs greater attention to produce continuing yields than other land introduces the notion of management and, therefore, the human element. Average land carefully used may produce more than good land unwisely tended.

The classification used in the map and described in the accompanying legend, considers four major kinds of limitations. The first is danger of erosion either by water or wind. The second is a surplus of water, produced by seepage, a high water table, or flooding. The third limitation is some unwanted soil characteristic such as low moisture holding capacity, imperviousness, stoniness or shallowness. The fourth is climatic and includes undesirable extremes of temperature or precipitation.

These limitations are the basis for the eight major classes of soil capability shown on the map. Class I land is most suitable for cultivated crops since it imposes virtually no limitation on agricultural use. Each succeeding lower classification has a reduced capability because of one or more of the factors of erosion, drainage, soil or climate.

The first four classes include all land suitable for cultivated crops. Class I land includes less than one-half of one percent of the total area of Oregon, and nearly two-thirds of this small amount lies in the Willamette Valley. Indeed, the pieces of Class I land found elsewhere are too small to show on the generalized map in the Atlas. Class II land is more widespread but still covers less than three percent of the state. Its location coincides with the major river floodplains of Oregon. Class III and IV lands, still suitable for cropping but requiring more care than the better soils, cover nearly seven percent of the state. They are still essentially river valley lands.

Eighty-seven percent of the land in Oregon falls into Classes V, VI, or VII and is suitable for grazing or forestry. Class VIII lands, covering 2½ percent of the state, are unsuited for cultivation, grazing, or forestry; they are best used for wildlife or recreational purposes.

The map, developed by the Oregon Agricultural Experiment Station and the U.S. Soil Conservation Service, was published in 1953. It remains the best map available and is essentially accurate except that new irrigation techniques have improved the land capability of certain dry areas of Oregon, particularly in northern Morrow and Umatilla Counties.

Land capability maps are available from the United States Department of Agriculture Soil Conservation Service, 1220 S.W. Third, Portland, 97204. Areas mapped are listed below, with date of publication:

- Alsea area, 1973
- Astoria area, 1949
- Baker area, 1954
- Benton County, 1920, 1975
- Columbia County, 1929
- Curry County, 1970
- Deschutes County, 1958
- Eugene Area, 1925
- Grande Ronde Valley, 1926
- Josephine County, 1919
- Linn County, 1920
- Marion County, 1972
- Polk County, 1922
- Prineville area, 1966
- Sherman County, 1964
- South Umpqua area, 1973
- Trout Creek-Shaniko area, 1975
- Umatilla County, 1948
- Yamhill County, 1974

Bibliography

Hill, William W., and Powers, W. L., *Land Capability for Soil and Water Conservation in Oregon*, Oregon Agricultural Experiment Station Bulletin 530; Corvallis, 1953.

LAND SUITED FOR CU

CLASS I

Very good cultivable land. Deep soil
no erosion, adapted to a wide variety
difficulties in farming.

CLASS II

Good cultivable land. Gentle slope
deep soil, or other minor problems
some moderate degree of protectio
improvement of the drainage.

CLASS III

Moderately good cultivable land. Us
somewhat steeper than capability II
soils, moderate to severe erosion
drainage on level land, with alkali in
protection from erosion, waterlogging,

CLASS IV

Fairly good land. Suitable for c
usually not more than 1 year in 6. B
pasture, or for orchards and vineyar
cover crops). Land of capability IV,
local problems, can be used for seaso
crops under careful management.

CLASS V

Very well suited for grazing or fores
physical limitation for such use. Req
woodland management.

LEGEND

TIVATION

nearly level, little or
of crops. No special

usually moderately
Frequently requires
from erosion or

lly moderate slopes,
and; often shallow
nmon. Some poor
laces. Needs careful
other hazards.

asional cultivation,
; suited for hay or
(if protected by
cause of special or
l or other special

. Has little or no
es good range or

LAND NOT SUITED FOR CULTIVATION

CLASS VI

Well suited for grazing or forestry. Not arable because of steep slopes, susceptibility to erosion, shallow soils, alkali or other unfavorable condition. Requires more careful range or woodland management than land capability V.

CLASS VII

Fairly well suited for grazing or forestry. It has major hazards or limitations for use because of very steep slopes, shallow or droughty soils, excessive erosion, or severe alkali condition. Requires very careful management.

CLASS VIII

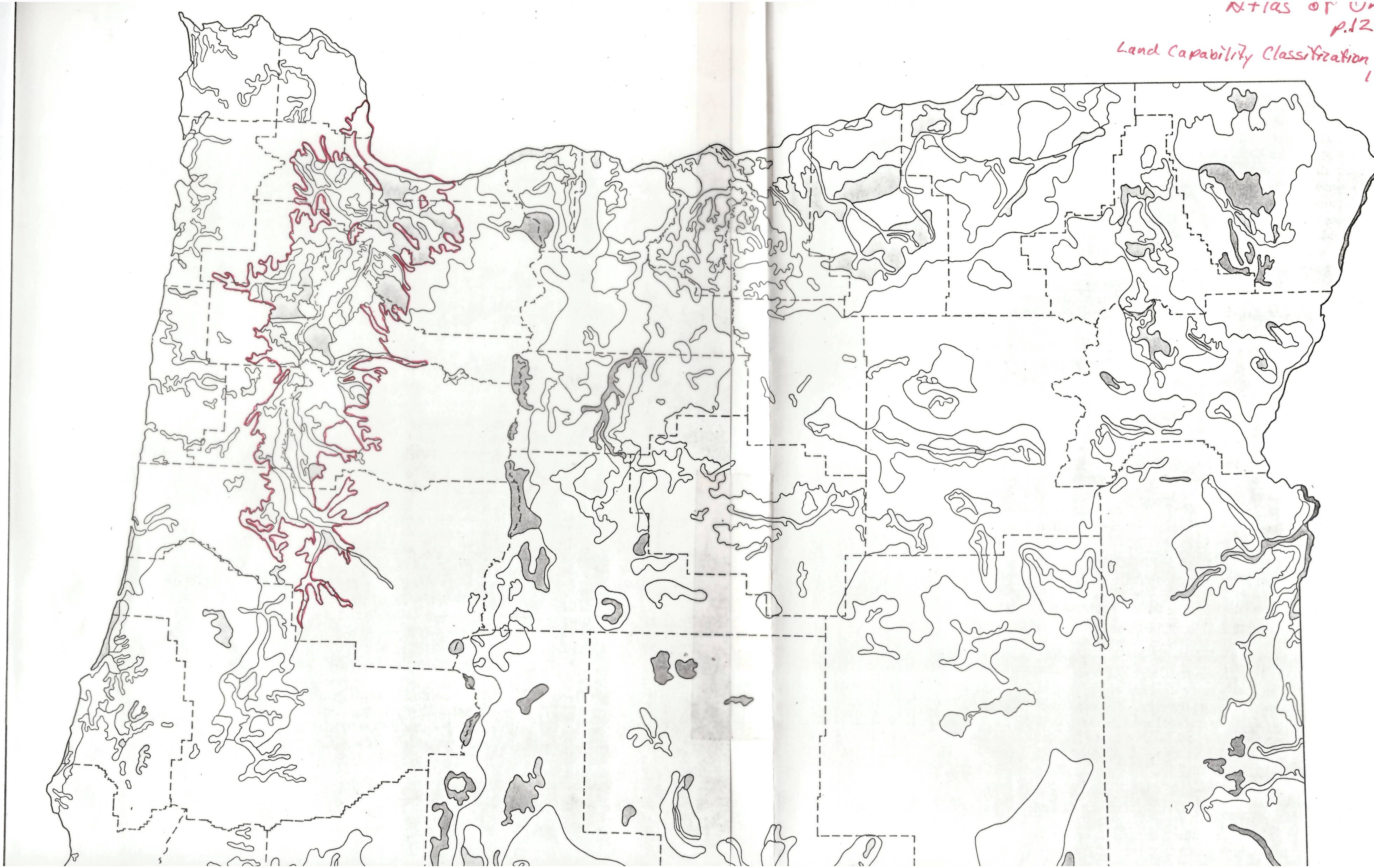
Land not suited for cultivation, grazing, or forestry. It may be used for wildlife, recreation, or protection of water supplies.

