YAKIMA VALLEY
APPELLATION
COMMITTEE

1520 SHERIDAN AVENUE
PROSSER, WASHINGTON
99350
(509)-786-2163

MAY 1, 1982

MR. G. R. DICKERSON
DIRECTOR
BUREAU OF ALCOHOL TOBACCO AND FIREARMS
WASHINGTON, D.C. 20226

DEAR MR. DICKERSON,

IN ACCORDANCE WITH THE PROVISIONS OF TREASURY DECISION ATF-53 AND 27 CFR PART 4, SECTION 4.25, THE PERSONS AND ORGANIZATIONS LISTED IN APPENDIX "A" SUBMIT THIS LETTER AND ITS ATTACHMENTS AS A PETITION TO ESTABLISH AN AMERICAN VITICULTURAL AREA TO BE KNOWN AS THE "YAKIMA VALLEY".

SINCE MANY OF US ARE SMALL WINERY OPERATORS OR GROWERS, WE WOULD FURTHER REQUEST THAT ANY HEARINGS IN REGARDS TO THIS PETITION BE HELD IN OR VERY NEAR THE PROPOSED AREA. I HAVE ASKED DR. LIN FAULKNER, SUPERINTENDENT OF THE IRRIGATED RESEARCH AND EXTENSION CENTER, WASHINGTON STATE UNVIVERSITY AND U.S.D.A. TO MAKE THEIR FACILITIES AVAILABLE FOR SUCH A HEARING. IF THIS IS POSSIBLE, PLEASE CONTACT HIM AT: IAREC; P.O. BOX 30; PROSSER, WA 99350; PHONE (509)-786-2226.

THANK YOU FOR YOUR CONSIDERATION.

SINCERELY,

MIKE WALLACE, CHAIRMAN

CC:
DR. LIN FAULKNER

Yakima Valley Appellation Committee

I. Current and historical evidence that the Yakima Valley is locally and nationally known and that the boundaries are as specified in the petition.

The Yakima Valley has long been known as a geographic agricultural and horticultural region and more recently as a viticultural area. Historical and current use of the term "Yakima Valley" as a geographic location is well documented (1, 2, 3, 5, 7, 9, 10, 11, 13, 14, 15, 16, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32). The Yakima Valley has been known as an agricultural region since it was settled by white men in the late 1800's (21, 22). In their book The Winemakers of the Pacific Northwest, Purser and Allen (18) point out, "the history of irrigation in the Yakima Valley is the is the history of the valley itself. It was the diversion of water from the Yakima River and its tributaries which transformed the semi-arid valley into the prosperous farm land it is today. "Yakima" name of the city, valley and river derives from the powerful Yakima Nation a loose confederacy of Indian tribes which once controlled a vast portion of Eastern Washington." Perhaps the most conclusive evidence for use of the term "Yakima Valley" as a geographic location may be found on United States geological survey maps: Yakima NL 10-6, 1958, 1971 revision and Walla Walla NL 11-4, 1953, 1963 revision which are part of this petition. These maps clearly label the area under consideration "Yakima Valley" and label other location with different geographic designations, e. g. Ahtanum Valley, Moxee Valley, Horse Heaven Hills, etc.

Yakima Valley Appellation Committee

The Yakima Valley has long been famous as a horticultural area being particularly well known for its apples, soft fruits and hops (1, 13, 22, 26). However since the entire state of Washington was not known as a wine producing state until after prohibition (20), its viticultural history is of more recent origin. Numerous references to the Yakima Valley as a viticultural area are made in scientific, enological, vititcultural, commercial and popular literature (1, 2, 3, 5, 6, 7, 9, 10, 11, 14, 15, 18, 19, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32). For example, Schoonmaker (19) refers to "Light Table Wines From Irrigated Vineyards in Eastern Washington, Notably in the Yakima Valley". In The Wines of America (1), Adams notes a large California winery obtaining grape juice from a "Growers Co-Op in the Yakima Valley of Washington". In their extension bulletin "Grapes Their Suitability for Production in Washington" Tukey and Clore (27) state much of their research data came from "Trials in the Yakima Valley".

A number of specific towns are often referred to in historical and wine related literature as being located in the Yakima Valley, (1, 2, 3, 5, 6, 9, 18, 24, 27). For example, Adams (1) states "Most of the 15,000 acres of vineyards.....are concentrated in the Lower Valley between Wapato, Sunnyside, Grandview, Prosser and Benton City." Some specific vineyards are referred to as being Yakima Valley vineyards. For example, Hinzerling Vineyards (3) specifies its vineyard is located "high on the north side of the Yakima Valley". In referring to grape pioneer

William Bridgeman, Adams (1) notes "He made a comparative study of climate between the Yakima Valley, Burgundy and Bordeaux and concluded.....The Yakima Valley.....should produce fine vinifera grapes. He chose a site on the Harrison Hills (sic) of Sunnyside." Purser and Allen (18) refer to the "The Washington State University Irrigated Agricultural Research Center in the Yakima Valley Town of Prosser".

The earliest known use of the appellation "Yakima Valley" on a wine label was by Associated Vintners (4, 12, 24); in 1967 they used the term "Yakima Valley Varietal Wine" in conjunction with varietal designations for wines produced from their Sunnyside vineyard. Currently, six wineries, Associated Vintners, E. B. Foote, Hinzerling, Kiona Vineyards, Tucker Cellars and Yakima River Winery use the Yakima Valley appellation for wines produced from vineyards in the proposed area (see appendix).

II. Evidence relating to the physical and climatological features distinguishing the Yakima Valley from surrounding areas.

The topography of Eastern Washington is characterized by a series of west to east basaltic uplifts which occured millions of years ago. (30) These uplifts created a series of small and large valleys with distinct north/south boundaries and slopes. The drainage of Central Washington is from the Cascade Mountains through these valleys to the Columbia River. The area under consideration is one of those distinct valleys between four of these uplifts. In general it is the area bounded on the north by the Ahtanum Ridge and Rattlesnake Hills, on the east by Rattlesnake Hills, Red Mountain and Badger Mountain, on the

south by the Horse Heaven Hills and Toppenish Ridge and on the west by the lower foothills of the Cascade Mountains. The valley encloses the drainage of the Yakima River from where it exits the Ahtanum and Moxee Valleys at Union Gap, following a southeasterly course to Benton City and Kiona where it turns north and exits the valley at a gap between Rattlesnake Mountain and Red Mountain. In his 1906 book "History of Yakima Valley" Professor W. D. Lyman (13) accurately described the area under consideration, "below this gap" (Union Gap)".....comes the next section the largest expanse of level land in the entire state of Washington, the areas of the Simcoe, Toppenish, Satus and their tributaries on the south side of the river, which here takes an easterly course, and on the north the vast areas of the Zillah, Outlook, Sunnyside, Grandview and Rattlesnake sections.....below Kiona and Benton City the great central valley is partially closed with a somewhat broken section of rocky land though not of great height, on the south steeper declivities ascend to the Horse Heaven country while on the north long slopes of gradually rising land swell to the Rattlesnake Mountains." Thus it can be seen that the Yakima Valley, in a topographical sense, is easily distinguished from surrounding areas. From a climatological point of view the valley is also easily distinguished from surrounding areas. Using data from available climatological reports (7, 8, 16, 17, 27, 30)

heat units (accumulated growing degree days - 50 degree Fahrenheit base) were calculated for stations in and near the proposed area.

Stations lying in the Yakima Valley:

Station	Heat Units
Benton City	2849
Prosser	2803
Prosser 4NE	2436
Fort Simcoe	2730
Sunnyside	2665
Toppenish	2207
Wapato	3048
White Swan R. S.	2389

These seven stations provide a statistical picture of the climate for viticulture in the Yakima Valley with a mean number of heat units of 2641, a median of 2665 and a range of 2207 to 3048. Using north-south and east-west bisectors to divide the valley into four roughly equal quadrants, one may look at heat units for areas lying just outside of the Yakima Valley and see differences in the climate. For the nearest stations lying outside of the northwest quadrant of the valley, the climate tends to be generally cooler as can be seen from the data for these stations:

Station	Heat Units
Ellensburg	1932
Ellensburg (Bow Field)	1948
Naches Heights	2330
Moxee	2574
Moxee 10E	1946
Yakima WSO	2314
Rimrock Dam	1150

Those stations lying nearest the northeast quadrant of the valley are much warmer:

Station	Heat Units
Hanford	3231
Richland 25NW	3890
Priest Rapids Dam	3720
Smyrna	3125
Wahluke	3890

Little data is available from stations lying near the southwest quadrant of the valley as here the elevation ascends steeply to the Horse Heaven Hills and foothills of the Cascade. In general, those stations lying in the most westerly part of this area tend to be much cooler:

Station	Heat Units
Bickleton	1778
Satus Pass	1334
Goldendale	1779

The stations nearest to the southeast quadrant of the proposed area are like those near the northeast quadrant are again warmer than the valley:

Station	Heat Units
Kennewick	3094
Kennewick 10SW	2890
McNary Dam	3201
Mottinger	3415

Thus it can be seen that the Yakima Valley may be distinguished from surrounding areas by unique topographical and climatological features.

III. Specific boundaries of the Yakima Valley

The Yakima Valley shall be defined as the area within a boundary starting at a point on the north at the Wapato Dam on the Yakima River, then in an easterly direction along the crest of the Rattlesnake Hills, then in a southeasterly direction along the crest of the Rattlesnake Hills, then southeasterly along a line between the summit of Rattlesnake Mountain to the summit of Red Mountain, then southeasterly in a line to the summit of Badger Mountain, then due south to the intersection of the 1000 foot elevation line of the Horse Heaven Hills, then westerly along a meandering line described by the 1000 foot elevation of the northerly slope of the Horse Heaven Hills to a point due south of the most eastern 1000 foot elevation point of the Toppenish Ridge, then due north along said line to Toppenish Ridge, then westerly along the crest of the Toppenish Ridge to Toppenish Mountain,

then in a line to Fort Simcoe, then due north to the crest of the Ahtanum Ridge, then easterly along the crest of the Ahtanum Ridge to a point due west of the Wapato Dam and then due east to the starting point at the Wapato Dam.

The reference for the above description is U. S. Geological Survey Maps: Yakima, NL 10-6, 1958, 1971 revision and Walla Walla NL 11-4, 1953, 1963 revision.

Yakima Valley Appellation Committee

TABLE OF CONTENTS:

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23. Stark, Paul Jr., "Northwest Could Challenge for Winegrape Supremacy", The Good Grape Grower, Vol. 2, No. 1, (15 Jan. 1972), 8-10.

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31. Willard, Helen, "Grape Industry Quickly Comes of Age in Washington State", The Good Grape Grower, Vol. 1, No. 1, (15 April 1971) 28.

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YAKIMA VALLEY APPELLATION COMMITTEE

APPENDIX- A

PETITIONERS:

MIKE WALLACE, HINZERLING VINEYARDS, INC.; PROSSER, WA

STAN CLARK, QUAIL RUN WINERY, ZILLAH, WA

ROGER JOHNSON, CIEL DU CHEVAL ENTERPRISES, RICHLAND, WA

GEORGE V. HANSON, INDIAN VALLEY FARMS, INC. TOPPENISH, WA

WADE H. WOLFE, GRANDVIEW, WA

JAMES AND CARLA WILLARD, WILLARD FARMS, PROSSER, WA

MICHAEL J. SAUER , LATUM CREEK RANCH, INC. WAPATO, WA

FRANK B. OLMSTEAD, GRANDVIEW, WA

GAIL PURYEAR, ZILLAH, WA

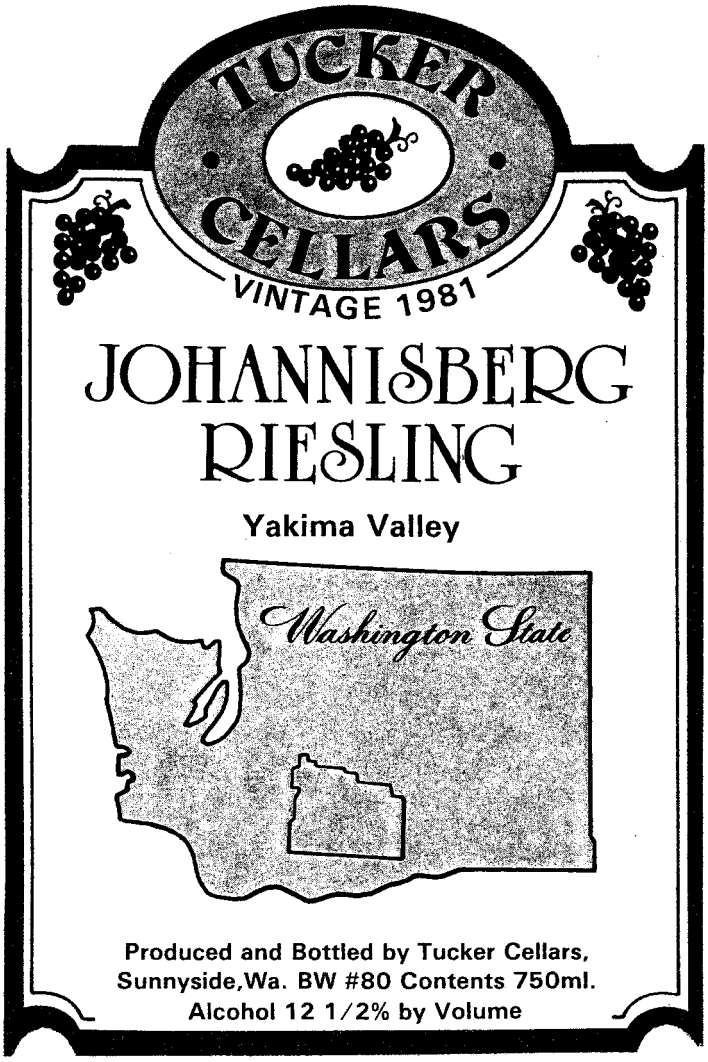
THE E. B. FOOTE WINERY, SEATTLE, WA

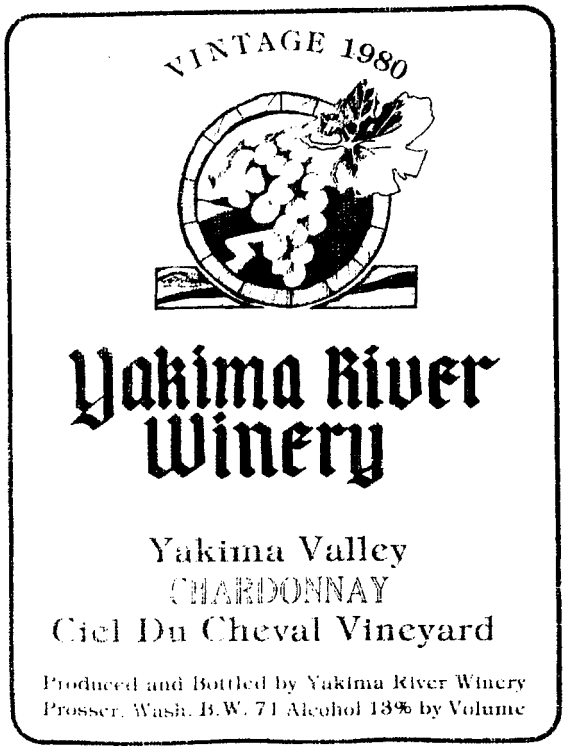
JOHN AND LOUISE RAUNER, YAKIMA RIVER WINERY, INC; PROSSER, WA

JOHN WILLIAMS, KIONA VINEYARDS, W. RICHLAND, WA

DEAN TUCKER, TUCKER CELLARS; SUNNYSIDE, WA

APPENDIX-B





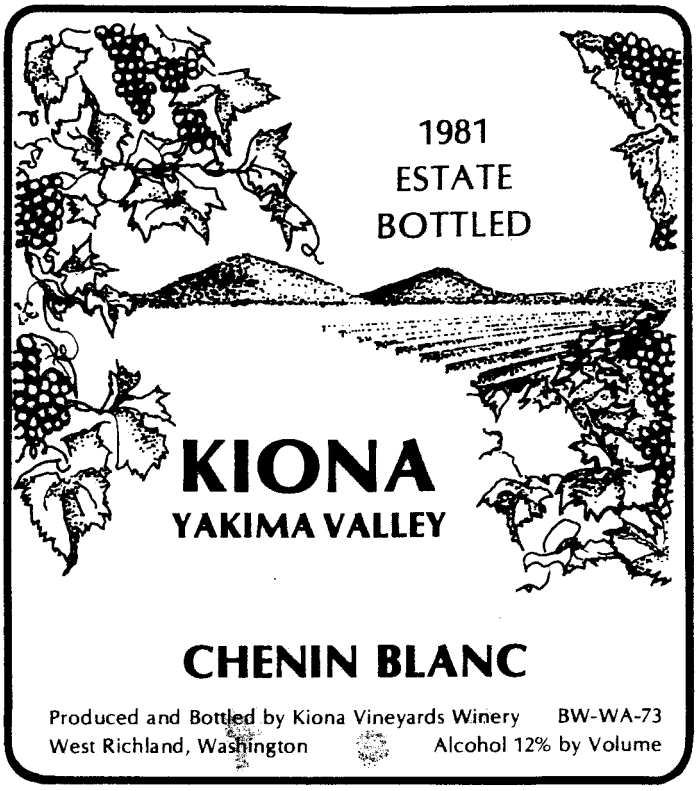
The Yakima River Winery invites you to visit their Winery when you are in the Yakima Valley.

Chardonnay is the noble variety of the Great White Burgundies such as Montrachet and Pouilly-fuisse.

Our Chardonnay is produced in the Burgundy Method, fermented in French Oak and aged in the same barrel. Serve at 52°.

YAKIMA VALLEY APPELLATION COMMITTEE

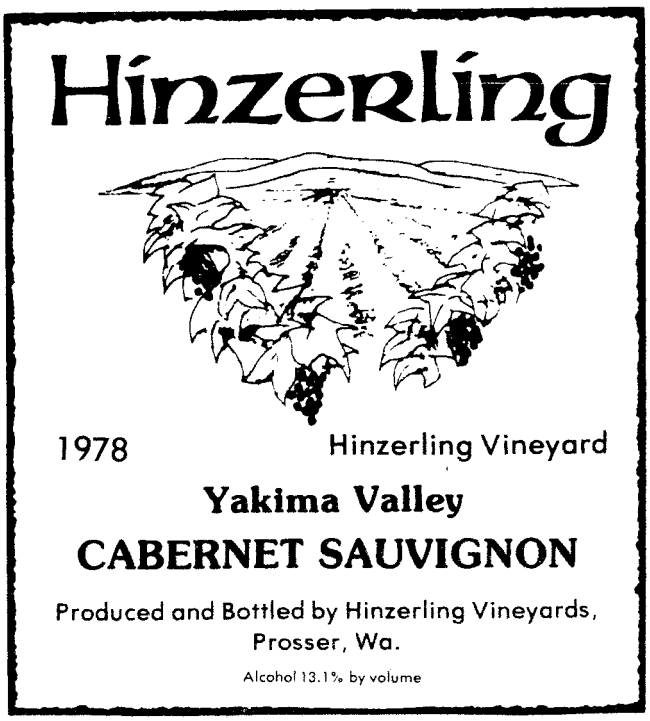
APPENDIX-B



Kiona Vineyards is located at the eastern end of the Yakima Valley near its transition to the Columbia Basin. Wines from this microclimate tend to combine crisp fruity flavors of the Valley with the rich full characteristics of the Basin. Our location is known locally as South Red Mountain; an area which has attracted several vineyards which produce grapes for wineries in Washington, Oregon and Idaho.

This Chenin Blanc was made from grapes picked in mid-October at a sugar content of 22 Brix and a 0.86 weight percent acid. Fermentation was conducted at 50 to 55° to produce a crisp fruity wine with sufficient sweetness to balance the natural acidity of the fruit.

Our winery is not open to the public, but may be visited by appointment by calling 509-967-3212.

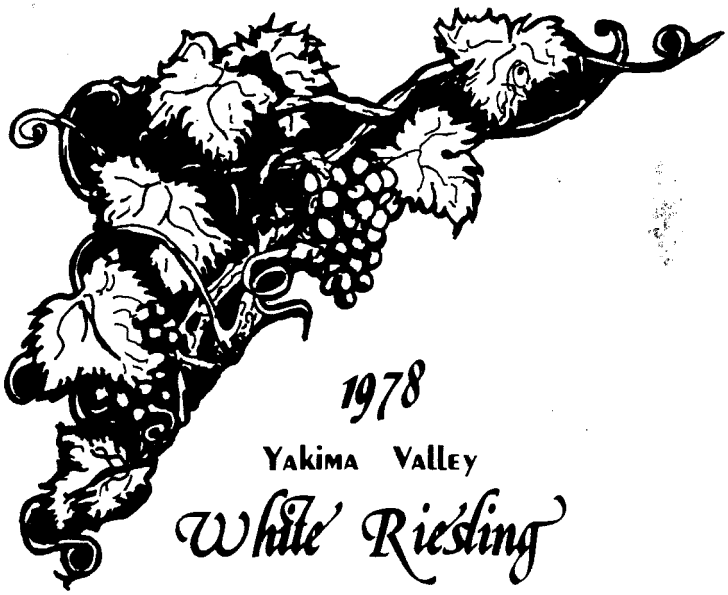


This wine was produced entirely from Cabernet Sauvignon grapes harvested from our vineyard 6 miles north of Prosser, Washington, beginning October 16, 1978. Must analysis was 23.8° Brix, 1.04G./100ml total acid and pH 3.31. A warm fermentation was carried out using "Pasteur Red" yeast with pressing done after 10 days on the skins. The wine was then racked into 50 gallon American oak barrels for aging and the completion of "malo-lactic" fermentation. The wine was given a light filtration and bottled in April of 1981. Since this wine has not been fined it may deposit some sediment in time and should be decanted before serving. We expect the wine to benefit from additional bottle aging and to begin maturing in 1987-90. We welcome visitors to our winery, which is located at State Hwy. 12 and Sheridan Ave., Prosser, WA. Since we are often in the vineyards, a call to (509) 786-2163 would insure someone being there to meet you.

