1997 WEATHER REPORT

Erik B. G. Feibert and Clint C. Shock
Malheur Experiment Station
Oregon State University
Ontario, Oregon

Introduction And Methods

Daily observations of air temperature and precipitation have been recorded at the Malheur Experiment Station since July 20, 1942. Installation of additional equipment in 1948 allowed for evaporation and wind measurements. Evaporation is measured as inches of water evaporated from a standard 10-inch deep by 47.5-inch diameter pan over 24 hours. Wind run is measured as total wind movement in miles over a 24 hour period measured at 24 inches above ground level. A soil thermometer at 4-inch depth was added in 1967. A biophenometer, to monitor degree days, and pyranometers, to monitor solar and photosynthetically active radiation, were added in 1985.

Since 1962, daily readings from the station have been reported to the U.S. Department of Commerce, Environmental Science Service Administration, and the National Weather Service. Each day the 8 AM air temperature, preceding 24-hour air and soil temperature extremes, and 24-hour accumulated precipitation are recorded and were transmitted to radio station KSRV in Ontario. KSRV then conveyed this information, along with their own daily readings, to the U.S. Weather Station in Boise, Idaho. During the irrigation season (April -October), evaporation, wind, and water temperature are also monitored and reported.

On June 1, 1992, in cooperation with the U.S. Bureau of Reclamation, a fully automated weather station, connected by satellite to the Northwest Cooperative Agricultural Weather Network (AgriMet) computer in Boise, Idaho, began transmitting data from Malheur Experiment Station. The automated station monitors air temperature, relative humidity, dew point temperature, precipitation, wind run, wind speed, wind direction, solar radiation, and soil temperature at 8-inch and 20-inch depths. Stored data is transmitted via satellite to the Boise computer every 4 hours and is used to calculate daily Malheur County crop water-use estimates. The database may be accessed via computer modem or through the Internet (http://www.pn.usbr.gov/agrimet).

In July 1997, the daily weather data started being reported directly to the National Weather Service computer via phone. In June 1997, the daily weather data and the monthly weather summaries started being posted on the Malheur Experiment Station web site on the Internet (http://www.primenet.com/mesosu). On October 17, 1997, sod was layed around and under the weather stations. The sod will be irrigated with

subsurface drip irrigation. The ground around and under the weather stations prior to October 17, 1997, was bare.

1997 Weather

The most unusual weather events in 1997 were a tornado and a microburst. The tornado occurred on April 30 at approximately 11 AM and went through the station, but did not hit any buildings on the station. A minisprinkler system with risers attached to metal stakes that was being used to germinate an onion field was torn apart. Some of the risers with metal stakes were thrown into an adjacent field about 150 feet away. The tornado then proceeded into Ontario causing damage to some buildings. The microburst occurred on June 17 near Nyssa and Adrian, Oregon and caused extensive crop damage.

The weather in 1996 did not exceed any record weather events recorded over the 54-year history for the Malheur Experiment Station (Table 1). Total precipitation was 9.45 inches for the year, close to the 10-year and 54-year station averages (Table 2). Total snowfall for 1996 was 5.8 inches, 29 and 30 percent below the 10-year and 54-year means, respectively (Table 3).

Mean monthly maximum air temperatures were close to the 10-year and 54-year means (Table 4). The monthly total accumulated growing degree days (50-86 °F) was slightly higher than the 10-year mean (Table 5, Figure 1). The monthly total number of degree days in the 86-104 °F range was close to the 8-year average (Table 6). The mean monthly maximum and minimum 4-inch soil temperatures were close to the 10- year and 54-year means (Table 7).

Total pan-evaporation for April through October was 59.8 inches, close to the 10-year mean and above the 48-year mean (Table 8).

The last spring frost (≤32 °F) occurred on May 3, seven days later than the 20-year mean date of April 26; the first fall frost occurred on October 8, four days later than normal (Table 9).
The monthly wind-run totals for the months of April through October were higher than the 49-year mean (Table 10).

Table 1. Record weather events at the Malheur Experiment Station, Oregon State University, Ontario, Oregon.

Record event	Measurement	Date
Greatest annual precipitation	16.87 in	1,983
Greatest 24-hour precipitation	1.52 in	Sep 14, 1959
Greatest annual snowfall	40 in	1,955
Greatest 24-hour snowfall	10 in	Nov 30, 1975
Earliest snowfall	1 in	Oct 25, 1970
Highest air temperature	108 °F	Aug 4, 1961

Table 2. Annual precipitation. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1986-1997.

1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	10-yr mean	54-yr mean
---------- inches ----------													
8.64	9.81	7.58	9.15	7.21	9.25	8.64	13.3	10.05	14.01	12.69	9.45	9.76	10.24

Table 3. Annual snowfall totals at the Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1986-1997.

1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	10-yr mean	54-yr mean
---------- inches ----------													
13	15.5	34.8	25.1	5.7	7.5	15.5	36	32	15	14.5	5.8	20.01	19.62

Table 4. Monthly air temperature. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1997.

