



**NOAA Technical Memorandum NWS WR-213**

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**IDAHO ZONE PREFORMAT, TEMPERATURE GUIDANCE,  
AND VERIFICATION**

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**July 1991**

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**U.S. DEPARTMENT OF  
COMMERCE**

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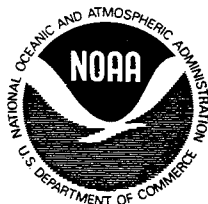
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*July 1991*

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# IDAHO ZONE PREFORMAT, TEMPERATURE GUIDANCE, AND VERIFICATION

## I. INTRODUCTION

A suite of AFOS application programs was developed to provide temperature guidance for remote zone locations, save forecaster preparation time, and generate verification statistics for the Idaho zone forecasts. They also provide winter and summer temperature guidance for 30 zone sites based on the LFM or NGM MOS guidance or the forecaster's own input. Verification of the temperature guidance is presented along with examples of the output of station and individual forecaster verification for temperature and precipitation. For the first time and in a rapid fashion, a WSFO Boise forecaster can view his temperature verification for 29 zone sites and precipitation verification for 10 of these sites at an AFOS ADM.

By keeping a history of his or her performance, a forecaster can examine weak spots and work to improve on them. The verification also produces a staff history of temperature and precipitation forecast performance for presentation to our users. This output is in a monthly and sliding year format.

## II. IDAHO ZONE PREFORMAT

Figure 1 shows an example of a portion of an Idaho zone preformat. WATCHDOG triggers an application program that produces this format twice a day: It generates an early morning zone preformat based on the 00Z LFM MOS guidance and a late afternoon zone preformat based on the 12Z LFM MOS guidance. The LFM MOS guidance is used from the following key stations: Boise, Lewiston, Spokane, Kalispell, Missoula, Pocatello, and Burley. Values of maximum/minimum temperature, wind speed and direction, and cloud cover are extracted from the first six sites for the first three forecast periods.

Maximum/minimum temperatures are extracted for Burley from AFOS key CCCFTPWR. The preformat program then produces maximum and minimum forecast temperatures for 30 zone sites throughout Idaho. The forecaster can choose the NGM MOS guidance by manually running a separate program from AFOS ADM, or input his own numbers and then re-running the program.

The preformat is set up with all the proper dates, times, generic codes, days of week, and spot forecast sites and temperature forecasts. All the forecaster needs to do is to supply the forecast narrative, probability of precipitation forecasts, and any temperature forecast changes. The preformat program also automatically changes from Mountain/Pacific standard time to Mountain/Pacific daylight time and vice versa. (Northern Idaho is on Pacific time and southern Idaho is on Mountain time.)

## III. TEMPERATURE GUIDANCE

The creation of the maximum/minimum equations was done in the following manner. Each of the zone spots was correlated to one or more of the above key (MOS guidance) stations. This pairing was usually based on the proximity of the zone site to one of the key stations. Then **actual** observed values of maximum and minimum temperatures were correlated to the **actual** observed values of maximum and minimum temperature at the key station. Data used were from April/May 1986 and September/October 1986. Attention was given to different cloud cover and wind regimes obtained from the daily weather maps for these periods. In most cases the

temperature differences fell into various groups based on differences of elevation, wind direction and speed, and cloud cover. An equation was written to try to account for the majority of weather situations. Finally, a bit of empiricism, based on the author's 15 plus years of forecasting and observing weather in Idaho, was included where it was felt necessary. No change was made to the LFM MOS guidance temperatures for Boise, Pocatello, Burley, and Lewiston.

Caldwell, a city about 25 miles west of Boise, will be used as an example of how the temperature equations were constructed. The maximum temperature equation for Caldwell is:

$$\text{Caldwell} = \underset{1}{\text{BOI}} + \underset{2}{(3 \times \text{T})} + \underset{3}{(2 \times \text{W})} - \underset{4}{(3 \times \text{C} \times \text{T})}$$

T = Time of Year  
W = Wind  
C = Clouds

Term one is Caldwell's key station -- in this case the MOS maximum temperature forecast at Boise. Term two is a location/elevation correction term modified by the time of year which, in this case, is a cosine function. Using a cosine function virtually eliminates this term in winter and adds three degrees in the summer. Some equations use a sine function which has the opposite effect. Term three takes the wind into account. It is negative for wind directions of 50 degrees to 240 degrees and positive for wind directions of 250 to 40 degrees. Three constants are used for different wind speeds: Zero for 3 knots or less, .7 for 4 to 8 knots, and 1.5 for 9 knots or more. Term four is for cloud cover. It employs four constants: Zero for clear, .2 for scattered clouds, .5 for broken, and .8 for overcast. For this equation, this term contains a time of year correction which operates in the same manner as in term two.

All the maximum and minimum equations operate in the same manner, e.g., all use different combinations of location/elevation, time of year, wind, and cloud cover terms. Again, an effort was made to account for the majority of weather situations. By examining the list of equations in Appendix IV, the Boise public service forecaster can easily ascertain the majority and hence become aware of the minority.

The author wishes to emphasize that the guidance for the temperature forecasts is totally objective. The LFM MOS guidance is read from AFOS, the maximums and minimums computed from the derived equations, and the zone preformat with guidance temperatures is set up for ready use by the public service forecaster. The forecaster can make a printout of the temperature guidance (Fig. 2), make needed adjustments, and type in the changes as he finalizes the zones.

If, however, the forecaster felt the LFM Guidance of temperature, wind, or cloud cover was poor, the extracted LFM MOS data in AFOS can be edited, then manually rerun the program to produce a new zone preformat with new guidance temperatures. Figure 3 shows an example of the extracted LFM Guidance which the forecaster can either accept or edit as he/she chooses.

As stated earlier, the forecaster may also substitute the NGM MOS forecast guidance by running another quick program. Therefore, the forecaster has the choice of using the LFM MOS, NGM MOS, or his/her own numbers as initial guidance.

A set of cold season equations for selected sites was developed in the same manner as described above. These equations take into account snow cover at higher elevations and the frequent tendency of trapped, cold air at lower elevations. Observational data from

December and January were used for these equations which only began in the winter of 1988-89. These equations automatically run between November 15 and February 20. A list of the summer and winter equations is in Appendix IV.

#### **IV. VERIFICATION OF TEMPERATURE GUIDANCE**

During the years 1987 through 1989, one temperature guidance forecast per day, on most days, was verified. This was either a 00Z or 12Z LFM guidance forecast. Verification was run for the first two forecast periods. Hence, the maximum and minimum temperature errors contain data from both periods. A cold bias resulted for each station for each month. Remember, these forecast numbers were not adjusted by the forecaster before being verified. It was assumed that the LFM MOS forecast of cloud cover, wind direction and speed, and temperature were acceptable. Of course, we all know this is not always the case. This is why the forecaster is allowed to change the input. Most of the time forecaster modifications should improve the forecast errors. Appendix I contains yearly tables of maximum and minimum forecast errors and the cold bias. Appendix II displays graphics of the maximum/minimum temperature errors for the 30 forecast sites.

#### **V. PERFORMANCE OF TEMPERATURE GUIDANCE**

Overall, the temperature guidance does a commendable job from March through October. There is some difficulty at the mountain stations where frequently clouds or precipitation remain after the valley stations clear out. Also, some stations correlate better with their key stations than others based on their proximity to the key station and similar geography. The quality of the guidance at each location is readily discerned from the graphics. In addition, the forecaster can

often improve the forecast if he/she is aware of the cold biases in the more difficult locations.

This technique is least accurate in the winter months. There are simply too many variables to cover by this process. This is why a cautionary note is attached to the temperature guidance printout (Fig. 2). In addition, sometimes MOS guidance is poor. In December 1988, the LFM MOS minimum temperature error at Pocatello averaged over five degrees. The same occurred with the Boise maximums in December 1989. With this poor start, it is difficult to expect a better performance elsewhere. But again, if the forecaster successfully adjusts the MOS input, then the equations in most instances will perform better at the neighboring sites.

Appendix III contains graphics of the guidance performance which show the percentage of forecasts which were within five degrees of the observed value. This clearly shows that at most sites the forecaster can have confidence in the system from the spring through early autumn months. The guidance needs to be scrutinized more carefully in the winter.

#### **VI. FORECASTER VERIFICATION**

A suite of programs resides on the WSFO Boise AFOS computer that automatically computes the zone verification for temperature and precipitation. This results in a large reduction of human number crunching time and allowed an expansion to include all 29 temperature sites. They produce monthly temperature verification (mean absolute error) for each forecaster and for each of the 29 forecast stations for three forecast periods (Fig. 4). The stations are broken down into the perennial 10 (the 10 sites verified since the birth of WSFO Boise for historical purposes) and into the other 19. Three period precipitation verification is for



every forecaster and 10 stations. It includes frequency of precipitation, probability of detection, threat score, false alarm, percent correct, and bias (Fig. 5). One program prints out an accumulation of results on a sliding year basis in the same format as Figs. 4 and 5. The observed temperature and precipitation data are quality controlled every day by the evening public service forecaster. This takes an average of three to five minutes. The verification data are computed and tabulated by AFOS also on a daily basis. Hence, a forecaster can have fairly rapid feedback on his forecast within a day or two. As an educational tool, the forecaster can also keep a record of his/her performance on a daily, weekly, monthly, sliding year, or warm/cool season basis. An example of this is shown in Figs. 6A and 6B.

## VII. CONCLUSION

The creation of an Idaho zone preformat and guidance temperatures is similar to programs at other Western Region WSFOs. It results in an obvious time savings. The verification of this guidance exhibits a commendable performance in the spring through autumn months. It also provides a measure of confidence in the guidance. It is most useful on severe weather days when the forecaster has little time to manually forecast all the maximum and minimum temperatures. The verification of all 29 zone spot forecast sites enables the forecaster to chart his/her own performance, and for the first time, to evaluate his/her skill at each site under different weather situations. Using this verification as an educational tool can only improve each forecaster's service to the people of Idaho.

## VIII. FURTHER EXPANSION

Expansion of this project is already on the drawing board. It will reside in three areas:

1. Improve the guidance equations through the use of the computed cold bias. Current thinking is to add a cold bias correction for each month based on the 1987-1989 verification.
2. Since current planning is for the termination of LFM MOS guidance in the fall of 1991 and an expansion of NGM MOS guidance sites, many equations will be rederived to take advantage of this wider NGM MOS coverage.
3. Write a program to compute each forecaster's temperature bias at each of the 29 verification sites for the warm and cold seasons. This added analysis should help many forecasters adjust their thinking, especially at places where he or she has not done so well in the past. Precipitation biases are already computed.

## IX. ACKNOWLEDGEMENTS

Foremost, the author wishes to thank the WSFO Boise Weather Service Specialists who daily enter verification temperatures in tandem with the AGCROP data. Thanks to Tom Egger who rewrote the AGCROP program to accommodate this verification scheme along with the AGCROP data, and to Dave Olsen who first introduced this temperature guidance idea to me in the mid-1970's. Finally, thanks to Ken Mielke, Chris Hill, Les Colin, and Ken Parker for their useful suggestions.

NNNN>##<A<  
<ZCZC BOIWRKZN1  
ETTAA00 KBOI 271832

IDAHO ZONE FORECASTS  
NATIONAL WEATHER SERVICE BOISE ID  
100 PM MST WED FEB 27 1991 ... DO NOT USE AFTER 10 PM TODAY.

TEMPERATURES AND PROBABILITIES OF MEASURABLE PRECIPITATION ARE FOR  
TONIGHT...THURSDAY AND THURSDAY NIGHT.

IDZ001-280430-  
TREASURE VALLEY  
400 PM MST WED FEB 27 1991

.TONIGHT...

.THURSDAY...

.THURSDAY NIGHT...

.FRIDAY...

.<  
BOISE 29 47 36 XX/XX/XX EMMETT 28 49 35 CALDWELL 26 45 34  
ONTARIO 20 45 29 XX/XX/XX PARMA 18 45 27 MTN HOME 31 50 29

##

IDZ002-280430-  
MAGIC VALLEY  
100 PM MST WED FEB 27 1991

.TONIGHT...

.THURSDAY...

.THURSDAY NIGHT...

.FRIDAY...

.<  
TWIN FALLS 17 47 29 XX/XX/XX JEROME 21 50 28  
BURLEY 21 50 33 XX/XX/XX RUPERT 20 52 32

##

XX = PoPs to be edited in by the forecaster.

Figure 1 -- Portion of Idaho Zone Preformat.

NNNN>##<A<  
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 ETTAA00 KBOI 271547

IDAHO ZONE TEMP FORECASTS 2/27/1991 15Z

S06	22	37	21	
SPT	25	36	25	
LWS	32	50	28	46
SB0	22	46	26	
MOS	29	45	26	
SMN	26	44	25	
CHA	30	31	33	
STN	12	43	16	
LOW	28	47	21	
MYL	22	45	31	
IDC	10	47	17	
OND	20	45	29	
WEI	18	45	27	
EMT	28	49	35	
PAR	18	45	27	
CAL	26	45	34	
BOI	29	47	36	
MUD	31	50	29	
JER	21	50	28	
TWF	17	47	29	
BYI	21	50	33	
RUP	20	52	32	
HAG	11	50	22	
FAI	16	43	25	
SUN	12	46	19	
PIH	18	45	29	
IDA	18	41	29	
REX	17	40	28	
MLD	11	47	26	
SDA	13	42	28	

CHECK TEMPS-- ESPECIALLY FOR ODDITIES SUCH AS SNOW COVER,  
 INVERSIONS, FOG, PCPN ETC.

Figure 2 -- Summary of Guidance Forecast Temperatures

NNNN>##<A<

<ZCZC BOIWRKZNS

ETTAA00 KBOI DDHHMM

MOS DATA FOR IDAHO ZONES 2/27/1991 15Z

	PD 1	PD 2	PD 3		
BOI	29	47	36	TEMPERATURE	
	1	2	4	CLOUD COVER	
	120	120	130	WIND DIRECTION	
	11	7	10	WIND SPEED	
FCA	26	37	17	TEMPERATURE	
	3	3	4	CLOUD COVER	
	30	30	30	WIND DIRECTION	
	11	25	27	WIND SPEED	
GEG	28	39	25	TEMPERATURE	
	1	3	4	CLOUD COVER	
	210	220	100	WIND DIRECTION	
	6	12	15	WIND SPEED	
LWS	32	50	28	46	TEMPERATURE
	1	3	4	CLOUD COVER	
	150	300	150	WIND DIRECTION	
	2	6	10	WIND SPEED	
MSO	23	40	22	TEMPERATURE	
	2	3	4	CLOUD COVER	
	150	70	100	WIND DIRECTION	
	4	15	19	WIND SPEED	
PIH	18	45	29	TEMPERATURE	
	1	2	4	CLOUD COVER	
	190	220	200	WIND DIRECTION	
	9	13	11	WIND SPEED	
BYI	21	50	33	TEMPERATURE	

Figure 3 -- Summary of MOS guidance for use in the forecast equations.  
The forecaster may change any of these numbers.