Total production of this wine — 352 cases, 8 bottles

Enologist

APPENDIX-B


1978
Yakima Valley
White Riesling
Produced & Bottled By
E. B. Foote Winery
Seattle, Washington
Alcohol 12 - 13% By Volume
Contents 750 ml.

YAKIMA VALLEY APPELLATION COMMITTEE

ADDENDUM TO PETITION OF MAY 1, 1982

ADDITIONAL REFERENCES CITED:

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YAKIMA VALLEY
APPELLATION
COMMITTEE

1520 SHERIDAN AVENUE
PROSSER, WASHINGTON
99350
(509)-786-2163

JUNE 24, 1982

MR. CHARLES N. BACON
RESEARCH AND REGULATIONS BRANCH
BUREAU OF ALCOHOL, TOBACCO AND FIREARMS
WASHINGTON, D. C. 20226

DEAR MR. BACON,

IN REPLY TO YOUR LETTER OF JUNE 7, 1982, I AM ENCLOSING THE ADDITIONAL INFORMATION AND COPIES OF AVAILABLE REFERENCES YOU REQUESTED.

I AM UNABLE AT PRESENT TO PROVIDE COPIES OF REFERENCES 6, 23, OR 31 AS THE PERSON THAT SUPPLIED THE ORIGINALS OF THIS MATERIAL IS CURRENTLY ON VACATION AND I DON'T HAVE A COPY. I WILL TRY TO SUPPLY YOU COPIES AS SOON AS SHE RETURNS. I AM ALSO ENCLOSING A COPY OF REFERENCE 33 WHICH SHOULD IN PART ANSWER YOUR REQUEST FOR INFORMATION REGARDING THE NUMBER OF VINEYARDS AND MAJOR GRAPE VARIETIES FOR WINE PRODUCTION. AS I POINTED OUT IN THE ATTACHED ADDENDA THERE IS NO CURRENT BREAK DOWN BY AREA FOR WINEGRAPES SO ANY SPECULATION AS TO TOTAL NUMBER OF VINEYARDS WOULD BE CRUDE AT BEST.

YOU SHOULD HAVE ALREADY RECEIVED THE ORIGINAL MAP UNDER SEPERATE COVER. PLEASE CONTACT ME IF I CAN PROVIDE ANY FURTHER INFORMATION.

SINCERELY,

Mike Wallace

880

MIKE WALLACE, CHAIRMAN

YAKIMA VALLEY APPELLATION COMMITTEE

ADDENDUM TO PETITION OF MAY 1, 1982

THE BOUNDARIES OF THE AREA UNDER CONSIDERATION AS THE YAKIMA VALLEY VITICULUTRAL AREA ENCLOSE A LANDMASS OF APPROXIMATELY 1040 SQUARE MILES (665,600 ACRES). A PRELIMINARY SURVEY BY WASHINGTON STATE UNIVERSITY INDICATES A TOTAL GRAPE ACREAGE IN WASHINGTON STATE OF 27,963 ACRES (33). THIS REPORT DOES NOT PROVIDE A BREAKDOWN BY COUNTIES OR AREAS BUT IT IS ESTIMATED THAT APPROXIMATELY 23,400 ACRES OF THIS TOTAL ARE WITHIN THE BOUNDARIES OF THE PROPOSED AREA (36). IT IS FURTHER ESTIMATED THAT APPROXIMATELY 3500 ACRES ARE PLANTED TO GRAPES OF THE EUROPEAN OR " VINIFERA" TYPE WITH THE REMAINDER BEING PLANTED TO AMERICAN BUNCH OR "LABRUSCA" TYPES USED MAINLY FOR JUICE PRODUCTION AND FRESH MARKET. GRAPES ARE PLANTED IN NEARLY EVERY LOCATION IN THE PROPOSED AREA WHERE IRRIGATION IS AVAILABLE. THE PREPONDERANCE OF ACREAGE OF THE EUROPEAN TYPE GRAPES ARE PLANTED ON THE SOUTH FACING SLOPES OF THE RATTLESNAKE HILLS, RED MOUNTAIN, SNIPES MOUNTAIN AHTANUM RIDGE AND THE STEEPER NORTH BANKS OF THE YAKIMA RIVER.

THE YAKIMA VALLEY LIES IN THE SO-CALLED "RAIN SHADOW OF THE CASCADE MOUNTAINS AND HENCE IS A SEMI-ARID REGION. FOR EIGHT REPORTING STATIONS WITHIN THE PROPOSED AREA MEAN AVERAGE ANNUAL PRECIPITATION IS 8.11 INCHES WITH A RANGE OF 5.88 INCHES AT TOPPENISH TO 12.41 INCHES AT FORT SIMCOE (8, 17). USING A 28 DEGREE BASE, MEAN AVERAGE GROWING SEASON LENGTH FOR FOUR REPORTING STATIONS IN THE YAKIMA VALLEY IS 190 DAYS WITH A RANGE OF 184 DAYS AT WHITE SWAN TO 196 DAYS AT BENTON CITY (8,17)

ONLY THE BENTON COUNTY AND YAKIMA INDIAN NATION IRRIGATED REGIONS OF THE PROPOSED AREA HAVE BEEN COMPLETELY SOIL MAPPED (34, 35). THERE ARE SOME THIRTEEN DIFFERENT SOIL ASSOCIATIONS WITH IN THE PROPOSED AREA, HOWEVER, MOST WINEGRAPES VINEYARDS ARE PLANTED IN SOILS OF THE WARDEN-SHANO AND SCOOTENAY-STARBUCK ASSOCIATIONS.

YAKIMA VALLEY APPELLATION COMMITTEE

ADDENDUM TO PETITION OF MAY 1, 1982 (CONTINUED)

WARDEN-SHANO ASSOCIATION SOILS ARE FOUND MAINLY ON THE SLOPES OF THE VALLEY. THESE SOILS ARE SILT LOAM THROUGHOUT AND DEEP TO MODERATELY DEEP OVER BASALT BEDROCK. THEY WERE FORMED IN LACUSTRINE MATERIAL AND LOESS. THE SCOOTENAY- STARBUCK ASSOCIATION SOILS ARE FOUND MAINLY ALONG THE YAKIMA RIVER; ARE SILT LOAM THROUGHOUT; SHALLOW TO VERY DEEP OVER GRAVEL OR BASALT BEDROCK. THEY WERE FORMED IN OLD ALLUVIUM AND LOESS. (34,35).

Kiona Vineyards
1511 Jadwin
Richland, WA 99352
June 13, 1982

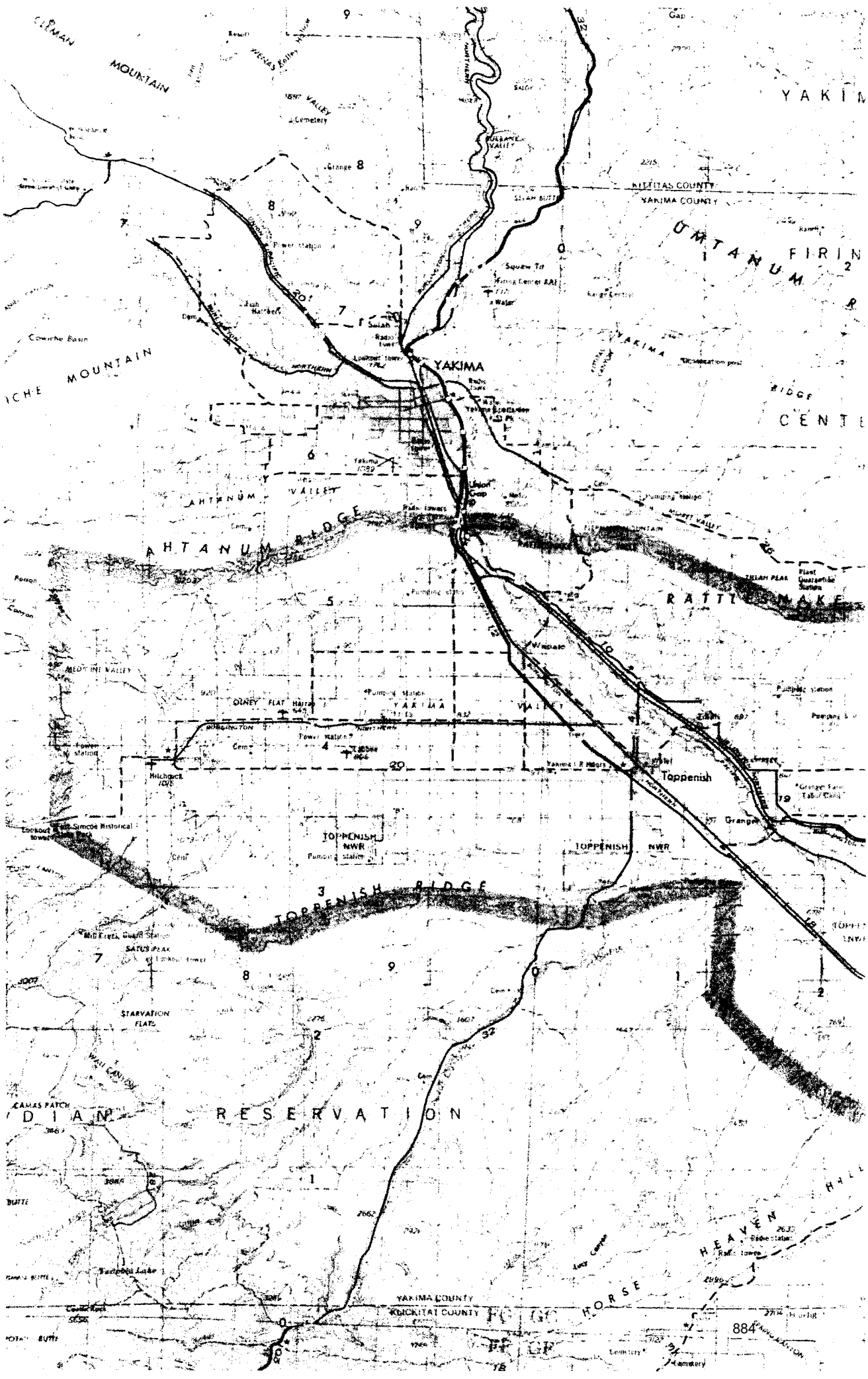
BATF
Research + Regulation Section
Washington, D.C. 20226

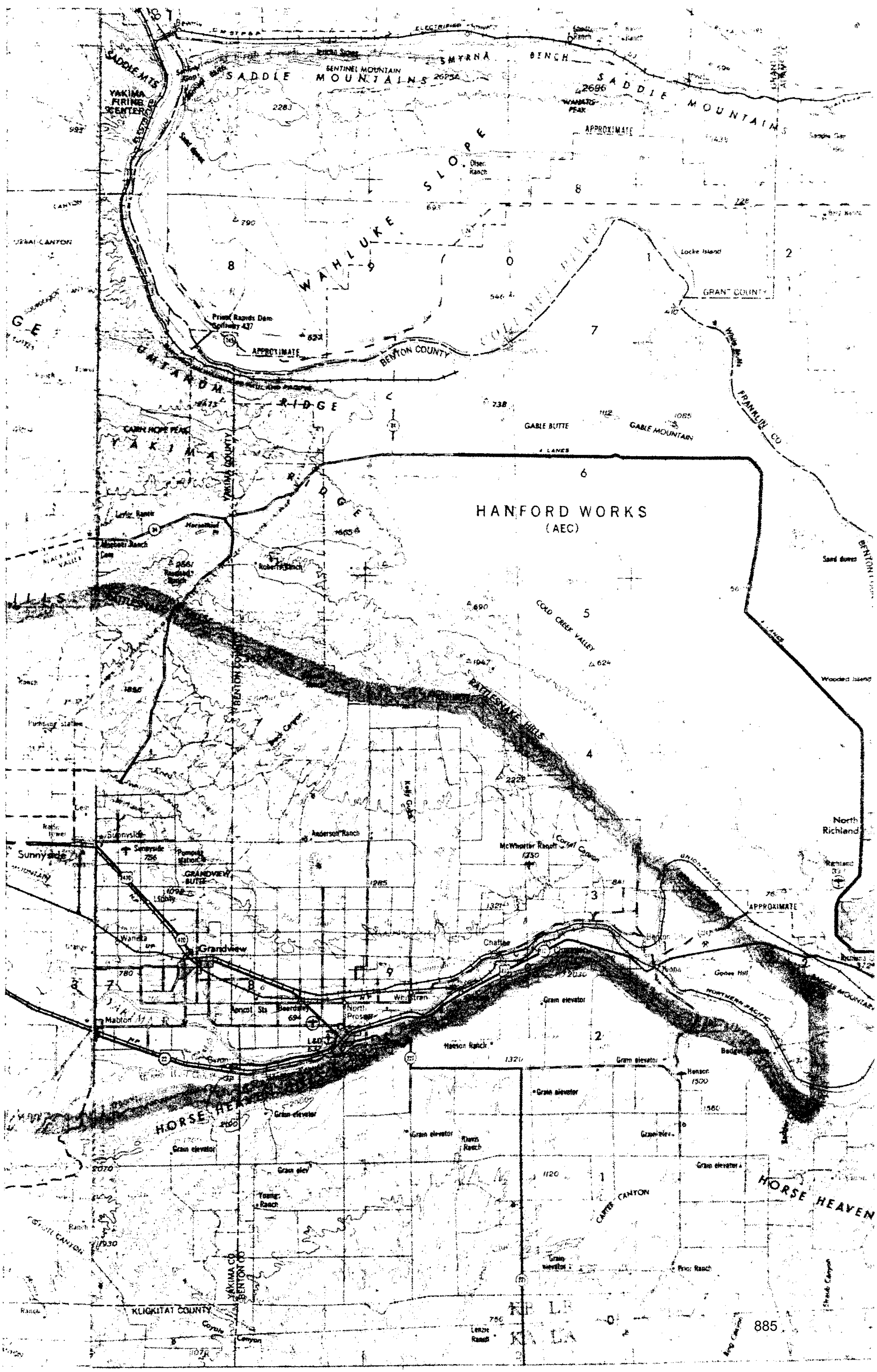
Dear Sirs:

Enclosed are the two original maps used to outline the Yakima Valley for the appellation application. Mike Wallace of Hinzerling Winery said you asked us to send them to you.

Sincerely,

John A. Williams


MOUNTAIN
YAKIMA
KITTITAS COUNTY
YAKIMA COUNTY
AHTANUM RIDGE
AHTANUM VALLEY
YAKIMA VALLEY
OLNEY FLAT
TOPPENISH RIDGE
TOPPENISH NWR
Toppenish
STARVATION FLATS
RESERVATION
HEAVEN
HORSE
KLICKITAT COUNTY


SADDLE MOUNTAINS
SMYRNA BENCH
SENTINEL MOUNTAIN
YAKIMA FIRING CENTER
WAHLUKE SLOPE
APPROXIMATE
GRANT COUNTY
Locke Island
BENTON COUNTY
COLUMBIA RIVER
UMTANUM RIDGE
YAKIMA RIDGE
GABLE BUTTE
GABLE MOUNTAIN
FRANKLIN CO
HANFORD WORKS
(AEC)
COLD CREEK VALLEY
RATTLESNAKE HILLS
YAKIMA COUNTY
BENTON COUNTY
Sand dunes
Wooded Island
North Richland
Richland
Sunnyside
GRANDVIEW BUTTE
Grandview
Anderson Ranch
McWhorter Ranch
Mabton
Whitstran
North Prosser
Chandler
Gooso Hill
NORTHERN PACIFIC
UNION PACIFIC
Hanson Ranch
Grain elevator
HORSE HEAVEN
CARTER CANYON
KLICKITAT COUNTY
YAKIMA CO
BENTON CO
Benton City
Badger

Reaching maturity

WINE

TOM STOCKLEY
Times columnist

Yakima vineyards come a long way

It is a rare privilege to be able to watch a small operation such as Hinzerling Vineyards in the Yakima Valley slowly put down roots and ultimately come to full flower (full grape?).

The other day I sat down to lunch with Mike Wallace, Hinzerling's winemaker and owner (along with his family) and we decided that we both had started in wine about the same time, in the early 1970s.

Mike has come a long way since he and his father purchased 23 acres of old asparagus ground and weeds in the valley and began planting grapes. That first winter, a freeze nearly wiped them out; but they started over again and went on to prove that fine and uniquely different wines could be produced from that area.

Hinzerling was not alone, of course. Associated Vintners and Chateau Ste. Michelle both have vineyards in the valley. And the pattern that I see emerging, after reviewing the latest releases from these wineries, is that time has coaxed the best out of the vineyards as well as the winemakers. Mike's talents have been sharpened by the experiences of nearly 10 years and, in the meantime, his vineyards have become established. These two elements have produced some wonderfully complex wines.

"Our vines really reached maturity in 1980," says Mike. "They're just about where we want them for the best results."

Results are what I witnessed as we tasted the latest releases from Hinzerling, wines that just are appearing on the shelves of local wine shops. They are, without any doubt, the best wines he has made. Here are my notes.

• **White Riesling 1980.** This wine really was introduced to Seattle at the recent "Meet the Winemaker" dinner at Mrs. Malia's, and they barely could open the bottles fast enough. Everyone went wild over the intense, floral character of this Riesling. Even though the sugar is 1.6 per cent, the acid is high enough to balance the wine and make it seem almost dry.

"This is the style we're going to do as much as possible," says the winemaker, adding that it has considerable aging potential. (About $6.25.)

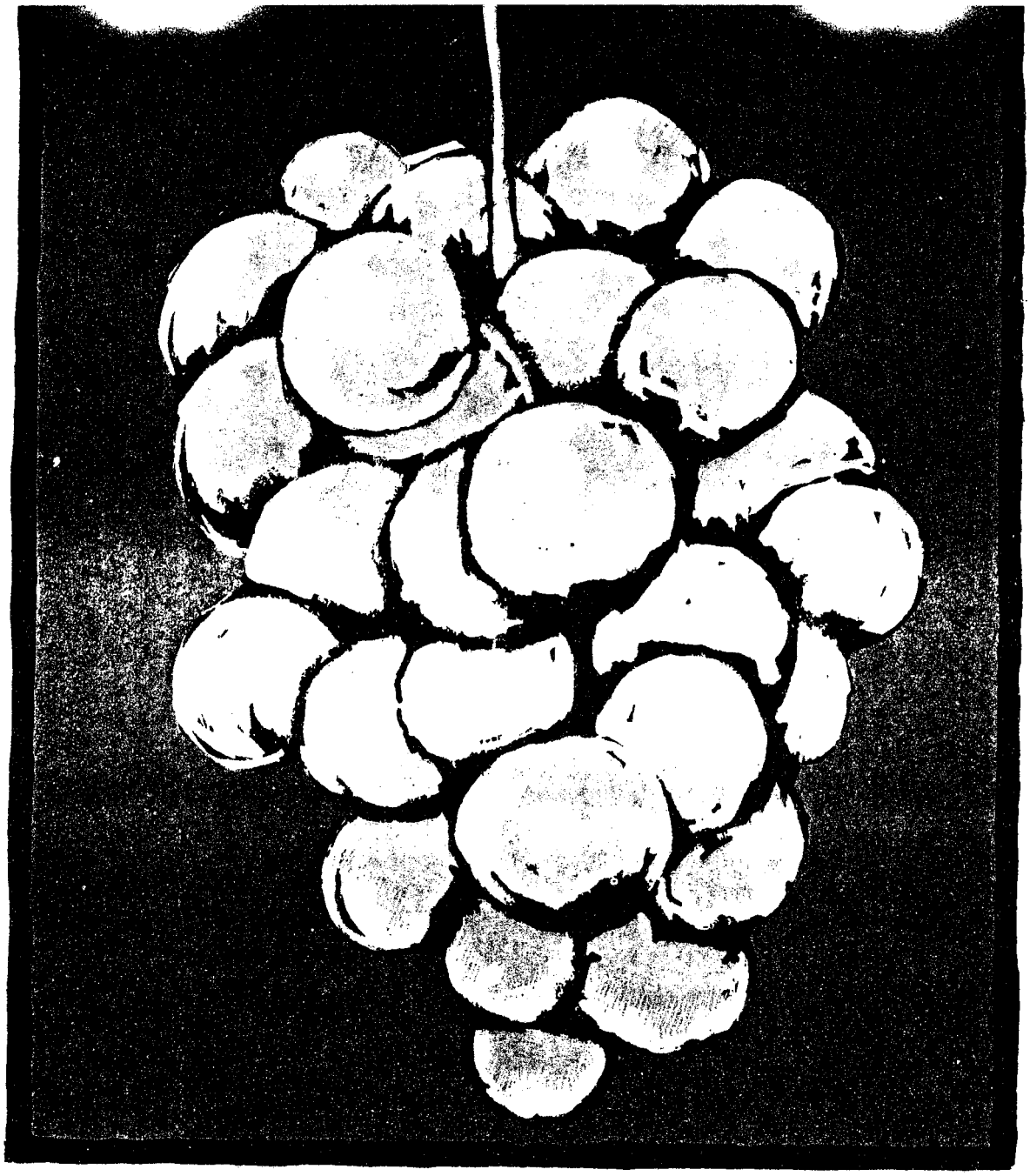
• **Gewurztraminer 1980.** A fat, rich version of Gewurztraminer, this wine turned out just slightly pink in color ("the true color of Gewurztraminer," according to Mike). Any efforts to dilute the color would only reduce the flavor, so Mike decided to leave it the way it is. It is limited: only 638 cases. (About $6.50.)

