

S
105
E55 Unbound issue
NO. 916 Does not circulate
COP. 2



Special Report 916
May 1993

The Climate of Oregon Climate Zone 4 Northern Cascades

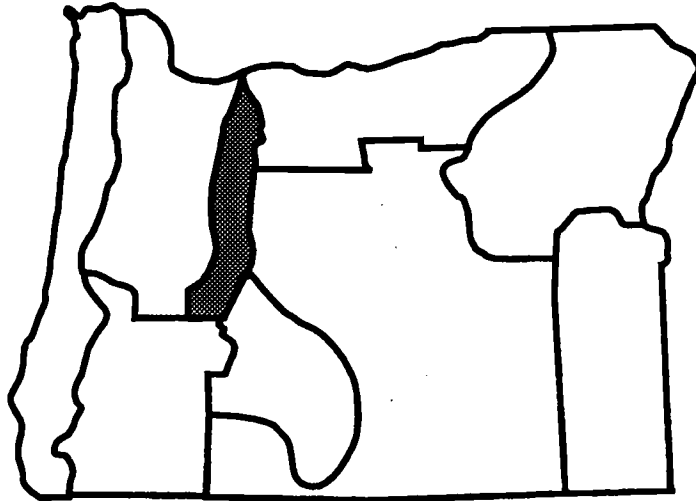
Property of
OREGON STATE UNIVERSITY
Library Serials
Corvallis, OR 97331-4503

Agricultural Experiment Station
Oregon State University

For additional copies of this publication, write:

George Taylor
State Climatologist
Oregon Climate Service
Strand Agriculture Hall 326
Oregon State University
Corvallis, OR 97331-2010

The Climate of Oregon



Climate Zone 4 Northern Cascades

George H. Taylor, State Climatologist
Alexi Bartlett

Oregon Climate Service
Oregon State University
Corvallis, Oregon

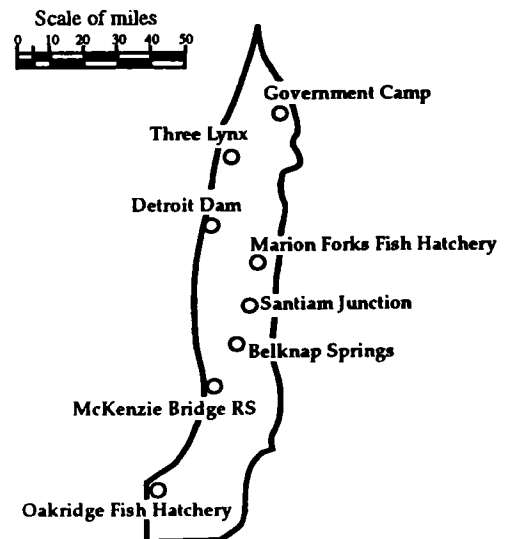
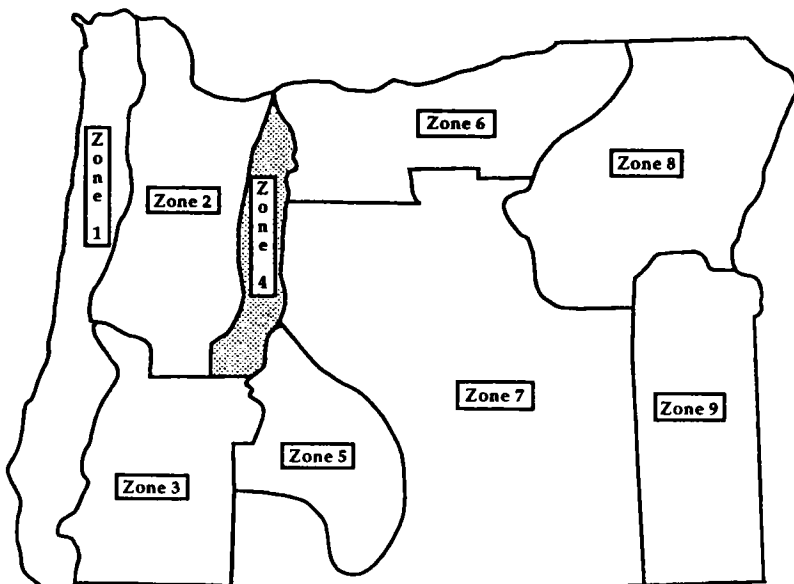
March, 1993

Oregon Climate Zone Summary

Zone 4--Northern Cascades

The Cascade Mountains, the dominant terrain feature in Oregon, encompass the entire length of the state from the California border to Washington. With average elevations in excess of 4,000 feet, the Cascades are crowned with a number of very high peaks. Mount Hood, near the Washington border, exceeds 11,000 feet, while Mt. Jefferson and the Three Sisters exceed 10,000 feet. Mt. McLoughlin near Medford is approximately 9,500 feet. The Cascades are a higher and more imposing topographic feature in the northern part of Oregon, however. Average elevations and the number of tall peaks (over 9,000 feet) are higher north of about 43.5°N latitude. The region extending from this latitude northward to the Columbia River and encompassing high elevations west of the Cascade crest is the fourth of nine Oregon climatic zones.