(mean absolute error)  
 WSFO BOISE ZONE TEMPERATURE VERIFICATION

MARCH 1991 INDIVIDUAL FORECASTERS

MET	ALL ZONE SPOTS						PERENNIAL TEN						THE OTHER NINETEEN							
	1ST PD	2ND PD	3RD PD	ALL PDS	1ST PD	2ND PD	3RD PD	ALL PDS	1ST PD	2ND PD	3RD PD	ALL PDS	1ST PD	2ND PD	3RD PD	ALL PDS				
1	3.39	225.	4.83	229.	4.23	227.	4.16	681.	3.10	80.	4.86	80.	3.99	80.	3.54	145.	4.82	149.	4.37	147.
2	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
3	3.95	200.	3.63	201.	4.00	200.	3.86	601.	3.96	70.	3.80	70.	3.56	70.	3.95	130.	3.53	131.	4.24	130.
4	3.96	28.	3.07	29.	2.62	29.	3.21	86.	3.60	10.	3.80	10.	2.30	10.	4.17	18.	2.68	19.	2.79	19.
5	3.29	170.	2.99	172.	4.13	171.	3.47	513.	3.32	60.	3.12	59.	4.29	59.	3.27	110.	2.93	113.	4.04	112.
6	3.78	172.	4.24	172.	3.25	172.	3.76	516.	3.90	60.	3.65	60.	3.68	60.	3.71	112.	4.56	112.	3.02	112.
7	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
8	3.53	230.	4.06	226.	4.13	228.	3.90	684.	3.77	80.	4.09	80.	4.40	80.	3.41	150.	4.04	146.	3.98	148.
9	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
10	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
11	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
12	3.42	57.	3.84	57.	4.54	57.	3.94	171.	4.15	20.	5.00	20.	4.95	20.	3.03	37.	3.22	37.	4.32	37.
13	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
14	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
15	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
16	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
17	3.85	400.	3.94	397.	4.67	397.	4.15	1194.	3.61	139.	4.01	140.	4.64	138.	3.97	261.	3.91	257.	4.69	259.
18	3.56	288.	3.54	285.	3.83	286.	3.64	859.	3.63	100.	3.32	99.	3.95	100.	3.52	188.	3.65	186.	3.76	186.
19	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
20	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
21	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
22	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
23	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
24	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
25	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
26	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
27	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.	0.00	0.
28	3.68	1371.	3.96	1367.	4.19	1367.	3.94	4105.	3.61	479.	3.99	479.	4.14	478.	3.71	892.	3.95	888.	4.22	889.
29	3.52	399.	3.65	401.	3.81	400.	3.66	1200.	3.69	140.	3.62	139.	4.12	139.	3.43	259.	3.67	262.	3.64	261.
30	3.64	1770.	3.89	1768.	4.10	1767.	3.88	5305.	3.63	619.	3.90	618.	4.13	617.	3.65	1151.	3.88	1150.	4.09	1150.

28=LEADS 29=OTHERS 30=STAFF

EACH ZONE SPOT ALL FORECASTERS

SITE	1ST PD	2ND PD	3RD PD	ALL PDS	SITE	1ST PD	2ND PD	3RD PD	ALL PDS											
*BOI	3.21	62.	3.50	62.	3.79	62.	3.50	186.	EMM	3.23	62.	3.37	62.	3.76	62.	3.45	186.			
CAL	2.76	59.	3.51	59.	3.46	59.	3.24	177.	ONO	3.27	62.	3.76	62.	4.08	62.	3.70	186.			
PAR	3.78	60.	3.68	60.	3.83	60.	3.77	180.	MUO	3.15	62.	2.89	61.	3.00	62.	3.01	185.			
TWF	3.87	60.	3.62	60.	3.95	60.	3.81	180.	JER	3.21	62.	3.44	62.	3.61	62.	3.42	186.			
*BYI	3.32	62.	3.34	62.	3.56	62.	3.41	186.	RUP	3.15	62.	3.56	62.	3.92	62.	3.54	186.			
IDC	3.12	59.	3.34	59.	3.68	59.	3.38	177.	MYL	3.79	62.	5.23	62.	4.68	62.	4.56	186.			
FAI	4.21	57.	3.95	57.	3.89	57.	4.02	171.	SUN	5.34	62.	5.52	62.	6.34	62.	5.73	186.			
*IDA	3.55	62.	4.00	62.	4.21	62.	3.92	186.	REX	4.28	60.	4.63	60.	4.28	60.	4.40	180.			
*PIH	3.44	62.	4.19	62.	4.13	62.	3.92	186.	*HLD	3.95	62.	4.05	62.	4.74	62.	4.25	186.			
SDA	3.95	57.	4.63	57.	4.32	57.	4.30	171.	*SMN	3.73	62.	4.02	62.	4.19	62.	3.98	186.			
CHA	3.16	62.	3.15	62.	4.26	62.	3.52	186.	STN	4.72	61.	5.59	61.	6.17	60.	5.49	182.			
*SS0	3.97	62.	4.05	62.	4.02	62.	4.01	186.	*LOW	4.57	61.	4.73	60.	5.20	59.	4.83	180.			
*LMS	2.61	62.	2.73	62.	3.08	62.	2.81	186.	NOS	3.54	61.	3.49	61.	3.67	61.	3.57	183.			
SPT	3.63	59.	3.22	59.	3.20	59.	3.35	177.	*S06	3.92	62.	4.47	62.	4.47	62.	4.28	186.			
COE	3.24	62.	3.24	62.	3.53	62.	3.34	186.	*PIH	3.44	62.	4.19	62.	4.13	62.	3.92	186.			
STOP																				

Figure 4 -- Example of monthly temperature verification for each WSFO Boise forecaster and staff performance at each zone site. (Reduction of dasher copy) (MAE/# forecasts verified)

WSFO BOISE ZONE PRECIPITATION VERIFICATION

MARCH 1991 INDIVIDUAL FORECASTERS

ALL ZONE SPOTS

MET	1ST PERIOD						2ND PERIOD						3RD PERIOD						NO.	FCSTS
	FQCY	POD	THRT	FALM	% COR	BIAS	FQCY	POD	THRT	FALM	% COR	BIAS	FQCY	POD	THRT	FALM	% COR	BIAS		
1	0.36	0.62	0.40	0.47	66.25	1.17	0.37	0.53	0.36	0.47	65.00	1.00	0.23	0.00	0.00	1.00	76.25	0.06	80.	
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
3	0.09	0.67	0.17	0.81	72.86	3.50	0.31	0.55	0.36	0.48	70.00	1.05	0.10	0.57	0.20	0.76	77.14	2.43	70.	
4	0.00	0.00	0.00	1.00	100.00	9.99	0.20	0.00	0.00	1.00	80.00	0.00	0.30	0.00	0.00	1.00	70.00	0.00	10.	
5	0.17	0.70	0.32	0.63	75.00	1.90	0.08	1.00	0.29	0.71	80.00	3.40	0.18	0.27	0.12	0.83	61.67	1.64	60.	
6	0.35	0.62	0.48	0.32	76.67	0.90	0.18	0.55	0.26	0.67	71.67	1.64	0.13	0.25	0.14	0.75	80.00	1.00	60.	
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
8	0.23	0.67	0.43	0.45	80.00	1.22	0.30	0.96	0.74	0.23	90.00	1.25	0.29	0.61	0.45	0.36	79.75	0.96	80.	
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
12	0.05	0.00	0.00	1.00	95.00	0.00	0.20	1.00	0.80	0.20	95.00	1.25	0.20	1.00	0.40	0.60	70.00	2.50	20.	
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
17	0.32	0.67	0.54	0.27	81.43	0.91	0.22	0.71	0.46	0.44	81.29	1.26	0.37	0.63	0.52	0.25	78.57	0.85	140.	
18	0.25	0.52	0.36	0.46	76.77	0.96	0.19	0.63	0.40	0.48	82.00	1.21	0.16	0.56	0.36	0.50	84.00	1.12	99.	
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	
28	0.26	0.63	0.41	0.46	76.83	1.15	0.27	0.66	0.45	0.41	78.50	1.13	0.25	0.50	0.37	0.41	78.96	0.86	479.	
29	0.23	0.62	0.40	0.47	78.57	1.19	0.14	0.75	0.33	0.62	78.57	2.00	0.16	0.39	0.18	0.75	70.71	1.57	140.	
30	0.25	0.63	0.41	0.46	77.22	1.16	0.24	0.68	0.43	0.46	78.51	1.25	0.23	0.49	0.33	0.50	77.10	0.97	619.	

28=LEADS 29=OTHERS 30=STAFF

EACH ZONE SPOT ALL FORECASTERS

SITE	FQCY	POD	THRT	FALM	% COR	BIAS	FQCY	POD	THRT	FALM	% COR	BIAS	FQCY	POD	THRT	FALM	% COR	BIAS	NO.	FCSTS
BOI	0.21	0.85	0.55	0.39	85.48	1.38	0.19	0.67	0.38	0.53	79.03	1.42	0.18	0.73	0.42	0.50	82.26	1.45	62.	
BYI	0.16	0.60	0.32	0.60	79.03	1.50	0.15	0.89	0.42	0.56	82.26	2.00	0.13	0.50	0.24	0.69	79.03	1.62	62.	
IDA	0.19	0.50	0.30	0.57	77.42	1.17	0.18	0.64	0.33	0.59	77.42	1.55	0.16	0.50	0.28	0.62	79.03	1.30	62.	
MLD	0.21	0.54	0.30	0.59	74.19	1.31	0.21	0.77	0.45	0.47	80.65	1.46	0.19	0.50	0.33	0.50	80.65	1.00	62.	
SMN	0.21	0.54	0.29	0.61	72.58	1.38	0.21	0.77	0.50	0.41	83.87	1.31	0.19	0.42	0.23	0.67	72.58	1.25	62.	
S80	0.26	0.75	0.50	0.40	80.33	1.25	0.25	0.73	0.44	0.48	77.05	1.40	0.26	0.44	0.29	0.53	72.58	0.94	61.	
P69	0.34	0.62	0.42	0.43	70.97	1.10	0.34	0.71	0.52	0.35	77.42	1.10	0.35	0.45	0.37	0.33	72.58	0.68	62.	
LWS	0.24	0.60	0.45	0.36	82.26	0.93	0.23	0.50	0.35	0.46	79.03	0.93	0.21	0.38	0.29	0.44	80.65	0.69	62.	
S86	0.47	0.66	0.53	0.27	72.58	0.90	0.45	0.57	0.48	0.24	72.58	0.75	0.44	0.48	0.41	0.28	69.35	0.67	62.	
PIH	0.21	0.54	0.33	0.53	77.42	1.15	0.19	0.67	0.35	0.58	75.81	1.58	0.18	0.55	0.35	0.50	82.26	1.09	62.	

STOP K  
Figure 5 -- Example of monthly precipitation verification for each WSFO Boise forecaster and staff performance at ten zone sites. (Reduction of dasher copy)

NNNN>##<A<  
 <ZCZC BOIWRKVER  
 ETAA00 KBOI 071911

WSFO BOISE ZONE TEMPERATURE VERIFICATION  
 FORECASTER NO. 18  
 FROM: 1/ 1/91 TO: 1/31/91

SITE	00Z CYCLE						12Z CYCLE					
	1ST PD MAX	2ND PD MIN	3RD PD MAX	1ST PD MIN	2ND PD MAX	3RD PD MIN	1ST PD MAX	2ND PD MIN	3RD PD MAX	1ST PD MIN	2ND PD MAX	3RD PD MIN
*BOI	2.20	5. 6.00	5. 5.60	5. 3.83	6. 4.50	6. 4.67	6.	6.	6.	6.	6.	6.
EMM	1.20	5. 5.60	5. 4.80	5. 1.33	6. 4.33	6. 4.17	6.	6.	6.	6.	6.	6.
CAL	2.80	5. 5.20	5. 3.60	5. 2.33	6. 3.50	6. 4.00	6.	6.	6.	6.	6.	6.
ONO	3.20	5. 4.60	5. 2.80	5. 2.83	6. 2.83	6. 3.00	6.	6.	6.	6.	6.	6.
PAR	2.00	5. 4.80	5. 3.60	5. 2.33	6. 2.50	6. 3.33	6.	6.	6.	6.	6.	6.
MUD	2.00	5. 4.80	5. 5.40	5. 3.83	6. 2.20	5. 4.80	5.	5.	5.	5.	5.	5.
TWF	2.00	4. 7.40	5. 4.00	4. 3.33	6. 2.50	6. 6.33	6.	6.	6.	6.	6.	6.
JER	1.00	5. 3.60	5. 1.40	5. 2.50	6. 2.50	6. 5.83	6.	6.	6.	6.	6.	6.
*BYI	1.20	5. 6.00	5. 2.40	5. 5.33	6. 3.17	6. 6.50	6.	6.	6.	6.	6.	6.
RUP	2.60	5. 5.00	5. 1.20	5. 3.67	6. 3.67	6. 6.50	6.	6.	6.	6.	6.	6.
IDC	3.80	5. 3.80	5. 7.40	5. 5.50	6. 4.33	6. 10.00	6.	6.	6.	6.	6.	6.
MYL	2.40	5. 5.60	5. 2.40	5. 5.00	6. 3.83	6. 6.50	6.	6.	6.	6.	6.	6.
FAI	4.40	5. 6.60	5. 3.80	5. 7.17	6. 4.67	6. 9.67	6.	6.	6.	6.	6.	6.
SUN	1.80	5. 4.80	5. 2.20	5. 5.33	6. 2.20	5. 10.60	5.	5.	5.	5.	5.	5.
*IDA	1.60	5. 5.20	5. 3.00	5. 6.00	6. 2.67	6. 9.50	6.	6.	6.	6.	6.	6.
REX	3.00	5. 7.00	4. 1.80	5. 4.83	6. 5.33	6. 8.83	6.	6.	6.	6.	6.	6.
*PIH	1.20	5. 4.20	5. 2.60	5. 4.33	6. 3.83	6. 10.00	6.	6.	6.	6.	6.	6.
*MLD	3.40	5. 7.60	5. 3.20	5. 3.00	6. 3.67	6. 9.17	6.	6.	6.	6.	6.	6.
SDA	4.75	4. 5.00	4. 6.25	4. 4.67	6. 4.00	5. 5.00	4.	4.	4.	4.	4.	4.
*SMN	2.00	5. 5.20	5. 2.40	5. 4.67	6. 3.17	6. 8.00	6.	6.	6.	6.	6.	6.
CHA	3.00	5. 5.80	5. 2.40	5. 5.33	6. 4.17	6. 8.33	6.	6.	6.	6.	6.	6.
STN	7.00	4. 5.40	5. 6.75	4. 6.33	6. 5.83	6. 8.00	6.	6.	6.	6.	6.	6.
*SS0	3.60	5. 3.60	5. 4.80	5. 5.67	6. 2.67	6. 4.00	6.	6.	6.	6.	6.	6.
*LOW	3.80	5. 2.60	5. 6.40	5. 2.00	6. 2.33	6. 3.17	6.	6.	6.	6.	6.	6.
*LWS	2.40	5. 2.00	5. 2.60	5. 2.00	6. 2.17	6. 2.00	6.	6.	6.	6.	6.	6.
MDS	2.40	5. 3.75	4. 2.80	5. 3.50	6. 3.00	6. 1.33	6.	6.	6.	6.	6.	6.
SB6	0.80	5. 3.20	5. 2.20	5. 4.33	6. 2.17	6. 2.33	6.	6.	6.	6.	6.	6.
*S06	4.00	4. 2.20	5. 7.50	4. 2.67	6. 1.50	6. 4.00	6.	6.	6.	6.	6.	6.
COE	1.67	3. 4.33	3. 1.67	3. 5.00	2. 3.50	2. 2.50	2.	2.	2.	2.	2.	2.