• **Merlot 1978.** All things considered, this may be the highlight of the new releases (although there's a Cabernet coming up that is in the classic category). First of all, this Merlot is a big, whopping 15.3 per cent alcohol and shows a lot of fruit and almost chewy richness. The blend is 77 per cent Merlot and 23 per cent Cabernet, a combination that works wonderfully here. It's the kind of wine you'd want with thick, juicy steaks or rack of lamb. (About $6.75.)

• **Cabernet Sauvignon (Mercer Ranch) 1978.** Hinzerling won one of the "best in show" awards at last year's Tri-Cities Wine Festival for the previous release of Cabernet. This one is very much in that style of the 1977: deep, complex and nicely balanced. One taster commented on its licorice or anise character. It's about $8.25 and there were only 156 cases made.

• **Gewurztraminer (Selected Clusters) 1979.** The winemaker established himself early on as a master of late-harvest, dessert-style wines. This honey-rich, botrytis-infected (a beneficial mold that attacks grapes) wine is the perfect ending to a meal. We sipped it slowly with fresh strawberries. ($9 for a tenth.)

Hinzerling wines don't last long on the market as the number of fans is growing daily. But if you move fast, you will have a chance to sample proof positive of the Northwest potential in fine wines. I'm glad I've had the chance to watch it all happen.



COOPERATIVE EXTENSION
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Their Characteristics and Suitability for Production in Washington

EB 635 Reprinted September 1973
Cooperative Extension Service College of Agriculture
Washington State University Pullman

subject to late fall and early winter freezes. All of these problems tend to be more acute with the European-type grape varieties and least serious with the American-type.

Selecting Grape Varieties and Vineyard Locations

One of the features of Washington is the remarkable range of conditions which can be found within the state. Significant differences can be found between regions in precipitation, sunlight, and temperature. Within regions there are differences in soil, elevation, and length of growing season. All have an effect on the selection and performance of the different types of grapes.

Identifying areas in the state where grapes might be grown commercially is aided by years of experience with American-type grapes, particularly the variety Concord. Being one of the earliest maturing and hardy varieties, it is useful in establishing the extreme limits of probable production.

Developing guidelines for the hybrid and European-type grapes is more difficult. Much of the experience with these grape varieties has come from limited research and commercial trials in the Yakima Valley. These trials have shown that a number of different varieties can be grown successfully. However, more work is needed to determine which varieties are best suited to different slopes, exposures, elevations, and microclimates.

LENGTH OF THE GROWING SEASON. One of the most useful general guidelines to delineate potential grape sites is the length of the growing season. This is the average number of frost-free days per year. Such information is available from weather records and has been outlined in Figures 1 and 2.

Most of the present grape acreage is located in the lower Yakima Valley. Additional acreages of Concord grapes have been grown commercially in the lower elevations of the Columbia Basin irrigation project and in the Wenatchee-Okanogan River Valleys. All have growing seasons of about 150 days or longer.

Few of the hybrid and European-type grapes are well adapted to such a short season. Preferred are areas with at least 160 to 170 frost-free days. This relationship is shown in Table 3. As indicated in Figure 2, areas with more than 150 frost-free days are located either west of the Cascade Mountains or in south central Washington within a radius of 50 miles of Pasco and Kennewick.

ACCUMULATED HEAT UNITS. While the length of the growing season limits the type and variety of grape grown, one of the critical differences between sites is the distribution and accumulation of heat units. Studies of grape growing areas around the world have shown that temperatures over 50° F. have a significant influence on the maturation and quality of the crop.

There is a general relationship between accumulated heat units and number of frost-free days, as shown in Figure 3. It shows that areas with less than 155 frost-free days are approximately equal to the cooler coastal areas of California, Region I, where some of the driest wines are produced. Areas with between 155 and 175 frost-free days are approximately equivalent to the most important table wine districts in California, Region II. These areas are considerably warmer than the grape growing areas in New York, Pennsylvania, Ohio, and Michigan.

Areas with over 175 frost-free days resemble Region III in California. These are areas which may be too warm for the best production of American-type grapes but are well suited to hybrids and European-type grapes. However, it is not sufficiently warm nor is the season sufficiently long to grow the later-maturing varieties.

While this general guideline is useful in iden-

Table 3. Relationship Between Length of Growing Season and Performance of Grapes

Length of Growing Season, Number Frost-Free Days	Performance of Various Type Grapes*		
	American	Hybrid	European
Under 140	Marginal	Unsuitable	Unsuitable
140-150	Good	Marginal	Unsuitable
150-160	Preferred	Fair	Marginal
160-170	Preferred	Satisfactory	Fair
170-180	Good	Preferred	Good
Over 180	Satisfactory	Good	Preferred

* Performance of selected varieties.

Prosser Winemakers Know Their Business

By Don Carter
P-I Wine Writer

PROSSER — Mike Wallace dips a glass into the fresh, green chardonnay juice gushing from his wine press. He tips the glass to his lips, smiles impishly and pronounces with mock seriousness: "Ah, young . . . but quite pretentious."

The delicious spoof on the vocabulary of the wine industry is part of the reason this tiny winery is a popular stop for visiting wine buffs. Wallace, the man, is fun to be around. Mike Wallace, the winemaker, is firmly established on the first rung of Washington's wine history.

Wallace is a former Seattle city-slicker who, upon moving to the Yakima Valley nine years ago, almost instantly became one of those "aw-shucks-down-home" good old boys who probably now exist more in legend than fact. He boasts proudly that he hasn't worn a necktie since 1968.

The casual attitude somehow makes you unaware of how fast this man and his family are moving, at the peak of the grape-picking season. He samples a couple of lots of experimental sparkling wine made from chardonnay grapes, confers with Bob Leo, the winery's one full-time employee, about several matters, drives out to the vineyard for another trailer-load of grapes, and still finds time to chat amiably with the steady stream of visitors who come to talk, taste and buy.

While Mike is directing this fast-paced show, his father, Jerry, is cleaning stainless-steel drums used for fermentation. His children, Sean, 3, and Katie, 6, play with the 55-gallon drums that are waiting to be cleaned. His wife, Donna, is in the front office working on the books, and his mother, Dee, is writing up wine orders for visitors.

The year 1980 has been good to the Wallace family and their Hinzerling Vineyards winery, which is named for the Hinzerling Road that takes you five miles north of Prosser to the 9-acre vineyard.

Last July, Hinzerling Vineyard's cabernet won a gold medal at the Tri-Cities Wine Festival and became one of the first Washington cabernets to attract much notice from out-of-state judges. The historical complaint about Washington cabernets has been that they aren't like California cabernets; the Washington cabernets are rich in flavor, but most of them lack the chewy, mouth-filling body of the Californias.

Mike shrugs philosophically that "California cabernet IS the standard," but that he doesn't think it should be. "I don't like to hear our cabernets labeled either better or worse (than the Californias)," says the winemaker. "I'd rather have them put on a par with Bordeaux . . . a lighter style with more elegance."

Hinzerling Vineyards also has won acclaim for big, full California-styled chardonnays and botrytised late-harvest wines.

It is the latter which, perhaps, may become the small winery's greatest claim to fame.

Botrytis cineria is a fungus which attacks grapes around harvest time. Its presence in a vineyard has been prized by winemakers over the centuries; the French call it "pourriture" and the Germans "edelfaule." Both words roughly translate into "noble rot."

The fungus covers the grape with a grayish film, and tiny roots stab through the grape skin to suck out moisture; the grape shrivels to the size of a raisin. The effect is much like reducing a sauce on the stove; flavors and sugar content are concentrated. Botrytis also imparts its own slightly nutty flavor to a wine.

Since heat and time both give grapes additional sugar, Wallace is playing a gambler's game to add the element of late harvest to a wine. While the Yakima Valley's warm days and cool nights seem ideal for botrytis growth, there are risks in leaving the grapes on the vines too long. Rain can cause rot; frost can make grapes shatter from the clusters.

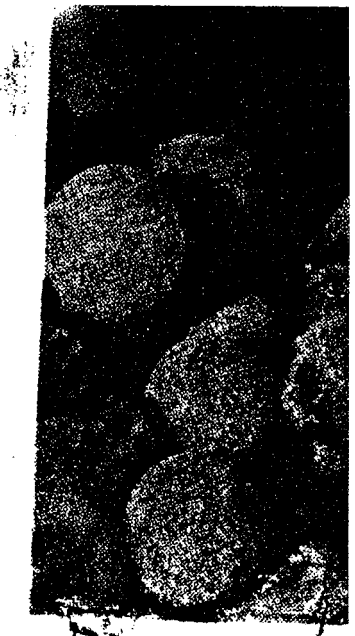
Thus far, Mike's gambles have paid off well. Proof is in his series of "Die Sonne" wines, made from late-harvest gewurztraminers, and in his late-harvest rieslings.

These are not dinner wines. Their full-bodied texture and rich sweetness make them a natural accompaniment to many desserts; or, they make a splendid dessert by themselves.

Because the concentrated wines mean a lot of acreage and work goes into a fairly small volume of wine, the late-harvests are much more expensive than higher-volume wines. Hinzerling's late-harvests usually go for about $5 a tenth, or $10 a fifth.

However, the late-harvest wines probably would be unaffordable if consumers paid the full tab for individually selected grapes and clusters. The labor for that job is mostly free; the Wallaces have a lot of friends who gather around harvest time to sort the botrytised grapes that go into unusual wines.

The Wallaces are the kind to make friends easily, and all of th



Washington's Wine Future

Proceedings of

A Seminar for the Pacific Northwest Grape and Wine Industry

Yakima, Washington — November 7-8, 1973

LLOYD WOODBURNE
Associated Vintners
Seattle, Washington

It was just eleven years ago that we planted our first vineyard on the outskirts of Sunnyside. One of the things that I think you should be aware of is how much has happened in that eleven years.

When we founded that vineyard, we really didn't know and had had a very hard time finding out what varieties of grapes would do well in that location. The net result was that on a very small vineyard of five acres we planted seven different varieties of vinifera in order to find out which ones would do well and which ones we would have trouble with. We were prepared to pull up the ones that didn't do well and plant others. But this was only eleven years ago and there has been a tremendous amount of work since. As Andre said there is a lot more work to be done with the help of Walter Clore and other people.

The varieties we planted were a determination really of our micro-climate. Here I would like to make a short quotation which I think my memory is correct with a joint quotation from Andre and Leon Adams when they were together one time with us. They said in effect "the wine and the grapes have their own timetable and you will violate it at your own . . . ". This applies also to the choice of varieties in terms of climate. It applies also to the location for planting particular varieties of grapes.

We have actually an amazing range of abilities in our stockholders. One of them was a Professor of meteorology at the University. He made a very quick comparison of the climate in Sunnyside as compared to every one of the major vineyard areas in Europe. He came up with the conclusion that we have the kind of temperature that Walter Clore was talking about this morning, 2200 degree days in the cool summer up to 2500 degree days in a warm summer. This meant we could plant not the Italian varieties, not the Rhone Vally probably, but the northern European grapes. We didn't have enough heat for some of the others. So we planted Johannisberg Riesling, the Gewurz-traminer, the Semillon and the Chardonnays for the whites and the Pinot Noir and the Cabernet for the reds. We also planted Grenache. But Grenache was one that we have had to close out. It's a beautiful grape, makes a lovely wine, but in our location, part of that small block freezes out every winter. I think if my memory is correct, Ste. Michelle, in order to get a good Grenache Rose had to bury most of those wines a good part of the time. So this is one factor of the difference between the varieties.

Let me say one other thing about the location. I have been disturbed to hear that several people have planted Cabernet Sauvgnon vines on the floor of the Valley and had very unfortunate

results. They have not matured, they have not bore fruit and they are thinking actually of pulling them up. I'm not sure that this is true but this has been reported. By comparison I want to paint a short picture for you. Our location is just outside Sunnyside at a place called Harrison Hill. Some of you I know are familiar with it. We have a fairly sharp slope, about 900 feet above sea level (valley floor is 400 or 500). It is a very rapid dropoff. This is what is called air drainage and most of you are familiar with it. We have left our Cabernet vines, our grapes on the vines, three weeks after the first killing frost in the fall with no damage of any kind when the whole floor of the valley was stripped. The only reason we could was because of that dropoff and the air drainage. We got no frost damage. We had three weeks longer growing period. Now this is what I mean by location for the particular varieties that you may be interested in. Part of the problem of making wine in the State of Washington, I think all of you people that are in this business will agree, stem from problems in the vineyards. Not all of them, but some of them. One of these for instance is crop size. You can overcrop, you can pick too early. You don't get the maximum quality. As Dick Erath said this morning in the latter part of the ripening season you get changes in terms of the flavor components and the acid and the rest of the things he was talking about.

To the best of our information we have tried to keep our small vineyards at the level of about six tons to the acre for all except two varieties which are shyer bearers which are the Pinot Noir and the Chardonnays. They give us about five tons. This would be a good season. We get six tons to the acre on everything else and five tons to the acre for the Chardonnay and the Pinot. This I'm sure most of you are aware is substantially more than a great many of the areas in California.

Let me give you just an illustration of what happens if you overcrop. One year we had too many buds left on the vines. That year we got the equivalent of 10 tons to the acre of Johannisberg Riesling and we got 1,400 gallons of Pinot Noir wine from one acre. The color was light, the body was light. The only reason that we got a decent wine was that they took longer to ripen. The Riesling took three weeks longer to ripen bearing 10 tons to the acre. So these are some of the viticultural problems that make problems in the winery itself.

The peculiarities of Washington grapes and Washington wines are quite different problems I think than many of the problems of a winemaker in California. We have much more nearly European climate than California or at least Northern European climate than California vineyards. We have in Sunnyside 400 degree days less than the middle of the Napa Valley. We have much cooler nights

Philip George
Manager, Port of Benton
Richland, Washington

We were asked to be here, the Port of Benton, because we have been interested in the wine business for a long time. It goes back 10 years actually. We helped with the Washington Winemakers to get financing to conduct experiments to develop plants that would withstand the winters. It is still an embryo industry as we all know. But when it came time for the Seneca folks to build a winery, they came to us and we did finance it. It is rather ironic that here is a public body sustained by tax dollars that owns a winery.

As a way of background, I would like to tell you what a Port District is. Many of you don't have them in your own districts. A Port District is a public sub-division, a political sub-division and it is governed by commissioners who are elected. The reason for existence is to encourage commerce, provide transportation facilities, promote and provide land facilities for industry. In other words, to do those things that are necessary to broaden an economic picture of a community.

We are in the business to provide services a normal community will not or cannot provide for themselves. We acquire land, improve it and then utilize it to create a hedge against speculators. We do this through the use of a number of different financial arrangements. One is a tax levy assessed against the property within our district. We have the right to issue G.O. Bonds against the credit of the taxing district. We can issue revenue bonds and that is what I am primarily going to talk to you about today for industrial development. We also utilize our operating income that comes as a result of our assets. The revenue bond is a bond which the legislature of the State of Washington permits Port Districts to issue. And it is secured by a lease with an entity. Therefore, in the case of Seneca we have a lease which is really the security for the issuence of the bond. We can go as high as $5 million on a revenue bond and the proceeds, the interest from that revenue bond will be tax-free to the holder of the coupon. Above that the interest becomes taxable, the bonds become literally unsaleable from that point. We have through the Legislature the right to build agricultural facilities, i.e. Seneca. We don't own the stock, they own the stock. We own the lock and the barrel of Seneca. We can purchase the pressing equipment, the bottling equipment, any kind of equipment that has to do with an agricultural product.

In the Yakima Valley there are only four Port Districts that would be able to do any of these things at the present time. Yakima, itself, does not have a Port District. There is one in Sunnyside and I guess if Yakima talked to the Sunnyside people nice enough they could annex them in. The new law for the State of Washington is that new Port Districts must be countywide. The Port of Benton lies between the Port of Sunnyside and the Port of Kennewick which is down on the far end of Benton County.

Bulletin 823

TEN YEARS OF GRAPE VARIETY RESPONSES AND WINE-MAKING TRIALS IN CENTRAL WASHINGTON

W. J. Clore, C. W. Nagel, and G. H. Carter
COLLEGE OF AGRICULTURE RESEARCH CENTER
Washington State University

lower Columbia Basin, and on the southern Wahluke and Horse Heaven Slopes. Many favorable microclimates for grapes exist in other areas of eastern Washington along ridges, lakes and rivers.

Winter injury

In eastern Washington, critically low temperatures occur often enough to make growing certain varieties of European grapes hazardous (table 2). For the past 51 years, about 1 year in 3 winter temperatures have been –6 F or colder; and about 1 year in 6, minimum temperatures have ranged from –12 to –20 F. Evaluating varieties for winter hardiness is difficult when considering the many factors involved, such as vine age, nutrition, growth, fruit load and condition at the time subjected to cold (4, 5). Climate (7, 12), soil, diseases (11), pests and cultural practices are also important contributing factors. The low temperatures in the winter of 1964-65 were most damaging to European and some American hybrid grape varieties. Some damage occurred on European and American hybrid varieties from the low temperatures in 1968-69. Damage was serious on young vines and vines on sandy soils during the dry winter of 1972-73.

A temperature of –7 F on December 17, 1964 caused more damage to grapes than anticipated. Even at this late date, grape wood was not fully dormant because mild wet weather preceded the rather drastic drop in temperature. The 1969 grape crop was injured (6) when the minimum temperature dropped to –11 F on December 30, 1968. However, this temperature was not as damaging to grapes (table 3) in the Yakima Valley as the –7 F in December 1964 (5). Early in December 1972, cold dry winds accompanied with –5 F on the 5th and –7 F on the 14th caused damage, mainly to immature young vines and roots and trunks of vines on sandy soil.

Table 2. Year and Month in which Temperatures Reached Zero °F or Below, Irrigated Agriculture Research and Extension Center, Prosser.

Year	January	February	November	December
1924	-3			-1
1926				0
1927	-15			-1
1929	-10	-15		
1930	-19			
1931				-1
1932		-3		-6
1933		-8		
1935	-6			
1936		-4		
1937	-14	-1		
1942	-3			
1943	-7			
1949	-8			
1950	-16	-20		
1954	-15			
1955			0	
1956	-3	-12		
1957	-18			
1959	-1			
1960	0			
1963	-1			
1964				-7
1968				-11
1969	-6			
1972	-1			-7
1974	-6			

ADAPTABILITY OF VARIETIES

Conducting varietal trials in a mixed planting is a distinct disadvantage for making comparisions, even when replicated, because the cultural management for each variety may vary considerably as does the competition between varieties. However, the economy of land and operations dictates the testing of large numbers of varieties in this manner. The harvests, yields and berry analyses in table 3 can be used as an indication of variety adaptability. The yields of varieties in 1965, 1969 and 1973 are evidence of vine maturity and hardiness that existed during the subzero temperatures in 1964, 1968 and 1972.

The more often the vines of a given variety survive with satisfactory yields after subzero temperatures occur, the more confidence there is in the possibility of being able to grow the variety commercially. Unfortunately, not all varieties can be evaluated for the 10-year period, as some data were not taken, even though analytical results are shown.

The American and American hybrid varieties Diamond, Delaware, Naples, Athens, Buffalo, Concord and Van Buren in full bearing were subjected to subzero temperatures in three winters. The years and the minimum tons per acre produced the years after the freezes were: 1964, 3.2; 1968, 5.1; and 1972, 4.6.

In both 1969 and 1973, other American hybrid varieties that yielded 4.6 tons per acre or more were: Alden, Brilliant, Hector, Kendaia, Niagara, Ripley, and Ruby. In 1969, Eumelan produced only 3.9 tons per acre and no yield was available for Vergennes, but both produced above 4.6 tons per acre in 1965 and 1973.

Yield data for each of the 3 years following subzero temperatures show that Seibel 10868 produced 2 tons per acre or more. French hybrids producing 7.4 tons per acre or more in 1969 and in 1973 were Aurore, Rosette, Seibel 13047, Verdelet, Cascade and Foch. Other French hybrids (limited data) that showed excellent survival in 1973 were Chelois, DeChaunac and Lucie Kuhlman.

Vinifera varieties that produced 2.2 tons per acre or more during the years of 1965, 1969, and 1973 were Chardonnay, French Colombard, Limberger, Meunier and Pinot noir. Those that produced 3.8 tons or more per acre in 1969 and 1973 were Chardonnet, Chenin blanc, Helena, Hungarian Excellent, Melon, Müller-Thurgau, Muscat Ottonel, Palomino, Pinot blanc, Semillon, Weingarten, White Pinot, White Riesling, Chasselas Rosé, Violet, Chauche gris, English Colossal, Flora, Gewürztraminer, Muscat Rouge, Barbera, Cabernet

Wine

by TOM STOCKLEY

Sampling Northwest dry Rieslings

THERE IS little doubt that the White or Johannisberg Riesling is becoming one of the premier wine grapes of the Pacific Northwest.

Oh, there are others that are front rank — Pinot Noir in Oregon, Semillon and Chardonnay in the Yakima Valley.

But it is the Riesling, classic fruit of the great German wines, that has established the Northwest as a serious challenge to other wine regions of the world.

That is why a group of us have been sitting down together over lunch lately to survey all the Northwest outpourings of Rieslings in an effort to evaluate what is on the market today.

We did not attempt to pick favorites or run a contest, but rather to define the wines as to their style, characteristics and good and bad points.

BECAUSE there is a wide variety, we broke the tasting up into two sessions: Dry and not quite so dry (not sweet, however). Perhaps the results will help serve as a guide to your favorite style in Riesling. We'll begin with the dry versions today and tackle the others next week. Here are our conclusions on the first tasting:

Amity Vineyards White Riesling 1976 — Here is one of the first offerings from an interesting and new Oregon winery. It was probably one of the driest Rieslings I have ever tasted and is rather light in style. All enjoyed it for its flowery nose and crisp, almost lemon-like style. I thought that it would be an ideal wine to serve before dinner, although later I discovered it perfectly complemented shellfish. (About $4.25 in local wine shops) Incidentally, the co-owner of Amity, Myron Redford, is a former Seattle resident.