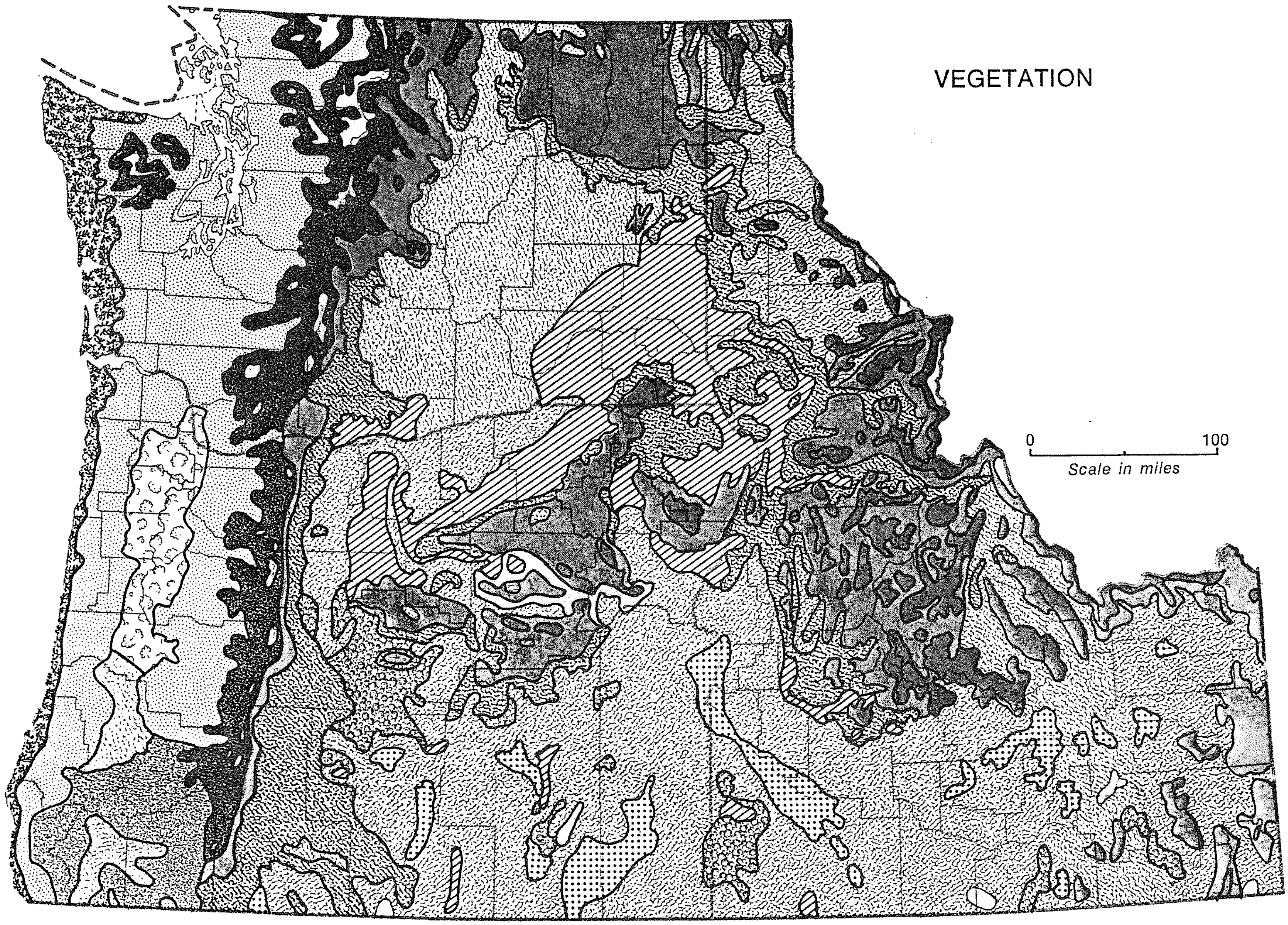
THE LAND USE CAPABILITY CLASSES

All land is divided into eight broad classes. The first four classes include land which can be plowed and cultivated safely, without lasting damage, if correct conservation procedures are followed. Class I land needs little special conservation treatment. Classes II, III and IV require increasing degrees of care and protection. The remaining four classes are not suited for cultivation. They need the protection afforded by a permanent cover of vegetation. Classes V, VI and VII require progressively more care even when used for grazing or forestry. Class VIII land can be used safely only for wildlife, recreation or watershed purposes.

Source: Legend is quoted directly from the map. Lakes are shown in gray.

Atlas of Oregon
p.127
Land Capability Classification of
1951




VEGETATION
0
100
Scale in miles

Major Vegetation Types

COASTAL SITKA SPRUCE TYPE: Confined generally within a few kilometers of the summer-cool winter-wet coastal strip, this coniferous type penetrates as much as 60-70 km up major valley bottoms in the Olympics, extends northward to Alaska, and grades into redwood forest in southwestern Oregon. Extensively altered by logging and fire, relatively few undisturbed stands remain. **Sitka spruce** (*Picea sitchensis*) characterizes the type although in many places **western hemlock** (*Tsuga heterophylla*) and **Douglas-fir** (*Pseudotsuga menziesii*) dominate forest stands. **Red alder** (*Alnus rubra*) often forms extensive patches in recently disturbed areas and riparian situations, while **western red cedar** (*Thuja plicata*) characterizes swampy situations. Beside coastal dune communities in which shore pine (*Pinus contorta*) is a prominent successional species, there are salt-marsh communities in estuaries and strand communities related to shifting dune systems along the extreme coastal strip. The Coastal Sitka Spruce Type rapidly grades into the Western Hemlock Type with which it bears close relationship.