END

Figure 6A Example of Individual Temperature Verification. Stations with an asterisk are the perennial ten - those verified since the birth of WSFO Boise. (MAE/# forecast verified).

NNNN>##<A<  
 <ZCZC BOIWRKVER  
 ETAA00 KBOI 060027

WSFO BOISE ZONE PRECIPITATION VERIFICATION  
 FORECASTER NO. 18  
 FROM: 11/ 1/90 TO: 11/30/90

		BOI	BYI	IDA	MLD	SMN	SBO	F69	LWS	S06	PIH
1	FQCY	0.33	0.17	0.25	0.08	0.08	0.25	0.42	0.25	0.67	0.25
S	POD	0.25	0.00	0.67	1.00	1.00	0.33	0.60	0.67	0.50	0.33
T	THRT	0.25	0.00	0.67	0.50	0.50	0.17	0.50	0.40	0.50	0.25
	FALM	0.00	1.00	0.00	0.50	0.50	0.75	0.25	0.50	0.00	0.50
P	% COR	75.	83.	92.	92.	92.	58.	75.	75.	67.	75.
D	BIAS	0.25	0.00	0.67	2.00	2.00	1.33	0.80	1.33	0.50	0.67

2	FQCY	0.17	0.08	0.08	0.08	0.08	0.25	0.50	0.42	0.67	0.17
N	POD	0.50	1.00	1.00	1.00	1.00	0.33	0.67	0.20	0.75	0.50
D	THRT	0.33	1.00	1.00	1.00	0.50	0.17	0.57	0.14	0.67	0.50
	FALM	0.50	0.00	0.00	0.00	0.50	0.75	0.20	0.67	0.14	0.00
P	% COR	83.	100.	100.	100.	92.	58.	75.	50.	75.	92.
D	BIAS	1.00	1.00	1.00	1.00	2.00	1.33	0.83	0.60	0.87	0.50

S	FQCY	0.17	0.08	0.17	0.00	0.08	0.18	0.42	0.25	0.67	0.25
R	POD	0.50	0.00	0.50	0.00	0.00	0.50	0.80	1.00	0.75	0.33
D	THRT	0.33	0.00	0.50	0.00	0.00	0.25	0.67	0.75	0.75	0.33
	FALM	0.50	1.00	0.00	1.00	1.00	0.67	0.20	0.25	0.00	0.00
P	% COR	83.	92.	92.	92.	83.	73.	83.	92.	83.	83.
D	BIAS	1.00	0.00	0.50	9.99	1.00	1.50	1.00	1.33	0.75	0.33

A	FQCY	0.22	0.11	0.17	0.06	0.08	0.23	0.44	0.31	0.67	0.22
L	POD	0.37	0.25	0.67	1.00	0.67	0.37	0.69	0.55	0.67	0.37
L	THRT	0.30	0.25	0.67	0.50	0.33	0.19	0.58	0.37	0.64	0.33
P	FALM	0.40	0.00	0.00	0.50	0.60	0.73	0.21	0.45	0.06	0.25
D	% COR	81.	92.	94.	94.	89.	63.	78.	72.	75.	83.
S	BIAS	0.62	0.25	0.67	2.00	1.67	1.37	0.87	1.00	0.71	0.50

BOI BYI IDA MLD SMN SBO F69 LWS S06 PIH

NO. OF FORECAST CYCLES VERIFIED: 12.00

END

Figure 6B -- Example of Individual Precipitation Verification.



## APPENDIX I

List of mean absolute maximum and minimum temperature errors for each station for each month for 1987-1989. Number under each temperature error is the cold bias, i.e., .60 would mean that 60 percent of the forecasts were too cold and 40 percent were too warm. (Again, unadjusted LFM MOS guidance used in forecast guidance equations.)

ZONE TEMPERATURE VERIFICATION

1987

MAX TEMPERATURES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SOG	4.09	6.77	7.81	6.64	5.13	4.38	4.35	3.58	3.60	5.10	2.96	5.15
	.59	.59	.19	.18	.17	.14	.13	.17	.56	.70	.22	.46
SPT	5.17	4.36	3.40	3.71	3.43	3.79	3.13	4.38	2.82	2.31	2.56	3.75
	.92	.79	.40	.50	.64	.57	.63	.31	.47	.63	.44	1.00
LWS	2.86	4.36	3.10	2.41	2.88	2.57	4.35	2.46	3.68	2.15	2.78	2.85
	.45	.55	.43	.41	.42	.33	.30	.33	.80	.55	.57	.38
SBO	4.82	4.68	4.24	3.59	3.42	4.10	4.83	3.25	2.76	3.40	4.13	4.70
	.23	.41	.29	.45	.63	.48	.52	.42	.64	.60	.22	.40
MOS	2.90	4.24	4.57	3.45	3.33	4.10	3.65	2.96	3.48	3.50	5.30	5.54
	.19	.43	.19	.23	.17	.14	.22	.13	.60	.50	.13	.15
SMN	3.68	5.14	4.05	3.27	4.04	4.95	5.05	3.79	2.92	3.89	4.39	4.92
	.55	.77	.38	.41	.33	.14	.32	.42	.44	.55	.17	.46
STN	5.29	4.68	6.05	3.91	6.24	4.47	6.22	5.42	5.54	5.47	5.57	7.38
	.29	.50	.32	.36	.67	.58	.94	.83	1.00	.79	.14	.31
MYL	6.18	5.41	7.05	2.59	2.92	3.48	2.35	2.17	2.60	2.55	8.64	6.38
	.18	.18	.19	.36	.58	.38	.61	.54	.72	.35	.00	.15
OND	6.82	5.68	3.86	4.09	3.71	4.00	2.74	2.58	2.60	3.80	4.48	5.77
	.14	.45	.71	.73	.50	.19	.39	.46	.28	.65	.35	.92
WEI	6.19	6.13	3.21	3.21	4.72	7.00	4.89	4.60	2.79	3.15	3.50	4.71
	.19	.47	.57	.64	.17	.00	.06	.00	.37	.69	.33	1.00
EMT	4.68	4.59	3.90	3.45	3.74	3.67	2.87	2.17	1.88	2.94	3.00	4.00
	.64	.73	.57	.91	.61	.24	.35	.46	.42	.56	.30	.67
PAR	5.27	5.18	4.62	5.77	3.27	4.76	3.26	2.42	2.88	3.90	4.71	6.23
	.23	.59	.81	1.00	.59	.05	.17	.29	.60	.75	.33	.92
CAL	4.45	6.55	3.67	4.18	3.71	5.24	4.17	2.96	2.76	3.21	3.61	5.25
	.59	.68	.90	.64	.50	.19	.13	.25	.28	.63	.52	.75
BOI	2.91	5.14	2.71	3.77	3.54	3.52	3.09	2.46	2.44	3.10	2.70	4.00
	.55	.73	.71	.82	.58	.38	.57	.54	.68	.55	.26	.69
MUD	3.05	6.00	2.69	3.38	3.57	3.60	3.59	2.90	3.80	2.71	2.21	3.42
	.26	.81	.69	.90	.71	.65	.71	.76	.90	.71	.32	.58
JER	6.36	5.27	4.67	3.64	3.71	3.00	4.52	3.57	3.88	3.35	3.55	3.54
	.73	.86	.62	.77	.58	.30	.48	.61	.54	.35	.60	.46
TWF	5.23	4.45	4.24	3.36	3.00	4.00	5.09	3.25	2.92	2.45	4.13	4.77
	.77	.77	.52	.55	.29	.14	.09	.25	.28	.30	.61	.62
BYI	5.19	5.41	4.43	5.41	5.13	3.20	5.17	3.70	3.72	3.40	3.96	2.46
	.76	.82	.62	.68	.46	.45	.35	.35	.64	.45	.57	.62
RUP	4.33	4.64	4.90	4.62	6.71	2.86	6.57	5.17	3.56	4.25	3.00	4.58
	.71	.73	.33	.62	.29	.48	.13	.08	.20	.10	.40	.17
HAG	4.41	7.41	5.57	4.09	3.08	2.68	5.57	3.54	3.65	3.05	3.83	4.85
	.82	.82	.71	.68	.71	.26	.09	.25	.30	.45	.70	.69
FAI	10.68	6.61	8.24	3.55	3.42	3.29	4.09	4.17	3.92	3.78	5.43	8.15
	.09	.06	.38	.91	.71	.52	.70	.83	.88	.89	.13	.08
SUN	6.55	4.43	6.52	4.15	3.45	2.42	3.55	3.10	3.04	2.93	6.40	8.40
	.25	.14	.19	.50	.45	.32	.36	.33	.29	.21	.05	.10
PIH	4.14	4.86	3.62	3.32	3.13	1.81	3.43	2.04	2.84	2.80	3.61	2.62
	.59	.86	.62	.68	.54	.29	.39	.58	.68	.50	.70	.54
IDA	4.00	3.95	4.29	4.00	4.42	2.90	3.87	4.17	4.48	2.50	4.57	5.85
	.41	.82	.71	.95	.88	.95	.70	.96	.88	.60	.78	.92
REX	3.57	4.24	3.83	4.95	4.83	3.16	4.56	2.42	4.74	2.88	4.33	6.11
	.43	.62	.83	.82	.79	.74	.44	.53	.87	.75	.67	.78
MLD	3.55	4.23	3.29	2.27	5.04	4.14	6.00	4.00	3.00	4.00	3.87	3.62
	.41	.64	.10	.36	.08	.05	.09	.17	.36	.40	.30	.31
SDA												

MIN TEMPERATURES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
S06	6.14	6.91	3.00	4.41	3.46	3.86	2.65	2.63	3.80	5.05	5.29	7.
	.82	.82	.67	.64	.63	.29	.39	.63	.68	.95	.90	./
SPT	5.43	4.60	4.06	4.50	3.81	5.38	5.00	5.72	5.62	5.05	4.95	5.80
	.36	.60	.19	.36	.19	.25	.50	.11	.10	.11	.55	.60
LWS	3.86	2.82	2.24	3.55	2.46	2.71	2.61	2.13	1.56	2.35	3.35	2.54
	.41	.55	.57	.59	.50	.57	.57	.33	.40	.20	.48	.62
S80	5.86	6.05	2.14	3.95	3.29	3.52	3.87	3.08	2.40	2.90	3.83	3.73
	.73	.73	.57	.68	.75	.62	.30	.17	.16	.45	.61	.82
MOS	3.91	3.86	1.38	4.32	2.63	3.29	3.70	3.38	2.80	2.74	3.61	4.00
	.45	.76	.38	.45	.25	.24	.09	.17	.28	.32	.22	.23
SMN	6.73	4.64	4.67	4.82	3.83	4.10	4.57	4.46	2.72	4.55	7.35	5.54
	.23	.27	.24	.18	.13	.05	.22	.08	.08	.25	.13	.46
STN12	12.19	10.75	6.69	4.38	5.43	4.95	6.32	6.63	4.52	4.32	6.50	12.15
	.19	.10	.25	.33	.24	.21	.32	.04	.16	.32	.41	.31
MYL	6.73	7.00	5.19	4.82	3.71	5.24	4.96	4.25	3.32	4.30	5.35	7.00
	.41	.23	.38	.27	.50	.24	.43	.25	.44	.25	.52	.46
ONO	5.36	5.81	6.05	7.41	4.50	5.52	5.09	5.50	3.12	6.05	3.64	5.54
	.59	.67	.76	.64	.71	.81	.48	.83	.36	.30	.50	.77
WEI	5.22	7.00	5.62	5.13	4.80	2.93	5.24	3.64	4.05	6.60	6.13	3.71
	.11	.44	.69	.53	.47	.33	.35	.21	.30	.30	.60	.57
EMT	4.41	3.59	2.95	3.52	3.04	2.81	3.00	2.29	2.88	2.37	2.81	4.08
	.55	.77	.67	.52	.54	.71	.61	.71	.76	.63	.48	.83
PAR	3.64	6.14	5.76	6.55	5.58	4.95	4.82	3.58	2.72	5.15	3.86	5.38
	.41	.77	.71	.68	.83	.81	.55	.71	.40	.40	.64	.85
CAL	4.95	5.59	6.30	5.71	6.08	4.86	4.30	3.67	3.04	3.90	3.14	2.42
	.55	.86	.85	.81	.83	.76	.61	.88	.84	.55	.59	.
BOI	4.55	3.18	3.24	4.36	3.83	2.57	3.00	2.50	3.84	2.80	3.00	3.
	.45	.41	.48	.41	.50	.57	.43	.42	.72	.45	.43	.46
MUD	4.00	3.36	4.06	5.18	3.73	2.20	3.94	3.63	2.43	3.30	3.74	4.36
	.40	.41	.24	.32	.64	.55	.44	.42	.19	.30	.37	.36
JER	6.14	4.45	3.62	5.82	3.79	2.90	4.09	4.22	4.64	3.75	4.00	4.85
	.45	.64	.29	.23	.33	.40	.22	.22	.60	.65	.55	.46
TWF	5.50	5.27	2.05	4.36	3.21	3.57	3.43	3.25	2.52	3.25	2.43	4.23
	.45	.77	.57	.45	.46	.52	.22	.17	.28	.45	.52	.38
BYI	7.95	5.55	3.86	6.00	4.42	4.10	3.48	2.26	5.40	7.50	5.23	4.15
	.43	.82	.71	.59	.71	.60	.57	.39	.	.68	.23	.
RUP	7.82	6.95	3.38	6.00	4.67	3.71	3.87	4.83	4.68	4.75	5.47	6.17
	.50	.82	.62	.52	.73	.57	.30	.04	.52	.80	.68	.17
HAG	7.91	6.05	7.10	4.59	4.67	4.62	3.35	3.17	1.88	3.47	5.38	5.31
	.73	.82	.90	.86	.83	.81	.52	.33	.58	.37	.76	.77
FAI	8.95	8.89	5.48	5.32	3.54	3.71	5.65	3.54	3.13	5.16	5.00	4.46
	.30	.22	.81	.36	.54	.43	.57	.21	.33	.37	.50	.54
SUN	6.53	3.43	4.85	4.94	2.91	4.55	3.65	4.13	2.63	4.58	5.83	6.10
	.26	.19	.40	.24	.27	.15	.35	.13	.38	.33	.61	.10
PIH	5.55	5.45	3.43	4.73	3.04	3.24	4.17	3.67	3.68	5.25	5.09	5.00
	.50	.73	.76	.59	.63	.43	.65	.42	.64	.65	.61	.38
IDA	5.23	5.73	3.81	4.23	3.75	3.71	4.13	3.42	4.24	4.60	5.52	4.85
	.50	.86	.76	.64	.63	.67	.74	.38	.68	.55	.70	.46
REX	5.55	4.27	4.06	5.55	3.71	3.63	2.53	2.95	4.09	3.36	4.90	4.82
	.45	.55	.72	.70	.67	.63	.59	.33	.65	.43	.50	.36
MLD	5.09	3.68	3.57	3.91	2.58	3.67	3.91	4.00	3.20	3.80	4.43	3.71
	.32	.68	.48	.23	.42	.29	.43	.21	.36	.70	.61	.
SDA												

