

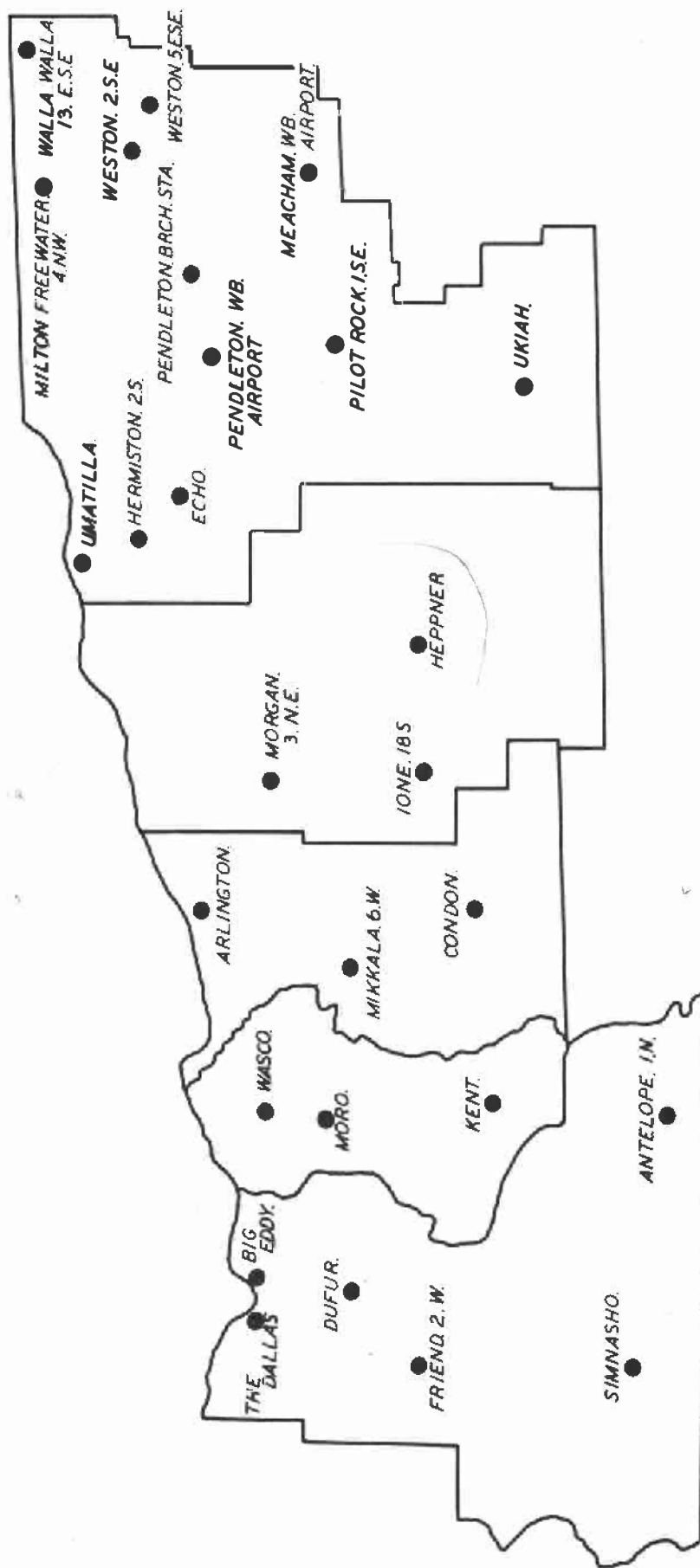
Climatological Data

For Oregon's Columbia Basin Counties



November 1966

Oregon State University



Network of Climatological Stations Used in Preparing Climate
of Oregon's Columbia Basin Counties

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Anyone preparing a climatological paper of this nature immediately realizes the very large part played in its accomplishment by the hundreds of voluntary weather observers in the State. It is these dedicated individuals who, without any form of monetary compensation, at the same time each day observe and record the temperatures and precipitation for the preceding 24 hours. The writer wishes to particularly acknowledge their work without which this or most other climatological publications would not be possible.

Special acknowledgment is also made to Mr. Marvin Magnuson, Regional Climatologist, Environmental Science Services Administration, for his assistance in reviewing the manuscript and the valuable suggestions he offered; to Miss Mildred Bergstrom, ESSA Clerk Stenographer, and to Mrs. Margaret Robson and Mr. Steven Slavens, temporary assistants, for their work in computing statistics and typing the material presented.

STATION LOCATIONS AND PERIOD OF RECORD USED

#STATION	COUNTY	ELEVATION	LATITUDE	LONGITUDE	*PERIOD OF RECORD
Arlington	Gilliam	315	45° 43'	120° 12'	1934-1964
Condon	Gilliam	2850	45° 14'	120° 11'	1934-1964
Mikkalo 6 W	Gilliam	1550	45° 28'	120° 21'	1929-1963
Heppner	Morrow	1950	45° 20'	119° 33'	1935-1964
Ione 18 S	Morrow	1925	45° 19'	119° 51'	1936-1964
Morgan 3 NE	Morrow	905	45° 35'	119° 53'	1932-1964
Kent	Sherman	2707	45° 12'	120° 41'	1935-1964
Moro	Sherman	1868	45° 29'	120° 43'	1935-1964
Wasco	Sherman	1264	45° 35'	120° 42'	1935-1964
Echo	Umatilla	660	45° 45'	119° 11'	1934-1964
Hermiston 2 S	Umatilla	624	45° 49'	119° 17'	1935-1964
Meacham WB Airport	Umatilla	4050	45° 30'	118° 24'	1943-1964
Milton Freewater 4 NW	Umatilla	962	45° 58'	118° 26'	1931-1964
Pendleton Br. Exp. Stn.	Umatilla	1487	45° 43'	118° 38'	1935-1964
Pendleton WB Airport	Umatilla	1482	45° 41'	118° 51'	1935-1964
Pilot Rock 1 SE	Umatilla	1697	45° 29'	118° 49'	1924-1964
Ukiah	Umatilla	3225	45° 08'	118° 56'	1930-1964
Umatilla	Umatilla	270	45° 55'	119° 21'	1935-1964
Walla Walla 13 ESE	Umatilla	2400	46° 00'	118° 03'	1940-1964
Weston 2 SE	Umatilla	2100	45° 48'	118° 24'	1920-1954
Weston 5 ESE	Umatilla	3222	45° 47'	118° 19'	1956-1964
Antelope 1 N	Wasco	2758	44° 55'	120° 43'	1932-1964
Big Eddy	Wasco	125	45° 38'	121° 08'	1925-1954
Dufur	Wasco	1330	45° 27'	121° 08'	1932-1964
Friend 2 W	Wasco	2490	45° 20'	121° 18'	1930-1964
Simmasho	Wasco	2400	44° 58'	121° 21'	1940-1964
The Dalles	Wasco	102	45° 36'	121° 12'	1934-1964

Occasionally station names are changed slightly, usually as a result of a relocation. Names shown here as well as elevation, latitude and longitude are for the latest location.

* Wherever possible the latest 30-year record, through 1964, was used in computing tables contained in this bulletin. If complete records had been available, in all cases this would have been 1935 through 1964. At some stations, however, no records were kept until a later date. At others there were years in the 1935-1964 period when no or only fragmentary records were available. In this latter case earlier years were substituted for the missing periods in order to provide 30 years of record.

CLIMATE OF OREGON'S COLUMBIA BASIN COUNTIES

Gilliam, Morrow, Sherman, Umatilla, and Wasco

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Environmental Science Services Administration

The area composing these five counties -- Wasco, Sherman, Gilliam, Morrow, and Umatilla in west to east order -- has a north-south width of from 40 to 65 miles and stretches some 150 to 175 miles east to west along Oregon's north central border. At the western end it extends up the east slopes of the Cascade Mountains to elevations of between 4,000 and 5,000 feet while its eastern extreme reaches to the crest of the Blue Mountains near 4,000 feet high. Except for a short distance in eastern Umatilla County the Columbia River is the northern border for all five counties. From its banks, with an elevation near 100 feet, the plateau on which these counties are mostly located slopes gradually upward to the south reaching about 3,000 feet above sea level at some points along the southern border. Most of this area is a series of shallow valleys and low-lying, gently rolling hills of less than 2,000 feet elevation.

The Pacific Ocean coastline is about 115 miles west of Wasco County's western border. Between here and the ocean two mountain ranges -- the Coast Range with a crest ridge generally between 1,500 and 2,500 feet and the Cascade Mountains with a ridge mostly between 5,000 and 6,000 feet above sea level -- extend, in north-south parallel lines, across both Oregon and Washington. Through these mountains the gorge cut by the Columbia River provides a relatively narrow, nearly sea level passageway between the inland Columbia Basin and the Pacific Ocean.

At this latitude most large air masses are moving from the west. Before arriving here they have acquired very definite marine characteristics due to their several days' travel across the Pacific Ocean. Their temperatures, at least in the lower several thousand feet, have become very near that of the water; and their moisture content has approached the saturation point. In reaching the inland Columbia Basin, however, these air masses must cross the two mountain ranges. Temperatures of these land surfaces respond much more rapidly to changes in solar heating than does the ocean. In consequence, they become much colder in winter and warmer in summer than the water. In the colder months incoming air from the ocean is cooled both by its contact with colder ground beneath and by its forced ascent over the mountains which reduces the temperature of from 3 to 5 degrees for each 1,000 feet increase in elevation. In these cooling processes large quantities of water vapor are condensed and fall out as rain or snow on the middle or upper slopes of both mountain ranges. Thus, air reaching the 5-county area of this study is much drier than the original marine air. In summer, as the ground heats more rapidly, the temperature of the incoming air increases as it moves eastward. It is true that the cooling

due to being lifted over the mountains continues to be a factor, but this is more than offset by surface heating. Despite this very marked cooling of incoming air in winter and heating in summer by land surfaces, the more extreme temperatures of both summer and winter are greatly modified by the Pacific Ocean.

The very cold Arctic air that forms in winter over northern and central Canada is, for the most part, blocked out of the Columbia Basin by the Continental Divide. Occasionally, however, it will break across the Divide and, instead of following its usual trek southward along the east slopes of the Rocky Mountains, will move between them and the Cascade Mountains. This very cold, dry air then spreads out over the Columbia Basin to produce the more extreme winter temperatures. The meeting of this cold Arctic air with much warmer moist marine air from the west may result in fairly heavy snow storms and occasionally very severe icing in the Columbia Gorge and over the 5-county area, particularly that within the first few miles immediately adjacent to the Columbia River.