WESTERN HEMLOCK TYPE: Mantling the Coast Range and the lower western slopes of the Cascades, this type is one of the most extensive in the PNW. It stretches north into British Columbia and south into California adjacent to the redwood belt and is especially important for timber production. Annual precipitation varies from 1,500 to 3,000 mm. Although named for the shade-tolerant western hemlock which characterizes the persistent vegetation, the dominant tree over much of the area is the seral species Douglas-fir. Extensive logging and agricultural clearing has occurred throughout the area. Other important coniferous species are western red cedar occurring in moist sites, **grand fir** (*Abies grandis*), and in the south, **sugar pine** (*Pinus lambertiana*), **ponderosa pine** (*Pinus ponderosa*), and **incense cedar** (*Libocedrus decurrens*). In disturbed moist sites, communities dominated by the red alder and **bigleaf maple** (*Acer macrophyllum*) are common. Plant communities within this type have been studied in considerable detail relating floristically defined units to site characteristics. Western hemlock gives way to Douglas-fir and, in some areas, to lodgepole pine on drier and sunnier sites; in wet situations as in northwestern Washington, western red cedar forms impressive stands; and as elevation increases and temperature decreases, Pacific silver fir (*Abies amabilis*) replaces western hemlock.

CASCADE SUBALPINE FOREST TYPE: An extremely complex series of vegetation types developing under heavy snow conditions is situated below the crest of the Cascades and Olympics and extends into British Columbia. Best regarded as a group of interfingering forested belts, this generalized type includes the Pacific silver fir zone dominated by *Abies amabilis* which commonly occurs above the Western Hemlock Type. At higher elevations, Pacific silver fir gives way to a more stunted, wind-firm forest dominated by **mountain hemlock** (*Tsuga mertensiana*) and **subalpine fir** (*Abies lasiocarpa*) both contributing to a park-like pattern of open meadow and forest stringers at timberline. In dry areas recently disturbed by fire or in areas of volcanic ash, **lodgepole pine** (*Pinus contorta*) prevails, typically forming even-aged stands. Species common in the Engelmann spruce forest of Idaho are frequently present in the northern Cascades. In southern Oregon the type bears close relationships to the red fir forest of California with species such as **white fir** (*Abies concolor*) and **Shasta red fir** (*Abies magnifica* var. *shastensis*), indicative of the affinity.

GRAND FIR/DOUGLAS-FIR TYPE: A mesic coniferous forest occurring in interior areas with some snow accumulation and exhibiting an exceedingly broad and complex distribution, this type embraces a variety of distinctive understory communities. Often both **grand fir** (*Abies grandis*) and **Douglas-fir** (*Pseudotsuga menziesii*) occur in mixed stands, although Douglas-fir tends to be more prevalent in Idaho and generally in warmer habitats. Other trees of importance in this type in order of increasing moisture tolerance are ponderosa pine, **western larch** (*Larix occidentalis*) and lodgepole pine; all of these species are fire-responsive pioneers. In moister, cooler areas in northern Idaho, western red cedar and western hemlock are prominent forest inclusions. **Oregon boxwood** (*Pachystima myrsinites*) and **common snowberry** (*Symphoricarpos albus*) dominate two prevalent understory communities.

PONDEROSA PINE TYPE: In a narrow fringing belt between the Grand Fir/Douglas-fir Type and Shrub/Steppe Type is a more open coniferous forest dominated by *Pinus ponderosa*. Understory vegetation varies from dense to open shrubby mats of **bitterbrush** (*Purshia tridentata*) and **snowbrush** (*Ceanothus velutinus*) in central Oregon to bunch grass meadows dominated by **Idaho fescue** (*Festuca idahoensis*) and **bluebunch wheatgrass** (*Agropyron spicatum*) further to the east. This type has been severely altered by timber harvest. Ponderosa pine, although persistent in this type, serves as a major seral species in the adjoining Grand Fir/Douglas-fir Type.

JUNIPER WOODLAND TYPE: In central Oregon this open woodland is the northern representative of the Pinyon-Juniper Zone, a vegetation type which is widespread in the Great Basin region and which penetrates the PNW region in southern Idaho. Shrub/Steppe vegetation dominated by **big sagebrush** (*Artemisia tridentata*) and by Idaho fescue typically comprises the understory of the Juniper Woodland Type. Commonly **western juniper** (*Juniperus occidentalis*) grows in open stands exhibiting a savanna type physiognomy. Throughout the arid regions of interior Oregon, juniper woodlands characterize rimrock habitats where local moisture supplies permit establishment of this xerophytic tree.

STEPPE TYPE: A distinctive plant cover of grassland without associated shrubs mantles large areas of north-central Oregon and the Palouse of southeastern Washington and adjacent Idaho. Since this grassland is very favorable for dryland farming much of the native vegetation has been severely altered by agricultural land use. Among the various broad communities identified within this grassland is the widespread *Agropyron-Festuca* type characterized respectively by bluebunch wheatgrass and Idaho fescue. In moister situations **Sandberg bluegrass** (*Poa secunda*) and Idaho fescue become more prominent along with a number of forbs and shrubby common snowberry. The Steppe Type has close relations to the more mesic ponderosa pine forest and more xeric shrub-steppe with the broad grassland communities commonly forming understory unions in these adjacent vegetation types.

SHRUB/STEPPE TYPE: Probably the most widespread vegetation type in the PNW, the Shrub/Steppe extends from the Canadian border in a narrow strip along the Okanogan River south into Nevada and west of the Cascades eastward to Wyoming and Colorado. Dominated by the aromatic big sagebrush, this type intermingles with the juniper woodland in central Oregon and juniper-pinyon pine woodland in southeastern Idaho. Stretches of this type have been transformed by irrigated agriculture in the Columbia River Basin; elsewhere the type largely supports nonintensive grazing. Plant communities within the type have been identified based on floristic composition of understory grasses, percent shrub cover, soils, and slope exposure. Two of the most prominent broad communities are *Artemisia tridentata/Festuca idahoensis* and the *Artemisia tridentata/Agropyron spicatum* types, the former having slightly greater moisture requirements. **Low sagebrush** (*Artemisia arbuscula*) frequently replaces big sagebrush in eastern Oregon in shallow stony soils. Commonly referred to as "desert," the Shrub/Steppe consists of nondesert species and exhibits a shrub-grass structure which is generally regarded as distinct from true deserts. Other shrubs include several species of sagebrush (*Artemisia* spp.) and **rabbit brush** (*Chrysothamnus* spp.).