ZONE TEMPERATURE VERIFICATION

1988

MAX TEMPERATURES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
S06	5.13	8.73	5.20	5.67	6.92	6.38	5.87	3.90	4.62	4.62	4.66	8.19
	.70	.58	.28	.19	.21	.25	.03	.07	.31	.52	.48	1.00
SPT	5.16	4.73	2.86	5.54	2.06	3.40	4.00	2.33	2.80	3.75	3.58	3.83
	.89	.86	.48	.71	.53	.15	.22	.37	.40	.30	.37	.50
LWS	3.00	4.46	2.44	3.48	2.79	4.42	3.00	2.77	3.44	3.00	2.90	2.85
	.54	.65	.37	.37	.25	.13	.30	.32	.52	.50	.59	.77
S80	3.88	5.23	3.96	5.11	4.79	3.21	4.27	2.80	3.33	4.00	4.07	3.50
	.25	.65	.52	.63	.33	.29	.47	.43	.52	.43	.17	.38
MOS	3.52	7.12	3.81	4.93	3.42	5.46	3.90	2.93	4.33	5.10	2.93	2.12
	.43	.69	.41	.41	.25	.13	.17	.27	.59	.77	.10	.54
SMN	4.16	5.62	3.59	4.63	4.96	5.63	3.87	3.55	4.35	3.23	5.07	7.73
	.44	.77	.41	.37	.33	.54	.70	.42	.54	.53	.07	.00
CHA					7.43	5.92	2.57	4.16	5.42	5.93	5.41	8.38
					.24	.25	.40	.16	.50	.73	.14	.08
STN	8.92	5.42	2.48	4.62	3.71	6.33	5.68	3.97	4.58	5.70	6.37	4.85
	.29	.46	.15	.19	.52	.79	.86	.68	.69	.80	.33	.42
LOW					4.13	3.52	3.57	3.23	5.26	4.50	3.79	2.73
					.27	.24	.40	.71	.44	.10	.28	.50
MYL	5.79	3.12	5.44	5.37	3.08	2.68	2.70	2.06	3.93	3.00	6.41	4.38
	.29	.35	.00	.33	.33	.48	.47	.61	.63	.50	.31	.77
IDC					4.80	4.04	3.45	3.38	4.04	3.90	8.93	4.63
					.39	.68	.86	.81	.73	.76	.00	.42
OND	4.32	4.31	3.41	3.89	4.13	3.36	3.03	1.77	4.26	2.73	5.14	3.19
	.40	.50	.74	.48	.33	.40	.47	.48	.59	.63	.62	.50
WEI	5.25	4.22	3.71	4.54	6.46	3.33	4.47	2.10	4.62	4.95	3.48	5.35
	.58	.50	.71	.23	.00	.00	.33	.62	.71	.86	.52	.71
EMT	4.71	5.40	3.59	3.52	4.13	3.24	2.43	2.33	3.85	2.57	3.25	3.65
	.33	.76	.74	.59	.54	.44	.50	.23	.54	.67	.54	.50
PAR	5.00	4.50	4.19	4.30	3.25	3.12	3.40	2.43	4.19	3.57	3.92	3.19
	.64	.62	.74	.67	.42	.32	.37	.23	.58	.83	.58	.50
CAL	4.92	5.27	3.85	3.85	4.21	4.12	3.77	3.00	4.41	3.59	4.52	3.48
	.28	.58	.70	.52	.38	.36	.27	.16	.41	.81	.59	.60
BOI	3.52	5.35	3.04	3.56	3.58	3.88	2.83	2.45	3.56	3.47	2.83	2.54
	.64	.65	.63	.63	.50	.60	.63	.45	.56	.87	.45	.35
MUD	3.65	5.09	3.52	3.27	4.41	5.43	2.60	2.88	3.70	2.89	4.08	3.72
	.70	.78	.48	.73	.59	.78	.63	.46	.52	.68	.35	.76
JER	5.44	6.81	3.81	4.33	7.17	5.96	3.96	4.58	4.78	3.57	4.04	3.38
	.72	.88	.54	.44	.54	.40	.61	.58	.41	.57	.18	.31
TWF	5.76	7.31	3.85	3.22	5.46	4.64	3.68	3.97	5.15	3.50	4.00	3.69
	.88	.92	.56	.56	.42	.44	.32	.19	.41	.63	.43	.46
BYI	5.24	6.42	4.00	4.93	6.25	5.96	3.64	3.03	4.52	3.20	2.82	3.19
	.88	.85	.67	.56	.38	.56	.68	.55	.52	.67	.32	.77
RUP	3.17	4.27	4.30	4.93	6.04	6.00	3.50	3.52	4.70	2.40	5.21	4.23
	.61	.73	.44	.41	.39	.46	.32	.42	.22	.50	.07	.15
HAG	5.76	8.42	5.44	5.41	6.24	4.16	3.39	2.94	6.12	3.90	4.63	4.08
	.88	.92	.80	.82	.43	.44	.39	.32	.38	.70	.30	.27
FAI	6.64	6.31	3.71	4.67	4.13	6.84	2.73	2.00	3.48	3.27	7.31	4.04
	.20	.00	.25	.74	.61	.76	.67	.42	.37	.57	.17	.38
SUN	5.57	5.71	5.37	4.15	5.90	3.09	4.00	3.29	4.65	2.32	6.00	4.43
	.43	.29	.15	.42	.50	.68	.59	.61	.38	.43	.14	.65

PIH	3.08	4.81	2.67	3.96	4.00	4.64	2.57	2.35	4.63	2.50	3.07	3.15
	.72	.85	.63	.59	.54	.80	.63	.52	.44	.73	.34	.46
IDA	4.40	4.73	4.59	4.69	3.38	4.44	3.07	3.06	4.41	3.67	3.55	3.42
	.72	.85	.74	.73	.83	.80	.80	.65	.59	.97	.41	.42
REX	4.76	2.96	3.89	4.22	4.12	4.04	1.61	2.40	5.48	2.92	5.00	3.29
	.76	.61	.59	.70	.59	.71	.39	.47	.48	.83	.19	.43
MLD	4.76	3.12	3.15	4.89	2.79	1.72	2.20	2.90	4.93	2.60	3.55	4.46
	.44	.27	.44	.37	.08	.20	.40	.35	.37	.87	.21	.46
SDA	.00	.00	.00	.00	4.92	4.26	2.43	3.94	4.29	1.78	3.50	3.69
	.00	.00	.00	.00	.08	.21	.26	.11	.21	.39	.23	.50

### MIN TEMPERATURES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
S06	7.70	6.27	2.48	5.30	4.13	5.29	5.47	5.23	3.65	3.17	5.34	6.52
	.78	.54	.48	.44	.33	.21	.07	.03	.31	.37	.72	.92
SPT	4.56	4.08	3.38	4.52	3.44	3.58	4.52	5.07	2.95	3.32	3.89	4.21
	.50	.33	.65	.52	.44	.26	.22	.15	.25	.32	.53	.57
LWS	3.38	3.96	2.30	2.52	2.04	2.63	2.10	2.97	2.11	2.50	2.59	3.92
	.63	.58	.41	.59	.42	.38	.57	.42	.41	.47	.66	.65
S80	5.50	5.15	4.30	3.59	2.83	3.29	1.67	2.57	2.30	4.93	3.45	4.69
	.71	.73	.52	.59	.58	.63	.57	.30	.52	.83	.45	.42
MOS	4.04	3.92	2.63	2.96	3.25	3.92	3.30	3.33	2.89	4.77	2.48	4.54
	.61	.65	.37	.41	.29	.25	.17	.20	.52	.90	.66	.77
SMN	6.96	5.46	4.48	3.41	3.83	3.75	1.97	5.10	3.92	4.40	4.62	6.88
	.28	.19	.07	.30	.17	.29	.33	.13	.08	.27	.28	.04
CHA					5.90	5.50	2.10	3.65	3.69	4.63	8.07	12.96
					.09	.29	.60	.13	.46	.27	.18	.00
STN11	11.76	16.00	9.85	4.56	4.29	3.91	4.40	7.73	4.64	5.73	5.89	7.38
	.28	.08	.22	.22	.29	.27	.07	.03	.20	.30	.37	.54
LOW					2.69	3.16	4.10	4.26	3.37	4.73	6.69	8.73
					.48	.52	.33	.06	.30	.47	.93	.96
MYL	7.08	6.46	5.70	4.85	4.88	5.68	3.60	4.48	3.67	4.79	6.41	6.32
	.33	.31	.37	.33	.54	.48	.37	.42	.37	.52	.48	.56
IDC					5.66	5.08	3.90	2.79	2.46	3.43	7.82	6.00
					.80	.68	.66	.43	.50	.47	.64	.50
OND	6.00	5.88	4.48	5.52	9.79	7.72	6.57	5.10	4.00	5.90	6.17	6.08
	.32	.65	.80	.56	.75	.76	.80	.61	.38	.33	.83	.65
WEI	6.92	6.53	3.53	6.58	10.55	7.41	3.41	4.86	3.63	4.86	7.67	6.67
	.25	.67	.67	.58	.82	.82	.47	.52	.53	.41	.76	.80
EMT	4.33	4.12	2.00	2.93	3.05	2.83	2.87	3.10	2.37	3.07	4.45	5.23
	.38	.44	.46	.56	.48	.50	.73	.52	.48	.70	.62	.69
PAR	5.88	5.73	4.96	6.78	9.50	7.17	4.33	4.19	2.93	4.28	6.52	6.08
	.44	.62	.88	.74	.79	.79	.73	.55	.52	.45	.83	.73
CAL	4.52	4.50	3.92	3.59	4.25	2.80	4.00	3.48	2.15	4.08	4.31	4.73
	.28	.42	.88	.63	.67	.64	.83	.58	.56	.54	.62	.65
BOI	4.76	3.92	2.93	2.56	4.92	3.92	2.97	2.55	3.30	2.93	3.38	4.12
	.40	.54	.41	.48	.46	.48	.37	.23	.56	.67	.59	.58
MUD	4.43	3.67	3.24	3.35	4.09	4.29	4.77	3.67	3.22	3.33	4.76	4.24
	.48	.50	.33	.35	.55	.54	.63	.41	.37	.57	.33	.32

JER	5.08	5.38	3.96	4.15	4.87	4.60	3.00	3.03	3.38	4.30	3.54	3.73
	.68	.62	.44	.15	.35	.32	.54	.35	.65	.83	.54	.62
TWF	4.12	4.92	3.22	2.48	3.83	3.92	4.43	3.97	2.93	4.23	4.69	4.92
	.72	.81	.59	.30	.30	.56	.75	.45	.63	.77	.81	.76
BYI	5.64	5.65	4.70	4.15	6.13	4.64	3.50	3.52	4.37	5.30	4.32	5.62
	.56	.73	.44	.26	.33	.40	.71	.45	.78	.90	.86	.77
RUP	7.30	7.04	5.22	4.93	5.39	4.58	3.21	2.84	2.88	3.47	3.89	4.96
	.61	.73	.44	.30	.35	.33	.54	.45	.73	.73	.71	.73
HAG	6.84	7.44	5.44	4.48	5.04	4.08	4.82	4.94	3.46	3.66	6.68	4.50
	.84	.88	.88	.90	.87	.64	.54	.35	.65	.69	.57	.38
FAI	10.00	5.77	5.04	4.26	3.43	4.40	4.00	4.55	4.26	3.50	6.28	7.77
	.29	.35	.75	.67	.43	.44	.60	.19	.26	.20	.40	.42
SUN	6.25	5.87	3.41	4.92	4.44	4.71	5.30	4.97	3.77	4.46	5.62	5.52
	.50	.22	.41	.46	.69	.19	.48	.30	.31	.46	.27	.35
PIH	5.28	4.69	3.48	2.52	2.92	4.24	4.17	3.68	5.00	4.07	3.90	5.38
	.52	.69	.59	.56	.42	.52	.63	.29	.67	.57	.66	.77
IDA	5.80	6.08	4.04	2.67	4.13	3.40	4.17	4.13	4.63	3.53	3.90	4.54

	.36	.69	.63	.56	.54	.64	.73	.32	.67	.70	.62	.54
REX	4.43	4.43	3.44	3.38	4.12	3.91	4.11	4.00	4.45	2.83	3.92	5.20
	.33	.43	.52	.54	.65	.74	.64	.33	.55	.58	.21	.50
MLI	9.08	7.23	4.22	3.04	2.71	3.70	5.33	5.42	3.69	3.63	4.07	6.27
	.28	.50	.56	.37	.21	.39	.37	.19	.35	.33	.66	.65
SIA	.00	.00	.00	.00	5.58	6.18	5.00	5.45	4.93	4.37	4.29	6.44
	.00	.00	.00	.00	.00	.24	.14	.15	.33	.16	.33	.67