The Columbia Gorge has a very definite daily and seasonal diurnal effect on the winds here. In the warmer months, during the late morning, afternoon and early evening, the inland masses heat much more rapidly than the ocean and the overlaying air is in turn heated and rises. The cooler air from the Pacific Ocean moves up the Gorge to replace it. At night, however, when the land is cooling rapidly, the cycle to a degree is reversed. In winter the land masses remain much colder than the ocean and the overlaying air is similarly colder and heavier. As a result, it tends to gravitate to the lowest points, which is the river level, and then downstream toward even lower levels to the west. The major storms moving in from the west are, of course, of much greater strength than the local circulation within the Gorge due to the temperature differences between its east and west ends. At those times all wind directions are dominated by the circulatory patterns around the storm centers.

II. GENERAL CLIMATOLOGICAL CHARACTERISTICS

1. Temperature: The modifying effects of the Pacific Ocean on the more extreme temperatures for this region were discussed earlier. The more extreme minimums of winter that do occur are usually associated with invasions of cold Arctic air from north central Canada across the Rocky Mountains. At these times temperatures as low as 15° - 25° below zero may be experienced throughout Wasco, Sherman, Gilliam, Morrow, and Umatilla counties. Ukiah, a higher elevation station in southern Umatilla County, is one of two stations at which the lowest temperature ever observed in Oregon, -54° , has been recorded.

In summer a high pressure cell may occasionally build up in central Canada as well as over the northern and central Columbia Basin. This large land mass, exposed to long cloudless days becomes very warm, creating a hot, dry air mass above it. At these times temperatures may go much above 100° throughout the

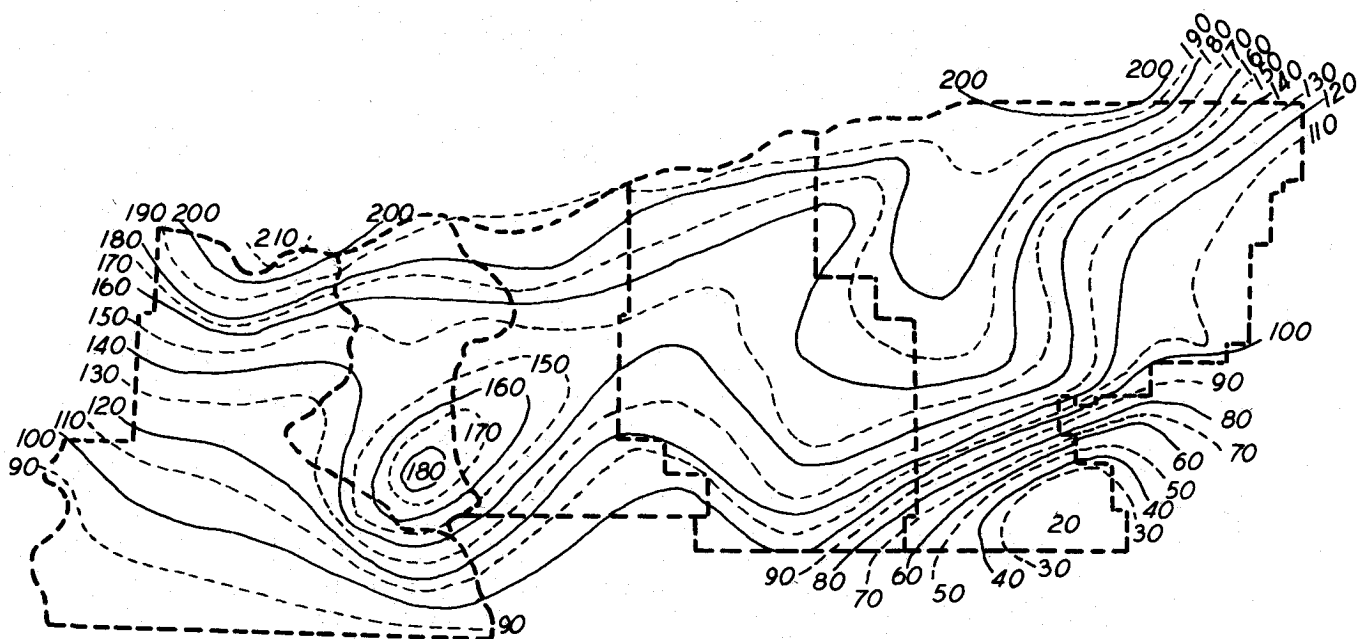


Figure 1 - Length of Growing Season -- Average Number of Days Between the Last in Spring and the First in Fall for a Temperature of 32° or Less

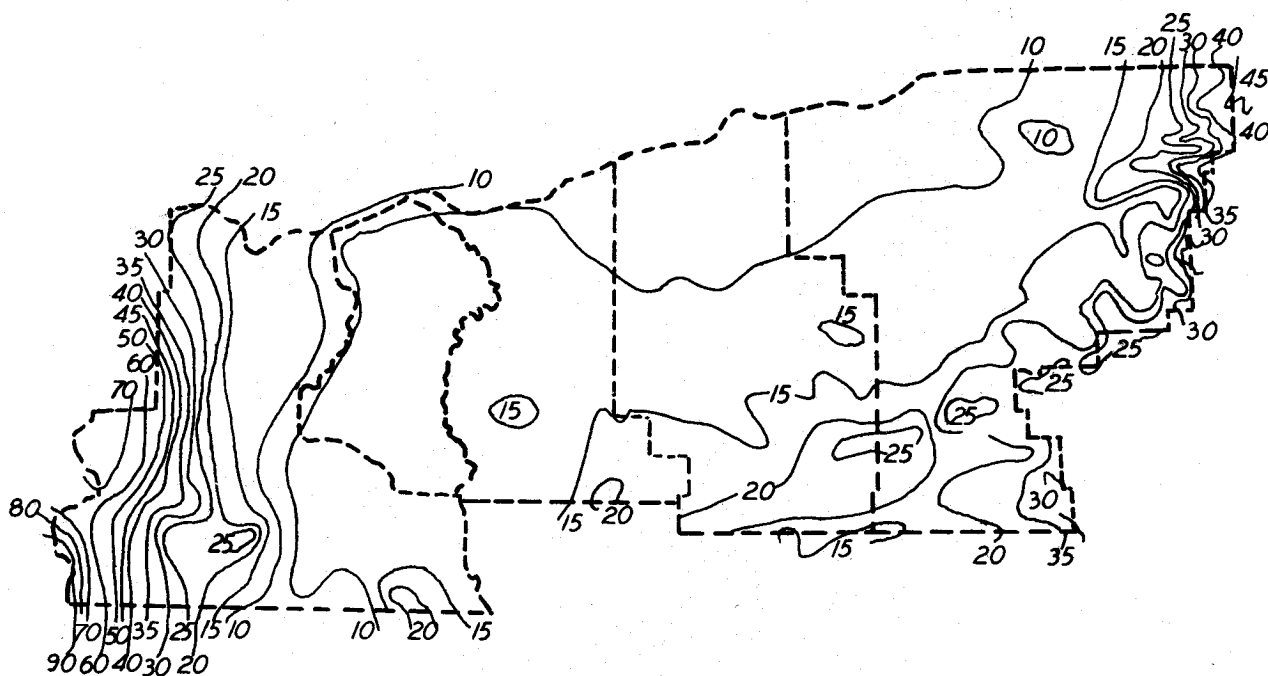


Figure 2 - Average Annual Rainfall, in inches, of Interior Columbia Basin Counties 2

Columbia Basin. Usually in the summer months this will be one of the warmest areas of the State. The Dalles will often have the highest, or one of the highest, monthly averages in Oregon. Pendleton is one of two places at which the State's record maximum of 119° was observed.

Long term averages indicate there are from 25 to 40 days a year with temperatures of 90° or more. Along the northern border those of 100° or higher have occurred 80-90% of the years of record. In the more southern part the average for those of 100° plus is for 1/3 to 1/2 the years of record. The average annual number of days for such occurrences (in years when they occur) ranges from 8 at The Dalles down to 2 in the southern boundary areas. At the other extreme, temperatures of 0° or lower occur about 6 years in 10 with an average of 3 to 4 days per year when they do occur. The annual average number of days with 32° or lower (freezing temperatures) ranges from 67 at The Dalles to 132 at Dufur.

In Table 1 is presented the latest 30-year monthly average maximum, minimum and mean temperatures as well as the highest and lowest temperatures recorded each month during that period for a fairly representative number of stations.

The importance to agriculture of the occurrence of certain temperatures near and below the freezing point has long been recognized. For that reason, Table 2 contains selected probabilities for dates of the last occurrence in spring and first in fall for temperatures of 32°, 28° and 24°. The growing season is a term applied to the period between the last occurrence in spring and the first in fall for temperatures of 32° or lower. The average number of days in the growing season to each of the three base temperatures is also included in Table 2. In Figure 1 the average number of days between the last 32° (or lower) temperatures in spring and first in fall is presented to provide an estimate of the variation in the length of the growing season on an areal basis. This should be accepted in only very general terms, however. Early morning low temperatures are greatly influenced by local terrain. Frequently, sharp differences in minimum temperatures occur over very short distances.

2. Precipitation: This area, like all of Oregon has a very definite winter rainfall climate. Approximately 60% of the annual total occurs in the five months, November through March; only about 12% in the three summer months, June-August. Yearly totals rise sharply with increase in elevation, but are much heavier on the upper slopes of the Cascades at the western extreme than at the same elevations on the Blue Mountains at the eastern extremity. This is largely due to the greater moisture content still remaining in the marine air when it reaches the Cascades. Average annual totals range from 80 inches on the upper slopes of the Cascades in southwest Wasco County to less than 9 inches in the Arlington and Umatilla area, then increase to near 35 inches at the crest of the Blue Mountains. Figure 2, extracted from an isohyetal map recently prepared by the ESSA RFC in Portland ^{1/}, graphically presents the areal distribution of annual rainfall totals. In Tables 3 and 4 are shown the monthly averages and the number of years in 10 that varying

totals may be expected. Table 5 presents the average number of days, monthly and annually, with 0.01, 0.10, 0.50 and 1.00 inch of rain have occurred. Table 6 includes some of the extreme values of record on a monthly and annual basis. Table 7 contains an estimate of the maximum rainfall intensities for durations of 30 minutes and 1, 3, 6, 12 and 24 hours and return periods of 2, 5, 10, 25 and 50 years. Representative values for three distinct areas are shown. 2/

Only on the higher slopes of the Cascades and the Blue Mountains does any significant amount of the precipitation occur as snow. The liquid content of Meacham's average annual 150 inches of snow makes up about one-half of its yearly total precipitation. In most of the 5-county area, however, moisture resulting from snow is only about 10% to 15% of the annual total. Table 8 provides long term monthly snowfall averages for a representative group of stations.