Ponzi Oregon White Riesling 1976 — Another small Oregon winery, situated in Beaverton, produced this fine Riesling. It was quite a bit fuller and richer than the previous wine but had a clean, freshness to it that we admired. It did not seem to possess that flowery quality that you sometimes associate with Rieslings. We all agreed that it would go nicely with food. ($4.95) This wine won a silver medal at the Wine Festival staged at the Seattle Center last month.

Associated Vintners Johannisberg Riesling 1975 — Now we turned to a Washington (Redmond) winery using Yakima Valley grapes, and the difference in style was quite dramatic. Also this wine was a year older which accounted for its spicy, clean finish.

Hinzerling Vineyards Johannisberg Riesling 1976 — This was probably the most interesting wine. The group mostly agreed that it was fuller in taste, bigger in style and perhaps tops in intensity of flavor. While it is still in the dry style, it had all the richness that one can expect from a Riesling. For most this was the favorite, which brings us to an interesting point: This Yakima Valley wine was completely ignored by the Wine Festival judges, earning not a thing.

"I have to admit that I came back to Prosser with my tail between my legs, and a bit dazed," the winemaker, Mike Wallace, told me last week. "We weren't expecting any gold medals, but neither were we expecting a zip."

Still, everyone at the festival who tasted the wine was immediately charmed by it. Wallace even picked up several new accounts (mostly restaurants) who want to handle the wine. It sells for about $5.

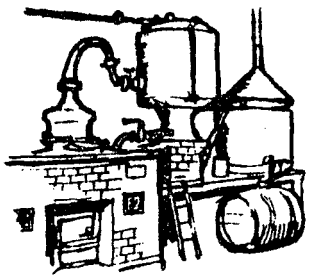
Thus encouraged, we tasters met the following week to take up the remainder of our fine Northwest Rieslings.

Next Wednesday: Sampling the sweeter varieties of Riesling.

WINE & LIQUOR UNCOMPLICATOR

By Gene Ford

What is an Alembic?



The alembic is the pot still used to make cognac in Southern France. Over four thousand of these simple devices are in use. They consist of a boiler, a head for the wine, a copper coil condenser and the receiving barrel. The rich, flavorful pungency of cognac comes from these simple country stills.

Local wineries prove Yakima potential as wine growing reg

In recent years the Yakima Valley has gained fame as an excellent area in which to grow wine grapes for some of the more prestigious wineries in the country. In the past 10 years, a number of small but excellent wineries have opened in the valley, competing with the more well known vineyards for quality wines.

One such wineries, the Hinzerling Vineyard is located at Highway 12 at Sheridan Ave ., in Prosser.

In a wine column published in the Seattles Times earilier this year, wine critic Tom Stockley said the Hinzerling wines are "proof postive of the Northwest's potential in fine wines."

The Hinzerling vineyards is a limited production winery operated by the Mike Wallace family. The first vineyards were planted in 1972 six miles north of the winery. Growers produce vinage dated, 100 percent varietal wines from the White Riesling, Gewurztraminer, Chardonnay and Cabernet Sauvignon grapes.

The winery is usually open weekdays and Saturdays from 10 a.m. to noon and from 1 to 5 p.m. The winery welcomes visitors for tasting and tours.

Because the Hinzerling Winery is a small operation, visitors are asked to please phone ahead at 509-786-2163 and make an appointment. During harvest and crush (Sept 15 to Nov 15) tours and tastings are by appointment only.

The Hinzerling wines are available at the winery, wineshops and fine restaurants in Washington.

The dry warm weather of Central Washington is ga reputation as being a fine region for wine grapes such as

Bob Thompson

Washington wine update

Washington state vintners continue to produce some intriguing variations on what we Californians think of as varietal character. Grapes grown along the Columbia River and up the Yakima Valley mostly go to Ste. Michelle Vineyards, by far the largest producer in the state. However, Ste. Michelle now has company in four small cellars, each taking different directions.

The vineyards are separated by 30-mile stretches of drylands, wheat fields or plantings of hops for beer. The plantings of wine grapes are mostly for white wine, especially northern European. Johannisberg riesling leads in volume, followed by chenin blanc and gewurztraminer. Semillon and chardonnay are also grown.

Ste. Michelle made its first great impression with its sweet-tart 1972 johannisberg riesling, a wine that won several blind tastings in California against classy competition from Germany and California. I do not think the riesling has been Ste. Michelle's best white since 1973, but it remains very good and true to the original style, which is to say an almost citric tartness playing against a round, ripe fruit flavor remindful of apricots. Enough botrytis visits the vineyards to lend intensity of fruit flavor, but there is no specific flavor of the noble rot itself.

Hinzerling Vineyards, the vineyard and winery of U-C Davis graduate Mike Wallace, produced a 1976 johannisberg — its first — that is dry and richly aromatic, a closer kin to an Alsatian than any German, but more refined than typical Alsatian wines. It is just about a flawless mate to cold cracked crab, or a bucket of steamer clams. (Unhappily, getting a bottle requires a trip to its home state. Such is the case with all four of the small cellars, at least for now. It wouldn't be fair to complain; a big lot is 400 cases; average, 150.)

Chenin blanc may well turn out to be the finest of the refresher whites, the ones best taken for their youthful charms. Ste. Michelle set the original Washington style with an off-dry model that has the appetizing aroma of a ripe melon. In 1974 and again in 1976, it was, to my mind, the pick of the Ste. Michelle bunch. Nobody has followed the lead. New-in-1976 Bingen Wine Cellars did produce a dry and overwhelmingly tart chenin blanc for its vineyards just across the Columbia River from The Dalles, Ore. In fact, the flavor was slightly underripe. The wine is well enough made to find favor with old Muscadet drinkers at fish dinners, but some slightly riper flavors should broaden its appeal considerably. Another new winery, Preston, located just to the north of Pasco, has a similar wine in barrel, but the proprietor plans to blend it with a sweeter lot.

Semillon, like chenin blanc, picks up a tarter, less bland character in Washington than it does typically in California. At least at Ste. Michelle it does. In its richest vintages, the wine even shows an echo of the herbaceous taste of sauvignon blanc. Made just off-dry enough to mute the acidity, this is a most successful wine, perhaps the most versatile of them all as a companion to all manner of fish and poultry. The 1975 was a beauty, but 1976 does not lag far off the pace.

Chenin blanc may well turn out to be the finest of the refresher whites, the ones best taken for their youthful charms

Finally, we come to gewurztraminer, which, despite small acreage, is the most broadly produced of the refresher whites. Ste. Michelle has one, characteristically off-dry and richly aromatic. The 1975 started out impressively for a first effort, went through a curious siege of smelling like cold cream, then re-gained form. As is my wont, I am saving most of my few bottles for next summer on grounds that the muscat-y taste of gewurz wants some tempering from bottle bouquet.

The 1976 gewurz from Hinzerling is both drier and subtler. With time, there should be an elegant harmony from this restraint. Wallace also made a very small special lot of botrytised gewurz, of which there were not enough bottles to satisfy family demand, let alone commercial wants. Alas.

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Reaching maturity

Yakima vineyards come a long way

WINE

TOM STOCKLEY
Times columnist

It is a rare privilege to be able to watch a small operation such as Hinzerling Vineyards in the Yakima Valley slowly put down roots and ultimately come to full flower (full grape?).

The other day I sat down to lunch with Mike Wallace, Hinzerling's winemaker and owner (along with his family) and we decided that we both had started in wine about the same time, in the early 1970s.

Mike has come a long way since he and his father purchased 23 acres of old asparagus ground and weeds in the valley and began planting grapes. That first winter, a freeze nearly wiped them out; but they started over again and went on to prove that fine and uniquely different wines could be produced from that area.

Hinzerling was not alone, of course. Associated Vintners and Chateau Ste. Michelle both have vineyards in the valley. And the pattern that I see emerging, after reviewing the latest releases from these wineries, is that time has coaxed the best out of the vineyards as well as the winemakers. Mike's talents have been sharpened by the experiences of nearly 10 years and, in the meantime, his vineyards have become established. These two elements have produced some wonderfully complex wines.

"Our vines really reached maturity in 1980," says Mike. "They're just about where we want them for the best results."

Results are what I witnessed as we tasted the latest releases from Hinzerling, wines that just are appearing on the shelves of local wine shops. They are, without any doubt, the best wines he has made. Here are my notes.

• **White Riesling 1980.** This wine really was introduced to Seattle at the recent "Meet the Winemaker" dinner at Mrs. Malia's, and they barely could open the bottles fast enough. Everyone went wild over the intense, floral character of this Riesling. Even though the sugar is 1.6 per cent, the acid is high enough to balance the wine and make it seem almost dry.

"This is the style we're going to do as much as possible," says the winemaker, adding that it has considerable aging potential. (About $6.25.)

• **Gewurztraminer 1980.** A fat, rich version of Gewurztraminer, this wine turned out just slightly pink in color ("the true color of Gewurztraminer," according to Mike). Any efforts to dilute the color would only reduce the flavor, so Mike decided to leave it the way it is. It is limited: only 638 cases. (About $6.50.)

• **Merlot 1978.** All things considered, this may be the highlight of the new releases (although there's a Cabernet coming up that is in the classic category). First of all, this Merlot is a big, whopping 15.3 per cent alcohol and shows a lot of fruit and almost chewy richness. The blend is 77 per cent Merlot and 23 per cent Cabernet, a combination that works wonderfully here. It's the kind of wine you'd want with thick, juicy steaks or rack of lamb. (About $6.75.)

• **Cabernet Sauvignon (Mercer Ranch) 1978.** Hinzerling won one of the "best in show" awards at last year's Tri-Cities Wine Festival for the previous release of Cabernet. This one is very much in that style of the 1977: deep, complex and nicely balanced. One taster commented on its licorice or anise character. It's about $8.25 and there were only 156 cases made.

• **Gewurztraminer (Selected Clusters) 1979.** The winemaker established himself early on as a master of late-harvest, dessert-style wines. This honey-rich, botrytis-infected (a beneficial mold that attacks grapes) wine is the perfect ending to a meal. We sipped it slowly with fresh strawberries. ($9 for a tenth.)

Hinzerling wines don't last long on the market as the number of fans is growing daily. But if you move fast, you will have a chance to sample proof positive of the Northwest potential in fine wines. I'm glad I've had the chance to watch it all happen.

SID MORRISON
...TH ...RICT, WASHINGTON

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July 14, 1982

Mr. William Drake
Assistant Director (Regulatory Enforcement)
Bureau of Alcohol, Tobacco and Firearms
Room 5020 - Federal Building
Washington, D. C. 20226

Dear Mr. Drake:

It is my understanding that Chateau Ste. Michelle Winery has applied for a viticultural appellation.

I want to add my enthusiastic support for approval of this appellation and to submit one additional suggestion. Washington State is very diverse in geographic distinctions and it would be difficult to include all of the grape producing sites under one general description.

An option could be to choose a general appellation such as "Columbia Plateau" and to add several subregions including "Yakima Valley" and others to be decided at a later date.

I am extremely proud of the wine made from Washington grown grapes which compares with the best from all over the world. It is essential for the Washington State wine producing area to be distinguished from those in other parts of the world in order to get the recognition that is deserved.

I would appreciate being apprised of any decision that is made.

With best regards,

Sincerely,

Sid Morrison

SM/daf

large number of potential hot spots that must be covered, U.S. commanders generally are heartened by moves to improve America's military posture in the region. They say that proposed new defense spending could provide immediately greater stocks of ammunition and fuel and more warships in the future.

Admiral Long reflects that cautious optimism. While warning that results of a showdown with the Soviets might be too close to call, he says that the outlook "now is significantly brighter than it was a couple of years ago."

VINEYARDS OF THE PACIFIC NORTHWEST

Mr. STEVENS. Mr. President, in past years connoisseurs of fine wine have felt obliged to look across the Atlantic Ocean for a world-class grape for world-class wine. No longer must Americans live in "palate deprivation." Let us look to the Pacific Northwest of the United States for the perfect grape, the perfect texture, yes, the perfect wine.

Recently, the vineyards of Idaho, Washington, and Oregon have taken their places in the world of fine wine and are being recognized as world-class wine regions. Americans who appreciate the fruits of the vine no longer have to look across the sea; they merely have to look to the great Northwest.

The U.S. Senate is privileged to have among its numbers one who is a pioneer in wines of the Northwest. The distinguished Senator from Idaho, Senator SYMMS, has made the Senate aware of the fine quality wine that Idaho and the Northwestern States have to offer. Last year, he and his family were kind enough to share a glass of Idaho's famous St. Chapelle wine with the Members of the Senate. After that experience I must say that Idaho wine may soon rival Idaho potatoes with respect to recognition and appreciation.

Mr. President, New Yorker magazine of June 28, 1982, contained an article regarding vineyards in the Northwest. The article describes the winery of St. Chapelle. My good friend from Idaho has good reason to be proud.

The country and the world should know about the progress the Northwest is making in this industry. Maybe some day the Matanuska Valley in Alaska will surprise the world with a world-class grape.

I ask unanimous consent that the text of the article be printed in the RECORD.

There being no objection, the article was ordered to be printed in the RECORD, as follows:

GOOD NEWS FROM THE NORTHWEST

(By Alexis Bespaloff)

Anyone looking for something new in wine need not go beyond the borders of this country: The vineyards of Washington, Oregon, and Idaho—often referred to as the Pacific Northwest—are beginning to take their place among the premium-wine regions of the world.

Though the Northwest has less than 10,000 acres planted with traditional wine-producing grapes (California has 340,000), there are already more than 50 wineries in Washington, Oregon, and Idaho. It's hardly surprising that many people are still unfamiliar with these wines: Most wineries in the region bottled their first wines less than six years ago, and even the oldest date back only twenty years. But some of the best examples from the Northwest are starting to arrive here; there are now more than 30 wines from six wineries in general distribution in New York.

It's easy for those of us with a sketchy sense of geography to assume that the vineyards of the Pacific Northwest (some of which are actually quite a distance from the ocean) are simply an extension of those in California. Northwestern wine-makers, however, are quick to point out that their wines have more in common with those of France and Germany than with the richer, more powerful wines of California. What's more, the climatic conditions and specific varieties cultivated in Washington, Oregon, and Idaho differ from one another, so the wines of each state are best considered separately.

In January 1962, David Lett, a young man with a degree in philosophy from the University of Utah, was waiting in San Francisco to begin his first semester in dental school. One day he toured the Napa Valley, visiting Mayacamas and the old Souverain winery (now Burgess Cellars). "It was rainy," he recalls, "but it was romantic, and I decided I'd rather grow grapes than teeth."

So he took up oenology at the University of California at Davis, gradually focusing his attention on Pinot Noir. "I wanted to produce the great American Pinot Noir," he says, "and I felt that California did not have the right climate for this grape." He eventually moved to the Willamette Valley, in northern Oregon, and in 1966 planted the first wine grapes there since Prohibition. "My oenology professor tried to dissuade me," says Lett. "He told me I'd be frozen out every spring, rained out every fall, and that I'd have athlete's foot up to my knees." In 1980, at a blind tasting of French and American Chardonnays and Pinot Noirs organized in Beaune by Burgundian shipper Robert Drouhin, the 1975 Pinot Noir from Lett's winery the Eyrie Vineyards, came in second, two-tenths of a point after a 1959 Chambolle-Musigny and well ahead of a 1961 Chambertin Clos De Bèze.

Five years before Lett's first planting in the Willamette Valley, Richard Sommer, who was interested primarily in Riesling, established Hillcrest Vineyard near Roseburg, about 180 miles south of Portland; he produced his first wines in 1963. Although a few others have also established wineries near Roseburg, most Oregon vineyards are in the Willamette Valley within a 45-mile radius south and west of Portland.

In 1970, there were 7 wineries in Oregon and about 85 acres of grapes; today, there are nearly 40 wineries and more than 2,000 acres. Dick Erath, who had been a home wine-maker in California, planted vines near the Eyrie Vineyards in 1969, and later joined Cal Knudsen to set up the Knudsen Erath winery. Bill Blosser and his wife, Susan Sokol, founded the Sokol Blosser winery near Knudsen Erath; they produced their first wines in 1977, as did Joe and Pat Campbell at Elk Cove Vineyards. Bill Fuller, who had been production manager at the Louis Martini winery, in the Napa Valley, for several years, established Tualatin, in the Willamette Valley, in 1973. "I didn't want to be just another winery on winery row," he says, "and I also felt that in Oregon I could produce a light, delicate European style of wine that California wasn't making."

The short, cool growing season in Oregon favors early-ripening varieties such as Pinot Noir, Chardonnay, and White Riesling (as the Riesling of Germany is labeled in Oregon). Other varieties planted there include Gewürztraminer, Pinot Gris, Müller-Thurgau, and Muscat Ottonel, varieties found primarily in Germany and Alsace. Notably absent, except in very small quantities, are three varieties widely planted in California—Cabernet Sauvignon, Merlot, and Sauvignon Blanc.

While waiting for the Tualatin vineyards to bear, Fuller bought grapes in Washington. He was the first Oregon wine-maker to do so, and many others followed his lead. As a result, a number of Oregon wineries now produce Chardonnay, Pinot Noir, and White Riesling from Oregon grapes, and Cabernet Sauvignon, Merlot, Sauvignon Blanc, and Semillon from Washington grapes. The origin of the grapes must be clearly stated on the label, of course; in fact, Oregon has particularly strict labeling requirements. If a wine is labeled with the name of a grape, at least 90 percent of the wine must be made from that grape; the federal minimum is only 51 percent. (The sole exception is Cabernet Sauvignon, which may be blended with up to 25 percent of such Bordeaux varieties as Merlot and Cabernet Franc.) Generic names, such as Chablis and Burgundy, are not permitted in Oregon.

Many Oregon wineries are still experimenting with different grapes—Dick Erath, for example, has planted five vines each of 60 varieties—and most wine-makers are still defining their individual styles. "The Oregon wine industry is still in an experimental stage," says Bob McRitchie, wine-maker at Sokol Blosser. "We haven't settled down yet, and we shouldn't."

Oregon wines are generally lighter-bodied, more delicate, and more restrained in varietal character than those from California, but the best of them have an elegance, balance, and style that make them easy to drink. Unfortunately, the overall level of wine-making in Oregon is not yet as high as that in California, and a number of wines I tried were flawed or undistinguished. The wines I liked included three Pinot Noirs (those of the Eyrie Vineyards are not available here)—the subtle, complex Knudsen Erath 1979 ($9.50), the restrained, elegant Elk Cove 1979 Reserve ($15.49), and the well-made, balanced Sokol Blosser 1978 ($9.50). "Pinot Noir is hard to grow and hard to sell," says Bill Blosser, "but we think it's the grape that will make Oregon's reputation."

I also liked the Sokol Blosser Chardonnay 1979 ($11.30), an attractive, restrained, and nicely structured wine. The Tualatin Chardonnay 1980 ($9.69, available in July) is also appealing, with a distinctive, toasty bouquet that suggests aging in new oak. Another distinctive wine, made primarily from Washington grapes, is the rich, spicy, intense 1979 Merlot of Knudsen Erath ($7.75).

Washington has long been a major producer of Concord grapes, which are used to make juice and jelly, but there were relatively few wine grapes available in the late 1950s, when Dr. Lloyd Woodburne, a professor at the University of Washington, began to make wines "in a garage on Saturday afternoons." He persuaded a few friends to take up amateur wine-making, and they became so pleased with their results that they took bottles of their wines to the growers from whom they had been buying grapes. The growers were so impressed that they stopped selling grapes to Woodburne and began to make wine themselves. Woodburne and his friends formed Associated Vintners in 1962, planted a few acres of

their own, and produced their first commercial harvest in 1967. The winery that later became Chateau Ste. Michelle also produced its first varietal wines in 1967. Of the 7,400 acres of wine grapes now planted in Washington, nearly 3,000 belong to Chateau Ste. Michelle.

Although the first wineries were located near Seattle, so that sales could be made directly to consumers, almost all the Washington vineyards are situated 200 miles southeast of Seattle, in the Yakima Valley and the adjoining Columbia Basin. This area, protected from the Pacific rains by the Cascade mountain range, was a semi-arid desert before extensive irrigation was introduced. "The only thing you could grow there was sagebrush," recalls one farmer. The area is now one of the nation's principal agricultural regions, and the vineyards established there are planted with such red varieties as Cabernet Sauvignon, Merlot, and Pinot Noir, and such whites as Chardonnay, Johannisberg Riesling, Gewürztraminer, Chenin Blanc, Semillon, and Sauvignon Blanc. The days are longer there than they are in California ("We get 15 percent more day per day," says Joel Klein, Ste. Michelle's winemaker), and the cold desert nights enable the grapes to retain their natural acidity. As a result, the grapes grown there are high both in sugar (which fermentation transforms into alcohol) and in acid, which gives the white wines a crisp, lively taste.

Chateau Ste. Michelle is the only Washington winery whose wines are widely available in New York. Although its annual production of about 225,000 cases makes it by far the biggest winery in the Northwest, many of its varietal wines are of relatively recent origin. It first planted Chardonnay in 1973, and its first Sauvignon Blanc (now labeled "Fumé Blanc") was bottled in 1977.

Attractive whites from this large, modern winery include a dry, elegant, and lively Semillon-Blanc 1981 ($5.69); a light-bodied but assertive, grassy Fumé Blanc 1980 ($7.29), with fresh acidity; a fairly dry, crisp Chenin Blanc 1980 ($6.89); a well-balanced, stylish Chardonnay 1980 ($9.39); an unusually crisp and lively Johannisberg Riesling 1981 ($6.29), whose relatively dry taste would make it a good dinner wine; and an appealing, semisweet, and distinctive Muscat Alexandria ($6.95). A dry Rosé of Cabernet 1980 ($4.95) displays the slight weediness of this variety, and a Cabernet Sauvignon 1977 ($8.99) is an attractive, medium-weight wine with restrained varietal character.