ZONE TEMPERATURE VERIFICATION

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MAX TEMPERATURES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SOG	8.73	8.29	7.18	5.08	3.50	4.13	3.13	4.36	3.15	4.42	5.24	8.85
	1.00	.68	.00	.35	.33	.46	.38	.27	.46	.23	.59	.96
SPT	3.41	6.69	4.12	3.32	4.00	2.00	3.26	2.67	3.88	3.57	3.63	2.90
	.53	.50	.41	.47	.46	.28	.42	.39	.13	.65	.38	.71
LWS	1.97	2.43	3.42	2.58	3.13	3.24	2.58	3.39	2.35	3.87	4.41	3.39
	.50	.32	.46	.62	.70	.40	.42	.61	.62	.77	.76	.64
SBO	4.10	3.68	4.85	3.42	3.87	3.96	3.22	3.96	3.08	3.84	4.14	3.96
	.27	.46	.38	.38	.47	.52	.61	.48	.46	.45	.43	.32
MOS	2.50	3.75	4.50	2.92	4.23	3.40	3.09	4.00	4.31	4.94	3.07	4.22
	.10	.32	.15	.46	.67	.48	.59	.50	.77	.65	.34	.52
SMN	4.47	3.50	4.54	3.70	4.07	3.54	4.96	3.68	3.31	4.42	4.72	6.35
	.20	.54	.46	.56	.47	.50	.75	.41	.54	.32	.45	.50
CHA	5.62	5.11	5.71	6.52	4.97	4.58	2.09	4.24	5.46	5.16	3.14	7.31
	.10	.61	.32	.19	.30	.21	.26	.19	.42	.39	.55	.73
STN	6.37	8.46	6.29	4.19	5.66	4.86	6.50	3.38	6.42	5.28	5.14	9.35
	.63	.61	.32	.22	.62	.77	.92	.71	.65	.41	.38	.92
LOW	4.00	7.61	7.46	4.23	4.27	4.92	4.08	4.83	3.62	3.55	7.41	9.18
	.33	.57	.04	.54	.27	.44	.58	.52	.38	.39	.83	.96
MYL	7.59	7.18	10.86	6.85	3.37	3.92	2.00	3.17	2.92	5.77	4.83	9.07
	.93	.71	.00	.07	.10	.36	.32	.30	.19	.06	.10	.96
IDC	5.76	5.86	7.19	3.41	3.07	3.60	4.48	3.18	3.40	3.35	5.86	6.00
	.31	.32	.00	.37	.52	.64	.78	.55	.72	.29	.03	.67
OND	5.23	5.82	5.93	2.70	3.23	4.16	2.83	2.83	2.88	2.97	5.31	6.07
	.27	.11	.21	.56	.37	.48	.29	.35	.35	.61	.55	.75
WEI	5.18	4.58	4.00	3.41	3.18	3.94	3.06	3.29	2.58	3.86	5.73	4.21
	.18	.37	.38	.65	.59	.39	.25	.14	.25	.24	.27	.64
EMT	4.21	4.62	4.54	2.70	2.69	3.68	2.88	2.55	2.50	3.00	4.70	6.61
	.41	.31	.46	.70	.55	.64	.67	.36	.17	.52	.52	.68
PAR	5.03	4.82	4.96	2.44	2.73	3.33	2.75	2.87	2.24	2.81	4.57	7.37
	.38	.14	.32	.59	.47	.46	.04	.26	.20	.61	.46	.74
CAL	5.27	5.39	4.00	2.81	3.27	3.72	4.52	3.30	2.85	3.23	4.14	8.52
	.63	.25	.39	.50	.43	.48	.13	.17	.15	.57	.55	.81
BOI	3.43	4.21	3.25	2.74	2.97	4.36	3.96	2.61	2.69	3.10	3.38	5.43
	.63	.50	.39	.59	.63	.72	.79	.48	.58	.52	.38	.86
MUD	4.79	4.00	4.58	2.54	2.72	3.25	4.50	2.90	3.54	3.47	2.48	7.96
	.76	.65	.19	.38	.45	.71	.77	.57	.58	.30	.48	.96
JER	4.14	4.86	4.93	4.04	5.03	5.33	4.04	3.77	4.48	4.61	4.22	4.85
	.41	.43	.32	.36	.30	.63	.54	.45	.70	.48	.67	.70
TWF	4.00	5.54	4.68	4.67	4.93	4.25	3.04	4.23	4.22	4.60	4.52	4.04
	.37	.57	.54	.37	.37	.46	.33	.32	.43	.30	.48	.63
BYI	4.23	3.93	4.29	4.04	3.93	4.52	4.17	2.91	4.17	3.84	3.56	5.85
	.80	.57	.21	.30	.47	.56	.63	.50	.91	.45	.63	.89
RUP	4.93	5.07	5.74	4.19	4.37	3.46	3.67	3.59	2.43	4.32	3.85	2.96
	.21	.11	.11	.26	.30	.38	.17	.36	.52	.13	.22	.30
HAG	3.70	5.68	5.04	4.00	4.40	4.84	2.67	2.64	4.83	5.61	4.30	3.87
	.43	.36	.46	.48	.70	.72	.63	.64	.83	.68	.52	.52
FAI	5.13	7.07	12.06	6.48	3.37	3.44	2.29	2.43	4.31	5.67	5.59	8.93
	.67	.39	.00	.11	.20	.36	.50	.39	.35	.23	.45	.96
SUN	5.50	8.00	7.92	2.75	4.14	3.08	2.48	3.45	4.41	5.82	4.46	4.52
	.70	.52	.04	.21	.54	.63	.43	.41	.36	.14	.46	.93

FIH	3.83	3.39	4.07	3.44	3.83	3.12	3.58	2.87	2.85	3.81	2.83	4.89
	.57	.25	.43	.56	.60	.60	.58	.65	.69	.45	.52	.89
IDA	5.53	4.61	6.46	4.00	3.50	3.60	2.96	3.17	3.58	3.74	4.21	3.32
	.43	.29	.36	.74	.67	.72	.58	.65	.81	.71	.62	.32
REX	3.39	4.70	5.24	3.96	3.46	4.21	3.41	2.91	3.30	3.43	3.60	3.12
	.48	.48	.28	.59	.65	.42	.36	.35	.50	.53	.48	.27

MLD	5.63	4.39	7.14	3.63	3.67	3.24	1.88	3.35	3.31	2.97	3.14	4.86
	.13	.43	.21	.41	.20	.24	.29	.35	.54	.45	.62	.71
SDA	3.94	4.50	7.35	4.65	4.83	3.59	2.77	3.92	2.55	3.30	3.85	4.62
	.56	.44	.18	.39	.22	.27	.23	.25	.35	.22	.41	.54

### MIN TEMPERATURES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SO6	7.37	7.25	4.18	5.50	4.50	3.67	4.04	4.59	2.96	3.07	4.24	7.46
	.77	.61	.18	.13	.13	.08	.04	.05	.15	.48	.45	.85
SPT	4.53	6.00	3.22	4.70	2.42	3.63	3.61	3.00	4.19	4.05	3.21	3.95
	.41	.47	.39	.30	.50	.53	.44	.37	.25	.36	.63	.65
LWS	2.80	3.36	2.81	2.88	3.20	2.44	2.50	1.96	1.96	3.48	4.72	3.36
	.57	.46	.65	.81	.73	.80	.71	.61	.69	.81	.83	.82
S80	3.41	4.54	3.88	3.62	3.13	2.52	3.13	2.91	2.42	3.48	5.41	3.75
	.41	.46	.46	.54	.63	.60	.57	.35	.31	.81	.66	.64
MDS	2.80	4.54	3.24	2.23	2.13	3.29	3.74	4.17	2.08	3.77	3.72	4.26
	.57	.61	.36	.65	.43	.21	.22	.09	.42	.53	.79	.85
SMN	7.47	6.14	4.57	5.12	4.87	4.42	3.42	4.27	3.38	3.06	5.34	5.27
	.13	.39	.36	.23	.20	.25	.25	.14	.08	.23	.28	.15
CHA13	13.11	7.57	5.54	6.69	5.57	4.83	4.81	4.38	2.58	3.71	6.38	6.77
	.07	.21	.14	.31	.17	.17	.48	.14	.46	.23	.24	.23
STN	8.83	10.26	7.96	5.52	3.93	3.78	5.70	6.18	3.23	4.00	7.04	7.77
	.27	.44	.52	.30	.30	.17	.30	.09	.46	.52	.64	.69
LOW	7.00	6.36	3.38	3.27	2.27	2.28	2.79	2.87	3.00	4.19	12.79	15.96
	.90	.68	.38	.38	.53	.52	.63	.30	.36	.77	1.00	1.00
MYL	6.38	7.43	7.39	4.26	3.90	4.64	5.44	4.09	6.08	5.35	5.72	5.93
	.72	.50	.21	.37	.47	.52	.44	.39	.32	.55	.69	.79
IDC	4.66	3.89	6.32	4.52	3.86	3.44	3.63	3.59	3.84	6.00	3.97	3.57
	.34	.37	.84	.78	.69	.76	.58	.55	.72	.90	.69	.68
OND	6.52	5.64	5.89	5.41	4.90	4.48	5.08	4.52	5.38	4.21	4.00	3.59
	.21	.24	.52	.63	.63	.84	.75	.70	.50	.48	.25	.48
WEI	5.82	7.94	6.29	5.12	4.59	4.18	5.07	4.50	3.82	4.32	5.55	3.38
	.36	.25	.71	.65	.64	.71	.79	.57	.45	.37	.18	.23
EMT	4.97	3.96	4.04	2.93	1.93	2.84	4.46	3.00	3.04	4.00	2.36	2.37
	.34	.25	.37	.67	.48	.84	.79	.70	.62	.77	.39	.52
PAR	7.33	6.24	7.00	6.85	6.50	5.52	4.42	4.43	4.46	3.90	3.56	3.48
	.23	.16	.62	.74	.73	.92	.75	.65	.58	.59	.22	.41
CAL	6.52	5.28	4.67	3.80	4.07	3.25	3.87	3.13	4.00	4.03	3.48	2.36
	.24	.20	.48	.48	.77	.83	.78	.65	.62	.66	.11	.40
BOI	4.37	4.04	3.64	3.59	3.83	2.76	4.71	2.78	3.92	2.71	3.31	2.57
	.40	.25	.54	.48	.27	.52	.75	.52	.62	.65	.45	.21
MUG	3.59	4.42	5.15	3.68	3.00	2.58	4.78	3.55	3.36	3.90	4.78	4.22
	.24	.46	.15	.44	.59	.75	.83	.55	.40	.43	.30	.22

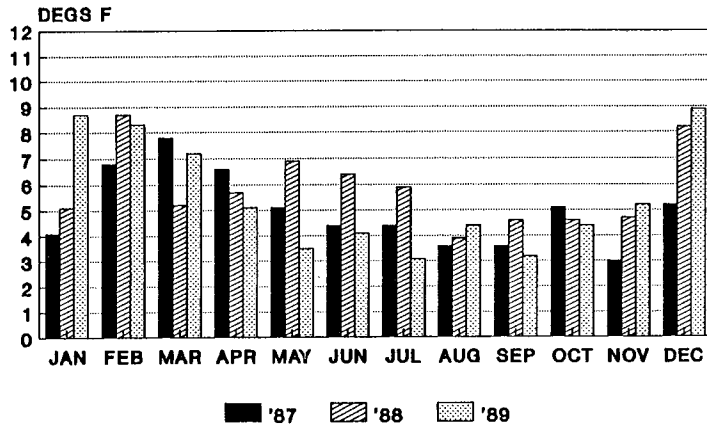


JER	4.13	4.15	3.04	3.15	2.27	3.40	3.21	2.41	4.09	4.32	3.85	2.27
	.13	.50	.41	.62	.40	.48	.71	.59	.65	.74	.58	.19
TWF	3.50	5.08	4.70	6.15	4.47	4.65	3.29	3.09	2.96	4.74	3.85	3.31
	.50	.85	.74	.85	.83	.74	.75	.68	.48	.87	.73	.67
BYI	3.87	5.32	4.11	4.37	3.87	3.92	2.88	2.55	3.57	4.68	4.15	5.11
	.57	.79	.68	.74	.73	.84	.63	.64	.74	.90	.85	.70
RUP	3.59	4.46	3.88	4.04	3.80	3.75	2.58	3.00	3.43	3.03	3.65	3.59
	.45	.62	.52	.64	.67	.79	.50	.59	.43	.81	.58	.52
HAG	5.37	5.50	8.52	8.72	8.32	5.76	3.67	3.27	3.13	6.00	6.19	5.67
	.23	.54	.93	.92	.93	.80	.58	.64	.39	.77	.54	.10
FAI	7.59	9.08	6.13	5.92	4.17	4.32	5.54	3.74	4.13	5.90	6.71	5.26
	.21	.28	.13	.64	.63	.44	.42	.22	.25	.65	.64	.67
SUN	7.48	5.25	6.12	5.71	4.66	4.33	5.32	4.23	4.40	6.12	5.04	5.13
	.31	.42	.24	.43	.66	.52	.45	.27	.55	.64	.33	.61
PIH	5.60	7.50	4.68	4.48	3.20	2.80	3.08	4.04	3.81	3.48	4.28	3.64
	.40	.75	.50	.67	.43	.40	.38	.35	.50	.58	.59	.46
IDA	7.87	7.14	5.32	4.96	4.20	3.20	3.25	3.35	3.32	4.71	4.72	5.50
	.20	.50	.36	.63	.63	.76	.54	.39	.56	.71	.52	.29
REX	7.30	7.12	5.43	4.15	3.96	3.00	2.86	3.14	4.00	3.83	4.79	3.88
	.35	.52	.13	.46	.38	.83	.64	.36	.33	.62	.67	.36
MLD	9.60	5.68	4.21	5.04	3.80	5.00	2.83	3.74	5.69	3.35	5.21	3.50
	.17	.64	.61	.56	.40	.32	.29	.30	.27	.29	.48	.46
SDA	7.41	5.35	5.55	4.00	3.96	3.79	4.50	3.75	4.44	4.29	4.73	6.27
	.47	.71	.30	.30	.35	.42	.29	.25	.61	.46	.50	.46

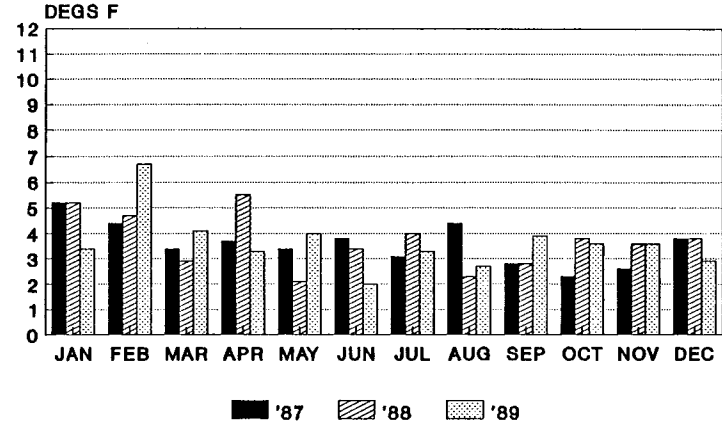
## APPENDIX II

Graphics of mean absolute maximum and minimum temperature errors for each month for 1987-1989. (Unadjusted LFM MOS guidance used in the forecast equations.)