DESERT SHRUB TYPE: Occupying isolated pockets within the broader cover of the Shrub/Steppe type, Desert Shrub is the most xeric plant cover of the PNW. Frequently the type occupies playas and playa margins where saline conditions characterized by salt crusts prevail, but the type also occupies the rainshadow areas on the lee of several north-south trending mountain ranges in southeastern Oregon and southern Idaho. Important shrubs, most of which are halophytic, include **shadscale** (*Atriplex confertifolia*), **salt sage** (*A. nuttallii*), **greasewood** (*Sarcobatus vermiculatus*) and **spring hopsage** (*Grayia spinosa*). Grasses and forbs are occasionally found in this well-spaced, low-shrub type. The type is best developed in the south and east of the region.

MIXED CONIFER/MIXED EVERGREEN TYPES: A highly complex type with close relation to several plant communities in California, this conifer and broadleaf evergreen forest is found in southwestern Oregon where it straddles the Siskiyou range. Edaphic, fire history, and climatic contrasts within this region lead to sharp breaks in plant cover. Douglas-fir dominates the upper canopy but various sclerophyllous evergreen trees are found in the low tree and shrub understory including **tanoak** (*Lithocarpus densiflorus*), **canyon liveoak** (*Quercus chrysolepis*), **Pacific madrone** (*Arbutus menziesii*) and **golden chinquapin** (*Castanopsis chrysophylla*). In more mesic situations, elements related to the Sierran Montane forest appear including Douglas-fir, sugar pine, ponderosa pine, and white fir. Areas of serpentine soil bearing a highly distinctive flora and depauperate vegetation are prominent in the Siskiyou Mountains. Other dry rocky areas in this range support a sclerophyllous broadleaf chaparral with **manzanita** (*Arctostaphylos* spp.) and *Ceanothus* spp.

ROGUE-UMPQUA FOREST-SHRUB TYPE: Occupying interior valleys in the rainshadow of the Siskiyou Mountains and southern Coast Range is a complicated mosaic of communities with many xeric characteristics. Woodlands are frequently dominated by **Oregon white oak** (*Quercus garryana*), with **California black oak** (*Q. kelloggii*) appearing on more mesic sites. Pacific madrone, ponderosa pine, sugar pine, and incense cedar appear in these woodlands and distinguish them from the woodland and forests of the Willamette Valley. On shallow soils and south slopes and in areas recently exposed to fire, sclerophyllous shrub communities are found with **narrow-leaved buckbrush** (*Ceanothus cuneatus*) and **white leaved manzanita** (*Arctostaphylos viscida*) as important species. Both the ponderosa pine forest and sclerophyllous shrub communities grade into related vegetation categories in adjacent northern California.

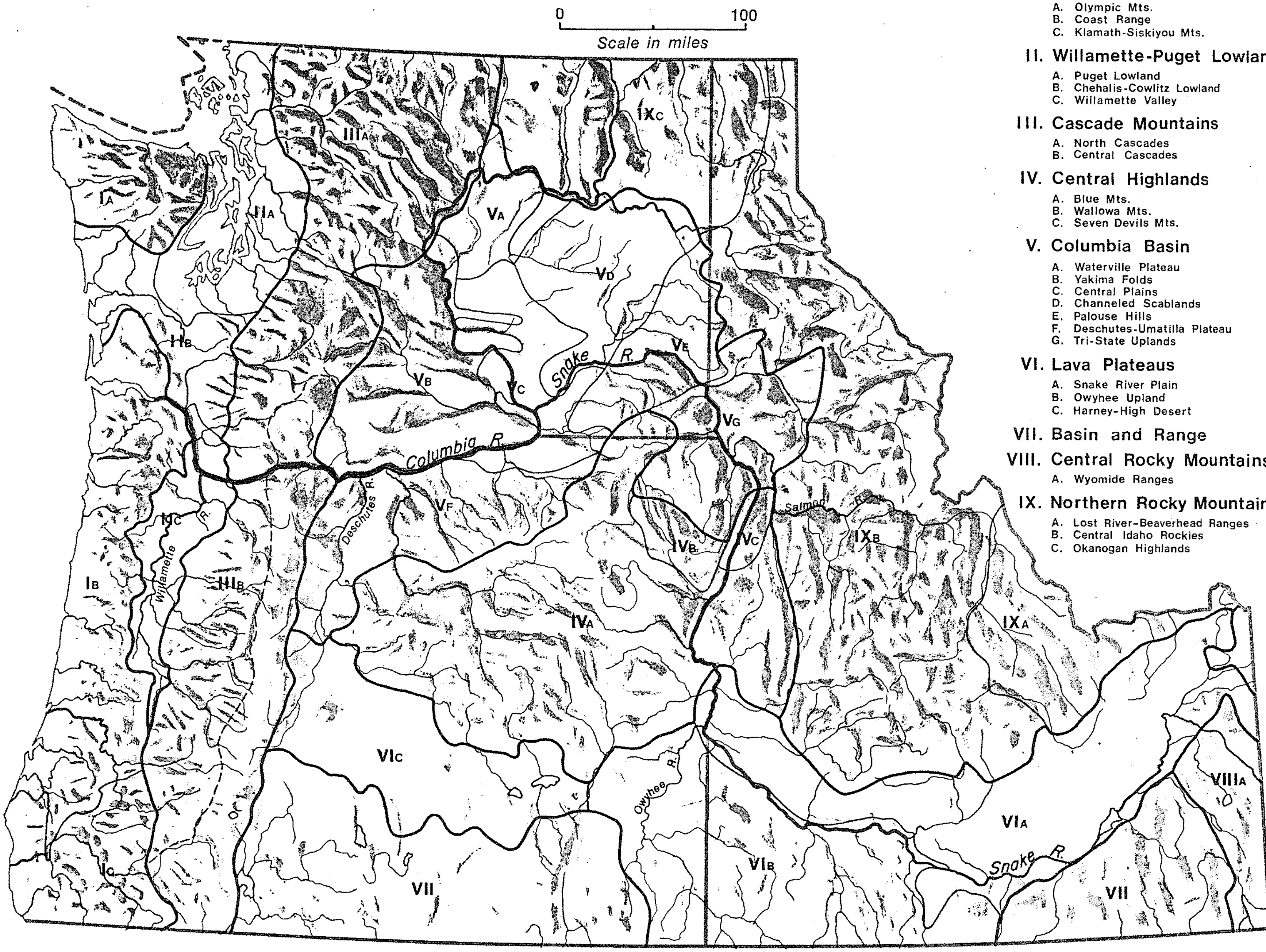
WILLAMETTE PRAIRIE-FOREST TYPE: Confined to the alluvial bottomland and adjacent slopes of the Willamette Valley is another complex mosaic of forest, woodland, open savanna with grassland understory, and prairie. Most of the original vegetation has been altered by agricultural and residential activities but also by changes in fire history. Apparently much of the Willamette Valley prairie and Oregon white oak savanna at the time of first settlement was maintained by aboriginal burning. Oak woodlands dominated by Oregon white oak often give way to invasion by Douglas-fir and grandfir with bigleaf maple becoming important on north-facing slopes. Grasslands presently maintained by grazing (formerly by fire) include a large complement of introduced species and tend to occupy drier sites. Lacing this mosaic of communities are narrow strips of riparian woodland in which **Oregon ash** (*Fraxinus latifolia*), **black poplar** (*Populus trichocarpa*), and species of **Willow** (*Salix* spp.) mark this special vegetation category.