3. Wind: Earlier, the Columbia Gorge and the temperature differences between one end of it and the other, the build up of high pressure cells in the Columbia Basin and the winter storms moving in from the Pacific were all mentioned briefly as significantly effecting the winds of the Columbia Basin counties. In general, these may be summarized: (1) Winds at any observation point follow very closely the direction of the Columbia Gorge at that point. Whether they are moving through it from the west to east, or the reverse, is dependent to a large degree on the season of the year and the time of the day. (2) In the warmer months winds are usually from the west in the late morning, afternoon and evening and from the east during the late night and early morning. (3) In the colder part of year light surface winds are from the east while strong storm winds are usually from a westerly direction. (4) The occasional strong east winds that do occur result when a high pressure cell builds up in the northern portion of the Columbia Basin, often associated with a low pressure trough along the Oregon coast. In summer these are very hot, dry winds; in winter very cold and dry. (5) In the spring and summer months lowest speeds occur during the early morning when temperatures at the east and west ends of the Gorge are nearly equal.

Occasionally, during major storms, very high winds will move up the Columbia River and then be even further accelerated when they escape the confines of the Gorge. In a study by the Bonneville Power Administration 3/ sustained winds (those lasting a minute or longer) of 50 miles per hour could be expected here at least once every other year, those of 60-70 mph once in 10 years and those of 80-100 mph once every 50 years.

4. Sunshine and Cloudiness: From the limited number of places at which cloudiness observations are made there appears to be 100 to 120 clear, 80 to 90 partly cloudy and 165 to 185 cloudy days a year. Actual sunshine records have never been made at any point in these 5 counties; but in a study 4/ in which records of cloudiness in the area and of sunshine at surrounding points were analyzed, it is estimated that the sun shines about 20% to 30% of the time possible in December and January; increasing to 55%-65% in April, May

and June; nearing 75%-85% in July, August and early September; then gradually decreasing again to the winter average.

5. Relative Humidity: In the early morning hours, when the air temperatures are reaching their lowest point, relative humidities of 90%-100% may occur even in the summer months and are quite frequent almost any time of the day in the late fall and winter. In contrast, during the warmest part of the day in summer it is not unusual to have values between 10% and 20%, occasionally even lower. Observations permitting relative humidity computations have been made for a number of years at Meacham, Pendleton and the Dallesport Airport in Washington, just across the river from The Dalles. Monthly averages for four times daily at the Dallesport Airport and Pendleton and twice daily at Meacham are presented in Tables 9a-c.

6. Evaporation: Annual evaporation from two Class A evaporation stations, Moro and Hermiston, indicate the annual average for the plateau area, which comprises most of the agricultural area, is between 40 and 50 inches. This includes: April, 4-5 inches; May, 6-7 inches; June, 7-9 inches; July, 9-11 inches; August, 8-10 inches; September, 4-6 inches; October, 2-3 inches. 5/

7. Evapotranspiration: This is the combined processes by which water is transferred from the earth's surface to the atmosphere by the evaporation of liquid water plus the transpiration from plants. Potential evapotranspiration is defined as the maximum amount of moisture which, if continuously available, could be removed from a land area by the combined processes under the existing conditions of temperature. In a paper recently prepared by Johnson 6/, and making use of techniques developed by Palmer and Havens 7/, the annual potential evapotranspiration is shown to vary from 22-25 inches annually in the cooler, more southern part of this area and 25-30 inches in the northern part.

Actual evapotranspiration is used to indicate the computed amount of water lost under existing conditions of temperature and moisture. The low rainfall is the principal limiting factor in the amount of actual evapotranspiration that can take place. In soils of a 2-inch holding capacity the annual average is between 8 and 10 inches in most areas. It is between 10 and 12 inches for soils with 6-inch holding capacity. For both soils it is 1 to 2 inches more in higher elevations where rainfall is greater.

8. Heating Degree Days: The heating degree day is the accepted measurement for computing heating needs of buildings in an area. It is obtained by finding the mean of the day's maximum and minimum temperatures and subtracting it from 65. The daily values thus computed are added to give a monthly total. Whenever the mean temperature for the day is 65 or more the number of heating degree days is 0. The monthly and seasonal average totals for a number of representative stations in this 5-county area are presented in Table 10. The method developed by H.C.S. Thom 8/ was followed in their computation.

TABLE 1--TEMPERATURES - AVERAGES AND EXTREMES (°F)

Station	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GILLIAM COUNTY													
Arlington													
Greatest mo. & annual	3.47	3.67	3.15	2.08	2.00	1.56	.56	.83	.83	2.89	2.93	6.87	13.48
Least mo. & annual	.21	.08	.03	0	T	T	0	0	T	0	0	.36	5.02
Greatest daily	1.43	1.02	.57	.67	.88	1.15	.61	.54	.56	.92	1.07	2.27	2.27
Condon													
Greatest mo. & annual	3.15	2.87	4.44	2.37	3.74	3.38	1.72	1.88	2.41	3.64	3.60	7.56	17.82
Least mo. & annual	.32	.13	.22	.01	T	.02	0	0	0	.06	.04	.13	6.58
Greatest daily	1.02	1.11	.81	.70	.87	2.02	1.39	.58	1.10	.94	1.35	2.25	2.25
Mikkalo 6 W													
Greatest mo. & annual	3.77	4.32	3.36	2.78	3.39	2.22	1.45	.96	1.44	3.35	3.29	3.18	14.88
Least mo. & annual	.30	.09	.08	0	.06	0	0	0	T	.05	T	.12	4.66
Greatest daily	1.23	1.45	.64	1.06	1.37	1.12	.54	.80	.91	1.43	1.01	1.05	1.45
MORROW COUNTY													
Heppner													
Greatest mo. & annual	2.74	2.30	4.08	3.78	3.27	3.03	1.24	2.18	2.21	3.64	3.24	4.40	19.23
Least mo. & annual	.31	.20	.23	.09	.02	.06	0	0	0	.04	T	.43	7.81
Greatest daily	1.07	.91	.80	1.11	.83	1.18	.91	.85	.80	2.05	1.17	.83	2.05
Ione 18 S													
Greatest mo. & annual	3.58	2.49	4.59	3.01	3.93	3.21	1.82	1.49	2.33	4.00	3.31	4.68	20.57
Least mo. & annual	.37	.09	.34	0	.01	0	0	0	0	.02	T	.56	7.25
Greatest daily	1.63	1.16	.98	1.15	1.05	1.70	1.25	1.09	.97	1.53	1.25	1.83	1.83
Morgan 3 NE													
Greatest mo. & annual	2.87	2.45	2.62	1.74	3.32	3.08	.78	1.10	1.77	3.23	2.62	4.99	14.97
Least mo. & annual	.29	.12	.04	0	T	0	0	0	0	.02	T	.26	5.26
Greatest daily	.89	1.05	.47	.99	1.10	1.56	.88	.60	.58	1.52	.73	1.09	1.56
SHERMAN COUNTY													
Kent													
Greatest mo. & annual	3.12	3.19	3.09	2.97	3.00	2.83	1.14	1.36	1.89	3.08	3.84	6.21	16.44
Least mo. & annual	.21	.21	.15	.07	.08	0	0	0	0	.03	.02	.30	4.63
Greatest daily	1.61	1.24	.52	.85	1.34	1.20	.65	.62	.82	.96	1.57	1.55	1.61
Moro													
Greatest mo. & annual	4.89	3.38	3.33	2.18	2.20	2.63	.61	.88	1.95	3.53	4.35	6.11	17.17
Least mo. & annual	.22	.25	.24	.01	.03	0	0	0	0	T	.03	.42	6.43
Greatest daily	1.67	1.14	.58	.66	1.05	1.21	.61	.55	1.41	.99	1.13	1.26	1.67
Wasco													
Greatest mo. & annual	4.77	4.37	3.08	2.14	2.07	2.10	.67	.89	2.08	3.67	3.76	5.72	17.16
Least mo. & annual	.25	.03	.09	.03	T	T	0	0	0	T	.06	.48	5.41
Greatest daily	1.70	1.31	.74	.68	.88	1.16	.52	.48	1.38	1.31	1.24	1.60	1.70
UMATILLA COUNTY													
Hermiston 2 S													
Greatest mo. & annual	2.72	2.85	2.72	1.44	2.20	2.19	1.16	.91	2.15	3.91	2.43	3.53	14.00
Least mo. & annual	.25	.12	.22	T	.01	.04	0	0	0	.03	T	.35	5.35
Greatest daily	1.01	.90	.54	1.10	.72	.78	.72	.53	1.69	3.36	.71	.88	3.36
Meacham AP													
Greatest mo. & annual	9.29	6.71	5.54	5.87	5.68	3.91	1.78	2.40	5.80	6.49	7.77	8.13	46.22
Least mo. & annual	1.48	.83	1.25	.40	1.04	.29	T	0	.09	.26	.79	1.17	21.12
Greatest daily	2.37	2.34	1.40	1.46	1.51	1.54	1.12	1.07	1.45	1.70	2.81	3.00	3.00
Milton Freewater 4 NW													
Greatest mo. & annual	2.94	2.98	2.75	2.96	4.44	3.52	1.23	1.19	2.29	4.38	3.57	3.71	19.49
Least mo. & annual	.39	.02	.29	.40	T	.07	0	0	0	0	0	.63	8.06
Greatest daily	.77	.89	.91	1.70	.99	1.29	.90	.95	.90	.93	.80	1.15	1.70
Pendleton WB AP													
Greatest mo. & annual	2.97	3.03	2.31	2.45	3.02	2.70	1.26	1.60	2.34	2.79	2.75	3.23	17.73
Least mo. & annual	.21	.07	.24	.01	.03	.12	T	0	T	.04	.04	.62	7.99
Greatest daily	1.29	1.09	.65	.81	1.14	1.49	1.19	.63	.95	1.09	1.03	1.23	1.49
Pilot Rock 1 SE													
Greatest mo. & annual	3.08	2.78	3.12	3.04	3.80	3.86	1.34	1.61	2.22	3.14	2.96	3.58	19.49
Least mo. & annual	.41	.25	.41	.07	.06	.02	T	0	T	.08	.07	.17	9.41
Greatest daily	.82	.78	.84	1.37	.93	1.10	.73	.89	.84	1.04	1.10	1.20	1.37
Ukiah													
Greatest mo. & annual	3.33	3.98	3.13	3.28	5.03	4.17	1.84	2.37	3.12	3.31	3.35	5.26	26.09
Least mo. & annual	.64	.51	.51	.42	.29	.09	0	0	0	T	.17	.91	11.51
Greatest daily	1.17	2.00	1.13	.74	1.22	2.90	.87	.96	1.08	.92	.80	1.25	2.90
Walla Walla 13 ESE													
Greatest mo. & annual	13.63	9.85	8.19	8.76	6.25	5.13	2.46	3.45	6.73	7.55	9.78	12.93	53.57
Least mo. & annual	1.67	1.36	1.10	.46	.95	.61	0	0	0	.37	1.03	1.39	27.72
Greatest daily	2.31	2.42	1.90	2.12	1.60	1.83	1.59	1.16	1.63	2.99	3.68	3.95	3.95
Weston 2 SE													
Greatest mo. & annual	4.27	6.15	4.21	4.18	4.45	3.57	1.72	2.50	2.20	4.06	4.77	4.66	24.91
Least mo. & annual	.60	T	.63	.30	.06	.14	0	T	T	.04	.08	.60	11.61
Greatest daily	.94	1.30	1.32	1.60	2.10	1.85	1.07	1.05	1.01	1.21	1.10	1.35	2.10
WASCO COUNTY													
Antelope 1 N													
Greatest mo. & annual	3.87	3.14	3.31	2.07	3.52	2.82	2.34	1.84	2.08	3.75	4.44	7.37	18.34
Least mo. & annual	.42	.04	.34	.02	.03	0	0	0	T	T	0	.36	7.01
Greatest daily	.94	1.90	.65	.83	1.12	.93	1.10	.90	1.25	1.40	1.45	2.16	2.16
Dufur													
Greatest mo. & annual	4.93	3.84	4.07	1.51	1.85	2.34	1.02	.89	1.95	4.07	2.86	6.80	17.33
Least mo. & annual	.31	.19	.21	T	T	T	0	0	0	.03	.01	.29	5.12
Greatest daily	1.31	.85	.65	.85	1.08	1.11	.90	.64	.85	1.06	1.57	1.80	1.80
Friend 2 W													
Greatest mo. & annual	6.36	4.82	5.07	2.05	3.16	2.59	1.45	.84	3.08	4.10	6.82	10.31	22.97
Least mo. & annual	1.02	.07	.06	0	T	0	0	0	0	.04	.05	.80	8.70
Greatest daily	1.80	2.00	1.47	.78	1.69	1.16	1.18	.77	1.20	1.28	2.95	2.65	2.95
The Dalles													
Greatest mo. & annual	6.57	4.79	3.84	1.48	2.05	2.81	.41	.95	1.60	3.98	5.10	9.05	21.82
Least mo. & annual	.43	.13	.09	T	.02	T	0	0	0	.01	.05	.48	6.37
Greatest daily	2.19	1.78	.78	.63	1.05	1.11	.30	.92	1.07	1.23	1.12	2.00	2.19