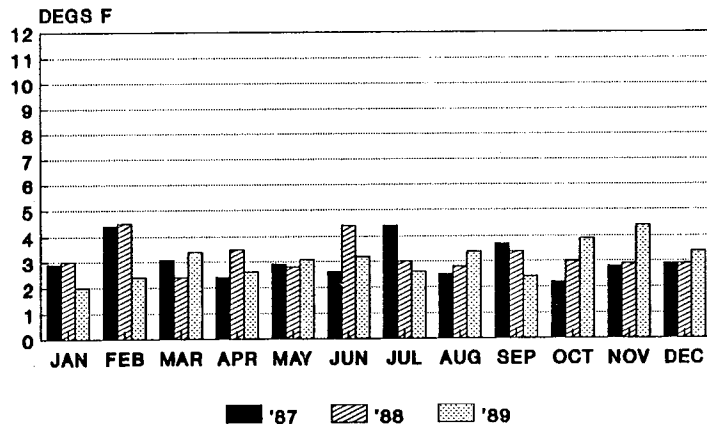
### MULLAN MAE -- MAX TEMPS



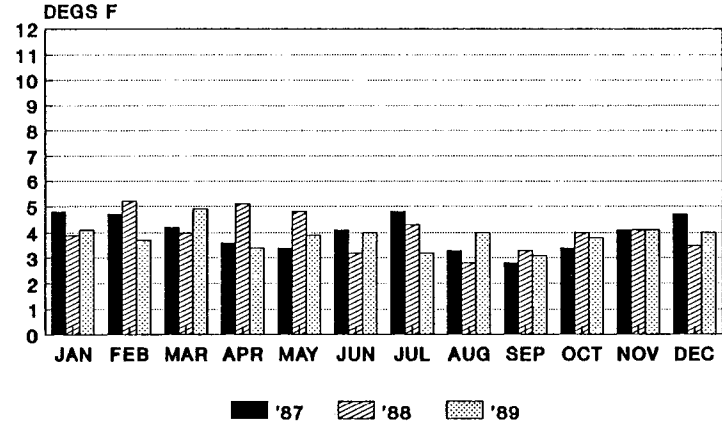
### SANDPOINT MAE -- MAX TEMPS



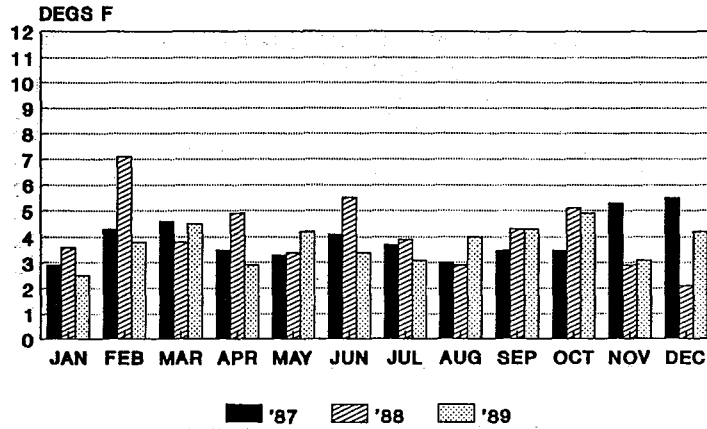
### LEWISTON MAE -- MAX TEMPS



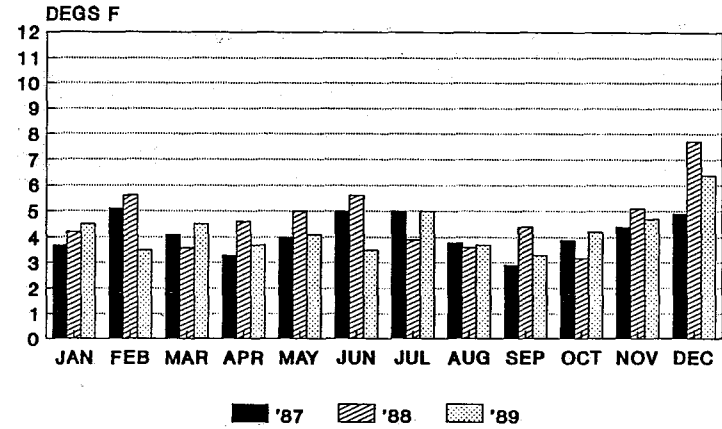
### GRANGEVILLE MAE -- MAX TEMPS



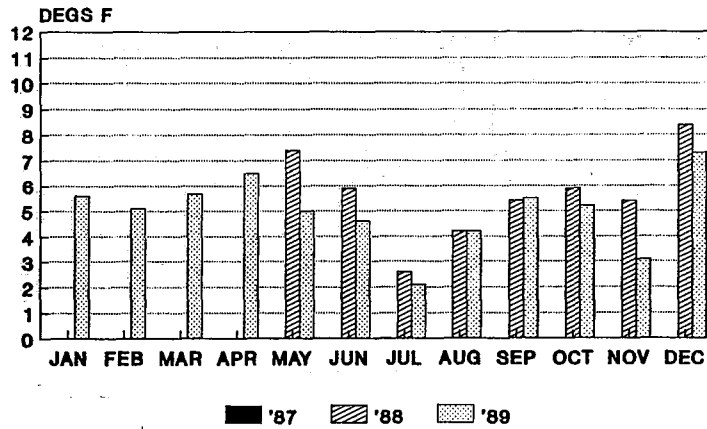
## MOSCOW MAE -- MAX TEMPS



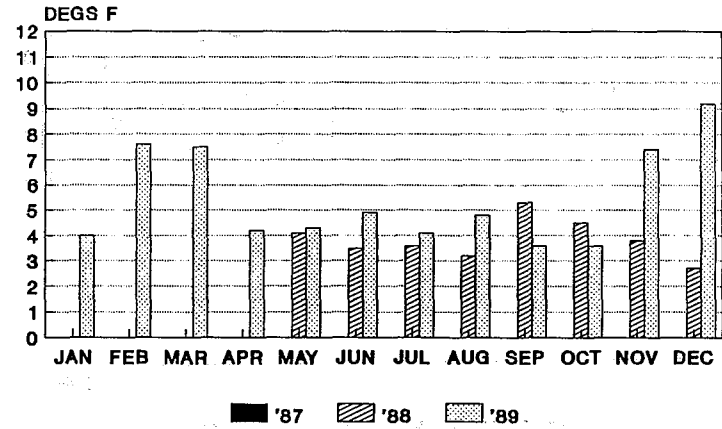
## SALMON MAE -- MAX TEMPS



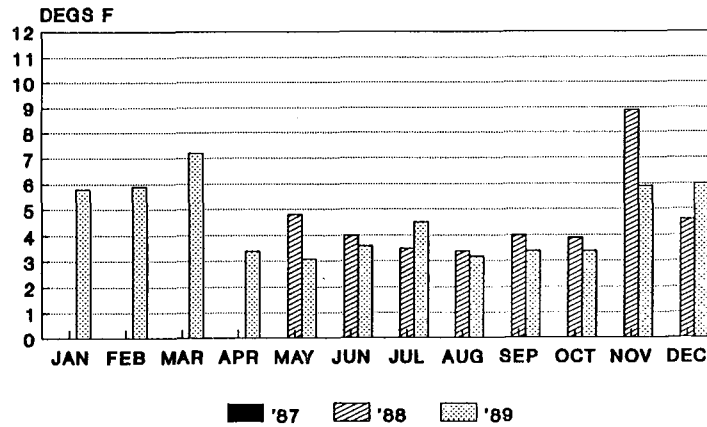
## CHALLIS MAE -- MAX TEMPS



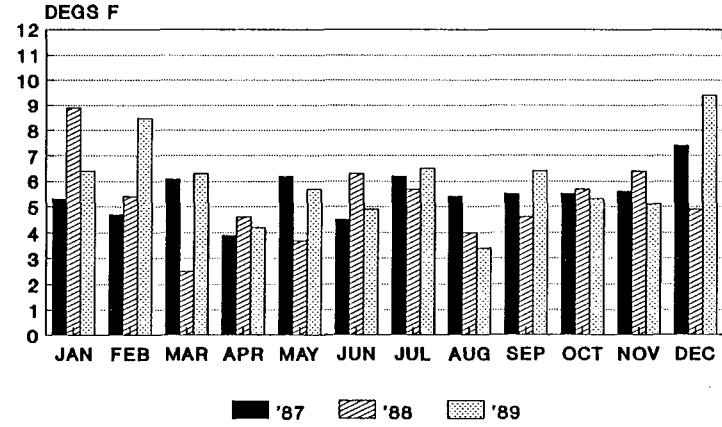
## LOWELL MAE -- MAX TEMPS



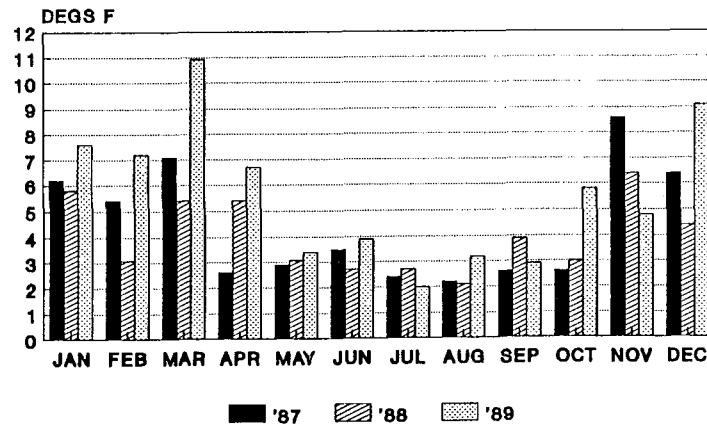
### IDAHO CITY MAE -- MAX TEMPS



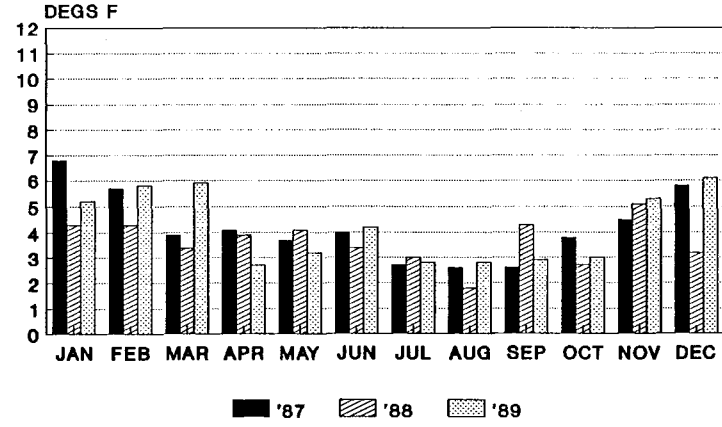
### STANLEY MAE -- MAX TEMPS



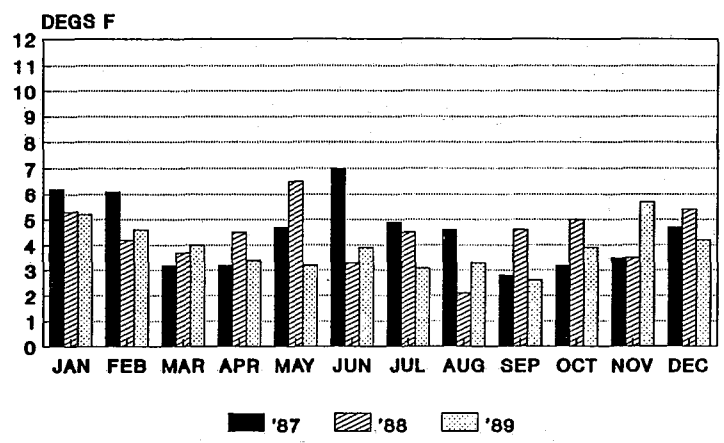
### MCCALL MAE -- MAX TEMPS



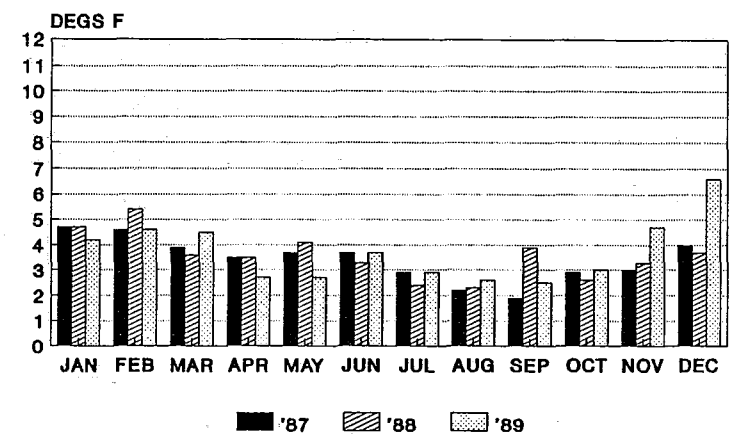
### ONTARIO MAE -- MAX TEMPS



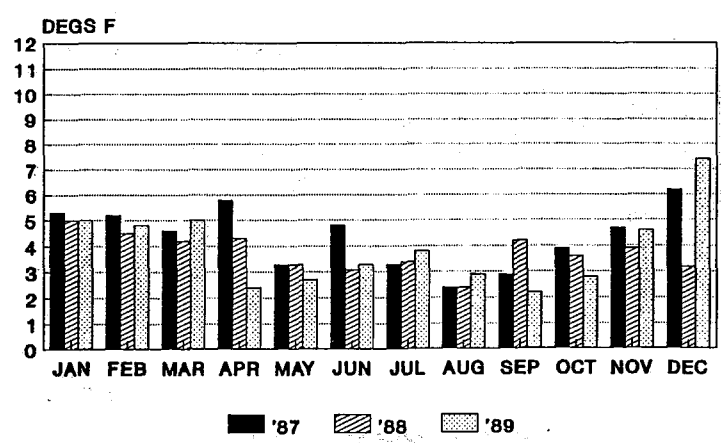
### WEISER MAE -- MAX TEMPS



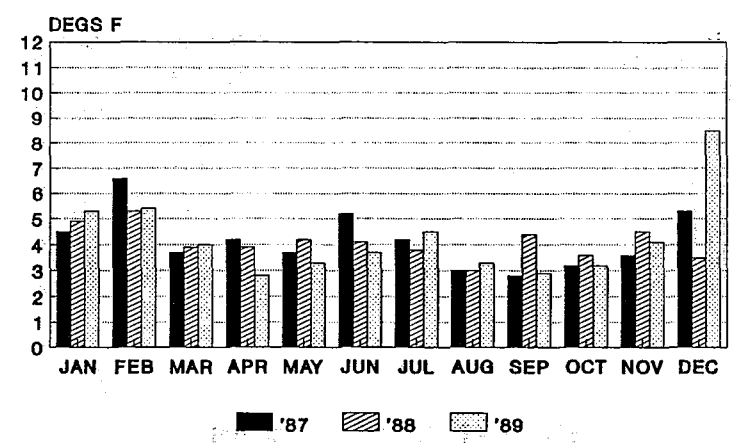
### EMMETT MAE -- MAX TEMPS



### PARMA MAE -- MAX TEMPS

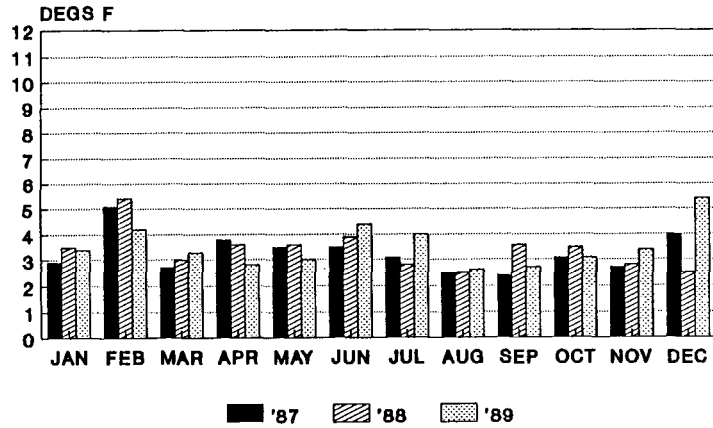


### CALDWELL MAE -- MAX TEMPS

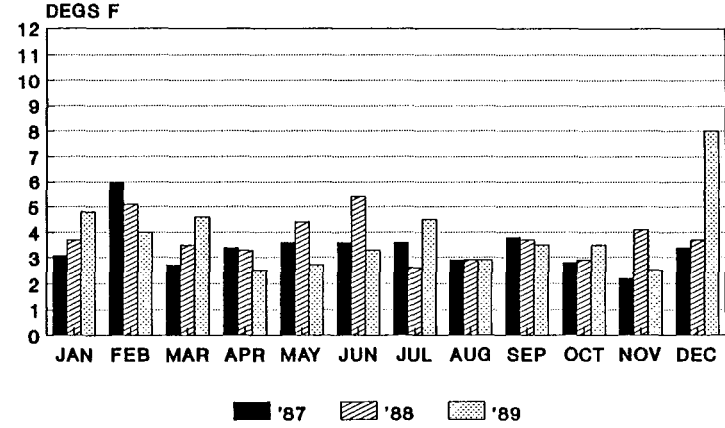


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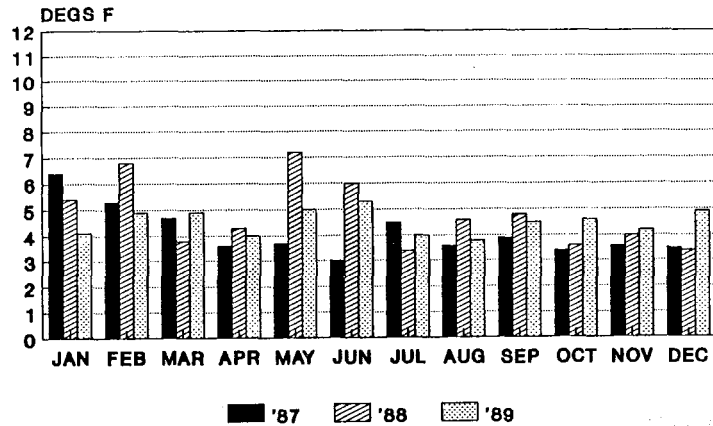
### BOISE MAE -- MAX TEMPS