Ste. Chapelle, Idaho's first winery, is situated in the Snake River Valley 35 miles west of Boise. It was named in honor of the thirteenth-century church on the Ile de La Cité, in Paris, and the unusual new winery has tall, narrow stained-glass windows that are replicas of those in Paris.

Wines were first produced in Idaho in 1976, and there are now 420 acres planted at Ste. Chapelle, primarily in Riesling and Chardonnay. "If we were in California, we would have been just another winery," says Bill Broich, a partner in the winery, "but I figure we have less competition selling Idaho wine—that is, once we persuade people we can grow grapes as well as potatoes."

Broich has a special interest in Chardonnay, and his balanced and elegant 1980 ($13.10) is a particular success that combines varietal character with subtle oak nuances. It represents a deliberate stylistic change from his previous Chardonnays, which were richer, more powerful wines, higher in alcohol and oak flavors. "One day I realized that even though my Chardonnays were winning gold medals in competition, I had trouble drinking them with dinner," Broich explains.

Ste. Chapelle's 1981 Johannisberg Riesling ($7.99) ia an appealing wine with a slightly honeyed bouquet and a taste that balances fruit and acidity. (The 1980, still around, is also excellent.) Even more impressive is another 1981 Idaho Riesling, labeled "Special Harvest" (available in late July at about $14)—more intense in flavor, yet fresh and lively despite its higher proportion of natural grape sugar.

All the wines suggested above are stocked by local distributors, but not many stores offer a wide selection. Three that do are Yorkville Wine and Liquor Corporation (1392 Third Avenue, at 79th Street, 288-6671); Manley's Liquor Store (35 Eighth Avenue, between Jane and 13th Streets, 242-3712); and Acker, Merall & Condit Company (2373 Broadway, near 86th Street, 787-1700).

I've focused primarily on wineries that market their wines here, but there are several others whose wines are worth looking for if you visit the West Coast, including Associated Vintners and Preston Wine Cellars, in Washington, and such Oregon producers as Adelsheim, Amity, the Eyrie Vineyards, Shafer, and, for its delicious fruit wines, Oak Knoll.

Mr. STEVENS. Mr. President, I reserve the remainder of our leadership time.

The PRESIDENT pro tempore. Without objection, it is so ordered.

Mr. STEVENS. I suggest the absence of a quorum.

The PRESIDENT pro tempore. The clerk will call the roll.

The assistant legislative clerk proceeded to call the roll.

Mr. STEVENS. Mr. President, I ask unanimous consent that the order for the quorum call be rescinded.

The PRESIDENT pro tempore. Without objection, it is so ordered.

Mr. STEVENS. I ask unanimous consent that the minority leader's time be reserved for his control at any time during the day.

The PRESIDENT pro tempore. Without objection, it is so ordered.

RECOGNITION OF SENATOR NUNN

The PRESIDENT pro tempore. The Senator from Georgia.

Mr. NUNN. Mr. President, is there a special order in the name of the Senator from Georgia?

The PRESIDENT pro tempore. The Senator is correct.

THE CRIME CONTROL ACT OF 1982, TITLE IV—HABEAS CORPUS REFORM

Mr. NUNN. Mr. President, this morning I want to continue to stress my concern over the outrageous abuse of habeas corpus petitions. As we have tried to impress upon our colleagues for some time now, Senator CHILES and I see a dire need for reform of our habeas corpus laws. Every day, our criminal justice system suffers the burden of blatant misuse of the writ of habeas corpus by convicted felons. Judges on all levels of our justice system have for years spoken of the urgent need to change our present habeas corpus laws. Criminals are being allowed to take advantage of the writ of habeas corpus as a swift and effective means to continually floodgate our criminal justice system, even after they have already received a "full and fair hearing" on the very issues of which they so vehemently complain.

Take note of the time wasted and the burdensome litigation that the case of Martin agaist Wainwright forced upon our criminal justice system. The defendant was convicted as a result of a robbery in 1970. He was subsequently sentenced to a term of imprisonment of 6 months to 20 years. After his conviction was affirmed on direct appeal in the State system, he filed a petition for habeas corpus in Federal district court raising the very same issues which had already been fully and fairly examined and decided in his State appeal. The Federal court denied the petition on its merits. This order was appealed to the Court of Appeals for the Fifth Circuit, which affirmed, and to the U.S. Supreme Court which denied certiorari.

Martin subsequently filed a second petition for habeas corpus in Federal court in 1975, alleging that his sentence was illegal because he was not given credit for time served (at that time, State law did not require it). In response, the State pointed out that Martin had not even attempted to exhaust State remedies on this issue, despite his previous extensive appellate litigation in the State system. He never pursued it on appeal despite doing so on other issues. By following this strategy, Martin could effectively force the Federal courts to consider on the merits each of a potential myriad of State issues in separate and time-consuming habeas corpus proceedings. After full consideration on the merits a second time, the Federal courts denied the petition because it did not state a Federal claim. The fifth circuit affirmed the denial, finding that the issue was one controlled by State law.

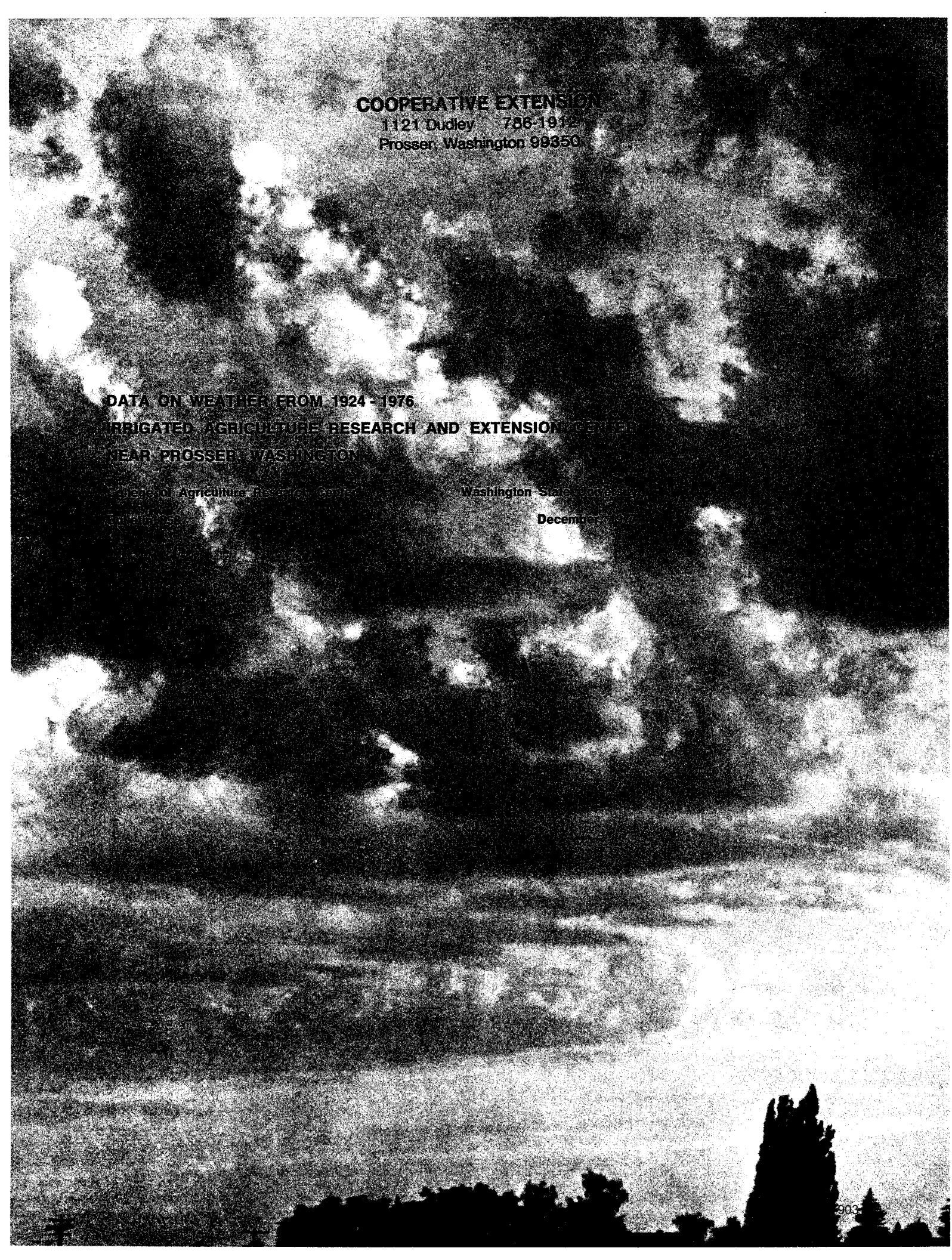
The perplexing problem evident here is that the court should never have been forced to consider the merits of the second petition because this issue was not even appealed in State court. The matter was not presented and fully litigated in State court, despite Martin's opportunity to do so. Habeas relief should have been barred since, had there been error, the State appellate process was the proper remedy, particularly so on a question of State law. Although the State ultimately won the case twice on the merits, it should have never been burdened by litigation of this type.

Mr. President, as I mentioned yesterday, and emphasize again, the time has come to reform our habeas corpus laws. Such reforms would help eliminate these repetitive and unnecessary petitions which daily exact such a heavy and costly toll from our crimi-

COOPERATIVE EXTENSION
1121 Dudley 786-1912
Prosser, Washington 99350

DATA ON WEATHER FROM 1924 - 1976
IRRIGATED AGRICULTURE RESEARCH AND EXTENSION CENTER
NEAR PROSSER, WASHINGTON

College of Agriculture Research Center Washington State University
Publication
December



CONTENTS

Data on Weather from 1924 to 1976, Irrigated Agriculture Research and Extension Center near Prosser, Washington

L. G. Kleingartner[1]

Summary

The climate in the lower Yakima Valley is characterized by low precipitation and mild winters with little snowfall. Although this region is essentially continental in character because of its inland position, the Pacific Ocean has a definite moderating effect that is not entirely cut off by the Cascade Mountains. Occasional sub-zero temperatures are recorded, but they don't last long. The winters are not so rigorous as those of the Rocky Mountain region or the Great Plains. Only 5 blizzards have been recorded in this area since 1880.

The summers are warm with low humidity and a very high percentage of clear days. Periods of hot weather that occur are usually brief, with moderately cool nights.

The high daily temperatures, the considerable sunshine, and the long days greatly favor rapid plant growth where irrigation water is available.

The growing season (frost-free period) is long for this latitude, and warm-season crops, such as field corn, apricots and peaches, do well in this area under irrigation.

The spring has considerable wind and cool, windy weather occasionally prevails until late May; but spring usually comes early, and spring plowing often begins in February. Early crops are often seeded in the latter part of February and in March.

There have been no tornadoes, and electrical storms are infrequent. Flash floods and hail are rare. The prevailing wind is from the southwest.

Late spring frosts have an important bearing on land use in the irrigated areas. In this general area, orchard heaters are kept in readiness during the critical blooming period of the stone fruits. Exposure, elevation, and air drainage are determining factors in growing these crops, and differences in frost hazards within short distances are marked.

The total evaporation from April to October, inclusive, is 49.9 inches. This further indicates a warm growing season with low relative humidity.

In this area, rain is incidental during the growing season in producing crops under irrigation, and the lack of extreme variations of weather favors stable agricultural production.

Introduction

The term *climate* refers to the long term sum total of weather conditions: temperature, precipitation, humidity, aspect of the sky, wind velocity, and other recorded daily phenomena. The data on each of these aspects of climate are averaged. Averages remain fairly constant from year to year, but there is a daily deviation. The data in this publication are of value as a guide to farmers in indicating:

1. What weather conditions may be expected at the time of planting and harvest
2. Suitable crops to be grown
3. Possibility of winter and frost injury
4. The probable temperature, wind speed and evaporation during critical periods of crop growth.

Methods

The weather station from 1924 through 1966 was located 5 miles northeast of Prosser, latitude 46°15'N, longitude 119°45'W, and 840 feet above sea level. In 1967, the weather station was moved .3 of a mile due north to an elevation of 890 feet. Maximum and minimum thermometers, a wet- and dry-bulb psychrometer, and a ventilating fan hydrothermograph are now housed in a regulation U.S. Weather Bureau instrument shelter. The shelter and other equipment are on a lawn. The National Weather Bureau Class A evaporation pan is set above ground on a wooden base. The total wind movement per day in miles was determined with an anemometer 2 feet above the ground. The precipitation was measured in an 8-inch nonrecording precipitation gauge.

The weather data have been recorded daily at 8:00 AM during the 53-year period. From 1933 to 1957, additional 12:00 noon and 5:00 PM daily recordings were made of aspect of the sky and whirling psychrometer readings, the latter from April 1 to November 1.

Precipitation

Precipitation includes rain, snow, and other forms of measurable moisture. The prevailing winds are westerly, and the station is in the lee of the Cascade Mountains; as a result, precipitation is low. The average precipitation is 7.54 inches a year.

The frequency distribution of total monthly precipitation by quarter-inch class intervals is shown in table 2. Most precipitation occurs during the winter. Average precipitation for July and August is 0.2 inch. No precipitation occurred in July during 16 years, and none in August during 11 years of the 53.

The total yearly snowfall, as shown in table 3, varied from none up to 31.5 inches. No snow fell in any October, and in only 11 years during March. It is evident from table 3 that the greatest snowfall is expected in January; the most snow during any one month, 19.6 inches, fell in January, 1950.

Only two blizzards are recorded in table 3. Prior to 1924, blizzards in this locality were reported during the winters of 1880-81, 1889-90 and 1919-20.

Distribution of Clear and Cloudy Days

Table 4 gives the average number of days that were clear, cloudy, partly cloudy, and days of rainfall. Forty-six percent of the days were clear, 26% were partly cloudy,

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and 28% were cloudy. Most of the clear days occurred during the crop season, from April to September, inclusive.

Temperature

Minimum. Table 5 gives the monthly average minimum temperatures, and the frequency distribution in intervals of 5°F.

The average minimum temperatures for May were 40 F or above 50 years during the 53-year period. The average minimum temperatures for June, July and August were 49.4 to 53.1 F and 46.5 F for September. These minimums, in combination with high maximum temperatures, make the climate favorable for growing warm season crops.

Table 8 shows one aspect of the severity of the winters and helps one interpret winter injury to certain crops. During the 53 years, 26 winters had no temperature of 0 F or lower. Eight winters had from 7 to 13 days with minimum temperatures below 0 F. The lowest recorded temperature was –20 F in February 1950.

Maximum. Table 10 gives the frequency distribution of monthly average maximum temperatures and the monthly averages. Table 11 shows how often maximum temperatures were 90 F or above. Although most of these have occurred in July and August, such temperatures are common in June, and have occurred in September and May, but on only 3 days in April from 1924 to 1976. From 1924 to 1976, maximum temperatures exceeded 100 F 43 times. The highest maximums, 110 F, were recorded in 1928 and 1939.

Mean. The frequency distributions of monthly mean temperatures by months, and the monthly mean averages are in table 13. The average monthly mean temperature has always exceeded 54.9 F in June, and 64.9 in July and August. The mean winter temperatures have usually been above 20 F, although in 5 years the mean January temperature was 15 F or below.

Frost-Free Period

The number of frost-free days is in table 14. The range has been from 122 days in 1926 to 205 days in 1956. The normal is 155 days. The average last spring frost is May 7 and the first fall frost October 9.

Wind Speed

The wind speed data in table 16 are based on 24-hour periods with the anemometer set 2 feet above the ground surface. During March, April, and May, wind is a critical factor in managing certain agricultural crops because of wind erosion and evaporation. These three months have the highest wind speed. The lowest wind speed occurs from July to November, inclusive.

Evaporation

The data on evaporation from a free-water surface are in tables 17, 17A and 17B. Table 17 has data from 1924 through 1961, table 17A from 1962 through 1966, and table 17B includes 1967 through 1976. From 1924 to 1961, a BPI pan 6 feet in diameter and 2 feet deep, so set in the ground that the tank projected 2 inches above ground level, was used. Beginning 1962, a National Weather Bureau Class A evaporation pan, set above the ground, was installed. Data obtained after 1961, therefore, are not comparable with those from preceding years and could not be included in table 17. Beginning in 1967, the evaporation pan, along with the weather station, was relocated. Because of environmental change, data obtained after 1967 are not comparable to data in table 17A; therefore, data from 1967 through 1976 are reported separately (table 17B).

On the basis of the data taken from 1967 on, the average evaporation is 5.78 inches in April, increases to 10.09 inches in July, and decreases in August. Further decreases in September and October are sharp. The evaporation correlates with the average maximum and minimum temperatures, as figure 1 shows. The average total evaporation for April to October inclusive for the 10 years is 49.90 inches (table 17B).

Relative Humidity

Relative humidity is the actual amount of water vapor in the air divided by the amount of water vapor in a saturated atmosphere at the same temperature. Relative humidity is expressed in percentage of saturation at a given temperature.

Because of changes in recording, or lack of continuous data, the period 1933 to 1957 is used in the tables 18, 19 and in figure 2.

The relative humidity gradually decreases from April to July, when the highest temperatures are recorded, and the air has a greatly increased capacity for vapor that cannot be satisfied (table 18 and figure 2). As the temperature decreases from August to October, the relative humidity increases.

During the day, the minimum temperatures occur during the morning. Consequently, the relative humidity is always higher in the morning than at noon or 5:00 PM. The difference in relative humidity between noon and 5:00 PM is small.

Records of relative humidity of less than 25% are not uncommon (table 19). During 2 of the 25 years 1933 to 1957, relative humidities of 25% or lower were recorded on 28 days in July and a like number in August.

This is an arid region. In spite of the irrigation of crops around the weather station, the relative humidity during the growing season is low, usually from 30 to 40%, because of advective heat from the surrounding dry areas.

Table 1. Precipitation in inches by months, 1924 to 1976.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1924	0.64	0.88	0.43	0.02	0.00	0.18	0.19	0.65	0.69	0.24	1.65	0.41	5.98
1925	0.52	0.83	0.03	0.59	0.73	0.11	0.00	0.10	0.96	0.03	0.83	0.34	5.07
1926	1.01	0.69	0.10	0.22	0.75	0.86	0.00	0.10	0.38	0.91	3.66	1.50	10.18
1927	2.03	1.07	0.60	0.05	0.69	0.23	0.01	0.35	1.54	1.08	1.51	0.23	9.39
1928	1.88	0.10	0.87	1.01	0.05	0.58	0.03	0.12	0.27	0.72	1.00	1.73	8.36
1929	1.10	0.10	0.11	0.11	0.21	0.66	0.00	0.01	0.04	0.17	0.03	1.74	4.28
1930	0.83	0.96	0.20	0.22	0.36	0.00	0.00	0.04	0.16	0.10	0.35	0.21	3.43
1931	0.50	0.20	1.17	0.43	0.01	0.80	0.00	0.00	0.17	0.51	1.51	3.02	8.32
1932	0.48	0.37	0.75	0.39	0.62	0.00	0.05	0.10	0.00	0.94	1.00	0.43	5.13
1933	0.60	0.71	0.97	0.35	1.15	0.42	0.07	0.17	0.98	0.47	0.32	1.24	7.45
1934	0.64	0.28	0.75	0.43	0.44	0.21	0.00	0.61	0.52	1.17	1.02	0.57	6.64
1935	0.14	0.53	0.02	0.38	0.07	0.28	0.34	0.00	0.05	0.90	0.40	1.13	4.24
1936	1.73	0.68	0.16	0.31	0.32	0.78	0.06	0.00	0.10	0.03	0.02	1.08	5.27
1937	0.88	0.90	0.73	0.99	0.04	1.48	0.39	0.21	0.34	0.82	2.09	2.03	10.90
1938	0.80	0.73	1.05	0.30	0.22	1.64	0.00	0.02	0.03	0.92	0.46	0.39	5.56
1939	0.88	0.65	0.56	0.04	0.08	0.17	0.16	0.00	0.66	0.31	0.00	1.14	4.65
1940	1.20	3.18	0.59	0.52	0.15	0.19	0.61	0.00	0.69	2.12	1.58	1.53	12.36
1941	1.61	0.87	0.28	0.38	1.11	1.74	0.30	0.78	0.66	0.80	0.95	0.60	10.08
1942	1.24	0.85	0.09	0.33	1.65	1.37	0.02	0.06	0.00	0.75	1.80	1.62	9.78
1943	0.41	0.73	0.50	1.08	0.25	0.22	0.00	0.25	0.00	1.58	0.31	0.41	5.74
1944	0.30	0.40	0.39	1.70	0.27	0.58	0.00	0.00	0.26	0.19	1.62	1.03	6.74
1945	0.98	1.24	0.79	0.48	1.74	0.06	0.03	0.05	0.48	0.70	0.82	1.55	8.92
1946	0.20	0.44	1.33	0.34	0.55	1.01	0.25	0.32	0.51	0.92	0.98	0.06	6.91
1947	0.07	0.64	0.32	0.84	0.07	1.36	0.57	0.95	0.62	2.50	0.77	0.65	9.36
1948	1.44	0.76	0.07	0.89	1.41	1.54	0.32	0.25	0.21	0.77	0.95	1.07	9.68
1949	0.15	0.90	1.18	0.10	0.27	0.01	0.00	0.06	0.70	0.30	1.39	0.05	5.11
1950	1.66	1.24	1.16	0.47	0.12	2.73	0.02	0.03	0.10	2.73	0.81	1.17	12.25
1951	0.96	0.60	0.13	0.36	0.57	1.19	0.16	0.31	0.56	1.29	1.12	0.61	7.86
1952	0.66	0.51	0.41	0.42	0.52	0.91	0.00	0.07	0.16	0.03	0.23	1.27	5.19
1953	2.35	0.25	0.23	0.83	0.92	0.28	0.00	0.74	0.00	0.74	1.48	0.83	8.65
1954	0.95	0.20	0.72	0.26	0.64	0.14	0.43	0.04	0.48	0.58	0.99	0.29	5.72
1955	0.31	0.17	0.24	0.81	0.23	0.21	0.65	0.00	0.77	0.72	1.75	2.41	8.27
1956	2.08	0.86	0.13	0.00	0.53	0.55	0.02	0.33	0.06	1.48	0.20	0.69	6.93
1957	0.38	0.40	1.89	0.54	1.03	1.90	0.10	0.02	0.83	1.57	0.62	0.81	10.09
1958	2.10	1.63	0.72	1.45	0.75	0.28	0.38	0.07	0.04	0.25	1.06	1.27	10.00
1959	2.00	0.60	0.31	0.30	0.16	0.53	0.18	0.03	0.90	0.59	0.30	0.36	6.26
1960	0.61	0.99	0.68	0.87	1.14	0.24	0.02	0.22	0.33	0.40	1.60	0.69	7.79
1961	0.70	3.08	1.18	1.42	1.90	0.47	0.17	0.69	0.19	0.11	0.97	0.91	11.79
1962	0.16	0.79	0.55	0.47	2.06	0.25	0.00	0.55	0.46	1.39	1.10	0.96	8.74
1963	0.29	0.77	0.74	1.55	0.87	0.36	0.44	0.03	0.08	0.41	0.92	1.32	7.78
1964	0.38	0.05	0.16	0.10	0.00	1.54	0.07	0.25	0.03	0.37	1.16	3.46	7.57
1965	1.04	0.01	0.10	0.41	0.28	0.57	0.06	0.25	0.09	0.06	1.35	0.54	4.76
1966	0.56	0.06	0.45	0.06	0.12	0.70	1.16	0.02	0.23	0.42	2.16	1.10	7.04
1967	0.73	0.00	0.09	1.07	0.31	0.79	0.00	0.00	0.14	0.29	0.51	0.24	4.17