WESTERN RED CEDAR/WESTERN HEMLOCK TYPE: Situated at moderate altitudes in relatively summer-moist locales in the northeastern portion of the region, this type is intermediate to the lower lying more xeric Grand Fir/Douglas-fir Type and the Spruce/Fir Type of higher elevations. Dominant trees include western red cedar, western hemlock, and **western white pine** (*Pinus monticola*), but grand fir and western larch are not uncommon in drier sites. Understory unions in the various identified communities in this type are similar to those of the Grand Fir/Douglas-fir Type with the exception of fern and Devil's club unions in moist habitats.

ENGELMANN SPRUCE/SUBALPINE FIR TYPE: Confined to the higher elevations of the eastern PNW region, this type is the counterpart of the Cascade subalpine forest. Varying from dense, moderately tall forest to open park-like stands, the dominant trees are **subalpine fir** (*Abies lasiocarpa*) and **Engelmann spruce** (*Picea engelmannii*) with occasional intrusions of **subalpine larch** (*Larix lyallii*) and whitebark pine (*Pinus albicaulis*) at higher elevations and in the north and Douglas-fir at lower elevations. Various communities within this type have been described and are differentiated mainly by understory shrub composition. In exposed situations near timberline the trees present krummholz form.

ALPINE TYPE: Found in true alpine environments near and above tree-line limits, this type is narrowly represented in the Cascades of Washington and Oregon and more extensively distributed in the Rocky Mountains. Although mainly comprised of herbaceous plants and low shrubs, there are a few trees displaying krummholz form and occupying habitats protected from excessive snow accumulation and wind exposure. Meadow communities found in the subalpine park area extend into the alpine type and commonly include species in the heather family (*Ericaceae*). Glaciers, permanent snow fields, and extensive areas of talus and rock cover much of the area within the Alpine Type.

LANDFORM REGIONS



I. Coastal Mountains
- A. Olympic Mts.
- B. Coast Range
- C. Klamath-Siskiyou Mts.

II. Willamette-Puget Lowland
- A. Puget Lowland
- B. Chehalis-Cowlitz Lowland
- C. Willamette Valley

III. Cascade Mountains
- A. North Cascades
- B. Central Cascades

IV. Central Highlands
- A. Blue Mts.
- B. Wallowa Mts.
- C. Seven Devils Mts.

V. Columbia Basin
- A. Waterville Plateau
- B. Yakima Folds
- C. Central Plains
- D. Channeled Scablands
- E. Palouse Hills
- F. Deschutes-Umatilla Plateau
- G. Tri-State Uplands

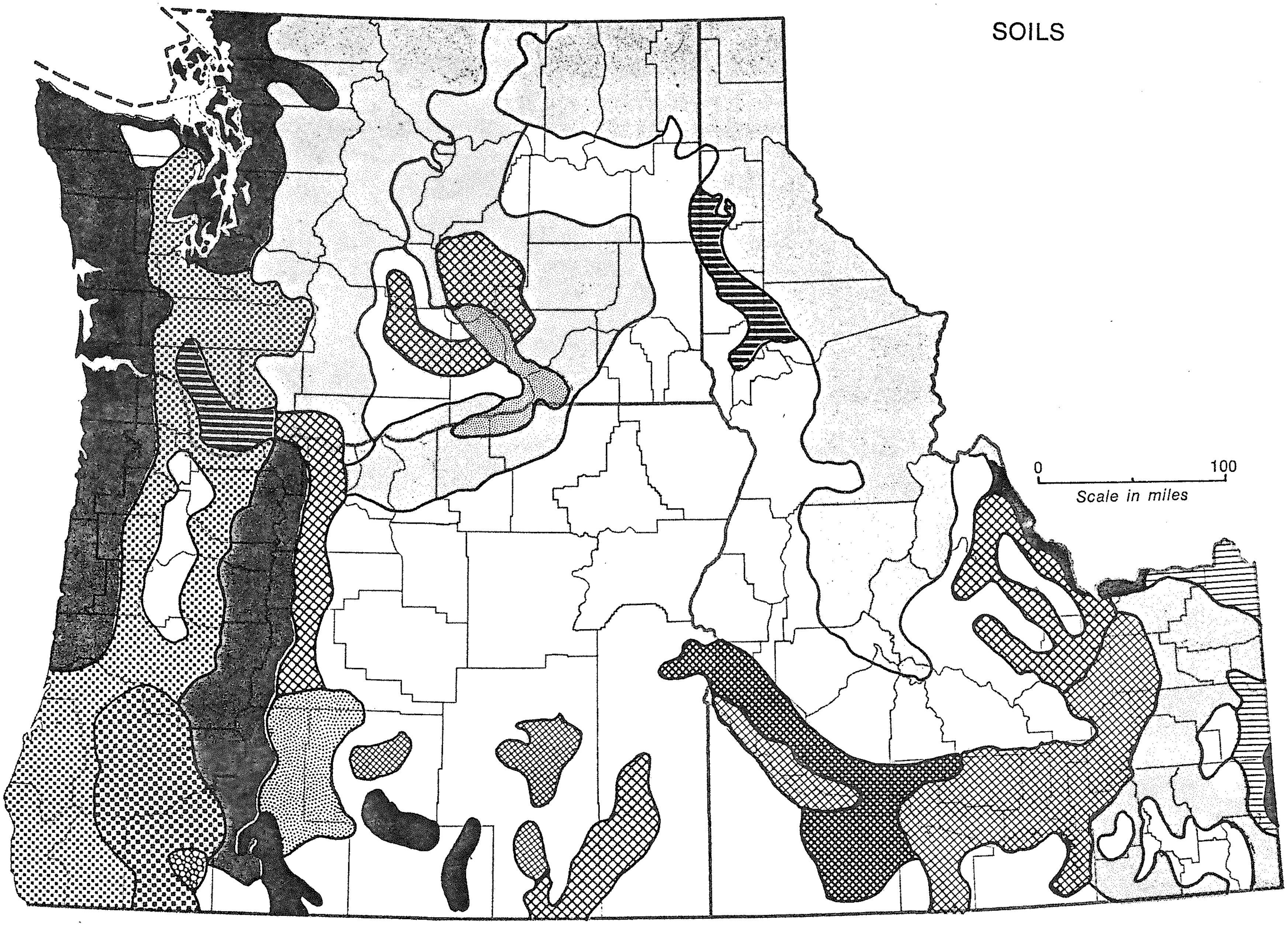
VI. Lava Plateaus
- A. Snake River Plain
- B. Owyhee Upland
- C. Harney-High Desert

VII. Basin and Range

VIII. Central Rocky Mountains
- A. Wyomide Ranges

IX. Northern Rocky Mountains
- A. Lost River-Beaverhead Ranges
- B. Central Idaho Rockies
- C. Okanogan Highlands

SOILS



Soil Orders

INCEPTISOLS

Soils with weakly differentiated horizons exhibiting some alteration of the parent material and therefore soils initiating development. The B horizon typically has little clay accumulation. In the PNW, these soils generally occur under cool summer climate where parent materials are of a late or post-Pleistocene origin and do not show translocation of clay. The order is present in the Puget lowland, Coast Range, Cascades, and Idaho mountains. Two suborders are shown:

UMBREPTS are soils with surface horizons darkened by high contents of organic matter, having crystalline clay minerals, relatively high capacity to hold exchangeable cations, freely drained, and exhibiting acidic reaction. They develop in areas of high winter precipitation and moderate winter temperatures in the Coast Range, Oregon Cascades, and Puget lowland where western coniferous forest is the prevailing vegetation.