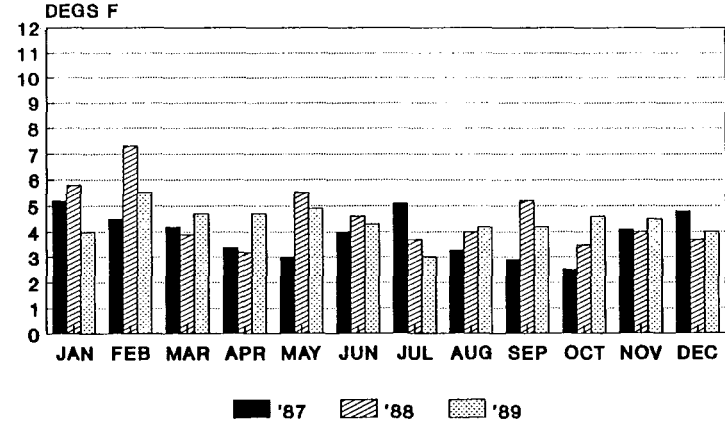
### MOUNTAIN HOME MAE -- MAX TEMPS



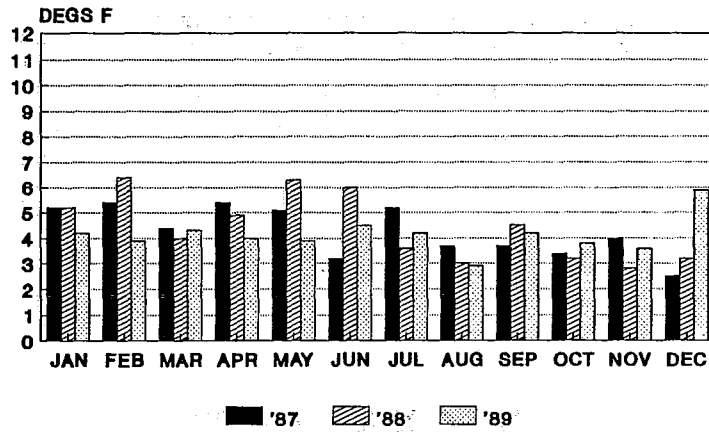
### JEROME MAE -- MAX TEMPS



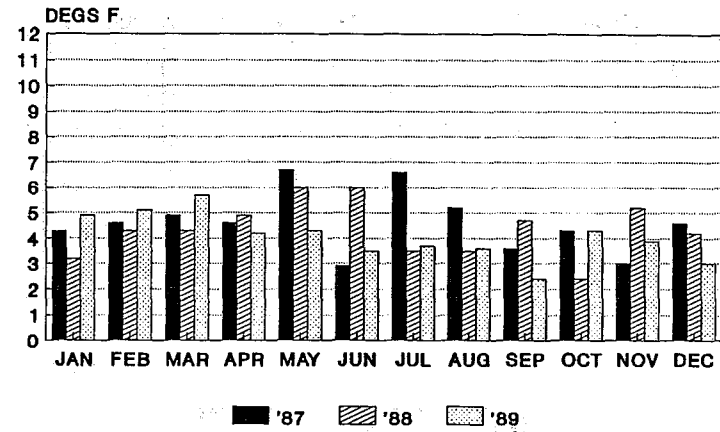
### TWIN FALLS MAE -- MAX TEMPS



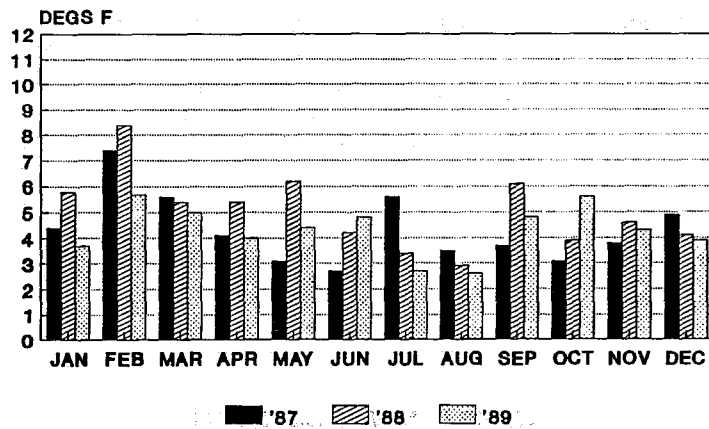
### BURLEY MAE -- MAX TEMPS



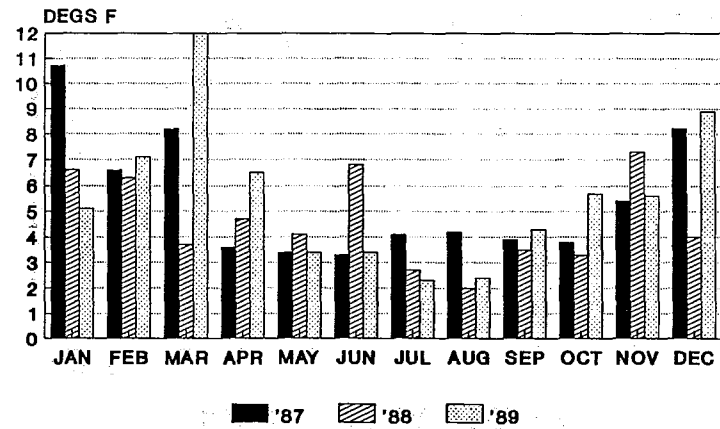
### RUPERT MAE -- MAX TEMPS



### HAGERMAN MAE -- MAX TEMPS

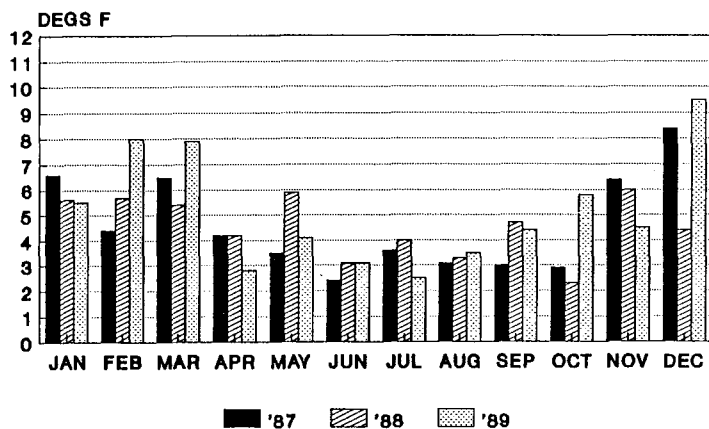


### FAIRFIELD MAE -- MAX TEMPS

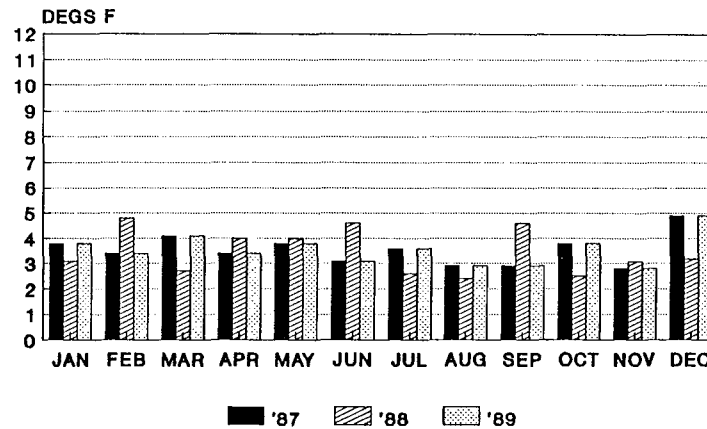




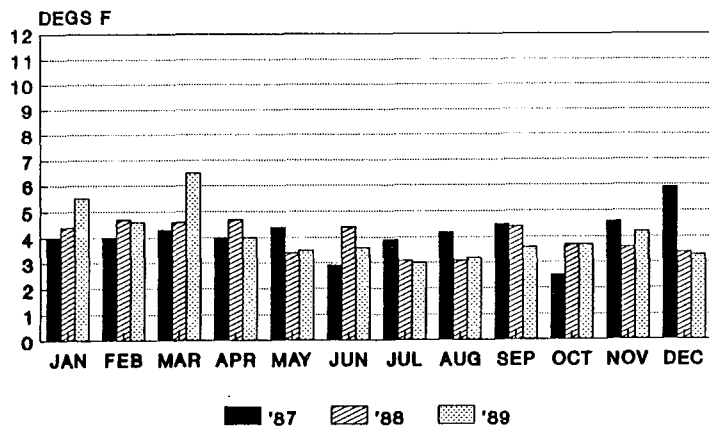
### SUN VALLEY MAE -- MAX TEMPS



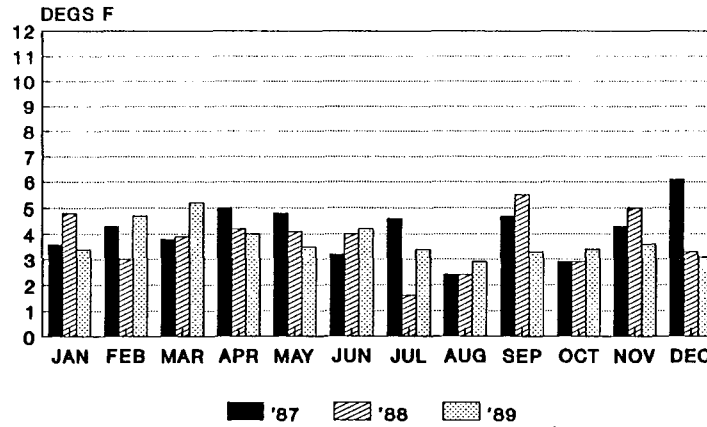
### POCATELLO MAE -- MAX TEMPS



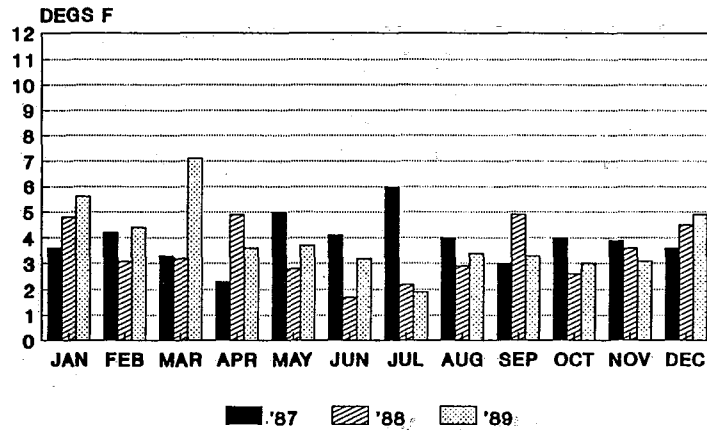
### IDAHO FALLS MAE -- MAX TEMPS



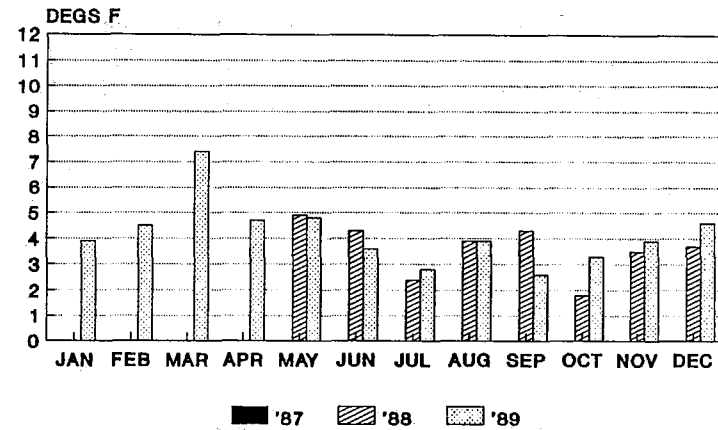
### REXBURG MAE -- MAX TEMPS



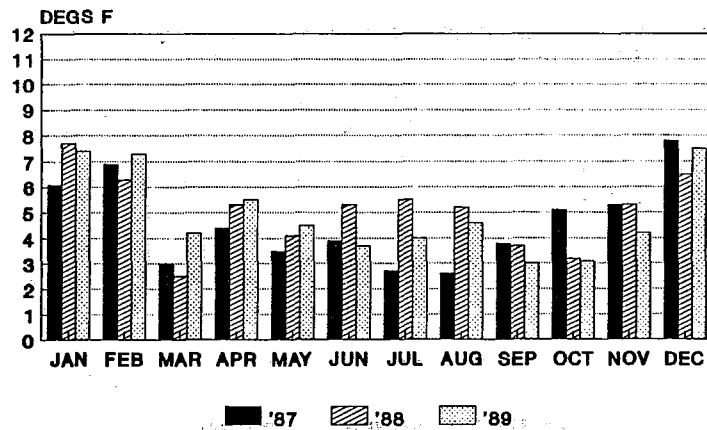
### MALAD MAE -- MAX TEMPS



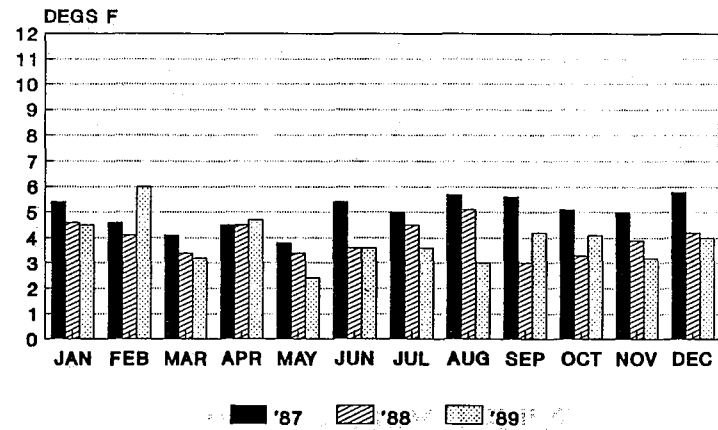
### SODA SPRINGS MAE -- MAX TEMPS



### MULLAN MAE -- MIN TEMPS

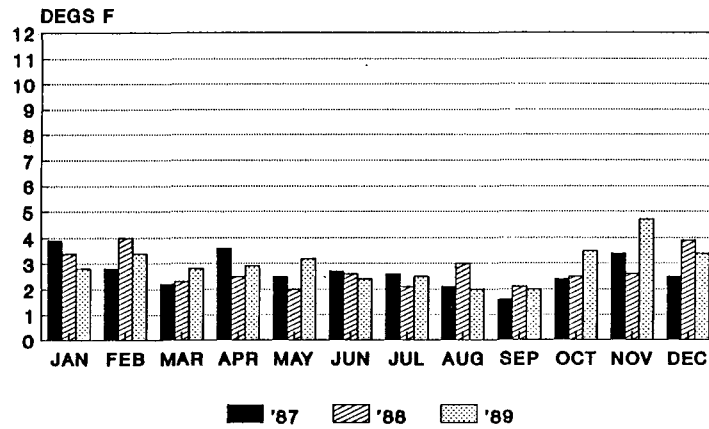


### SANDPOINT MAE -- MIN TEMPS

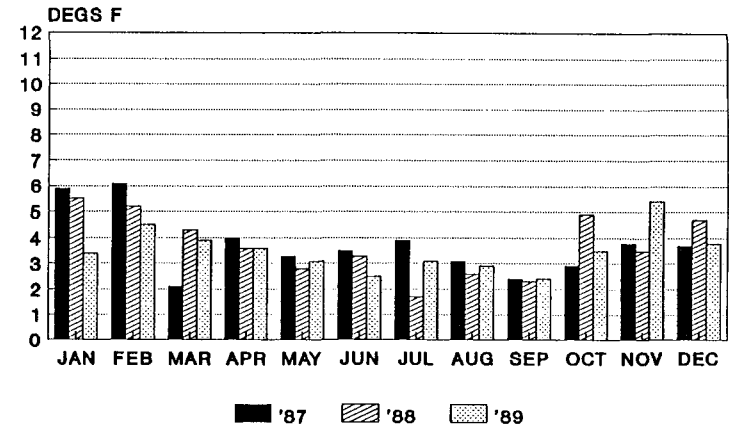