Table 1 continued

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1968	0.93	0.75	0.05	0.09	0.20	0.45	0.03	0.74	0.40	1.41	1.73	.91	7.69
1969	1.52	0.68	0.25	0.94	0.94	0.23	0.00	0.00	0.57	0.14	.32	1.59	7.18
1970	2.94	1.16	0.21	0.36	0.26	0.15	0.09	0.00	0.15	0.48	1.03	.65	7.48
1971	0.94	0.12	1.35	0.27	0.36	1.32	0.20	0.07	1.19	0.29	0.72	1.25	8.08
1972	0.11	0.08	1.07	0.12	2.29	1.52	0.27	0.16	0.24	0.21	0.45	1.46	7.98
1973	0.84	0.32	0.23	0.06	0.45	0.08	0.00	0.02	0.56	1.59	2.74	2.42	9.31
1974	0.66	0.54	0.62	1.44	0.42	0.20	0.75	0.00	0.01	0.22	1.03	1.20	7.09
1975	1.44	1.04	0.36	0.93	0.20	0.06	0.40	1.13	0.00	1.15	0.51	1.13	8.35
1976	0.65	0.13	0.18	0.63	0.29	0.01	0.43	0.79	0.04	0.16	0.00	0.17	3.48
Mean	0.95	0.71	0.54	0.54	0.58	0.64	0.18	0.22	0.37	0.74	1.02	1.05	7.54

Table 2. Frequency distributions of total monthly precipitation in quarter-inch class intervals by months from 1924 to 1976.

Frequency class, inches	Number of years of occurrence by months												
	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Totals
3.75-3.99													
3.50-3.74									1				1
3.25-3.49										1			1
3.00-3.24										1		2	3
2.75-2.99											1		1
2.50-2.74				1				2	1				4
2.25-2.49			1							2	1		4
2.00-2.24			1					1	2	1	4		9
1.75-1.99	1		1	1					2				5
1.50-1.74		2	2	4			1	2	7	7	5	1	31
1.25-1.49	2	3	1	4				4	3	6	2		25
1.00-1.24	6	3	4	2	1	1	1	4	10	10	5	5	52
0.75-0.99	5	8	5	5	1	3	5	9	11	5	9	13	79
0.50-0.74	11	4	8	9	6	6	11	7	2	8	13	13	98
0.25-0.49	12	21	13	7	10	8	9	11	8	7	7	7	120
0.01-0.24	16	11	15	18	19	24	21	13	4	5	6	11	163
0.00-0.00		1	2	2	16	11	5		2			1	40
Av Precip	0.54	0.54	0.58	0.64	0.18	0.22	0.37	0.74	1.02	1.05	0.95	0.71	7.54
% of annual	7.16	7.16	7.69	8.49	2.39	2.92	4.90	9.81	13.53	13.93	12.60	9.42	

Table 3. Inches of snowfall for the winter months from 1924-1925 to 1975-1976.

Year 19--	Months Nov	Dec	Jan	Feb	Mar	Total in.	Year 19--	Months Nov	Dec	Jan	Feb	Mar	Total in.
24-25	2.4	--	--	--	--	2.4	52-53	--	--	4.1	0.1	--	4.2
25-26	2.0	4.2	--	--	--	6.2	53-54	--	--	6.4	0.2	--	6.6
26-27	4.0	6.0	14.0	--	--	24.0	54-55	--	--	2.8	1.0	0.6	4.4
27-28	--	0.1	8.0	0.2	--	8.3	55-56	7.9	14.6	8.0	1.0	--	31.5
28-29	--	2.0	5.0[a]	--	--	7.0	56-57	0.1	0.2	5.2	1.4	0.6	7.5
29-30	0.3	8.1	8.2	0.6	--	17.2	57-58	--	--	--	--	--	0.0
30-31	--	--	--	--	--	0.0	58-59	--	--	5.0	6.0	--	11.0
31-32	3.4	8.8	3.8	0.8	1.0	17.8	59-60	--	--	7.6	--	2.0	9.6
32-33	--	2.3	2.7	5.9	--	10.9	60-61	--	2.8	1.0	--	--	3.8
33-34	--	5.0	1.6	0.1	--	6.7	61-62	3.5	3.5	--	1.0	--	8.0
34-35	--	--	1.0	1.6	0.2	2.8	62-63	--	--	3.5	3.7	--	7.2
35-36	2.1	0.8	7.8	6.8	1.5	19.0	63-64	--	4.5	4.0	--	--	8.5
36-37	--	5.0	8.6	10.7	--	24.3	64-65	0.5	18.0	8.5	--	--	27.0
37-38	--	1.8	2.5	4.2	--	8.5	65-66	--	3.9	1.0	--	--	4.9
38-39	--	1.0	--	1.0	0.9	2.9	66-67	--	2.5	--	--	--	2.5
39-40	--	0.3	5.0	8.4	--	13.7	67-68	--	2.0	2.0	--	--	4.0
40-41	2.5	--	6.4	0.5	--	9.4	68-69	--	3.0	18.0	3.0	--	24.0
41-42	--	0.6	2.9	2.1	--	5.6	69-70	--	3.0	5.5	--	--	8.5
42-43	6.7	9.8	5.5	2.5	--	24.5	70-71	--	--	--	--	1.3	1.3
43-44	--	--	0.8	0.2	0.3	1.3	71-72	--	8.0	1.0	1.0	--	10.0
44-45	0.9	--	1.4	4.3	--	6.6	72-73	--	5.3	1.8	1.5	--	8.6
45-46	1.2	3.9	--	--	--	5.1	73-74	4.8	7.3	2.5	--	--	14.6
46-47	8.2	0.1	0.8	--	--	9.1	74-75	--	--	2.5	8.8	--	11.3
47-48	--	2.0	--	5.2	--	7.2	75-76	2.0	0.5	0.5	--	--	3.0
48-49	1.0	8.0	2.0	5.8	2.5	19.3							
49-50	--	--	19.6[b]	4.7	--	24.3							
50-51	0.3	1.0	5.5	4.1	0.4	11.3							
51-52	--	6.4	5.3	0.7	--	12.4							
						Mean							10.0
						Pct. of total		10.2	29.5	39.5	18.7	2.1	

[a] Blizzard January 31. Temperature 8° with 5 inches of snow.

[b] Blizzard January 13. Temperature -6° with 3.5 inches of snow.

Table 4. Average number of days with recorded rainfall, clear days, partly cloudy and cloudy days by months, 1924-1967.

Months	Days with 0.01 inch or more precipitation	Clear days	Partly cloudy days	Cloudy days
January	7	6	9	16
February	5	7	8	13
March	5	11	11	9
April	4	15	9	6
May	4	16	10	5
June	4	17	8	5
July	1	24	5	2
August	2	23	6	2
September	3	19	7	4
October	5	14	9	8
November	8	8	8	14
December	8	6	7	18

Table 5. Frequency distributions of monthly average minimum temperatures by months and the monthly averages, 1924-1976.

Frequency class, degrees F.	Number of years temperatures occurred by months											
	Mar[a]	Apr	May	June	July[a]	Aug[a]	Sept[a]	Oct	Nov[a]	Dec	Jan[a]	Feb[a]
55.0-59.0					9	4						
50.0-54.9				21	42	37	5					
45.0-49.9			12	32	1	11	37					
40.0-44.9		2	38				9	17				
35.0-39.9	1	26	3				1	30	7		1	2
30.0-34.9	35	20						6	27	9	4	14
25.0-29.9	13								16	29	21	26
20.0-24.9									2	11	12	7
15.0-19.9										4	6	1
10.0-14.9											4	2
5.0- 9.9											3	
0.0- 4.9											1	
Av. min. temp.	31.7	36.8	43.6	49.4	53.1	51.9	46.5	38.7	30.9	26.3	22.6	27.5

[a]51 years because of missing data.

Table 6. Maximum and minimum temperatures in degrees Fahrenheit for each month, 1924 to 1976.

	Jan		Feb		Mar		April		May		June	
Year	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1924	61	- 3	a	a	a	a	77	22	89	32	93	40
1925	58	16	61	24	72	25	83	30	87	37	98	35
1926	55	23	62	25	71	21	90	27	85	31	102	42
1927	54	-15	59	21	67	24	86	18	88	30	90	41
1928	50	7	52	20	70	18	76	22	96	26	102	36
1929	49	-10	52	-15	69	22	78	22	90	32	95	35
1930	55	-19	65	21	78	25	82	28	83	26	92	34
1931	58	12	62	17	62	18	86	25	96	33	100	40
1932	54	8	69	- 3	72	20	82	27	86	33	96	38
1933	62	4	55	- 8	62	20	85	23	85	30	102	35
1934	61	22	61	25	77	24	90	27	99	32	100	39
1935	66	- 6	55	18	71	16	75	14	84	29	92	37
1936	54	8	62	- 4	71	20	87	19	98	35	99	43
1937	43	-14	55	- 1	75	26	75	27	88	30	100	41
1938	57	18	50	15	67	20	82	21	92	26	94	37
1939	58	20	57	10	80	21	89	23	95	29	100	35
1940	49	10	58	19	75	23	73	30	94	31	99	36
1941	53	17	55	22	72	18	80	25	90	30	93	39
1942	49	- 3	54	15	74	17	86	26	84	29	97	36
1943	55	- 7	59	9	69	27	86	27	84	30	89	34
1944	52	13	57	18	75	13	80	25	91	31	96	37
1945	63	19	63	19	70	11	78	23	88	35	97	34
1946	55	19	58	18	65	22	86	24	87	31	96	38
1947	58	0	68	14	76	21	87	28	98	34	94	40
1948	54	11	64	3	72	18	78	24	89	29	102	44
1949	42	- 8	56	11	63	22	82	25	95	28	98	39
1950	46	-16	64	-20	65	23	70	24	88	30	96	41
1951	53	1	64	8	69	15	84	25	94	31	90	39
1952	48	5	58	15	71	20	87	26	89	32	90	37
1953	59	27	60	21	67	21	76	22	80	30	83	37
1954	51	-15	62	21	61	15	70	24	94	26	92	36
1955	54	18	55	19	59	6	76	22	82	30	95	38
1956	51	- 3	51	-12	65	20	85	24	93	34	93	38
1957	45	-18	63	11	61	25	87	29	92	41	96	42
1958	60	16	62	25	64	21	74	30	97	33	99	41
1959	56	- 1	57	22	65	22	79	25	87	30	94	38
1960	50	0	59	8	81	11	79	23	87	32	93	39
1961	60	18	62	24	67	24	74	26	90	32	101	40
1962	62	3	60	8	63	20	85	30	79	31	94	35
1963	55	- 1	60	6	70	23	72	26	89	33	98	41
1964	56	20	60	21	75	19	72	25	82	30	90	43
1965	59	10	65	26	69	13	80	29	90	29	94	38
1966	53	20	59	20	77	22	79	28	94	34	94	36
1967	61	26	65	21	67	20	69	27	90	34	96	45

continued

Table 6 continued

Year	Jan Max	Jan Min	Feb Max	Feb Min	Mar Max	Mar Min	Apr Max	Apr Min	May Max	May Min	June Max	June Min
1968	64	10	64	18	67	23	88	22	85	31	95	39
1969	47	- 6	47	2	71	22	77	28	91	34	99	42
1970	50	5	56	25	77	24	69	25	88	30	101	37
1971	69	14	66	17	64	12	72	25	86	30	92	39
1972	57	- 1	67	5	74	21	75	23	92	32	93	42
1973	58	1	60	22	67	23	78	26	92	33	96	37
1974	60	- 6	59	23	68	19	73	29	81	30	98	38
1975	60	12	62	15	63	17	75	22	85	29	89	37
1976	64	18	61	8	68	12	74	27	88	33	93	35

Year	July Max	July Min	Aug Max	Aug Min	Sept Max	Sept Min	Oct Max	Oct Min	Nov Max	Nov Min	Dec Max	Dec Min
1924	101	41	95	41	91	33	81	25	64	19	73	- 1
1925	98	42	97	38	88	38	71	30	65	20	59	24
1926	104	45	98	41	86	20	73	26	62	24	56	0
1927	103	44	96	40	85	34	75	24	71	25	62	- 1
1928	110	46	96	46	94	35	78	25	59	22	56	8
1929	104	44	101	43	92	36	82	30	62	10	56	12
1930	103	42	101	46	93	35	80	22	66	18	49	15
1931	104	47	100	46	96	38	84	28	76	4	50	- 1
1932	97	45	100	40	94	32	90	26	71	23	62	- 6
1933	101	42	102	45	88	29	83	24	72	22	65	21
1934	105	45	98	46	97	34	85	29	71	27	59	25
1935	103	40	94	41	95	35	84	11	56	5	53	22
1936	103	43	100	44	92	30	83	26	56	13	62	13
1937	103	43	99	40	94	32	77	32	63	26	63	20
1938	107	46	95	39	96	43	77	27	64	9	59	8
1939	110	40	100	40	91	37	75	27	64	21	62	17
1940	101	43	96	44	92	40	79	30	55	17	57	6
1941	107	46	100	44	82	34	71	29	64	20	62	12
1942	103	41	103	42	94	36	82	24	59	23	54	17
1943	99	38	95	42	95	37	86	25	63	23	59	15
1944	102	40	95	40	99	34	80	33	62	17	56	19
1945	100	42	97	42	92	32	82	23	68	20	56	8
1946	101	43	100	42	84	32	72	20	65	19	60	10
1947	97	46	95	40	91	38	78	33	63	26	56	21
1948	95	42	93	43	94	30	77	22	57	25	51	4
1949	99	43	100	42	97	37	72	23	61	29	58	17
1950	96	42	98	42	97	34	72	26	62	20	54	23
1951	101	43	97	42	92	33	74	25	58	18	56	9
1952	101	45	98	42	93	41	84	31	60	13	54	18
1953	99	44	97	46	90	38	80	32	63	24	56	23
1954	94	40	96	43	86	34	70	27	60	22	51	15
1955	100	38	98	42	97	34	72	28	65	0	55	10
1956	100	46	99	41	92	36	77	26	61	15	58	7

(Continued)

Table 6 continued

Year	July		Aug		Sept		Oct		Nov		Dec	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1957	95	42	91	42	93	35	78	33	59	20	58	17
1958	101	45	100	46	93	33	86	25	64	10	64	21
1959	103	42	95	43	88	38	75	27	72	10	63	12
1960	103	43	99	37	90	36	83	29	65	21	50	13
1961	102	45	101	49	85	33	79	26	58	12	56	7
1962	100	38	96	42	92	38	74	33	64	23	54	16
1963	90	44	96	44	93	41	81	28	60	17	52	11
1964	102	44	94	43	88	36	74	32	72	20	55	- 7
1965	99	45	102	39	87	31	81	30	66	25	51	16
1966	95	42	97	44	95	43	80	31	64	23	55	23
1967	100	47	102	48	98	39	77	30	74	22	58	9
1968	105	44	98	44	91	36	83	27	59	24	57	-11
1969	96	40	97	37	91	35	71	21	64	19	52	22
1970	100	44	98	42	87	30	82	23	59	15	58	6
1971	102	37	105	42	84	29	81	19	60	18	51	9
1972	95	42	103	45	91	29	80	22	56	23	62	- 7
1973	99	40	96	69	92	35	74	30	60	13	58	12
1974	98	41	98	44	95	32	78	24	60	22	57	18
1975	104	46	92	40	90	36	77	27	73	17	61	12
1976	97	42	92	40	96	37	84	27	66	12	58	11

[a]No data were taken

Table 7. Monthly average minimum temperatures in degrees Fahrenheit by months, 1924 to 1976.

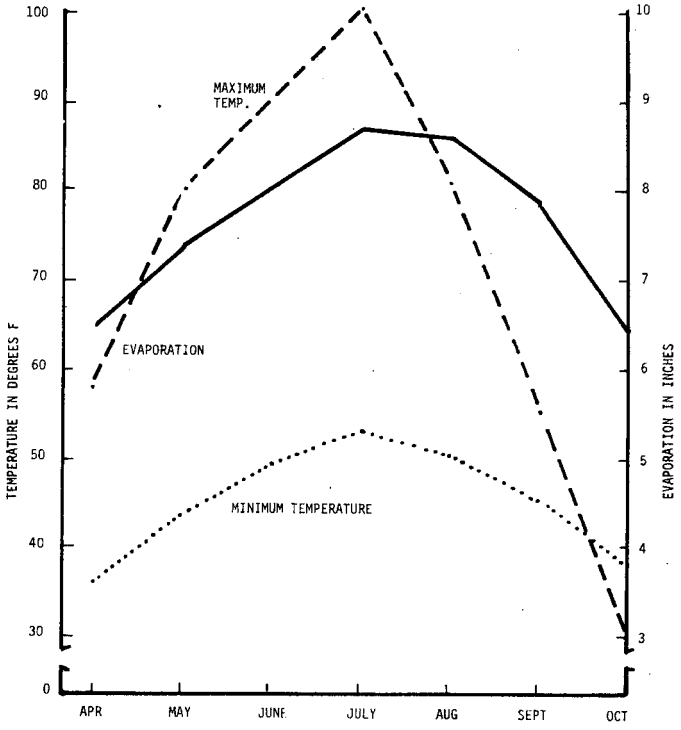
Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1924	10.3	a		33.3	44.0	49.4	51.4	52.3	47.3	40.7	32.5	19.9
1925		34.4	33.4	38.5	46.6	49.5	55.2	51.3	47.7	38.6	29.5	28.7
1926	29.2	32.1	32.9	38.9	44.0	51.5	55.2	51.8	41.8	39.2	31.7	22.4
1927	19.5	30.6	30.7	33.3	39.2	49.1	50.3	53.0	45.6	38.1	33.3	18.8
1928	21.6	26.1	33.6	32.3	43.0	47.2				41.0		21.8
1929	15.1	11.8	31.0	34.9	41.0	47.8	51.1	52.9	45.6	38.9	22.0	27.7
1930	4.4	31.6	33.7	36.9	40.9	47.0	51.3	53.3	47.8	34.7	30.0	26.6
1931	29.2	27.8	32.9	38.3	46.0	50.5	54.4	52.3	47.6	38.5	28.2	19.8
1932	21.0	25.8	35.0	39.1	42.8	48.7	52.2	52.1	44.8	41.4	34.5	21.0
1933	25.4	20.2	32.0	36.1	40.9	49.0	52.9	53.5	44.7	41.9	33.9	34.5
1934	31.4	30.6	35.6	43.9	46.0	50.0	52.6	53.8	45.4	43.7	37.2	30.3
1935	27.3	29.0	29.5	34.2	40.9	48.9	53.1	49.8	48.0	36.7	27.0	27.5
1936	29.9	13.9	30.7	40.2	46.8	52.4	52.5	51.2	44.1	38.0	22.7	27.7
1937	6.3	20.7	34.7	36.6	41.2	51.7	55.2	49.7	46.9	41.5	36.2	29.7
1938	28.1	27.8	31.7	38.1	40.6	50.4	55.8	48.3	50.5	39.9	25.2	25.4
1939	28.3	25.2	34.0	37.2	44.5	47.5	53.9	53.5	47.2	38.2	27.7	31.0
1940	23.8	30.9	35.3	38.5	43.6	48.6	53.9	51.7	50.0	42.3	26.7	25.7
1941	26.5	27.6	33.1	38.5	43.4	48.8	56.5	55.2	45.1	39.4	33.1	28.4
1942	18.3	27.2	28.6	37.2	43.8	46.7	54.0	54.5	46.3	38.0	30.6	27.2
1943	14.9	28.8	28.9	39.6	39.8	46.0	51.9	49.5	46.2	39.6	33.1	25.8
1944	21.7	27.3	28.3	36.6	42.5	48.8	53.2	50.8	47.4	40.7	31.7	26.1
1945	30.1	30.5	32.2	34.2	44.5	46.0	52.3	52.3	44.3	39.4	31.2	26.4
1946	26.3	27.6	33.3	37.1	46.2	49.1	53.0	53.0	45.1	35.7	27.2	27.8
1947	18.1	28.0	33.5	38.9	47.4	49.4	52.6	49.3	48.6	43.6	32.8	28.8
1948	24.3	24.3	28.6	34.4	44.8	53.6	50.0	51.9	45.4	35.9	30.3	21.1
1949	6.5	24.7	32.0	35.3	45.3	46.5	49.5	50.7	48.9	33.8	36.2	27.8
1950	6.7	22.9	31.7	35.2	39.6	51.7	51.7	52.3	46.2	41.1	34.3	33.0
1951	26.3	27.4	27.6	35.5	43.7	50.2	52.8	50.9	47.6	39.4	30.2	21.7
1952	19.8	29.4	31.0	36.7	44.3	50.0	53.1	51.8	47.4	41.0	25.1	29.6
1953	36.0	30.7	32.1	36.4	40.5	45.6	50.7	53.4	46.8	40.6	34.5	29.3
1954	21.4	31.3	27.5	35.8	43.5	46.8	50.4	50.1	46.3	36.7	37.4	25.4
1955	25.5	25.6	26.5	33.5	41.1	49.4	52.6	49.4	46.8	39.2	25.4	23.3
1956	25.2	17.1	32.5	37.9	48.4	47.3	54.8	52.2	46.6	39.8	30.4	27.6
1957	10.2	26.4	33.3	38.1	49.1	50.8	50.2	49.6	49.0	40.0	29.9	30.6
1958	30.2	35.7	31.1	37.3	49.2	54.4	57.2	54.0	46.7	37.6	31.9	29.7
1959	25.4	28.2	30.7	37.4	41.2	49.6	52.9	49.1	47.3	38.7	26.0	25.8
1960	14.9	27.6	30.5	38.0	42.4	48.4	54.0	50.1	46.1	39.8	31.6	23.6
1961	28.9	35.1	34.8	37.7	44.2	52.3	55.2	56.6	43.8	37.0	25.2	26.9
1962	23.5	29.1	29.6	39.8	43.0	47.7	52.3	52.7	48.2	40.9	31.5	32.0
1963	19.6	30.8	33.2	38.6	44.2	50.6	52.2	53.7	52.0	42.1	35.0	27.0
1964	29.8	26.8	30.5	35.7	41.7	50.5	54.5	51.3	45.7	38.3	32.4	22.7
1965	27.5	32.0	29.3	39.1	42.4	50.2	55.2	56.0	45.4	42.3	37.6	27.0
1966	29.2	29.4	32.9	38.4	44.7	49.1	52.9	54.7	50.7	39.8	35.0	32.1
1967	32.7	31.8	32.4	34.2	43.9	53.1	54.7	56.0	50.9	40.8	31.7	25.9