Cryumbrepts—in cold regions.

Haplumbrepts—in temperate to warm regions.

ANDEPTS are soils in the PNW with high contents of volcanic ash and are therefore of low bulk density. They are of recent development occurring in mountainous areas in Idaho and in the northern Cascades under cool summer conditions.

Cryandepts—in cold regions.

ULTISOLS

Strongly weathered and leached soils low in bases with clay-enriched horizons under moderately warm (mean annual temperature greater than 46° F) and moist (40 to 120 inches mean annual precipitation) climates, Ultisols develop in a variety of parent materials and usually exhibit considerable stability. This order is found in the low hilly regions between the Cascades and Coast Range where they generally support coniferous forest growth, display good drainage, increasing acidity with depth, and horizons with accumulations of silicate clays. Many are reddish. Two suborders are distinguished:

HUMULTS are highly organic Ultisols developing under moist conditions showing good drainage and are mostly dark colored. They develop on steep slopes and are found in southwestern Oregon and the foothills of the Cascades and Coast Range.

Haplohumults—with subsurface horizon of clay and/or weatherable minerals; in temperate climates.

XERULTS are freely drained Ultisols in areas of Mediterranean climate with little organic material in the upper horizons and are seldom saturated with water. They are confined to the hilly regions in the middle portion of the Rogue and Umpqua drainage and support a mixed coniferous-broadleafed evergreen vegetation with xeric elements.

Haploxerults—with subsurface horizon of clay and/or weatherable minerals.

MOLLISOLS

Soils that have dark-colored, friable, organic-rich surface horizons, which are high in bases occurring in areas in subhumid and semiarid climates which may vary from warm to cold, are widespread in the region, especially in areas of steppe and shrub/steppe vegetation. These soils may have clay-enriched horizons, calcic horizons, sodium-rich horizons, or indurate horizons. Most soils are well drained, but wet soils may have soluble salts or high exchangeable sodium or both. Three suborders are shown:

AQUOLLS are Mollisols that are seasonally wet with a thick, nearly black surface horizon and gray subsurface horizons. In south-central Oregon in the Warner Valley and Klamath Lake area, horizons have been altered, but no accumulation of calcium or clay has taken place.

Haplaquolls—with horizons in which materials have been altered or removed, but little calcium carbonate or gypsum.

XEROLLS are Mollisols in winter-moist, summer-dry climates. The soils are continually dry for long periods of time. With irrigation and when adequate natural soil moisture is available, these soils are important for grain and forage. These are the prevailing soils in the steppe and shrub/steppe areas of the region.

Argixerolls—with subsurface clay horizon, either thin or brownish.

Haploxerolls—with subsurface horizon high in bases, but with little clay, calcium carbonate, or gypsum.

BOROLLS are Mollisols of cool and cold regions exhibiting black surface horizons. In the Pacific Northwest they are confined to the extreme eastern portion of Idaho.

Argiborolls—with subsurface clay horizon, in cool regions.

ARIDISOLS

As suggested by the name, this order occurs in dry areas where the soils are never moist for periods of more than three consecutive months. The soils are low in organic content and the horizons are light in color and have a soft consistency when dry. These soils are found in the rainshadow area of the Cascades and in extensive areas in southern Idaho. Two suborders are shown:

ORTHIDS are Aridsols that display accumulations of calcium carbonate and other salts but do not have clay accumulations in horizons. Such soils are found in scattered localities in the drier areas of the Pacific Northwest.

Calciorthids—with a horizon containing much calcium carbonate or gypsum.

Camborthids—with horizons from which some materials have been removed or altered, but little calcium carbonate or gypsum.

ARGIDS are Aridsols distinguished by a horizon in which clay has accumulated. These are mostly found in Snake River Plain to the south of Boise.

Haplargids—with loamy horizon of clay, with or without alkali (sodium) accumulation.

Natrargids—with a horizon of clay and alkali (sodium) accumulation.

ENTISOLS

Soils in this order exhibit no horizon development. In the Pacific Northwest these soils are developing in sandy parent material and are of very recent origin on gently sloping terrain. They continue to receive parent material. They occur to the lee of the Cascade Range. One suborder is shown on the map:

PSAMMENTS are Entisols with loamy fine sand to coarser sand texture developing in areas of shifting to stabilized sand dunes. Sand origin is largely fluvial but with local redeposition by wind.

Torripsamments—contain easily weatherable materials; never moist for three consecutive months.

Xeropsamments—in climates with wet winters and dry summers; continually dry during long period in warm season.

ALFISOLS

Soils in this order are differentiated by clay-enriched horizons, moderate organic matter accumulation, gray to brown color, and are usually leached and are acid. Climate is cool and moist. Three areas are dominated by Alfisols—the hilly region north of Portland, the area northeast of Moscow, and the mountains near east boundary of Idaho. Two suborders are shown:

UDALFS are Alfisols with a mesic or warmer temperature regime and are almost always moist despite periods of summer dryness. These soils are brownish or reddish. The area north of Portland in which Udalfs prevail has a complex of other soils as well. The Udalf area in Idaho occurs in steep mountainous terrain.

Hapludalfs—with subsurface clay horizon, either thin or brownish.

BORALFS are Alfisols of cool and cold regions and are rarely water-saturated. A bleached eluvial horizon often grades into a horizon containing clay or alkali. Found in mountains of eastern Idaho.

Cryoboralfs—in cold regions; with sandy upper layers, grayish color, and subsurface clay horizon.

VERTISOLS

Relegated to this order are clayey soils that have wide, deep cracks which form during the dry season. They occur in areas with marked dry-wet periods. One suborder is present:

XERERTS are Vertisols that have wide, deep cracks that open and close once a year, remaining open for periods of more than two months. In the Pacific Northwest, one area in the vicinity of Medford is characterized by this suborder.

Chromoxererts — with a brownish surface horizon.