The northern Cascades exert a profound effect on Oregon climate and weather. Mid-latitude storms approaching from the west are forced to rise as they encounter the Cascades, resulting in large amounts of orographic (terrain-induced) precipitation on the western slopes. So effective are the Cascades in removing moisture from the Pacific air masses, however, that most of Oregon east of the Cascades lies in a "rain shadow," resulting in large areas with annual precipitation less than 12 inches. Most of the northern Cascades, on the other hand, receive an excess of 80 inches per year; the highest peaks collect more than 150 inches per year, most of it in the form of snow. As in the case of rest of western Oregon, most of the precipitation in the Northern Cascades falls during



the winter months with November through March period accounting for more than 75 percent of the total annual precipitation. Spring and fall rain and snow and summer thunderstorms contribute to the annual total, but they are dwarfed by the winter precipitation totals.

Monthly mean snowfall totals vary significantly according to elevation. Since precipitation tends to increase with increasing elevation, more potential moisture for snowfall is available at higher elevations. Since temperatures generally decrease with increasing elevation, those high precipitation amounts are more likely to be in the form of snow. As an example, McKenzie Bridge (elevation 1400 feet) receives an average of about 42 inches snow per year, while Marion Forks (2,500 feet) receives about 150 inches and Government Camp (3,980 feet) about 300 inches per year.

Table 1 lists mean monthly and annual precipitation for Zone 4. Figure 1 is an isopleth map showing estimated annual precipitation for the entire zone. The highest totals, near the Cascade crest, are in excess of 100 inches. Significant variations can be seen at some of the lower elevations, especially in valleys on the lee side of sizable ridges.

Mean monthly temperature data appear in Table 2. The correlation of temperature with elevation is quite strong, with the highest station (Government Camp) having consistently lower temperatures than the other sites. McKenzie Bridge has by far the highest annual mean maximum temperatures, but its annual average temperature is only slightly higher than Detroit Dam due to lower minimum temperatures at McKenzie.

Median dates of the last occurrence in spring and first occurrence in fall of four low temperature thresholds appear in Table 3. Table 4 lists the average growing season in days between those dates. Detroit Dam, at an elevation of 1,220 feet, has an exceptionally long growing season. This is probably due to the fact that its location above the valley floor prevents significant accumulation of cold air on clear nights, and the presence of nearby Detroit Lake serves to moderate any low temperatures. The growing season at higher elevation sites such as McKenzie Bridge, Marion Forks, and Belknap Springs is only about 50 percent as long as at Detroit: for example, Marion Forks at 2,480 feet has an average of only 116 days between occurrences of 32°F temperatures compared with 244 days at Detroit Dam.

**Oregon Climate Zone 4
Northern Cascades**

**Table 1. Monthly and Annual Precipitation (inches)
1961-1990 Means**

Name	Elevation (feet)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Belknap Springs	2150	11.18	9.22	8.02	4.97	3.55	2.29	.90	1.19	2.55	5.80	11.89	12.98	73.39
Detroit Dam	1220	12.79	10.24	9.42	6.39	4.87	3.27	.90	1.61	3.56	6.42	13.21	13.98	87.10
Government Camp	3980	13.65	10.01	8.92	7.15	4.75	3.42	1.13	1.83	3.90	6.13	11.92	14.01	86.03
Marion Forks	2480	10.70	8.24	7.30	4.30	3.31	2.14	.91	1.27	2.40	4.91	10.62	11.40	68.06
McKenzie Bridge	1480	9.88	7.33	7.03	5.02	3.58	2.59	.85	1.36	2.93	5.26	10.01	10.76	67.88
Oakridge	1280	6.49	4.86	4.84	3.62	2.61	1.68	.53	1.18	1.74	3.33	7.18	7.12	45.18
Santiam Junction	3750	7.85	5.89	7.23	4.70	3.51	2.23	1.45	1.60	.74	2.74	11.63	7.98	54.32
Three Lynx	1120	11.37	8.31	7.85	5.36	3.95	2.67	.90	1.33	2.99	5.32	10.58	11.82	72.43