TABLE 2--PROBABILITY OF FREEZING TEMPERATURES

	TEMP (°F)	PROBABILITY - SPRING					PROBABILITY - FALL					Growing Season Mean Length (days)
		90%	75%	50%	25%	10%	10%	25%	50%	75%	90%	
GILLIAM COUNTY												
Condon	32	May 8	May 19	May 29	Jun 9	Jun 19	Sep 11	Sep 19	Sep 28	Oct 7	Oct 15	122
	28	Apr 17	Apr 25	May 4	May 13	May 21	Sep 22	Oct 1	Oct 12	Oct 23	Nov 1	161
	24	Mar 12	Mar 24	Apr 7	Apr 21	May 3	Oct 9	Oct 17	Oct 27	Nov 6	Nov 14	203
MORROW COUNTY												
Heppner	32	Apr 19	Apr 28	May 8	May 18	May 27	Sep 19	Sep 27	Oct 6	Oct 15	Oct 23	151
	28	Mar 23	Apr 2	Apr 13	Apr 24	May 4	Oct 8	Oct 16	Oct 25	Nov 3	Nov 11	195
	24	Feb 20	Mar 3	Mar 16	Mar 29	Apr 9	Oct 21	Nov 1	Nov 13	Nov 25	Dec 6	242
SHERMAN COUNTY												
Kent	32	May 3	May 11	May 20	May 29	Jun 6	Sep 23	Oct 1	Oct 11	Oct 21	Oct 29	144
	28	Mar 31	Apr 11	Apr 24	May 7	May 18	Oct 11	Oct 18	Oct 27	Nov 5	Nov 12	186
	24	Feb 21	Mar 6	Mar 24	Apr 8	Apr 20	Oct 31	Nov 7	Nov 15	Nov 23	Nov 30	235
Moro	32	Apr 11	Apr 22	May 7	May 20	May 31	Sep 18	Sep 26	Oct 4	Oct 12	Oct 20	150
	28	Mar 26	Mar 29	Apr 13	Apr 28	May 11	Oct 9	Oct 17	Oct 26	Nov 4	Nov 12	196
	24	Feb 18	Mar 5	Mar 22	Apr 8	Apr 23	Oct 11	Oct 25	Nov 9	Nov 25	Dec 11	231
Wasco	32	Apr 11	Apr 21	May 2	May 13	May 23	Sep 24	Oct 2	Oct 12	Oct 22	Oct 30	163
	28	Mar 16	Mar 27	Apr 8	Apr 20	May 1	Oct 8	Oct 17	Oct 28	Nov 8	Nov 17	203
	24	Jan 25	Feb 19	Mar 12	Mar 30	Apr 16	Oct 18	Oct 28	Nov 10	Nov 23	Dec 5	240
UMATILLA COUNTY												
Echo	32	Apr 6	Apr 15	Apr 24	May 3	May 12	Sep 15	Sep 24	Oct 4	Oct 15	Oct 24	163
	28	Mar 17	Mar 28	Apr 8	Apr 19	Apr 30	Oct 8	Oct 18	Oct 25	Nov 3	Nov 13	200
	24	Feb 22	Mar 6	Mar 20	Apr 3	Apr 15	Oct 20	Oct 30	Nov 10	Nov 21	Dec 2	235
Hermiston 2 S	32	Apr 12	Apr 20	Apr 29	May 8	May 16	Sep 20	Sep 28	Oct 6	Oct 14	Oct 22	160
	28	Mar 24	Apr 1	Apr 9	Apr 17	Apr 25	Oct 1	Oct 10	Oct 20	Oct 30	Nov 8	194
	24	Mar 8	Mar 17	Mar 28	Apr 8	Apr 17	Oct 13	Oct 22	Nov 1	Nov 11	Nov 20	218
Meacham AP	32	May 7	May 18	May 31	Jun 13	Jun 24	Sep 14	Sep 20	Sep 27	Oct 4	Oct 10	119
	28	Apr 26	May 3	May 10	May 17	May 24	Sep 31	Oct 9	Oct 18	Oct 27	Nov 5	161
	24	Mar 29	Apr 6	Apr 15	Apr 24	May 2	Oct 23	Oct 30	Nov 6	Nov 13	Nov 20	205
Milton Freewater 4 NW	32	Mar 17	Mar 27	Apr 7	Apr 18	Apr 28	Oct 5	Oct 14	Oct 21	Oct 31	Nov 9	200
	28	Mar 3	Mar 13	Mar 24	Apr 4	Apr 14	Oct 17	Oct 25	Nov 3	Nov 12	Nov 20	224
	24	Jan 21	Feb 11	Mar 1	Mar 17	Mar 31	Oct 27	Nov 7	Nov 20	Dec 3	Dec 20	260
Pendleton Branch Exp. Station	32	May 1	May 12	May 24	Jun 5	Jun 16	Sep 11	Sep 19	Sep 28	Oct 8	Oct 15	127
	28	Mar 30	Apr 12	Apr 26	May 10	May 23	Sep 20	Sep 30	Oct 11	Oct 22	Nov 1	168
	24	Feb 20	Mar 7	Mar 24	Apr 10	Apr 25	Oct 3	Oct 15	Oct 29	Nov 12	Nov 24	219
Pendleton Round-Up Park	32	Apr 9	Apr 18	Apr 28	May 8	May 17	Sep 19	Sep 28	Oct 6	Oct 15	Oct 23	161
	28	Mar 21	Mar 29	Apr 7	Apr 16	Apr 24	Oct 5	Oct 13	Oct 22	Oct 31	Nov 8	198
	24	Feb 18	Mar 4	Mar 19	Apr 3	Apr 17	Oct 13	Oct 25	Nov 9	Nov 22	Dec 6	233
Pilot Rock 1 SE	32	Apr 9	Apr 22	May 2	May 14	May 25	Sep 18	Sep 28	Oct 9	Oct 20	Oct 30	160
	28	Mar 14	Mar 25	Apr 5	Apr 16	Apr 27	Oct 4	Oct 14	Oct 24	Nov 3	Nov 13	202
	24	Jan 27	Feb 19	Mar 10	Mar 27	Apr 11	Oct 13	Oct 24	Nov 7	Nov 21	Dec 8	238
Ukiah												
Umatilla	32	Mar 28	Apr 5	Apr 13	Apr 21	Apr 29	Oct 9	Oct 14	Oct 21	Oct 28	Nov 2	191
	28	Mar 8	Mar 19	Mar 30	Apr 10	Apr 21	Oct 15	Oct 23	Nov 1	Nov 10	Nov 18	216
	24	Feb 11	Feb 28	Mar 13	Mar 26	Apr 6	Oct 23	Nov 2	Nov 13	Nov 24	Dec 4	243
WASCO COUNTY												
Antelope 1 N	32	May 20	May 31	Jun 13	Jun 26	Jul 7	Aug 27	Sep 5	Sep 15	Sep 25	Oct 4	94
	28	May 1	May 10	May 21	Jun 1	Jun 10	Sep 13	Sep 22	Oct 2	Oct 12	Oct 21	134
	24	Apr 7	Apr 17	Apr 27	May 7	May 11	Sep 26	Oct 8	Oct 20	Nov 1	Nov 13	176
Big Eddy	32	Mar 7	Mar 17	Mar 29	Apr 10	Apr 20	Oct 11	Oct 20	Oct 30	Nov 9	Nov 18	215
	28	Feb 9	Feb 23	Mar 11	Mar 26	Apr 10	Oct 18	Oct 29	Nov 11	Nov 24	Dec 7	244
	24	Jan 16	Feb 2	Feb 16	Mar 2	Mar 14	Oct 30	Nov 11	Nov 28	Dec 16	-	279
Dufur	32	May 1	May 9	May 19	May 29	Jun 6	Sep 22	Sep 29	Oct 6	Oct 13	Oct 20	141
	28	Apr 2	Apr 13	Apr 25	May 7	May 18	Oct 8	Oct 16	Oct 25	Nov 3	Nov 11	184
	24	Feb 27	Mar 13	Mar 28	Apr 12	Apr 26	Oct 17	Oct 30	Nov 12	Nov 24	Dec 8	228
The Dalles	32	Mar 13	Mar 24	Apr 3	Apr 13	Apr 22	Oct 10	Oct 18	Oct 27	Nov 5	Nov 13	207
	28	Feb 13	Feb 23	Mar 7	Mar 19	Mar 29	Oct 26	Nov 1	Nov 9	Nov 17	Nov 24	247
	24	-	Feb 2	Feb 17	Mar 3	Mar 15	Nov 8	Nov 21	Dec 8	-	-	282