	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
	Daily																							
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
	°F																							
Max.	58	41	56	32	79	45	76	48	92	59	90	57	102	65	101	59	94	60	94	45	64	39	48	33
Min.	27	6	32	19	45	22	50	19	58	26	71	42	72	44	84	46	67	35	50	21	39	16	30	18
1997 mean	40	22	46	25	59	29	63	34	78	45	82	51	88	55	91	53	82	47	66	33	52	27	38	23
10-yr mean	35	20	43	23	56	31	65	38	74	46	82	53	90	57	89	54	81	46	67	35	47	27	38	20
53-yr mean	35	19	43	25	55	31	64	37	74	45	82	52	91	57	90	55	80	46	65	36	48	28	37	22

Table 5. Cumulative monthly growing degree-days (50-86 °F). Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1988-1997.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,988	0	5	56	236	554	1,139	2,050	2,741	3,117	3,426	3,446	3,446
1,989	0	0	13	197	469	1,018	1,751	2,332	2,721	2,838	2,852	2,852
1,990	2	9	88	327	588	1,085	1,819	2,454	3,039	3,077	3,077	3,077
1,991	0	13	29	153	365	754	1,530	2,248	2,684	2,878	2,879	2,879
1,992	0	13	119	321	803	1,377	2,016	2,720	3,105	3,279	3,283	3,283
1,993	0	0	23	104	527	885	1,349	1,873	2,281	2,533	2,539	2,539
1,994	0	2	94	283	652	1,175	1,969	2,743	3,252	3,396	3,398	3,398
1,995	0	29	61	167	460	893	1,573	2,161	2,633	2,734	2,737	2,747
1,996	0	5	58	193	436	929	1,687	2,345	2,709	2,903	2,921	2,923
1,997	4	4	85	202	621	1,130	1,791	2,497	2,977	3,134	3,154	3,154
Mean	1	8	63	218	548	1,034	1,754	2,411	2,852	3,020	3,029	3,030

Table 6. Monthly degree-days (86-104 °F). Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1990-1997

Year	Apr	May	Jun	Jul	Aug	Sep	Oct
1,990	0	0	13	56	41	14	0
1,991	0	0	2	41	36	4	0
1,992	0	5	20	23	54	2	0
1,993	0	4	4	2	11	5	0
1,994	0	2	16	68	54	7	0
1,995	0	0	4	23	22	7	0
1,996	0	0	5	54	32	4	0
1,997	0	4	0	27	31	5	0
mean	0	2	8	37	35	6	0

Table 7. Monthly 4 inch soil temperature. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1997.

	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
	Daily																							
	High	low	High	low	High	low	High	low	High	low	High	low	High	low	High	low	High	low	High	low	High	low	High	low
	°F																							
Max.	47	44	50	40	65	51	75	56	89	71	90	73	95	80	95	80	85	77	72	67	53	53	47	45
Min.	31	29	32	32	39	35	53	41	59	47	72	61	62	61	80	72	67	62	52	51	45	44	37	37
1997 mean	35	34	38	33	52	41	62	47	71	56	85	67	92	75	89	72	77	62	63	52	48	40	36	34
10-yr mean	33	32	39	35	51	42	62	50	73	59	81	67	89	74	87	74	78	66	63	53	45	40	35	33
31-yr mean	33	32	38	34	51	41	62	48	74	58	82	67	90	75	88	74	77	64	61	51	44	39	34	33

Table 8. Pan-evaporation totals. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1997.

Totals	April	May	Jun	Jul	Aug	Sep	Oct	Total
Daily	inches							
Mean	0.21	0.28	0.35	0.36	0.35	0.24	0.17	
Max.	0.35	0.5	0.47	0.55	0.55	0.39	0.46	
Min.	0.01	0.07	0.16	0.06	0.18	0.09	0.04	
Annual	inches							
1997	6.17	8.66	10.43	11.06	10.82	7.32	5.38	59.84
10-yr mean	6.1	9.01	9.81	11.83	10.42	7.59	4.36	59.12
48-yr mean	5.54	7.6	8.8	11.1	9.5	6.19	3.09	51.15

Table 9. Last and first frost (≤32 °F) dates and number of frost-free days. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1976-1997.

Year	Date of last frost	Date of first frost	Total number of frost-free days
	Spring	Fall	
1,976	Apr 23	Oct 5	165
1,977	Apr 20	Sep 22	155
1,978	Apr 23	Oct 14	174
1,979	Mar 20	Oct 27	221
1,980	Apr 13	Oct 17	187
1,981	Apr 14	Oct 1	170
1,982	May 5	Oct 5	153
1,983	Apr 27	Sep 20	146
1,984	May 7	Sep 25	141
1,985	May 13	Sep 30	140
1,986	May 23	Oct 12	142
1,987	Apr 21	Oct 11	173
1,988	May 2	Oct 30	181
1,989	May 19	Sep 13	117
1,990	May 8	Oct 7	152
1,991	Apr 30	Oct 4	157
1,992	Apr 24	Sep 14	143
1,993	Apr 20	Oct 11	174
1,994	Apr 15	Oct 6	174
1,995	Apr 16	Sep 22	159
1,996	May 6	Sep 23	139
1,997	May 3	Oct 8	158
Mean	April 26	October 4	161

Table 10. Daily wind-run totals and monthly totals, Malheur Experiment Station, Oregon State University, Ontario, OR, 1997.

Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily	---------- miles ----------											
Max.	278	180	168	226	172	145	118	105	127	231	88	163
Min.	24	15	30	38	14	33	30	27	25	18	22	12
Mean	58	64	81	99	64	78	61	54	60	86	50	53
Annual	---------- miles ----------											
1,997	1,787	1,792	2,513	2,970	1,981	2,331	1,877	1,686	1,808	2,668	1,491	1,594
10-yr mean				2,247	2,369	1,983	1,774	1,597	1,562	1,660		
49-yr mean				2,110	1,891	1,531	1,449	1,291	1,228	1,252		