YAMHILL COUNTY

McDANIEL VINEYARDS 36
James McDaniel
[redacted]
Dundee, OR 97115

WYNYATE VINEYARDS 36
William & Julia Wayne
[redacted]
Dundee, OR 97115

DUNDEE HILLS' VINEYARD 36
John & Sally Bauers
[redacted]
Dundee, OR 97115

Fred Jensen 36
[redacted]
Amity, OR 97101

ELK COVE VINERY 36
Joe H. Campbell
[redacted]
Gaston, OR 97119

RIBBON RIDGE VINEYARDS
Dewey Kelly
[redacted]
Portland, OR 97219

CHEHALEM VINEYARDS 36
C. Montgomery
[redacted]
Yamhill, OR 97148

CAMBUS BELLUS VINEYARD 36
E.S. C.G. C.S. Campbell
[redacted]
Amity, OR 97101

HYLAND VINEYARDS, INC. 36
Wm. & Ruth Welch
Dr. & Mrs. Markley, M.D.
[redacted]
McMinnville, OR 97128

ADELSHEIM VINEYARDS 36
David & Virginia Adelsheim
[redacted]
Newberg, OR 97132

ADAMS VINEYARD
Peter F. Adams
[redacted]
Portland, OR 97201

CHARDONNAY OAKS VINEYARD 36
Roy J. & Betty J. Whale
[redacted]
Yamhill, OR 97148

CLEAR MOUNTAIN VINEYARD
Harry & Judy Nedry
[redacted]
Portland, OR 97212

DURANT VINEYARDS 36
Penny & Ken Durant
[redacted]
Dundee, OR 97115

EOLA HILLS VINEYARD 36
Don & Carolyn Byard
[redacted]
Salem, OR 97302

KIRSCHWOLD VINEYARD 36
Albert & Magdalene Lobo
[redacted]
Amity, OR 97101

MARVAL VINEYARDS 36
Marvin L. Smith
Alvin Hansen
[redacted]
Portland, OR 97213

RED HILLS VINEYARD 36
James & Lois Maresh
[redacted]
Dundee, OR 97115

SOKOL BLOSSER VINEYARDS 36
Susan & Bill Blosser
[redacted]
Dayton, OR 97114

John A. Stewart 36
[redacted]
Dayton, OR 97114

THE EYRIE VINEYARDS 36
[redacted]
Dundee, OR 97115
c/o David Lett

STONEHEDGE VINEYARD 36
John Schetky
David Lett
[redacted]
Dayton, OR 97114

Bill Cattrall 36
[redacted]
Amity, OR 97101

John Rich 36
[redacted]
Newberg, OR 97132

Chateau Benoit 36
[redacted]
Carlton, OR 97111

Thomas A. Saucy Vineyards 36
Tom Saucy
[redacted]
Dundee, OR 97115

ERATH VINEYARDS 36
Richard Erath
[redacted]
Dundee, OR 97115

KNUDSEN VINEYARDS 36
C. Calvert Knudsen
[redacted]
Dundee, OR 97115

AMITY VINEYARDS 36
Myron Redford
Amity, OR 97101

CLEAR MOUNTAIN VINEYARD 36
[redacted]
PORTLAND OR 97212

Mark W. Teppola 36
[redacted]
Portland OR 97214

Mark Benoit 36
WILLAMETTE VINEYARD SERVICE

WASHINGTON COUNTY

34

MULHAUSEN VINEYARDS
Zane Mulhausen
[redacted]
Newberg, OR 97132

34

Paul Choban
[redacted]
Forest Grove, OR 97116

34

COTES des COULOMBE VINEYARD
Joseph R. P. Coulombe
[redacted]
Portland, OR 97225

34

John P. Dennis, MD
[redacted]
Portland, OR 97225

34

DION VINEYARD
Ronald A. Johnson
[redacted]
Beaverton, OR 97005

34

FIVE MOUNTAINS VINEYARD
Jim Taylor, Jr.
[redacted]
Cornelius, OR 97113

34

LADD HILL VINEYARD
Mark Landis
[redacted]
Sherwood, OR 97140

34

LAUREL HILL VINEYARD
Bill Beran
Rickey Koehler/Beran
[redacted]
Hillsboro, OR 97123

34

MT COOPER VINEYARD
Robert Gross
[redacted]
Beaverton, OR 97007

34

NON de PLUM
William Jasper
[redacted]
Beaverton, OR 97005

OLD PUMPKIN RIDGE
Don & Bonnie Babbitt
[redacted]
Cornelius, OR 97113

34

PERRAULT VINEYARD
Walter J. Perrault
[redacted]
Hillsboro, OR 97123

34

SUNSET VINEYARDS
Bruce & Virginia Adams
[redacted]
Buxton, OR 97109

34

TUALATIN VINEYARD
William Fuller
[redacted]
Forest Grove, OR 97116

34

VAN SHEPEN VINEYARDS
Mr. & Mrs. David Van Shepen
[redacted]
Hillsboro, OR 97123

34

WINDHILL VINEYARDS
Sandy & Virginia Reece
[redacted]
Banks, OR 97106

34

WIRTZ VINEYARDS
Dave Reiner Wirtz
[redacted]
Forest Grove, OR 97116

34

LEYDEN, HELEN & JAMES
[redacted]
Banks, OR 97106

34

Mel Christensen
[redacted]
Hillsboro, OR 97123

34

Heesacker Vineyards
Jim & Linda Heesacker
[redacted]
Forest Grove, OR 97116

34

Milton Ritter
[redacted]
Beavercreek, OR 97009

SHAFER VINEYARD
Harvey Shafer
[redacted]
Forest Grove, OR 97116

34

REUTER HILL VINEYARD
[redacted]
Veneta, OR 97487
c/o Mark Benoit

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MARION COUNTY

ANKENY VINEYARD
Joseph S. Olexa
[redacted]
Salem, OR 97306

24

WAHL VINEYARD
Pat Wahl
[redacted]
Salem, OR 97306

24

PORTERS VINEYARD
Raymond & Diana Porter
[redacted]
Aumsville, OR 97325

24

SILVER FALLS VINEYARDS
Jim & Joyce Palmquist
[redacted]
Sublimity, OR 97385

24

SKYLINE VINEYARD
Don Voorhies
[redacted]
Salem, OR 97302

24

SUNNYSIDE VINEYARDS
Tom Owen
[redacted]
Salem, OR 97302

24

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JOSEPHINE COUNTY 17

Edna Milar Dively 17
[redacted]
Cave Junction 97523

FEEHELY'S FOOTHILL FARM INC. 17
Michael T. Feehely
[redacted]
O'Brien, OR 97534

Don Ferrell 17
[redacted]
Grants Pass, OR 97526

Ted Gerber 17
[redacted]
Cave Junction, OR 97523

GREAT OAK VINEYARD 17
Ralph L. Seltzer
[redacted]
Selma, OR 97538

LAKESHORE VINEYARD 17
Robert S. Steele
[redacted]
Selma, OR 97538

OREGON CAVES WINERY 17
Clifton W. Kemper
[redacted]
Cave Junction, OR 97523

PAIR-A-DICE VINEYARD 17
Robert Blunk
[redacted]
Cave Junction, OR 97523

ROCKYDALE VINEYARDS 17
Robert Kerivan
[redacted]
Cave Junction, OR 97523

SISKIYOU VINEYARDS COMPANY 17
~~Charles~~ & Carol David
[redacted]
Cave Junction, OR 97523