TABLE 3 --AVERAGE MONTHLY AND ANNUAL PRECIPITATION (Inches)

Station	Elevation	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GILLIAM COUNTY														
Arlington	315	1.39	1.12	.78	.54	.59	.61	.12	.19	.29	.74	1.13	1.46	8.96
Condon	2850	1.38	1.19	1.22	.99	1.30	1.20	.41	.35	.60	1.13	1.51	1.63	12.91
Mikalo 6 W	1550	1.37	1.08	.88	.77	.91	.81	.19	.17	.47	.87	1.12	1.31	9.95
MORROW COUNTY														
Heppner	1950	1.26	1.22	1.26	1.34	1.40	1.41	.37	.43	.72	1.27	1.47	1.50	13.65
Ione 18 S	1925	1.46	1.27	1.31	1.15	1.40	1.26	.44	.42	.63	1.15	1.42	1.50	13.41
Morgan 3 NE	905	1.27	1.05	.82	.72	.81	.73	.12	.24	.41	.91	1.08	1.26	9.42
SHERMAN COUNTY														
Kent	2707	1.28	1.17	.97	.90	1.10	1.07	.28	.27	.58	.94	1.35	1.48	11.39
Moro	1868	1.71	1.35	1.04	.80	.84	.88	.19	.20	.50	1.07	1.62	1.76	11.96
Wasco	1264	1.76	1.40	1.03	.74	.75	.78	.21	.23	.46	.98	1.66	1.77	11.77
UMATILLA COUNTY														
Echo	660	1.30	1.12	.90	.84	.80	.85	.21	.21	.51	.93	1.17	1.37	10.21
Hermiston 2 S	624	1.13	1.01	.78	.66	.72	.77	.20	.17	.45	.86	1.04	1.23	9.02
Meacham AP	4050	4.06	3.69	3.29	2.66	2.57	1.91	.49	.72	1.56	2.81	4.23	4.73	32.72
Milton Freewater 4 NW	962	1.29	1.25	1.39	1.24	1.36	1.28	.29	.29	.69	1.25	1.49	1.76	13.58
Pendleton Br. Exp. Stn.	1487	1.84	1.63	1.64	1.56	1.51	1.48	.36	.28	.71	1.49	1.82	2.11	16.43
Pendleton WB AP	1482	1.42	1.21	1.10	1.12	1.19	1.07	.25	.29	.64	1.15	1.38	1.53	12.35
Pilot Rock 1 SE	1697	1.40	1.22	1.46	1.27	1.46	1.27	.30	.49	.80	1.09	1.35	1.67	13.78
Ukiah	3225	1.80	1.63	1.63	1.45	1.88	1.78	.43	.53	.93	1.36	1.86	2.24	17.52
Umatilla	270	1.06	.91	.75	.61	.72	.74	.22	.18	.44	.83	1.03	1.31	8.80
Walla Walla 13 ESE	2400	5.11	4.62	4.66	3.52	2.99	2.66	.62	.79	2.05	4.18	5.50	6.26	42.96
Weston 2 SE	2100	1.99	1.85	1.98	1.82	1.39	1.67	.32	.43	.80	1.57	2.05	2.33	18.20
Weston 5 ESE	3222	2.76	2.37	2.34	2.32	2.85	1.51	.34	.98	1.64	2.41	2.89	3.15	25.56
WASCO COUNTY														
Antelope 1 N	2758	1.44	1.22	1.09	.85	1.41	1.08	.33	.39	.69	1.08	1.64	1.72	12.94
Big Eddy	125	2.37	1.87	1.15	.51	.59	.61	.06	.14	.47	1.08	2.01	2.26	13.12
Dufur	1330	1.99	1.34	1.23	.67	.74	.80	.18	.21	.48	1.07	1.47	1.72	11.91
Friend 2 W	2490	2.72	1.91	1.53	.81	1.09	.85	.14	.22	.55	1.13	2.41	2.84	16.20
Sinnasho	2400	2.21	1.37	1.01	.55	1.10	1.03	.19	.27	.56	1.00	1.75	2.17	13.21
The Dalles	102	2.56	1.92	1.38	.58	.59	.62	.09	.20	.44	1.23	2.10	2.57	14.28

TABLE 4--PRECIPITATION PROBABILITIES (Inches)