continued

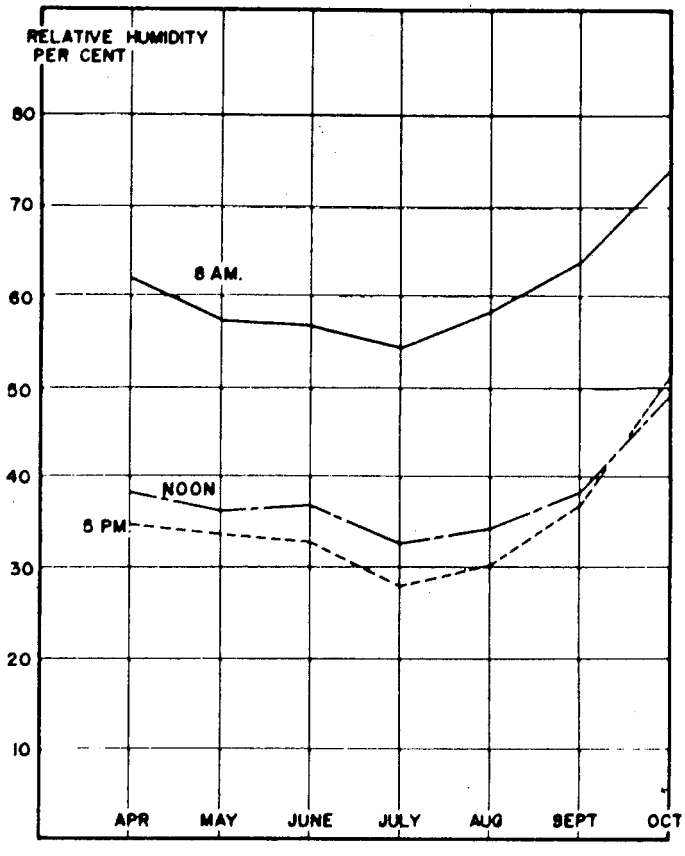
Table 7 continued

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	27.0	31.9	36.1	36.2	43.7	49.0	54.7	52.6	46.9	34.1	32.3	20.8
1969	13.2	22.9	32.5	37.6	46.8	54.4	50.2	48.1	47.1	33.7	29.9	27.3
1970	22.2	30.7	32.3	34.9	41.8	51.4	52.5	47.1	42.3	35.1	29.8	23.7
1971	27.7	27.4	28.7	35.1	43.9	45.8	51.9	52.7	39.8	33.7	30.1	24.4
1972	23.3	27.0	33.7	34.2	46.8	51.5	54.6	54.0	42.5	35.9	31.8	18.7
1973	21.6	29.2	32.1	36.5	43.9	49.5	53.3	50.1	46.5	37.5	31.8	30.3
1974	20.2	29.5	32.5	38.0	41.2	50.3	52.5	51.0	45.0	34.7	32.3	27.6
1975	23.9	24.2	29.4	32.6	41.2	47.8	56.9	49.2	43.3	37.6	28.7	27.1
1976	26.2	26.0	28.5	37.0	43.0	46.3	52.1	52.4	47.8	35.4	29.0	21.5
Mean	22.6	27.5	31.7	36.8	43.6	49.4	53.1	51.9	46.5	38.7	30.9	26.3

[a]Total 52 years because of missing data



1. Monthly average maximum and minimum temperatures, 1924-1976 inclusive; and evaporation from a free water surface, 1967-1976 inclusive.



2. Average relative humidity at 8 am, noon, and 5 pm, Pacific Standard Time, 1933-1957 inclusive.

Table 8. Lowest daily minimum temperature and the number of days the minimum temperature was 0 F or lower for the winter months from 1923-1924 to 1975-1976.

Year 19--	Month: Nov Min.	Nov Days 0° or below	Dec Min.	Dec Days 0° or below	Jan Min.	Jan Days 0° or below	Feb Min.	Feb Days 0° or below	Summary for four months: Min.	Summary for four months: Days 0° or below
23-24	15		- 8	1	- 4	3	22		- 8	4
24-25	19		-11	7	16		24		-11	7
25-26	20		24		23		25		20	
26-27	24		0	1	-15	5	21		-15	6
27-28	25		- 1	1	7		20		- 1	1
28-29	22		8		-10	3	-15	8	-15	11
29-30	10		12		-19	13	21		-19	13
30-31	18		15		12		17		12	
31-32	4		- 1	1	8		- 3	2	- 3	3
32-33	23		- 6	6	4		- 8	2	- 8	8
33-34	22		21		22		25		21	
34-35	27		25		- 6	1	18		- 6	1
35-36	5		22		8		- 4	2	- 4	2
36-37	13		13		-14	10	- 1	2	-14	12
37-38	26		20		18		15		15	
38-39	9		8		20		10		8	
39-40	21		17		10		19		10	
40-41	17		6		17		22		6	
41-42	20		12		- 3	3	15		- 3	3
42-43	23		17		- 7	6	9		- 7	6
43-44	23		15		13		18		13	
44-45	17		19		19		19		17	
45-46	21		8		19		18		8	
46-47	19		12		0	1	14		0	1
47-48	26		20		11		3		3	
48-49	21		4		- 8	9	11		- 8	9
49-50	30		17		-16	10	-20	4	-20	14
50-51	25		1		24		8		1	
51-52	18		9		5		15		5	
52-53	13		18		29		21		13	
53-54	24		24		-15	2	21		-15	2
54-55	22		15		18		19		15	
55-56	0	1	16		- 3	1	-12	3	-12	5
56-57	15		7		-18	11	11		-18	11
57-58	20		17		16		25		16	
58-59	10		21		- 1	2	22		- 1	2
59-60	10		12		0	2	8		0	2
60-61	21		13		18		24		13	
61-62	12		7		3		8		3	
62-63	23		16		- 1	2	6		- 1	2
63-64	17		11		20		21		11	
64-65	20		- 7	3	10		26		- 7	3
65-66	25		16		20		20		16	
66-67	23		23		26		21		21	

continued

Table 8 continued

Year 19--	Month: Nov Min.	Nov Days 0° or below	Dec Min.	Dec Days 0° or below	Jan Min.	Jan Days 0° or below	Feb Min.	Feb Days 0° or below	Summary for four months Min.	Summary for four months Days 0° or below
67-68	22		9		10		18		9	
68-69	24		-11	3	- 6	6	2		-11	9
69-70	19		22		5		25		5	
70-71	15		6		14		17		6	
71-72	18		9		- 1	2	5		- 1	2
72-73	23		- 7	6	1		22		- 7	6
73-74	13		12		- 6	7	23		- 6	7
74-75	22		18		12		15		12	
75-76	17		12		18		8		8	

Table 9. Monthly average maximum temperatures in degrees F by months, 1924 to 1976.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1924	37.2	a		65.6	78.1	79.7	86.4	83.1	77.3	65.8		35.5
1925	46.6	54.3	61.9	70.6	79.8	83.4	90.6	84.7	77.9	66.1	50.1	42.5
1926	41.5	52.0	64.0	73.7	73.1	87.1	93.5	87.5	72.4	65.9	51.9	39.1
1927	36.3	48.0	56.9	66.5	70.3	82.5	90.4	88.8	73.1	64.9	54.0	38.8
1928				59.7	78.2	80.0						34.6
1929	28.2	32.7	58.8	63.7	74.6	79.9	89.4	92.3	75.6	69.6	48.4	41.2
1930	22.2	49.5	62.2	72.2	73.7	80.7	91.8	91.6	78.8	62.5	48.0	36.5
1931	41.9	48.5	58.0	67.7	80.5	80.7	92.6	91.0	78.1	65.5	46.3	33.0
1932	35.8	43.2	55.1	67.1	72.5	85.1	85.1	87.3	81.3	65.7	53.2	40.5
1933	43.6	38.2	54.5	65.8	69.1	82.4	90.2	89.3	72.7	69.9	50.0	48.5
1934	47.9	53.8	64.8	73.9	78.5	84.6	90.2	89.6	75.7	66.3	52.8	42.8
1935	39.7	46.5	53.7	60.9	72.5	78.3	87.5	84.1	81.8	62.5	42.3	35.5
1936	40.5	30.5	56.1	71.0	78.2	81.1	89.2	88.6	78.2	71.1	43.8	43.5
1937	22.9	39.7	57.5	62.0	73.1	79.4	90.6	84.5	79.2	67.4	50.9	41.7
1938	40.6	42.5	55.2	66.9	75.1	84.0	93.6	86.0	83.5	64.4	48.1	44.2
1939	43.4	45.2	58.1	70.2	77.5	79.4	90.8	90.4	78.8	65.0	51.6	45.7
1940	34.5	45.9	60.8	65.7	78.2	85.9	87.1	85.2	77.7	64.8	41.0	39.8
1941	37.7	48.0	63.5	67.9	71.3	78.9	92.3	84.7	71.5	62.2	52.5	42.9
1942	29.6	45.4	57.7	66.9	70.2	77.0	89.5	90.6	81.9	68.2	44.4	39.9
1943	31.0	45.5	54.5	66.8	68.6	76.1	89.1	84.2	83.1	63.7	45.7	38.0
1944	37.9	45.4	55.7	64.2	73.8	79.5	89.0	85.8	81.4	70.5	45.8	34.8
1945	41.7	49.5	53.0	63.1	73.4	79.4	90.8	89.0	75.7	68.3	47.9	37.9
1946	44.0	50.3	55.6	65.4	76.8	77.5	87.2	87.3	75.2	61.1	46.6	43.5
1947	38.7	50.8	61.7	69.2	81.0	77.9	86.9	84.6	78.3	61.2	48.4	40.0
1948	39.0	41.9	53.5	60.7	67.9	83.0	84.4	83.2	76.1	63.4	49.3	36.6
1949	25.0	41.0	54.5	70.4	77.8	80.9	85.6	85.7	79.2	61.9	53.2	44.2
1950	23.0	39.2	51.9	61.7	71.6	76.5	87.7	88.2	81.1	60.2	48.6	42.8
1951	41.0	45.8	51.0	68.5	73.5	80.2	89.4	86.9	79.1	62.0	47.3	36.5
1952	31.0	46.1	54.5	68.9	74.1	77.6	88.9	86.8	81.9	72.0	42.6	39.4
1953	50.5	51.5	57.0	61.5	69.1	73.2	87.9	84.1	80.4	66.4	52.3	46.8
1954	37.8	43.9	52.0	62.9	73.2	74.9	84.5	81.6	75.7	61.5	53.1	40.7
1955	36.0	44.9	49.8	57.4	67.8	81.2	81.9	86.9	78.8	64.0	40.3	36.4
1956	37.8	32.1	53.7	69.2	75.2	77.2	89.8	86.1	80.3	62.1	43.6	41.3
1957	24.3	43.9	52.3	64.3	75.1	81.7	84.6	82.2	80.1	59.2	49.8	45.9
1958	44.2	52.4	53.6	60.9	80.0	84.0	90.8	90.7	76.2	67.1	49.9	40.9
1959	39.6	43.9	56.7	66.1	68.5	79.1	88.3	82.4	72.5	64.5	47.8	39.5
1960	29.4	47.8	54.8	63.5	69.5	81.8	92.4	81.9	78.5	60.6	53.1	34.2
1961	39.4	52.8	55.3	63.4	70.2	85.9	89.3	90.0	74.4	63.5	46.7	43.1
1962	40.4	47.3	51.6	68.2	66.1	79.6	86.5	82.2	78.9	60.6	51.9	43.2
1963	35.3	44.0	57.7	59.6	72.5	79.9	82.1	83.7	82.2	67.0	52.4	35.4
1964	45.9	51.9	54.5	62.7	70.5	77.9	86.9	81.0	75.3	64.4	46.6	35.6
1965	38.3	51.4	55.5	66.5	72.1	79.7	87.9	84.7	74.6	68.7	51.8	41.7
1966	41.3	48.9	56.0	66.8	75.6	76.9	84.3	86.7	80.4	64.6	52.7	45.9
1967	48.9	55.0	55.7	58.4	72.7	83.6	90.5	92.8	87.3	66.0	51.2	43.3

continued

Table 9 continued

Year	Jan	Feb	Mar	Apr	May	June	June	Aug	Sept	Oct	Nov	Dec
1968	43.5	51.3	59.8	63.5	70.2	77.9	90.0	81.5	76.9	60.8	46.7	37.8
1969	26.7	38.7	55.9	62.2	76.0	84.7	86.7	84.3	77.0	61.1	50.8	37.7
1970	36.0	48.4	56.9	59.7	73.3	82.3	89.3	87.3	71.9	62.9	49.3	39.3
1971	46.3	50.8	50.5	63.0	74.8	74.1	88.6	92.0	71.9	62.4	50.3	40.4
1972	40.0	43.3	58.1	61.1	73.8	79.7	85.4	87.4	72.9	65.1	47.6	36.0
1973	38.6	45.8	58.3	65.9	74.1	79.3	88.3	85.8	76.0	62.8	45.3	44.7
1974	36.5	50.1	56.0	62.4	68.6	83.9	84.0	86.6	81.1	65.8	50.0	44.6
1975	40.8	42.9	52.3	58.7	71.5	78.1	89.4	81.2	79.6	62.4	49.6	41.6
1976	42.9	47.2	53.3	61.2	73.4	76.5	85.1	80.2	80.2	65.8	51.2	40.0
Mean	37.7	45.1	56.1	65.0	73.5	80.2	87.7	86.2	77.9	64.6	48.8	40.3

[a]Data missing.

Table 10. Frequency distribution of monthly average maximum temperatures by months and monthly averages, 1924-1976.

Frequency class, degrees F.	Number of years temperatures occurred, by months											
	Mar[a]	Apr	May	June	July[b]	Aug[b]	Sept[b]	Oct[b]	Nov[a]	Dec	Jan[b]	Feb[a]
95.0-99.9												
90.0-94.9					16	9						
85.0-89.9				4	29	22	1					
80.0-84.9			3	20	7	21	15					
75.0-79.9			14	26			26					
70.0-74.9		7	27	2			10	3				
65.0-69.9		20	9					20				
60.0-64.9	7	20						28				
55.0-59.9	27	6						1				1
50.0-54.9	16								22		1	13
45.0-49.9	1								22	5	5	19
40.0-44.9									7	24	15	11
35.0-39.9										20	19	4
30.0-34.9										4	3	3
25.0-29.9											4	
20.0-24.9												
15.0-19.9											4	
Av. max. temp.	56.1	65.0	73.5	80.2	87.7	86.2	77.9	64.6	48.8	40.3	37.7	45.1

[a]Total 51 years. [b]52 years because of missing data.

Table 11. Frequency distribution by months of number of times maximum temperatures of 90 F or more were recorded, 1924-1976.

Days of max. of 90 F or more	Number of years of occurrence by months					
	April	May	June	July	Aug	Sept
0	51	29	2			14
1	1	8	10			10
2	1	4	5		1	6
3		4	8	1	2	11
4		3	7		2	5
5		2	4	1	3	1
6			2		3	2
7		2	1	2	5	1
8			3	2	6	2
9			1	4	2	1
10			4	4	4	
11				2	2	
12		1	2	1	5	
13			3	3	2	
14			1	3	2	
15				4		
16				8	3	
17				5	1	
18				5	3	
19				1	2	
20				4	3	
21					2	
22				1		
23				1		
24				1		

Table 12. Monthly mean temperatures in degrees Fahrenheit by months, 1924-1976.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1924	23.8	a		49.4	61.0	64.6	68.9	67.7	62.3	53.2		27.7
1925		44.4	47.6	54.6	63.2	66.4	72.9	68.0	62.8	52.4	39.8	35.6
1926	35.4	42.0	48.4	56.3	58.6	69.3	74.4	69.6	57.1	52.6	41.8	30.8
1927	27.9	39.3	43.8	49.9	54.8	65.8	70.4	70.9	59.4	51.5	43.6	28.8
1928	27.9			46.0	60.6	63.6						28.7
1929	21.9	22.2	44.9	49.3	57.8	63.8	70.2	72.6	60.6	54.2	35.2	34.4
1930	13.3	40.6	48.0	54.6	57.3	63.8	71.6	72.4	63.3	48.6	39.0	31.6
1931	35.6	38.2	45.4	53.0	63.2	65.6	73.5	71.6	62.4	52.0	37.2	26.4
1932	28.4	34.5	45.0	53.1	57.6	66.9	68.6	69.7	63.0	53.6	43.8	30.8
1933	34.5	29.2	43.2	51.0	55.0	65.7	71.6	71.4	58.7	55.9	42.0	41.5
1934	39.6	42.2	50.2	58.9	62.2	67.3	71.4	71.7	60.6	55.0	45.0	36.6
1935	33.5	37.8	41.6	47.6	56.7	63.6	70.3	67.0	64.9	49.6	34.6	31.5
1936	35.2	22.2	43.4	55.6	62.5	66.8	70.8	69.9	61.2	54.6	33.2	35.6
1937	14.6	30.2	46.1	49.3	57.2	65.6	72.9	67.1	63.0	54.4	43.6	35.7
1938	34.4	35.2	43.4	52.5	57.8	67.2	74.7	67.2	67.0	52.2	36.6	34.8
1939	35.8	35.2	46.0	53.7	61.0	63.4	72.4	72.0	63.0	51.6	39.6	38.4
1940	29.2	38.4	48.0	52.1	60.9	67.2	70.5	68.4	63.8	53.6	33.8	32.8
1941	32.1	37.8	48.3	53.2	57.4	63.8	74.4	70.0	58.3	50.8	42.8	35.6
1942	24.0	36.3	43.2	52.0	57.0	61.8	71.8	72.6	64.1	53.1	37.5	33.6
1943	23.0	37.2	41.7	53.2	54.2	61.0	70.5	66.8	64.6	51.6	39.4	31.9
1944	29.8	36.4	42.0	50.4	58.2	64.2	71.1	68.3	64.4	55.6	38.8	30.4
1945	35.9	40.0	42.6	48.6	59.0	62.7	71.6	70.6	60.0	53.8	39.6	32.2
1946	35.1	38.9	44.4	51.2	61.5	63.3	70.1	70.2	60.1	48.4	36.9	36.5
1947	28.4	39.4	47.6	54.0	64.2	63.6	69.7	66.9	63.4	52.4	40.6	34.4
1948	31.6	33.1	41.0	47.6	56.4	68.3	67.2	67.6	60.8	49.6	39.9	28.8
1949	15.8	32.9	43.2	52.9	61.6	63.7	67.6	68.2	64.1	47.8	44.7	36.0
1950	14.9	31.1	41.8	48.5	55.6	64.1	69.7	70.3	63.7	50.6	41.4	37.9
1951	33.7	36.6	39.3	52.0	58.6	65.2	71.1	68.9	63.4	50.7	38.8	29.1
1952	25.4	37.8	42.8	52.8	59.2	63.8	71.0	69.3	64.6	56.5	33.8	34.5
1953	43.3	41.1	44.6	48.9	54.8	59.4	69.3	68.8	63.6	53.5	43.4	38.0
1954	29.6	37.6	39.7	49.3	58.4	60.8	67.5	65.8	61.0	49.1	45.2	33.0
1955	30.8	35.3	38.2	45.5	54.4	65.3	67.3	68.1	62.8	51.6	32.8	29.8
1956	31.5	24.6	43.1	53.5	61.8	62.2	72.3	69.1	63.5	51.0	37.0	34.5
1957	17.2	35.1	42.8	51.2	62.1	66.2	67.4	65.9	64.6	49.6	39.8	38.2
1958	37.2	44.0	42.3	49.1	64.6	69.2	74.0	72.3	61.5	52.3	40.9	35.3
1959	32.5	36.1	43.7	51.8	54.9	64.3	70.6	65.8	59.9	51.6	36.9	32.7
1960	22.2	37.7	42.7	50.8	55.9	65.1	73.2	66.0	62.3	50.2	42.4	28.9
1961	34.1	44.0	45.0	50.6	57.2	69.1	72.2	73.3	59.1	50.3	35.9	35.0
1962	31.9	38.2	40.6	54.0	54.5	63.7	69.4	67.5	63.5	50.8	41.7	37.6
1963	27.5	37.4	45.5	49.1	58.3	65.2	67.2	68.7	67.1	54.5	43.7	31.2
1964	37.9	39.4	42.5	49.2	56.1	64.4	70.7	66.2	60.5	51.4	39.5	29.2
1965	32.9	41.7	42.4	52.8	57.2	64.9	71.5	70.4	60.0	55.5	44.4	34.4
1966	35.3	39.2	44.5	52.6	60.1	63.0	68.6	70.7	65.6	52.2	43.9	39.0
1967	40.8	43.4	44.1	46.3	58.3	68.3	72.6	74.4	69.1	53.0	41.5	34.6

continued

Table 12 continued

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	35.3	41.6	48.0	49.9	57.0	63.5	72.3	67.0	61.9	47.5	39.5	29.3
1969	20.0	30.8	44.2	49.6	61.4	69.6	68.5	66.2	62.1	47.4	40.4	32.5
1970	29.1	39.6	44.6	47.3	57.5	66.9	70.9	67.2	57.1	49.0	39.6	31.5
1971	37.0	39.1	39.6	49.1	59.4	60.0	70.3	72.3	55.8	48.1	40.2	32.4
1972	31.7	35.2	45.9	47.6	60.3	65.6	70.0	70.8	57.7	50.5	39.7	27.4
1973	30.1	37.5	45.2	51.2	59.0	64.4	70.8	68.0	61.3	50.2	38.6	37.5
1974	28.4	39.8	44.3	50.2	54.9	67.1	68.3	68.8	63.1	50.3	41.2	36.1
1975	32.4	33.6	40.9	45.7	56.4	63.0	73.2	65.2	61.5	50.0	39.2	34.4
1976	34.6	36.6	40.9	49.1	57.8	61.4	68.6	66.3	64.0	50.6	40.1	30.8
Mean	30.1	36.8	43.9	50.9	58.5	64.8	70.7	69.1	62.2	51.7	39.8	33.3

[a]Data missing.