Oregon Climate Service
1993

Oregon Climate Zone 4 Northern Cascades

**Table 2. Monthly Temperatures (°F)
1961-1990 Means**

Station	Code	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Belknap Springs	Mean Maximum	39.2	44.4	49.7	56.7	64.6	73.0	80.6	80.7	74.2	62.3	47.1	38.9	59.4
	Mean Minimum	27.1	29.0	30.6	33.5	38.5	45.0	48.4	48.3	43.6	37.5	32.8	28.4	37.0
	Monthly Mean	33.2	36.7	40.2	45.1	51.6	59.0	64.5	64.5	58.9	49.9	39.9	33.6	48.2
Detroit Dam	Mean Maximum	43.2	47.4	51.7	56.4	63.3	70.3	77.3	77.9	72.2	61.9	49.6	43.6	59.5
	Mean Minimum	32.9	34.4	35.8	38.3	43.4	49.4	53.1	53.9	50.3	44.5	38.8	34.2	42.4
	Monthly Mean	38.1	40.9	43.7	47.4	53.4	59.9	65.2	65.9	61.3	53.2	44.2	38.9	51.0
Government Camp	Mean Maximum	35.4	38.5	40.6	45.2	52.2	60.0	67.7	68.1	62.0	53.4	40.8	36.2	50.0
	Mean Minimum	23.5	25.6	27.1	29.9	34.6	40.9	45.8	46.3	41.9	36.2	29.5	24.7	33.8
	Monthly Mean	29.5	32.1	33.9	37.5	43.4	50.5	56.8	57.2	51.9	44.8	35.1	30.5	41.9
Marion Forks Fish Hatchery	Mean Maximum	38.3	43.5	48.2	54.5	62.9	72.1	79.7	79.4	71.6	60.6	45.4	38.1	57.7
	Mean Minimum	25.8	27.5	29.4	32.3	37.0	43.4	46.1	45.3	39.7	34.5	31.0	26.9	34.8
	Monthly Mean	32.0	35.5	38.8	43.4	50.0	57.8	62.9	62.4	55.6	47.5	38.2	32.5	46.2
McKenzie Bridge	Mean Maximum	42.7	50.3	55.4	62.9	71.7	78.8	85.8	86.2	79.0	64.9	50.4	42.5	66.7
	Mean Minimum	28.3	31.0	32.6	35.3	40.0	45.8	47.8	47.4	42.8	37.5	33.8	30.2	38.7
	Monthly Mean	35.5	40.6	44.0	49.1	55.8	62.3	66.8	66.8	60.9	51.2	42.1	36.4	52.8
Oakridge Fish Hatchery	Mean Maximum	46.3	52.0	56.1	61.3	68.0	75.2	82.1	82.9	77.3	66.7	52.3	45.5	63.8
	Mean Minimum	29.7	31.4	33.5	36.8	41.5	47.2	49.7	49.5	44.5	38.8	34.8	30.7	39.0
	Monthly Mean	38.0	41.7	44.8	49.1	54.8	61.2	65.9	66.2	60.9	52.8	43.6	38.1	51.4
Santiam Junction	Mean Maximum	36.9	39.7	43.5	56.4	60.3	70.8	76.4	76.1	73.0	62.8	44.6	41.5	57.2
	Mean Minimum	21.1	19.7	25.3	30.5	33.8	39.4	42.9	41.6	38.6	32.6	28.7	21.3	31.5
	Monthly Mean	29.0	29.7	34.4	43.4	47.1	55.1	59.7	58.8	55.8	47.7	36.6	31.4	44.3
Three Lynx	Mean Maximum	41.7	46.7	51.9	57.5	64.1	70.8	77.4	78.3	72.7	62.0	48.5	42.0	59.5
	Mean Minimum	30.7	32.4	34.3	37.1	41.8	47.4	50.3	50.4	46.4	40.7	36.1	31.6	40.0
	Monthly Mean	36.2	39.6	43.1	47.3	53.0	59.1	63.9	64.3	59.5	51.3	42.3	36.8	49.7

**Oregon Climate Zone 4
Northern Cascades**

**Table 3. Median Frost Dates
1961-1990 Means**

Station	Median Dates of Last Occurrence in Spring of				Median Dates of First Occurrence in Fall of			
	24° F	28° F	32° F	36° F	24° F	28° F	32° F	36° F
Belknap Springs	1-Mar	20-Apr	12-May	1-Jun	4-Dec	5-Nov	7-Oct	18-Sep
Detroit Dam	25-Jan	5-Feb	30-Mar	5-May	29-Dec	20-Dec	29-Nov	1-Nov
Government Camp	12-Mar	19-Apr	13-May	1-Jun	24-Nov	5-Nov	11-Oct	22-Sep
Marion Forks Fish Hat.	16-Mar	29-Apr	25-May	13-Jun	27-Nov	14-Oct	17-Sep	2-Sep
McKenzie Bridge	14-Mar	25-Apr	20-May	8-Jun	23-Nov	19-Oct	23-Sep	6-Sep
Three Lynx	30-Jan	2-Mar	16-Apr	15-May	25-Dec	6-Dec	24-Oct	9-Oct

**Table 4. Growing Season
1961-1990 Means**

Station	Average Days Between Occurrences of			
	24° F	28° F	32° F	36° F
Belknap Springs	278	199	148	109
Detroit Dam	340	319	244	181
Government Camp	256	200	151	113
Marion Forks Fish Hat.	256	169	116	81
McKenzie Bridge	255	177	126	90
Three Lynx	330	279	191	147

Oregon Climate Service
1993