Station	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		ANNUAL	
	Less Than	More Than	Less Than	More Than	Less Than	More Than	Less Than	More Than	Less Than	More Than	Less Than	More Than	Less Than	More Than	Less Than	More Than	Less Than	More Than	Less Than	More Than	Less Than	More Than	Less Than	More Than	Less Than	More Than
GILLIAM COUNTY																										
Arlington																										
1 yr. in 10	.4	3.0	.3	2.4	.2	1.4	.1	1.0	.1	1.6	.1	1.3	.1	.4	.1	.5	.1	.7	.1	1.8	.1	1.9	.5	2.5	6.0	12.2
2 yr. in 10	.6	2.5	.5	1.8	.3	1.1	.2	.9	.1	1.1	.1	1.2	.1	.2	.1	.5	.1	.5	.2	1.4	.3	1.7	.6	2.1	6.8	11.7
3 yr. in 10	.7	1.8	.6	1.4	.4	1.0	.3	.7	.2	.8	.2	1.0	.1	.1	.1	.2	.1	.4	.2	.9	.6	1.7	.8	1.7	7.1	10.9
4 yr. in 10	.9	1.2	.8	1.1	.5	.8	.4	.6	.3	.6	.3	.7	.1	.1	.1	.2	.1	.4	.4	.7	.9	1.5	1.1	1.4	7.3	9.5
Condon																										
1 yr. in 10	.6	2.7	.4	2.2	.4	2.1	.2	2.2	.3	2.8	.1	2.4	.1	1.3	.1	1.3	.1	1.2	.2	2.3	.3	2.4	.5	2.5	8.9	17.3
2 yr. in 10	.8	2.3	.7	1.7	.6	1.7	.4	1.6	.4	2.3	.4	1.9	.1	.7	.1	.8	.1	.9	.5	1.9	.5	2.2	.9	2.3	9.5	16.0
3 yr. in 10	.9	1.7	.7	1.5	.8	1.4	.5	1.3	.5	1.6	.5	1.7	.3	.6	.1	.3	.3	.7	.6	1.4	1.0	2.0	1.0	1.8	10.5	15.1
4 yr. in 10	1.0	1.3	1.0	1.3	.9	1.3	.7	1.1	.8	1.3	.7	1.6	.1	.3	.1	.2	.3	.8	.7	1.1	1.4	1.9	1.1	1.6	12.1	14.7
Mikkalo 6 W																										
1 yr. in 10	.5	2.9	.4	2.4	.2	1.7	.1	1.7	.1	1.8	.1	1.6	.1	.6	.1	.6	.1	1.2	.1	2.0	.1	2.4	.3	2.8	5.9	13.8
2 yr. in 10	.6	2.0	.5	1.7	.3	1.3	.3	1.1	.3	1.4	.2	1.3	.1	.3	.1	.3	.1	.8	.4	1.5	.2	2.0	.6	2.0	7.5	13.2
3 yr. in 10	.7	1.7	.6	1.2	.5	1.0	.4	.9	.4	1.2	.3	1.2	.1	.1	.1	.2	.2	.6	.5	1.0	.6	1.6	.7	1.7	7.9	12.4
4 yr. in 10	.8	1.4	.7	.9	.7	.9	.5	.8	.7	1.0	.6	.9	.1	.1	.1	.1	.3	.4	.6	.8	.7	1.3	.9	1.4	8.5	11.2
MORROW COUNTY																										
Heppner																										
1 yr. in 10	.6	2.5	.4	2.2	.5	2.1	.4	2.5	.2	3.0	.3	2.8	.1	1.1	.1	1.2	.1	1.5	.2	3.0	.4	2.5	.7	2.6	9.4	17.7
2 yr. in 10	.7	1.7	.6	2.0	.7	1.8	.7	2.1	.4	2.4	.3	2.5	.1	.8	.1	1.0	.2	1.2	.5	1.9	.5	2.2	.8	2.1	10.6	17.0
3 yr. in 10	.9	1.5	.6	1.8	.8	1.4	.9	1.8	.5	2.1	.8	1.8	.1	.4	.1	.4	.3	1.1	.7	1.6	1.0	2.0	.9	1.8	11.6	15.6
4 yr. in 10	1.0	1.4	.8	1.4	1.0	1.2	.9	1.4	.7	1.8	1.1	1.6	.1	.2	.1	.3	.4	.9	.9	1.3	1.2	1.8	1.1	1.7	12.2	14.8
Ione 18 S																										
1 yr. in 10	.6	2.5	.3	2.2	.5	2.1	.3	2.8	.1	3.5	.1	2.3	.1	1.4	.1	1.2	.1	1.4	.3	2.4	.1	2.4	.6	2.5	9.5	18.3
2 yr. in 10	.9	2.0	.6	1.9	.6	1.9	.4	1.8	.3	2.3	.3	2.1	.1	1.0	.1	.8	.1	1.1	.4	1.7	.3	2.2	.6	2.0	9.9	16.6
3 yr. in 10	1.0	1.6	.8	1.6	.8	1.6	.6	1.5	.6	1.9	.5	1.8	.1	.8	.1	.6	.3	.8	.6	1.5	.7	2.0	.9	1.8	10.8	15.8
4 yr. in 10	1.1	1.4	1.0	1.6	1.0	1.5	.8	1.3	1.0	1.7	1.1	1.5	.1	.2	.1	.4	.3	.7	.8	1.2	1.2	1.8	1.1	1.6	12.1	14.4
Morgan 3 NE																										
1 yr. in 10	.5	2.5	.4	2.2	.3	1.3	.1	1.3	.1	1.9	.1	1.6	.1	.4	.1	.9	.1	1.1	.1	2.3	.2	1.9	.4	2.2	6.3	12.5
2 yr. in 10	.6	2.2	.5	1.5	.4	1.2	.2	1.1	.2	1.4	.1	1.2	.1	.3	.1	.4	.1	.8	.3	1.6	.3	1.6	.6	1.7	7.0	11.5
3 yr. in 10	.7	1.6	.6	1.3	.5	1.0	.4	.9	.2	1.2	.2	1.0	.1	.1	.1	.2	.1	.5	.5	1.0	.6	1.4	.8	1.5	8.0	10.7
4 yr. in 10	.9	1.4	.7	1.1	.7	.9	.5	.8	.3	1.0	.5	.9	.1	.1	.1	.2	.2	.4	.6	.9	.9	1.3	.9	1.2	8.7	10.4
SHERMAN COUNTY																										
Kent																										
1 yr. in 10	.4	2.8	.3	2.3	.3	1.8	.1	1.8	.2	2.7	.1	2.3	.1	.8	.1	1.0	.1	1.5	.1	2.2	.2	2.5	.4	2.6	7.4	14.5
2 yr. in 10	.5	2.0	.5	1.6	.4	1.4	.2	1.4	.3	1.9	.3	1.8	.1	.6	.1	.4	.1	1.0	.3	1.5	.5	2.1	.7	2.1	8.3	14.0
3 yr. in 10	.7	1.4	.7	1.4	.5	1.3	.7	1.1	.5	1.4	.5	1.6	.1	.4	.1	.3	.3	.7	.4	1.2	.8	1.8	.8	1.9	9.6	13.7
4 yr. in 10	1.0	1.3	.9	1.2	.7	1.0	.7	1.0	.7	1.0	.7	1.2	.1	.3	.1	.2	.4	.5	.6	.9	1.1	1.6	.9	1.4	10.5	13.1
Moro																										
1 yr. in 10	.5	3.4	.7	2.6	.4	2.0	.2	1.7	.1	1.8	.1	1.7	.1	.4	.1	.7	.1	1.3	.2	2.7	.1	2.8	.6	3.1	7.3	15.8
2 yr. in 10	.7	2.8	.8	2.0	.5	1.3	.2	1.3	.2	1.6	.1	1.6	.1	.4	.1	.4	.1	.8	.4	1.8	.7	2.4	.7	2.5	8.4	14.8
3 yr. in 10	.8	2.3	.9	1.4	.7	1.2	.4	1.0	.3	1.2	.3	1.3	.1	.3	.1	.3	.2	.7	.5	1.3	1.0	2.2	.9	2.1	10.3	13.8
4 yr. in 10	1.0	1.9	1.0	1.2	.8	1.1	.6	.9	.5	.9	.5	1.0	.1	.2	.1	.2	.3	.4	.6	.9	1.5	1.9	1.4	1.9	11.8	13.0
Wasco																										
1 yr. in 10	.5	3.3	.5	2.8	.3	1.9	.1	1.6	.1	1.9	.1	1.7	.1	.6	.1	.7	.1	1.0	.2	2.1	.3	2.7	.6	3.0	7.4	16.2
2 yr. in 10	.8	2.7	.7	2.0	.5	1.7	.2	1.2	.2	1.3	.2	1.5	.1	.5	.1	.5	.1	.8	.4	1.7	.6	2.2	.7	2.7	8.7	14.9
3 yr. in 10	1.0	2.4	.9	1.5	.7	1.2	.3	.9	.3	.9	.3	1.3	.1	.3	.1	.3	.1	.7	.5	1.2	1.1	2.2	.8	2.1	10.2	14.2
4 yr. in 10	1.1	1.8	1.0	1.4	.7	1.0	.5	.9	.5	.8	.5	.8	.1	.2	.1	.3	.2	.5	.7	.8	1.8	2.0	1.6	1.9	11.4	12.7
UMATILLA COUNTY																										
Hermiston 2 S																										
1 yr. in 10	.4	2.5	.4	1.8	.3	1.3	.2	1.3	.1	1.7	.1	1.8	.1	.8	.1	.7	.1	1.3	.1	2.3	.2	1.7	.5	2.1	5.8	12.0
2 yr. in 10	.5	1.8	.6	1.4	.4	1.1	.3	1.1	.2	1.2	.3	1.3	.1	.4	.1	.3	.1	.8	.3	1.1	.4	1.5	.7	1.8	7.0	11.2
3 yr. in 10	.7	1.5	.8	1.1	.4	1.0	.4	.9	.3	1.0	.4	1.0	.1	.2	.1	.2	.1	.5	.4	1.0	.7	1.3	.8	1.5	7.5	10.0
4 yr. in 10	.8	1.2	.8	1.0	.6	.9	.5	.7	.4	.7	.5	.7	.1	.1	.1	.1	.5	.5	.8	.9	1.2	.9	1.2	8.3	9.6	
Meacham WB Airport																										
1 yr. in 10	1.5	7.1	1.4	6.6	1.5	4.9	1.1	4.1	1.2	4.7	.8	3.5	.1	1.4	.1	1.5	.2	2.7	.8	5.4	1.6	6.5	1.7	7.2	23.0	41.3
2 yr. in 10	2.0	6.0	2.6	5.4	2.2	4.3	1.8	3.4	1.4	3.9	.9	3.2	.1	.9	.1	1.3	.5	2.2	1.0	3.9	2.7	5.7	2.6	6.1	27.3	36.5
3 yr. in 10	2.4	5.0	2.9	4.2	2.3	3.9	2.4	3.2	1.6	3.1	1.2	2.8	.1	.7	.2	1.1	.9	1.8	1.4	3.6	3.1	5.5	3.1	5.5	29.6	34.3
4 yr. in 10	2.8	3.8	3.3	3.8	3.0	3.6	2.6	2.9	1.8	2.7	1.4	2.3	.2	.5	.3	.9	1.1	1.7	2.3	3.3	3.3	4.3	3.9	5.1	31.8	32.6
Milton Freewater 4 NW																										
1 yr. in 10	.7	2.4	.4	2.2	.5	2.4	.6	2.2	.1	3.5	.2	2.7	.1	.9	.1	1.1	.1	1.8	.3	2.4	.3	2.8	.8	3.3	10.1	17.7
2 yr. in 10	.8	1.7	.5	2.0	.8	1.9	.7	1.9	.4	2.6	.5	2.0	.1	.7	.1	.5	.1	1.4	.5	1.7	.5	2.1	.9	2.4	10.8	17.5
3 yr. in 10	.9	1.6	.8	1.7	.9	1.7	.9	1.5	.5	1.7	.8	1.5	.1	.4	.1	.3	.2	1.0	.7	1.6	1.0	1.9	1.1	2.1	11.4	15.8
4 yr. in 10	1.0	1.4	1.0	1.5	1.1	1.7	1.0	1.2	.7	1.5	1.1	1.3	.1	.2	.1	.3	.3	.7	.9	1.2	1.4	1.8	1.4	1.9	12.3	14.4
Pendleton WB Airport																										
1 yr. in 10	.5	2.4	.4	2.0	.4	2.1	.3	2.0	.3	2.8	.2	2.4	.1	.9	.1	1.0	.1	1.4	.1	2.5	.3	2.4	.7	2.5	8.9	15.7
2 yr. in 10	.8	2.1	.6	1.7	.5	1.6	.5	1.8	.4	2.2	.3	2.0	.1	.4	.1	.6	.1	1.0	.5	1.8	.5	1.9	.9	2.0	9.9	14.8
3 yr. in 10	1.0	1.8	.8	1.6	.6	1.4	.7	1.6	.5	1.8	.4	1.6	.1	.3	.1	.3	.2	.8	.7	1.6	1.1	1.8	1.1	1.9	10.5	14.3
4 yr. in 10	1.1	1.4	.9	1.4	.8	1.2	.8	1.2	.7	1.2	.6	1.1	.1	.2	.1	.2	.3	.7	.8	1.4	1.3	1.7	1.3	1.8	11.6	13.1
Pilot Rock 1 SE																										
1 yr. in 10	.6	2.2	.5	2.2	.6	2.6	.6	2.6	.2	3.2	.4	2.6	.1	1.1	.1	1.2	.1	1.7	.2	2.2	.2	2.5	.7	2.8	10.1	17.9
2 yr. in 10	.7	2.0	.6	1.8	.9	2.1	.7	1.7	.5	2.3	.5	2.0	.1	.5	.1	.9	.2	1.3	.5	1.3	.8	1.9	1.0	2.2	11.0	16.1
3 yr. in 10	1.0	1.6	.7	1.6	1.0	1.8	.8	1.7	1.1	1.8	.7	1.5	.1	.4	.1	.7	.4	1.1	.7	1.2	.9	1.7	1.2	2.0	12.1	15.5
4 yr. in 10	1.2	1.5	.9	1.4	1.1	1.7	.9	1.3	.7	1.6	.9	1.2	.1	.3	.2	.4	.6	.9	.9	1.1	1.0	1.6	1.4	1.9	12.9	14.5
Ukiah																										
1 yr. in 10	.8	2.9	.9	2.4	.6	2.7	.6	2.8	.4	4.3	.3	4.0	.1	1.3	.1	1.6	.1	1.9	.3	2.5	.5	3.2	1.1	4.1	12.0	22.3
2 yr. in 10	1.2	2.4	.9	2.2	.7	2.6	.7	2.2	.7	3.6	.5	2.9	.1	.9	.1	.9	.2	1.5	.7	2.0	.6	2.9	1.2	3.2	14.0	21.0
3 yr. in 10	1.5	2.1	1.2	1.8	1.0	2.0	.9	1.7	1.1	2.2	.8	2.5	.1	.5	.2	.7	.4	1.1	.8	1.9	1.2	2.6	1.3	2.6		