Table 13. Frequency distribution of monthly mean temperatures by months and monthly averages, 1924 to 1976.

Frequency class, degrees F	Number of years temperatures occurred, by months											
	Mar[a]	Apr	May	June	July[b]	Aug[b]	Sept[b]	Oct[b]	Nov[a]	Dec	Jan[b]	Feb[a]
70.0-74.9					36	19						
65.0-69.9				24	16	33	4					
60.0-64.9			17	28			39					
55.0-59.9		3	29	1			9	5				
50.0-54.9	1	27	7					36				
45.0-49.9	15	23						11	2			
40.0-44.9	31								21	1	2	11
35.0-39.9	4								23	17	12	29
30.0-34.9									5	25	16	7
25.0-29.9										11	11	1
20.0-24.9											5	3
15.0-19.9											3	
10.0-14.9											3	
Av. mean	43.9	50.9	58.5	64.8	70.7	69.1	62.3	51.7	39.8	33.3	30.1	36.8

[a]Total, 51 years. [b]52 years because of missing data.

Table 14. Occurrence of last frost in the spring and first frost in the fall, 1924-76.

Year	Last spring frost	First fall frost	No. of frost-free days	Year	Last spring frost	First fall frost	No. of frost-free days
1924	May 4	Oct. 9	158	1951	May 29	Oct. 15	139
1925	Apr. 29	Oct. 30	184	1952	May 4	Oct. 15	164
1926	May 24	Sept. 23	122	1953	May 12	Oct. 24	165
1927	May 20	Oct. 5	138	1954	May 2	Oct. 1	152
1928	May 3	Oct. 3	153	1955	May 31	Oct. 6	128
1929	May 3	Oct. 10	160	1956	Apr. 8	Oct. 30	205
1930	May 25	Oct. 9	137	1957	Apr. 25	Nov. 4	193
1931	May 7	Oct. 4	150	1958	Apr. 23	Oct. 20	180
1932	Apr. 21	Sept. 21	153	1959	May 11	Oct. 7	149
1933	May 9	Sept. 25	139	1960	May 21	Oct. 9	141
1934	May 20	Oct. 16	149	1961	May 6	Oct. 18	165
1935	May 10	Oct. 16	159	1962	May 4	Nov. 7	186
1936	Apr. 8	Sept. 15	160	1963	Apr. 16	Oct. 19	186
1937	May 6	Sept. 23	140	1964	May 14	Oct. 3	142
1938	May 9	Oct. 17	161	1965	May 5	Sept. 17	135
1939	May 5	Oct. 8	156	1966	Apr. 19	Oct. 13	177
1940	May 26	Oct. 27	154	1967	Apr. 28	Oct. 20	175
1941	May 18	Oct. 8	143	1968	May 5	Oct. 2	150
1942	May 11	Oct. 13	155	1969	Apr. 26	Oct. 13	170
1943	May 17	Oct. 12	148	1970	May 11	Sept. 15	127
1944	May 22	Nov. 2	163	1971	May 17	Sept. 18	124
1945	Apr. 28	Sept. 27	152	1972	May 1	Sept. 25	147
1946	May 1	Sept. 28	150	1973	Apr. 29	Oct. 2	156
1947	Apr. 10	Nov. 2	196	1974	May 16	Sept. 27	134
1948	May 2	Sept. 29	150	1975	May 19	Oct. 22	156
1949	May 5	Oct. 10	158	1976	Apr. 25	Oct. 15	173
1950	May 23	Oct. 1	131				
			53-year average		May 7	Oct. 9	155

Table 15. Monthly average wind speed in miles per hour by months, 1924-1976.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1924	2.78	3.22	3.81	4.59	3.63	2.24	2.74	1.97	2.14	2.70	2.15	2.57
1925	3.59	3.97	3.90	2.78	2.50	2.75	1.44	1.82	1.85	2.63	2.33	1.90
1926	3.09	3.07	3.20	3.02	3.87	2.22	1.12	0.95	1.39	1.74	1.65	2.42
1927	1.27	3.12	2.43	4.69	3.91	1.50	1.34	1.39	2.68	1.45	2.75	2.90
1928	1.83	2.28	4.19	4.49	2.55	2.24	1.14	2.26	1.21	1.98	1.05	0.87
1929	3.13	1.22	3.61	3.82	2.89	2.37	2.22	1.91	1.99	1.68	1.28	2.41
1930	2.82	3.05	4.63	4.25	3.64	2.47	1.30	1.08	1.04	1.01	0.73	0.68
1931	0.92	1.14	2.74	4.23	3.48	2.10	1.38	1.20	1.67	2.22	2.27	4.02
1932	1.98	3.08	4.05	3.94	3.04	2.83	3.48	2.24	2.03	1.87	2.11	3.55
1933	3.54	3.34	2.67	3.11	3.19	2.64	1.26	1.02	1.41	1.75	1.23	3.84
1934	2.10	1.62	2.78	2.37	2.27	1.94	1.18	1.98	1.13	1.63	1.60	2.81
1935	2.73	2.01	4.62	4.46	3.00	2.24	1.90	1.17	0.93	1.31	1.30	0.99
1936	2.23	3.29	4.08	2.81	2.23	1.62	1.79	1.39	1.36	0.96	1.11	2.61
1937	3.89	2.52	2.36	3.92	3.25	1.82	1.63	1.60	0.70	0.64	2.12	1.61
1938	1.71	1.23	2.39	2.12	1.66	1.10	2.04	1.96	1.16	1.79	2.07	2.08
1939	2.25	2.90	2.94	3.22	2.85	2.69	2.83	2.09	1.78	1.79	1.25	1.58
1940	1.75	2.00	2.86	3.17	2.33	2.00	1.84	1.60	1.33	1.46	1.57	1.44
1941	1.32	1.34	2.47	2.65	2.51	1.98	1.44	1.34	1.86	1.69	1.61	1.82
1942	0.58	1.16	1.93	2.24	1.48	1.75	0.90	1.11	1.53	1.72	2.18	2.28
1943	2.85	2.24	3.26	2.88	2.48	2.44	1.83	1.70	1.54	1.39	1.31	1.72
1944	1.33	2.38	3.57	3.09	2.71	2.92	2.64	2.08	1.78	1.39	1.73	1.64
1945	2.17	2.39	3.91	4.16	1.92	2.55	2.08	1.88	2.42	2.01	2.52	2.04
1946	2.30	2.73	3.81	3.11	3.97	2.79	1.95	2.08	1.84	2.38	2.72	3.32
1947	3.40	3.06	2.90	3.66	3.11	3.23	2.41	1.89	2.11	1.95	2.05	1.96
1948	2.40	3.63	3.47	3.24	2.93	2.62	2.59	2.19	2.18	1.66	2.59	2.50
1949	2.67	3.32	3.63	3.07	2.49	3.20	2.28	1.50	2.06	2.17	1.87	3.19
1950	3.29	2.04	3.17	4.00	3.14	2.23	1.97	1.63	1.37	2.00	2.07	1.51
1951	3.23	2.47	2.98	2.75	2.54	1.84	2.00	1.55	2.07	1.77	1.73	2.71
1952	2.08	2.24	3.71	3.19	2.74	2.62	2.01	1.93	1.76	1.32	1.08	2.10
1953	4.51	3.26	3.38	2.57	2.37	1.86	2.21	1.40	1.80	1.86	2.27	3.02
1954	3.98	3.92	4.17	4.47	2.75	3.28	1.89	1.26	1.18	1.51	1.79	2.63
1955	2.07	4.07	6.37	5.49	3.85	3.44	2.11	1.55	1.81	2.38	3.78	3.01
1956	2.39	3.76	5.53	4.44	3.19	3.20	1.80	1.26	1.46	1.75	1.97	3.32
1957	2.02	3.78	3.34	3.97	2.45	2.75	2.21	1.64	1.63	1.78	2.63	4.10
1958	2.35	2.37	3.33	3.56	2.19	2.64	1.97	1.56	2.52	2.20	3.14	2.47
1959	3.14	2.88	4.35	4.95	3.32	2.32	2.19	2.23	3.12	2.08	3.13	2.34
1960	1.74	3.43	3.70	4.10	2.74	2.49	1.33	1.51	1.12	1.30	1.73	0.94
1961	1.40	2.81	2.76	3.33	2.05	1.45	1.02	1.11	1.70	0.90	1.30	2.08
1962	2.69	2.15	1.93	2.70	2.58	2.64	2.02	1.61	1.38	1.73	1.69	1.15
1963	1.73	1.66	2.70	2.22	1.65	2.05	1.62	1.37	1.26	1.52	2.01	1.17
1964	2.93	2.46	3.75	3.49	2.77	2.35	2.02	1.63	2.16	1.65	1.30	2.01
1965	1.73	1.97	2.43	1.96	2.07	1.57	1.24	1.22	1.56	1.26	1.50	1.25
1966	2.34	1.80	2.50	2.62	2.25	1.80	1.40	1.10	0.95	1.22	0.82	1.04
1967	2.42	2.10	2.57	1.98	1.39	1.22	1.28	1.19	1.03	1.63	1.64	1.67

continued

Table 15 continued

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	1.77	1.82	2.01	3.41	2.44	2.18	1.96	1.18	1.87	2.32	1.98	2.68
1969	2.70	2.47	3.26	3.16	1.53	1.03	a	1.51	1.57	2.13	1.63	1.65
1970	2.60	1.85	2.79	4.69	1.83	2.03	1.00	.94	1.76	.97	1.66	2.10
1971	3.20	3.30	2.70	2.39	2.20	1.30	1.30	1.00	1.50	1.79	1.42	1.65
1972	4.01	1.97	2.32	3.48	1.36	1.73	2.62	1.88	2.18	1.97	1.53	2.68
1973	2.40	2.60	3.27	3.04	2.87	3.40	2.50	1.83	1.95	1.73	2.40	1.92
1974	4.27	3.55	4.05	3.55	3.23	2.68	2.19	1.58	1.54	1.44	1.71	1.83
1975	2.40	3.22	4.25	3.76	3.57	3.38	2.70	2.29	2.21	2.22	2.91	2.73
1976	2.72	4.78	4.40	4.14	3.05	3.40	2.25	1.84	1.42	1.67	1.73	1.65
Mean	2.50	2.64	3.36	3.46	2.68	2.32	1.88	1.59	1.68	1.70	1.88	2.19

a
Data missing

Table 16. Frequency distribution of wind speed and monthly averages, 1924 to 1976.

Frequency class in miles per hour	Number of years of occurrence by months											
	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb
6.26-6.50	1											
6.01-6.25												
5.76-6.00												
5.51-5.75	1											
5.26-5.50		1										
5.01-5.25												
4.76-5.00		1										1
4.51-4.75	2	3									1	
4.26-4.50	2	4									1	
4.01-4.25	5	5								2	1	1
3.76-4.00	4	6	4						1		2	4
3.51-3.75	6	4	3	2						2	2	2
3.26-3.50	7	4	2	5	1					2	2	6
3.01-3.25	2	10	8	3			1		2	3	5	7
2.76-3.00	7	3	6	3	1				1	2	4	3
2.51-2.75	5	5	8	10	5		2	2	5	7	6	3
2.26-2.50	7	2	8	6	3	2	1	2	4	6	8	7
2.01-2.25	1	3	6	9	12	6	9	8	8	6	7	6
1.76-2.00	2	2	2	7	11	11	11	12	4	5	3	6
1.51-1.75			3	4	2	13	8	14	14	9	5	2
1.26-1.50			3	3	10	8	10	9	7	1	4	1
1.01-1.25				3	5	10	7	2	5	4		4
0.76-1.00					2	3	2	3	1	3	1	
0.51-0.75							1	1	1	1	1	
Av. wind speed M.P.H.	3.36	3.46	2.68	2.32	1.88	1.59	1.68	1.70	1.88	2.19	2.50	2.64

[a]July of 1969 left out because of missing data.

Table 17. Evaporation in inches from a free water surface, 1924 to 1961.

Year	Apr	May	June	July	Aug	Sept	Oct	Total
1924	4.04	6.05	6.84	7.28	6.18	3.71	2.61	36.71
1925	4.02	5.13	6.69	7.25	5.69	3.48	2.20	34.46
1926	3.80	5.56	6.28	6.94	4.82	3.68	1.91	32.99
1927	4.93	5.36	5.80	7.43	6.15	3.42	2.62	35.71
1928	4.07	6.46	6.29	7.04	6.24	3.67	2.17	35.94
1929	4.53	4.85	5.36	7.43	6.26	3.64	2.24	34.31
1930	4.81	4.67	6.70	7.28	6.01	4.20	2.29	35.96
1931	4.31	6.64	5.65	8.31	6.61	4.02	2.13	37.67
1932	4.57	5.25	7.60	7.54	6.49	4.41	2.41	38.27
1933	4.40	5.00	6.85	7.49	6.38	3.43	2.01	35.56
1934	4.03	5.82	6.83	7.42	5.93	3.99	2.36	36.38
1935	4.25	5.51	6.54	7.52	5.69	4.09	2.06	35.66
1936	4.25	6.17	6.18	8.28	7.15	5.22	2.96	40.21
1937	4.87	6.32	5.47	9.10	7.76	3.55	1.79	38.86
1938	3.98	5.42	6.68	7.49	6.68	4.34	4.12	38.71
1939	5.24	6.56	7.15	10.84	6.35	4.01	2.39	42.54
1940	3.76	5.78	7.67	8.33	6.41	3.65	1.83	37.43
1941	4.25	5.06	5.45	7.69	6.25	4.08	2.04	34.82
1942	3.94	4.43	7.14	8.36	7.30	4.48	4.07	39.72
1943	3.69	4.73	6.80	8.36	6.12	4.36	1.77	35.83
1944	3.65	5.59	6.61	8.55	6.99	4.34	2.13	37.86
1945	4.18	4.78	7.36	8.08	6.23	4.37	2.43	37.43
1946	3.81	6.56	6.19	7.17	6.62	3.80	2.02	36.17
1947	4.58	6.21	6.84	7.68	6.30	3.77	2.42	37.80
1948	3.32	4.03	6.47	7.54	6.36	3.97	2.16	33.85
1949	4.37	5.67	7.29	7.03	5.37	3.83	2.43	35.99
1950	4.23	6.04	5.01	7.48	5.82	4.25	1.34	34.17
1951	4.80	5.79	6.44	8.02	6.75	4.46	1.92	38.18
1952	4.67	6.04	6.36	7.76	6.72	4.41	2.35	38.31
1953	3.44	5.04	5.80	8.36	6.21	4.69	2.37	35.91
1954	4.21	5.78	6.55	7.26	5.99	3.97	2.35	36.11
1955	3.68	5.49	7.78	6.52	6.73	4.40	1.97	36.57
1956	6.37	6.47	7.62	8.02	6.61	4.42	1.92	41.43
1957	4.41	5.41	7.77	7.99	6.55	4.19	1.80	38.12
1958	2.24	6.20	7.68	8.61	7.30	4.38	2.81	39.22
1959	4.21[a]	6.38	6.78	7.93	6.20	4.01	2.29[a]	37.80
1960	4.21[a]	5.67	7.27	8.11	5.83	4.01	2.28	37.38
1961	3.92	5.28	6.75	7.58	5.77	4.89	2.22	36.41
Average	4.21	5.61	6.65	7.82	6.34	4.09	2.29	37.01

a Average inserted because of missing data

Table 17A. Evaporation in inches from a free water surface, 1962-1966.

Year	Apr	May	June	July	Aug	Sept	Oct	Total
1962		6.48	8.11	10.37	7.77	4.98	3.29	32.89
1963	3.86	6.73	8.76	9.56	7.98	5.62	3.20	45.71
1964	6.19	8.22	8.36	9.09	6.49	5.44	2.71	46.50
1965	4.15	6.61	8.93	8.87	7.28	5.11	2.89	43.84
1966	4.02	6.25	7.69	9.63	8.15	5.32	3.01	44.07
Average	4.56	6.85	8.37	9.50	7.53	5.29	3.02	45.12

Table 17B. Evaporation in inches from a free water surface, 1967-1976.

Year	Apr	May	June	July	Aug	Sept	Oct	Total
1967	4.02	6.25	7.69	9.63	8.15	5.32	3.01	44.07
1968	5.77	7.99	8.92	9.11	7.03	4.82	3.42	47.06
1969	5.95	8.37	10.41	11.11	8.80	5.56	3.08	53.28
1970	6.69	8.50	9.09	10.31	8.97	6.28	3.19	53.63
1971	5.76	8.89	7.45	10.80	9.88	5.73	3.69	52.20
1972	6.29	7.87	8.06	9.93	8.38	5.34	3.03	48.90
1973	6.88	8.35	9.73	12.14	8.29	4.95	2.49	52.83
1974	5.06	7.45	9.49	8.77	7.94	6.13	2.93	47.77
1975	5.39	8.42	9.57	9.68	7.75	6.39	2.62	49.82
1976	6.02	8.42	9.76	9.38	6.83	5.54	3.38	49.33
Average	5.78	8.05	9.09	10.09	8.20	5.61	3.08	49.90

Table 18. Frequency distributions of monthly average relative humidity, taken at 5 p.m. daily, and monthly average humidity at 8 a.m., noon, and 5 p.m., P.S.T., 1933 to 1957.

Frequency class, percent	Number of years of occurrence by months							
	Apr[a]	May	June	July	Aug	Sept	Oct	Total
76-80								
71-75							1	1
66-70							1	1
61-65							3	3
56-60						1	3	4
51-55	1					1	5	7
46-50	1	3	1	1		2	4	12
41-45	3	3	2		3	3	4	18
36-40	7	2	8	2	2	4	4	29
31-35	4	8	3	4	5	10		34
26-30	6	7	9	10	11	3		46
15-25	2	2	2	8	4	1		19
Av humidity 5 p.m.	35	34	33	28	30	37	51	174
Av humidity noon	38	36	37	33	34	38	49	
Av humidity 8 a.m.	62	58	57	55	58	64	74	

[a] Data missing for 1946

Table 19. Relative humidity recording during the day of 25 percent or lower, 1933-1957.

Freq (days) RH 25% or less	Number of years of occurrence by months							
	Apr[a]	May	June	July	Aug	Sept	Oct	Total
0	3	2	1	1	3	4	14	28
1	1	1		2	1	1	2	8
2	1	1				3	5	10
3	2		4			2	1	9
4	1	2			1	2		6
5	1	1	2	1		1		6
6	1		1	1	1	1	2	7
7	1							1
8		2		1	1	1		5
9		2	2		1		1	6
10					3	2		5
11	1	2	1		1	1		6
12	2	1	3		1	2		9
13	2	1	1	3	2	1		10
14	1	3	2	1	2	1		10
15			2	2	1	1		6
16	1	1		1		1		4
17	2	1	2	2	1			8
18	3	2	2					7
19				1	2			3
20		1						1
21		2		2	1			5
22	1		1	3				5
23				1	1			2
24			1	1	1			3
25				1				1
26						1		1
27								
28				1	1			2
Total days 25% or lower	232	270	280	381	301	179	36	1679
Av. no. days per month	9.7	10.8	11.2	15.2	12.0	7.2	1.4	

[a] Data missing for 1946