HELEN'S VINEYARD 17
[redacted]
Grants Pass, OR 97526

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LINN COUNTY

MEADOWS' VINEYARD 22
[redacted]
HALSEY OR 97348

MARKHEIM VINEYARDS 22
[redacted]
SWEET HOME OR 97386
SEND TO:

Ray & So Yun Higgins 22
[redacted]
Florence OR 97439

22

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HOOD RIVER
COUNTY

CRIPPEN FAMILY ORCHARD 14
[redacted]
HOOD RIVER OR 97031

WASCO COUNTY

BANGSUND VINEYARDS 33
John Bangsund
[redacted]
THE DALLES OR 97058

MORROW COUNTY

LA CASA de VIN VINEYARD 25
F. E. GLENN
[redacted]
BOARDMAN OR 97818

RICK & SUE MC NESNEY 25
[redacted]
IRRIGON OR 97844

10

DOUGLAS COUNTY

ANDERSON VINEYARD 10
John & Claudia Anderson
[redacted]
Tenmile, OR 97481

BER-MAR VINEYARDS 10
Bernard & Margaret Gunshore
[redacted]
Roseburg, OR 97470

Douglas Doerner 10
[redacted]
Roseburg, OR 97470

ELKTON VINEYARDS 10
Ken Thomason
Bob Bingham
[redacted]
Elkton, OR 97436

GATES' ELGAROSE VINERY 10
Richard & Jewell Gates
[redacted]
Roseburg, OR 97470

HENRY VINEYARD (Winery) 10
Scott Henry
[redacted]
Umpqua, OR 97486

HILLCREST VINEYARD 10
Richard H. Sommer
[redacted]
Roseburg, OR 97470

RED HILL VINEYARD 10
Conrad J. Feren
[redacted]
Oakland, OR 97462

RED HILL VINEYARD 10
Fred & Anne Howell
[redacted]
Oakland, OR 97462

SIMS VINEYARD 10
William H. Sims
[redacted]
Roseburg, OR 97470

SOUTH UMPQUA VINEYARD 10
Alfred McCorquodale
[redacted]
Roseburg, OR 97470

VINEDO VINEYARD 10
Ken Wallick
[redacted]
Roseburg, OR 97470

VINORCH VINEYARD 10
Judd & Blanche Chapman
[redacted]
Roseburg, OR 97470

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POLK COUNTY

COOPER HOLLOW VINEYARD 27
William K. Ousterhaut
[redacted]
Monmouth, OR 97361

James H. Feltz 27
[redacted]
Salem, OR 97304

BETHEL HEIGHTS VINEYARD 27
Ted Casteel & Patricia Dudley
[redacted]
Salem, OR 97304

GLENN CREEK VINEYARD & WINERY 27
Thomas I. Dumm
[redacted]
Salem, OR 97304

SPRING VALLEY VINEYARD 27
Alvin & Mary Jo Alexanderson
[redacted]
Salem, OR 97304

DUSSCHEE VINEYARDS
Dan & Helen Dusschee
[redacted]
Dallas, OR 97338

ASHFORD, JASON 27
[redacted]
Salem, OR 97304

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LANE COUNTY

HINMAN FARMS 20
Doyle W. Hinman
[redacted]
Eugene, OR 97405

Florian Wipper 20
[redacted]
Portland, OR 97213

W. A. Wright 20
[redacted]
Eugene, OR 97401

McKENZIE RIVER VINEYARD 20
Dennis Short
[redacted]
Eugene, OR 97401

FORGERON VINEYARDS 20
George L. Smith
[redacted]
Elmira, OR 97437

PEACEFUL VALLEY VINEYARD 20
Ray Janisse
[redacted]
Eugene, OR 97405

SCHALVICHRIS VINEYARDS 20
Al & Vicki Eckerdt
[redacted]
Eugene, OR 97402

David & Annette Smith 20
[redacted]
Eugene, OR 97405

Pauline McIntire 20
[redacted]
Eugene, OR 97402

GOSHEN HOLE RANCH 20
[redacted]
JUNCTION CITY OR

BENTON COUNTY

ALPINE VINEYARDS 2
Dan & Christine Jepsen
[redacted]
Alpine, OR 97456

BROADLEY VINEYARDS
Craig Broadley
[redacted]
Eugene, OR 97440

KINGS VALLEY VINEYARD
L. C. Raniere
[redacted]
Corvallis, OR 97330

MARY'S PEAK VINEYARD 2
Rodger Kohnert
[redacted]
Corvallis, OR 97333

McCLAIN'S VINEYARDS 2
Harold & Robyn
Mike & Karen McLain
[redacted]
Corvallis, OR 97330

NATURAL HIGH FARMS 2
Charles W. Sholes
[redacted]
Eugene, OR 97401

SPIELHOF VINEYARDS 2
M. F. Marti
[redacted]
Monroe, OR 97456

CLACKAMAS COUNTY

BIG FIR WINERY 2
[redacted]
Boring, OR 97009

Carl & Olga Joplin 2
[redacted]
Sherwood, OR 97140

KELLAR'S CELLAR 2
George Keller
[redacted]
Milwaukie, OR 97222

Dave Kurkoski
[redacted]
Oregon City, OR 97045

LADD HILL VINEYARD 2
Victor C.Marquardt, Jr.
[redacted]
Wilsonville, OR 97070

NEEDY VINEYARDS 2
Gerald Zimmer
[redacted]
Canby, OR 97013

NORTH WILLAMETTE 2
EXPERIMENT STATION
[redacted]
Aurora, OR 97002

Pinot Submarine 2
M.A. Conway
[redacted]
Wilsonville, OR 97070

Don Walman 2
[redacted]
Oregon City 97045

Jim Wasson 2
[redacted]
Oregon City, OR 97045

Steve Milliren 2
[redacted]
Wilsonville, OR 97070

JACKSON COUNTY

APPLEGATE VINEYARD
Richard Sharp
[redacted]
Medford, OR 97501

John Ousterhout 15
[redacted]
Eagle Point, OR 97524

DUNBAR ORCHARDS 15
Dunbar Carpenter
[redacted]
Medford, OR 97501

LAYNE VINEYARD 15
Roger Layne
[redacted]
Grants Pass, OR 97526

EVANS VALLEY VINEYARD 15
Heuertz-Mott-White
[redacted]
Central Point, OR 97502

GEBHARD ORCHARDS 15
Frank Gebhard
[redacted]
Central Point, OR 97502

VALLEY VIEW VINEYARD 15
[redacted]
Jacksonville, OR 97530

Hummingbird Hill 15
Peter Giffen
[redacted]
Ashland, OR 97520

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