TABLE 5--AVERAGE NUMBER OF DAYS WITH PRECIPITATION

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GILLIAM COUNTY													
<u>.01 or more</u>													
Condon	11	9	11	9	8	7	3	3	4	7	10	11	93
<u>.10 or more</u>													
Condon	5	4	4	3	4	4	2	1	2	4	5	6	44
<u>.50 or more</u>													
Condon	*	*	*	*	1	1	*	*	*	*	1	*	3
<u>1.00 or more</u>													
Condon	*	*	0	0	0	*	*	0	*	0	*	*	*
MORROW COUNTY													
<u>.01 or more</u>													
Heppner	11	10	11	9	9	7	3	3	5	8	11	12	99
<u>.10 or more</u>													
Heppner	4	4	4	5	4	4	1	1	2	4	5	5	43
<u>.50 or more</u>													
Heppner	*	*	*	*	1	1	*	*	*	*	1	*	3
<u>1.00 or more</u>													
Heppner	*	0	0	*	0	*	0	0	0	*	*	0	*
SHERMAN COUNTY													
<u>.01 or more</u>													
Moro	11	10	10	7	6	5	2	2	3	7	10	11	84
<u>.10 or more</u>													
Moro	6	5	4	3	3	3	1	1	2	3	5	6	42
<u>.50 or more</u>													
Moro	1	*	*	*	*	*	*	*	*	*	1	1	3
<u>1.00 or more</u>													
Moro	*	*	0	0	*	*	0	0	*	0	*	*	*
UMATILLA COUNTY													
<u>.01 or more</u>													
Hermiston	10	9	8	7	6	5	1	2	3	7	9	11	78
Meacham AP	19	17	19	14	14	11	3	5	7	11	17	18	155
Milton Freewater	9	9	9	8	7	6	2	3	4	7	9	12	85
Pendleton WB AP	12	11	11	9	8	7	2	3	4	8	11	14	100
<u>.10 or more</u>													
Hermiston 2 S	4	4	3	2	2	3	1	*	1	2	4	4	30
Meacham AP	11	10	10	8	8	6	1	2	4	7	10	11	88
Milton Freewater 4 NW	5	5	5	4	4	4	1	1	2	4	5	6	46
Pendleton WB AP	5	4	4	4	4	3	1	1	2	4	4	5	41
<u>.50 or more</u>													
Hermiston 2 S	*	*	*	*	*	*	*	*	*	*	*	*	*
Meacham AP	2	2	1	1	1	1	*	*	1	2	2	2	15
Milton Freewater 4 NW	*	*	*	*	1	1	*	*	*	1	*	1	4
Pendleton WB AP	*	*	*	*	1	*	*	*	*	*	*	*	1
<u>1.00 or more</u>													
Hermiston 2 S	*	0	0	*	0	0	0	0	*	*	0	0	*
Meacham AP	*	*	*	*	0	*	*	0	*	*	1	1	2
Milton Freewater 4 NW	*	0	0	*	0	*	*	0	0	0	0	*	*
Pendleton WB AP	*	0	0	0	0	*	*	0	0	0	*	0	*
WASCO COUNTY													
<u>.01 or more</u>													
Antelope 1 N	10	8	10	7	7	7	2	3	4	7	10	10	85
Dufur	10	9	9	5	5	5	2	2	3	6	9	10	75
The Dalles	14	12	11	6	6	5	1	2	3	7	12	15	94
<u>.10 or more</u>													
Antelope 1 N	5	4	4	3	4	4	1	1	2	4	5	5	42
Dufur	6	4	4	2	3	2	1	1	1	3	5	5	37
The Dalles	7	6	5	2	2	2	*	1	1	3	5	7	41
<u>.50 or more</u>													
Antelope 1 N	*	*	*	*	*	*	*	*	*	*	1	1	2
Dufur	1	1	*	*	*	*	*	*	*	*	1	1	4
The Dalles	1	1	*	*	*	*	0	*	*	*	1	1	4
<u>1.00 or more</u>													
Antelope 1 N	0	*	0	0	*	0	*	0	*	*	*	*	*
Dufur	*	0	0	0	*	*	0	0	0	*	*	*	*
The Dalles	*	*	0	0	*	*	0	0	*	*	*	*	*

TABLE 6--PRECIPITATION EXTREMES

Station	Data	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
GILLIAM COUNTY														
Arlington	Av. Max.	39.7	47.2	56.7	66.5	75.2	84.5	91.0	88.6	81.5	69.1	49.9	42.8	66.1
	Av. Min.	25.4	30.4	35.2	41.0	47.6	53.9	60.2	59.1	51.9	42.5	33.0	30.4	42.6
	Mean	32.6	38.8	46.0	53.8	61.4	69.2	75.6	73.9	66.7	50.8	42.0	36.6	54.4
	Highest	66	74	84	105	103	110	114	115	104	90	76	68	115
	Lowest	-22	-23	0	-4	14	36	43	43	30	12	6	-7	-23
Condon	Av. Max.	36.8	42.5	49.7	57.8	65.7	73.2	83.8	81.9	74.3	61.5	47.1	40.8	59.6
	Av. Min.	20.9	25.7	28.2	33.3	38.4	44.2	49.6	48.2	44.3	36.5	28.8	25.6	35.3
	Mean	28.9	34.1	39.0	45.6	52.1	58.7	66.7	65.1	59.3	49.0	38.0	33.2	47.5
	Highest	67	68	77	85	96	97	106	102	96	88	74	69	106
	Lowest	-20	-16	2	17	19	27	29	32	24	3	-13	-14	-20
MORROW COUNTY														
Heppner	Av. Max.	40.0	46.0	52.6	60.3	67.8	74.5	84.3	82.3	75.8	64.3	49.9	44.1	61.8
	Av. Min.	23.8	28.6	32.1	35.7	42.0	46.9	52.1	50.9	46.1	38.5	31.3	28.1	38.0
	Mean	31.9	37.3	42.4	48.0	54.9	60.7	68.2	66.6	61.0	51.4	40.6	36.1	49.9
	Highest	68	71	78	89	93	105	107	107	99	89	75	75	107
	Lowest	-16	-18	9	19	25	33	37	36	28	10	-8	-15	-18
SHERMAN COUNTY														
Kent	Av. Max.	36.5	42.0	48.6	57.3	65.7	73.1	83.1	81.2	74.0	61.5	46.6	39.8	59.1
	Av. Min.	21.7	26.4	29.7	34.3	40.6	46.4	52.7	51.6	46.8	38.6	29.6	26.4	37.1
	Mean	29.1	34.2	39.2	45.8	53.2	59.8	67.9	66.4	60.4	50.1	38.1	33.1	48.1
	Highest	60	66	77	82	92	100	105	104	97	89	74	65	105
	Lowest	-17	-19	5	18	24	32	34	38	28	8	-8	-14	-19
Moro	Av. Max.	36.4	43.0	50.9	59.7	68.2	74.9	84.4	82.5	76.1	62.1	46.7	40.1	60.4
	Av. Min.	22.4	27.6	31.2	36.0	41.9	47.5	53.1	51.9	46.4	38.4	30.3	27.3	37.8
	Mean	29.4	35.3	41.1	47.9	55.1	61.2	68.8	67.2	61.3	50.3	38.5	33.7	49.1
	Highest	59	64	75	84	96	102	111	104	98	87	70	63	111
	Lowest	-22	-23	7	19	20	31	34	37	24	8	-10	-11	-23
Wasco	Av. Max.	36.4	43.5	53.6	62.4	70.5	77.1	86.3	85.0	77.3	63.6	47.7	40.6	62.0
	Av. Min.	23.1	27.5	32.9	37.4	43.0	49.2	54.7	53.7	46.7	39.3	31.9	28.0	39.0
	Mean	29.8	35.5	43.3	49.9	56.8	63.2	70.5	69.4	62.0	51.5	39.8	34.3	51.0
	Highest	62	71	77	91	100	105	113	105	101	87	76	65	113
	Lowest	-16	-11	15	20	26	34	40	37	21	11	6	-7	-16
UMATILLA COUNTY														
Hermiston 2 S	Av. Max.	39.3	47.2	57.6	67.3	75.9	82.7	91.3	88.6	81.2	67.1	50.2	42.7	65.9
	Av. Min.	22.5	27.8	32.6	39.1	46.1	52.7	57.8	55.3	47.7	38.9	30.2	27.8	39.9
	Mean	30.9	37.5	45.1	53.2	61.0	67.7	74.6	72.0	64.5	53.0	40.2	35.3	52.9
	Highest	69	70	82	91	101	106	112	113	101	87	72	70	113
	Lowest	-31	-29	8	18	22	37	39	36	28	6	-12	-8	-31
Meacham AP	Av. Max.	31.9	37.0	40.4	49.4	58.0	65.5	77.2	75.0	67.7	55.2	41.2	35.0	52.8
	Av. Min.	19.4	23.8	25.5	31.0	37.7	43.0	49.6	49.0	44.0	36.6	28.0	24.1	34.3
	Mean	25.7	30.4	33.0	40.2	47.9	54.3	63.4	62.0	55.9	45.9	34.6	29.6	43.6
	Highest	54	59	68	81	87	93	103	105	97	82	68	53	105
	Lowest	-23	-14	-4	19	20	29	32	35	27	18	-12	-22	-23
Milton Freewater 4 NW	Av. Max.	40.0	46.3	56.6	65.8	73.8	81.0	89.9	87.0	78.8	65.7	50.2	43.7	64.9
	Av. Min.	25.4	30.1	36.3	41.9	47.7	53.7	58.8	56.9	51.0	42.6	33.7	29.9	42.3
	Mean	32.7	38.2	46.5	53.9	60.8	67.4	74.4	72.0	64.9	54.2	42.0	36.8	53.6
	Highest	68	73	81	90	99	105	109	111	100	88	76	68	111
	Lowest	-17	-17	14	15	25	38	40	43	30	13	-2	-9	-17
Pendleton AP	Av. Max.	39.3	45.4	54.2	63.5	72.1	78.9	89.3	87.3	78.1	64.7	49.4	43.0	63.8
	Av. Min.	25.1	29.4	36.0	40.5	47.1	52.6	57.8	56.5	50.2	42.6	33.1	29.9	41.7
	Mean	32.2	37.4	45.1	52.0	59.6	65.8	73.6	71.9	64.2	53.7	41.3	36.5	52.8
	Highest	67	66	79	89	99	108	110	113	102	86	72	67	113
	Lowest	-22	-18	10	18	25	36	42	41	33	11	-6	-12	-22
Pilot Rock 1 SE	Av. Max.	41.3	47.2	55.6	63.6	72.6	80.7	90.8	88.5	78.2	66.3	51.9	44.1	65.1
	Av. Min.	24.2	28.0	32.6	37.3	43.1	48.5	52.7	51.5	45.8	38.4	30.7	27.5	38.4
	Mean	32.8	37.6	44.1	50.5	57.9	64.6	71.8	70.0	62.0	52.4	41.3	35.8	51.8
	Highest	80	79	79	94	101	108	116	114	103	90	81	77	116
	Lowest	-21	-15	9	17	25	31	36	34	19	12	-15	-21	-21
Ukiah	Av. Max.	34.1	41.1	48.2	58.0	64.7	72.4	84.6	82.8	74.7	64.2	47.3	37.9	59.2
	Av. Min.	12.2	18.0	23.4	28.3	32.7	37.0	39.1	37.1	32.1	28.4	23.0	17.9	27.4
	Mean	23.2	29.6	35.8	43.2	48.7	54.7	61.9	60.0	53.4	46.3	35.2	27.9	43.3
	Highest	56	64	74	84	93	100	106	110	104	91	71	68	110
	Lowest	-46	-54	-17	9	16	22	21	20	8	2	-17	-28	-54
WASCO COUNTY														
Antelope 1 N	Av. Max.	38.6	45.2	51.9	60.7	68.5	75.7	86.5	84.6	77.3	65.0	50.6	43.5	62.3
	Av. Min.	20.6	25.1	28.1	31.9	37.4	43.2	47.6	46.6	42.0	34.9	28.1	25.5	34.3
	Mean	29.6	35.2	40.0	46.3	53.0	59.5	67.1	65.6	59.7	50.0	39.4	34.5	48.3
	Highest	63	68	78	85	93	103	107	109	101	90	76	72	109
	Lowest	-27	-22	7	11	18	25	29	30	20	8	-4	-15	-27
Dufur	Av. Max.	39.7	46.1	54.3	63.4	71.3	77.7	86.3	85.1	78.6	64.8	49.4	42.6	60.0
	Av. Min.	22.8	27.0	31.3	35.1	40.5	45.3	49.0	48.2	44.3	37.6	30.3	27.4	36.6
	Mean	31.3	36.6	42.8	49.3	55.9	61.5	67.7	66.7	61.5	51.2	39.9	35.0	50.0
	Highest	65	69	78	90	99	106	109	109	101	92	75	66	109
	Lowest	-26	-28	9	20	21	30	33	34	28	10	-9	-12	-28
The Dalles	Av. Max.	40.4	47.4	56.5	66.1	73.8	80.2	88.0	87.3	80.5	67.0	51.1	44.6	65.2
	Av. Min.	27.6	31.5	36.3	42.5	48.8	55.0	59.5	58.0	51.8	43.4	35.2	32.8	43.5
	Mean	34.0	39.5	46.4	54.3	61.3	67.6	73.8	72.7	66.2	55.2	43.2	38.7	54.4
	Highest	65	70	81	93	101	110	115	110	107	91	77	74	115
	Lowest	-13	-21	19	29	32	40	44	41	34	22	3	4	-21

TABLE 7--DESIGN RAINFALL INTENSITIES (IN INCHES AND TENTHS)

a. East Slopes of the Cascades

Duration	RETURN PERIODS				
	2-Year	5-Year	10-Year	25-Year	50-Year
30 minutes	0.4	0.5	0.6	0.7	0.8
1 hour	0.5	0.6	0.8	0.9	1.0
3 hours	0.8	1.1	1.5	1.7	2.0
6 hours	1.5	2.0	2.2	2.7	3.1
12 hours	2.0	3.0	3.2	4.0	4.1
24 hours	3.0	3.7	4.0	4.3	5.2

b. Plateau Area

30 minutes	0.3	0.4	0.5	0.6	0.7
1 hour	0.4	0.6	0.7	0.8	0.8
3 hours	0.6	0.8	1.0	1.2	1.4
6 hours	0.8	1.0	1.4	1.5	1.8
12 hours	0.9	1.5	1.8	1.9	2.0
24 hours	1.3	1.6	2.0	2.4	2.6

c. Upper West Slopes of the Blue Mountains

30 minutes	0.3	0.5	0.6	0.6	0.8
1 hour	0.4	0.6	0.8	0.8	1.0
3 hours	0.8	1.0	1.1	1.5	1.6
6 hours	1.0	1.5	2.0	2.1	2.2
12 hours	1.5	2.0	2.2	2.6	3.0
24 hours	2.0	2.5	3.0	3.2	3.4

TABLE 8--AVERAGE MONTHLY AND SEASONAL SNOWFALL (INCHES AND TENTHS)

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
GILLIAM COUNTY													
Arlington					.9	2.0	4.6	2.5	.2	T	T		10.2
Condon			.2	.1	2.0	4.1	9.8	6.2	3.4	1.1	T		26.9
MORROW COUNTY													
Heppner				T	1.0	2.7	6.4	3.9	1.6	.4	T		16.0
Ione 18 S			T	.2	1.0	2.0	6.7	4.8	2.2	.5	T		17.4
SHERMAN COUNTY													
Kent			.2	.2	1.5	5.1	8.2	5.3	3.2	.7			24.4
Moro			.1	T	1.8	4.0	9.7	4.0	1.9	.2			21.7
UMATILLA COUNTY													
Hermiston 2 S					.6	1.7	4.6	2.1	.3	T			9.3
Meacham WB Airport	T		.1	3.6	17.8	28.2	32.8	25.6	25.9	11.7	3.3	.5	149.5
Milton Freewater 4 NW				T	1.2	3.0	5.2	2.4	1.0	T	T		12.8
Pendleton WB Airport				T	1.3	2.7	8.0	4.2	.9	.1	T		17.2
Pilot Rock 1 SE			T	.2	1.3	2.6	7.2	4.4	1.4	.2	T		17.3
Walla Walla 13 ESE				.3	5.3	15.0	19.1	18.2	11.6	.5	T		70.0
WASCO COUNTY													
Antelope 1 N			T	.1	1.4	4.4	8.7	4.6	2.9	.5	.1	T	22.7
Dufur			T	T	1.1	4.1	11.0	4.1	1.4	T	T	T	21.7
Friend 2 W			.2	1.0	4.4	9.2	19.8	10.1	5.4	1.0	T	T	51.1
The Dalles				T	1.1	4.2	12.5	4.2	1.3	T			23.3

TABLE 9a--DALLESPORT, WASHINGTON. MONTHLY AND ANNUAL AVERAGE RELATIVE HUMIDITIES
(IN PERCENT)

TIME (PST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
4 A.M.	86	85	78	73	74	72	69	70	72	84	88	89	78
10 A.M.	83	76	61	49	49	48	45	48	49	64	78	82	61
4 P.M.	79	62	49	39	39	40	33	36	34	52	72	80	51
10 P.M.	85	81	68	61	60	58	51	55	57	75	86	86	69

TABLE 9b--PENDLETON, OREGON. MONTHLY AND ANNUAL AVERAGE RELATIVE HUMIDITIES
(IN PERCENT)

TIME (PST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
4 A.M.	82	80	74	72	71	66	54	55	62	75	81	83	71
10 A.M.	78	71	58	50	47	43	34	37	42	57	72	79	56
4 P.M.	77	66	49	41	38	33	23	26	32	50	71	80	49
10 P.M.	82	78	70	63	59	53	38	42	52	69	79	82	64

TABLE 9c--MEACHAM, OREGON. MONTHLY AND ANNUAL AVERAGE RELATIVE HUMIDITIES
(IN PERCENT)

TIME (PST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
10 A.M.	80	75	71	62	62	56	40	14	48	63	79	82	63
4 P.M.	81	76	71	59	57	54	35	36	44	65	80	84	62

TABLE 10--AVERAGE MONTHLY AND ANNUAL HEATING DEGREE DAYS - BASE 65°F

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
GILLIAM COUNTY													
Arlington	0	0	54	288	690	880	1004	734	589	342	161	18	4760
Condon	37	59	201	496	810	986	1119	865	806	582	400	201	6562
MORROW COUNTY													
Heppner	25	37	165	422	732	896	1026	776	701	510	319	156	5765
SHERMAN COUNTY													
Kent	28	40	171	462	807	989	1113	862	800	576	366	165	6379
Moro	16	28	150	456	795	970	1104	832	741	513	310	135	6050
Wasco	0	12	135	419	756	952	1091	826	673	453	270	90	5677
UMATILLA COUNTY													
Hermiston 2 S	0	0	102	372	744	921	1057	770	617	354	177	39	5153
Meacham WB Airport	78	118	294	592	912	1097	1218	969	992	744	530	321	8562
Milton-Freewater 4 NW	0	0	96	335	690	874	1001	750	574	339	180	48	6505
Pendleton WB Airport	0	0	108	350	711	884	1017	773	617	390	208	63	5121
Pilot Rock 1 SE	0	6	150	391	711	905	998	767	648	435	248	84	5343
Ukiah	118	164	351	580	894	1150	1296	991	905	654	505	309	7917
WASCO COUNTY													
Antelope 1 N	31	43	189	465	768	946	1097	837	775	561	372	177	6261
Dufur	22	31	141	428	753	930	1045	795	688	471	288	126	5718
The Dalles	0	0	63	304	654	815	961	714	577	324	152	27	4591

(Heating Degrees estimated from monthly mean temperatures)

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