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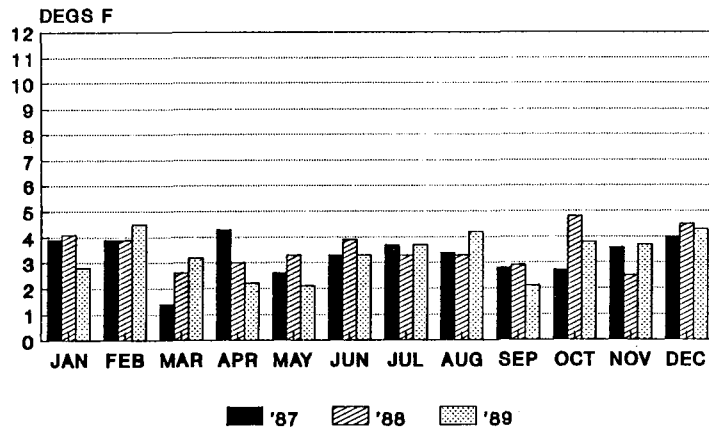
### LEWISTON MAE -- MIN TEMPS



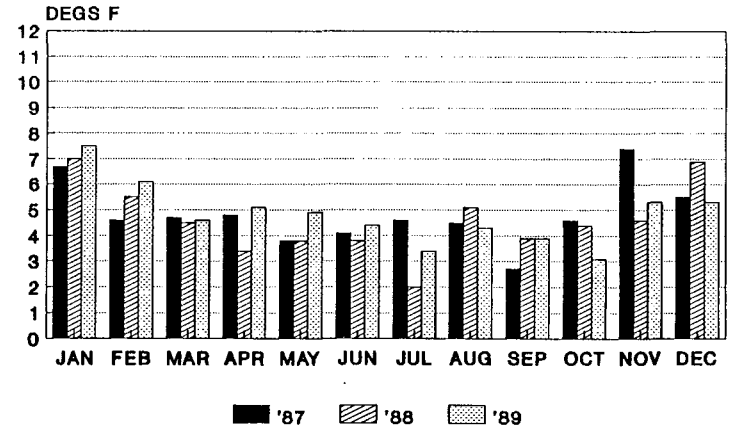
### GRANGEVILLE MAE -- MIN TEMPS



### MOSCOW MAE -- MIN TEMPS

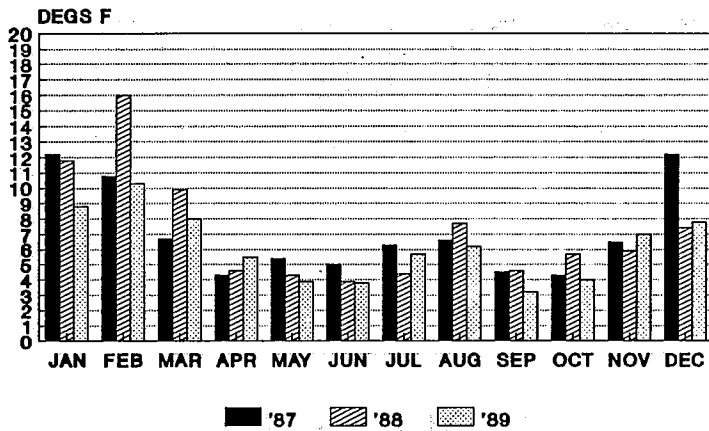


### SALMON MAE -- MIN TEMPS



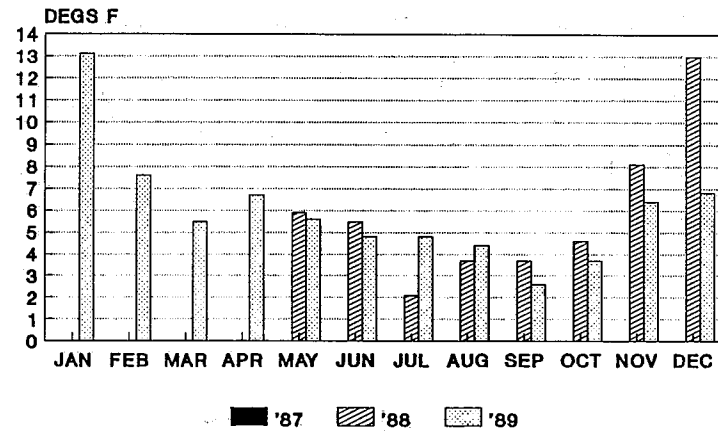
## STANLEY

MAE -- MIN TEMPS



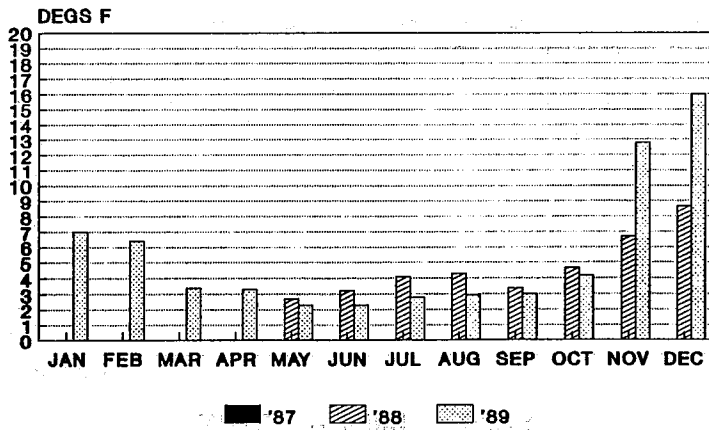
## CHALLIS

MAE -- MIN TEMPS



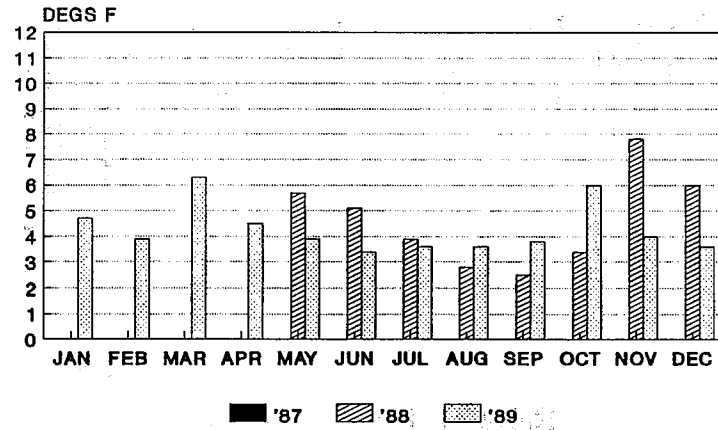
## LOWELL

MAE -- MIN TEMPS



## IDAHO CITY

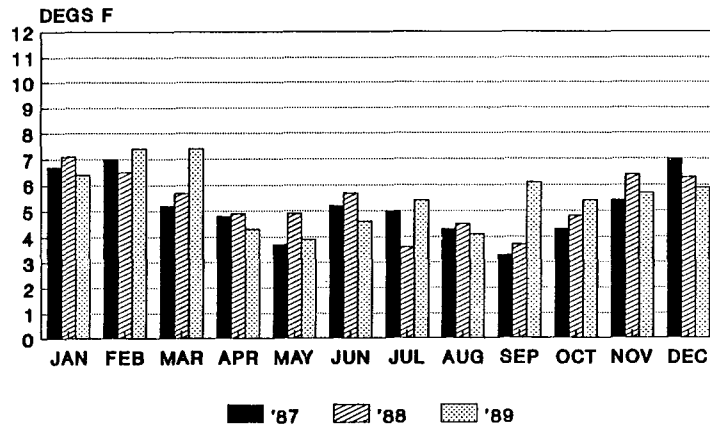
MAE -- MIN TEMPS



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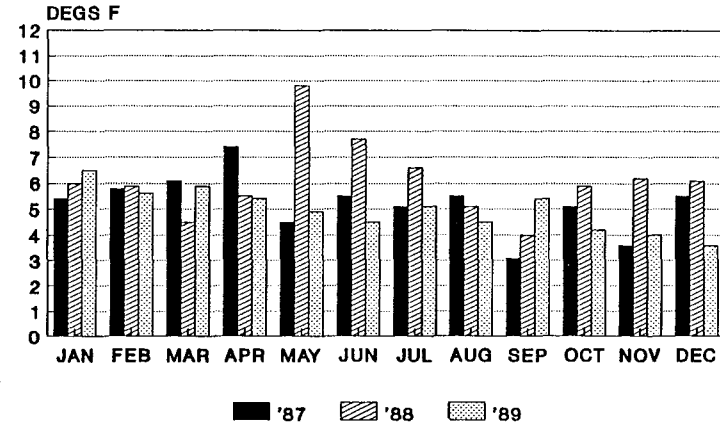
## MCCALL

### MAE -- MIN TEMPS



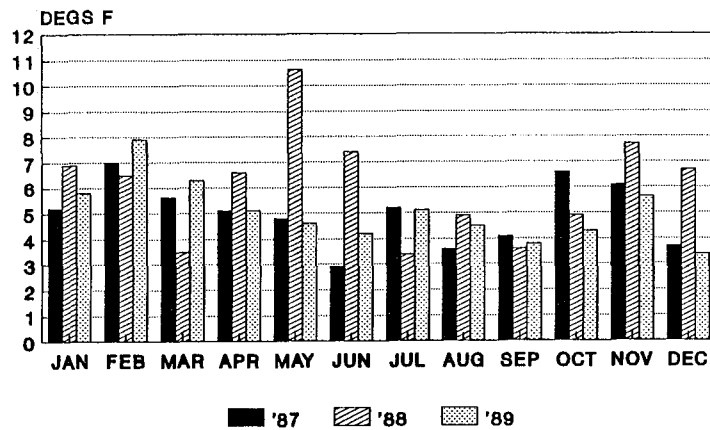
## ONTARIO

### MAE -- MIN TEMPS



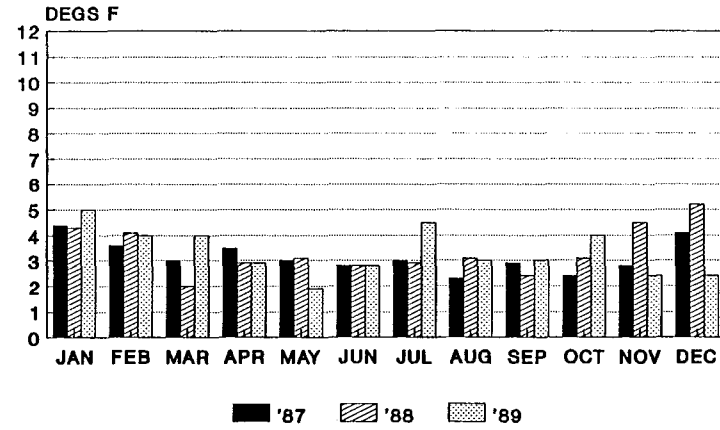
## WEISER

### MAE -- MIN TEMPS

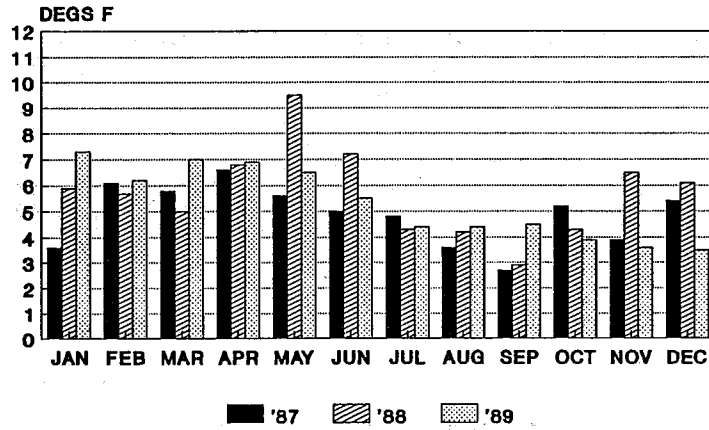


## EMMETT

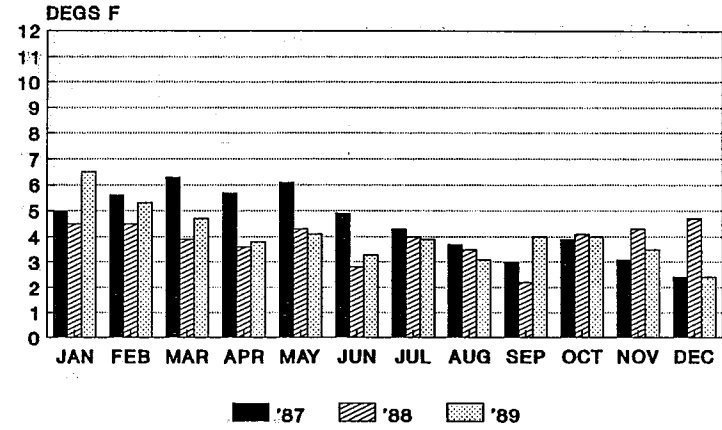
### MAE -- MIN TEMPS



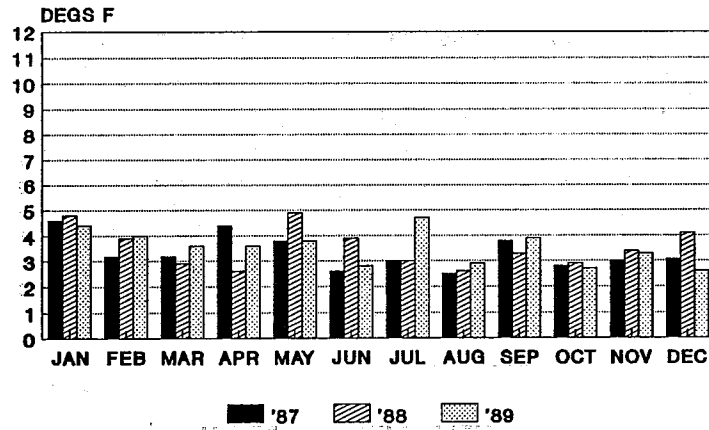
### PARMA MAE -- MIN TEMPS



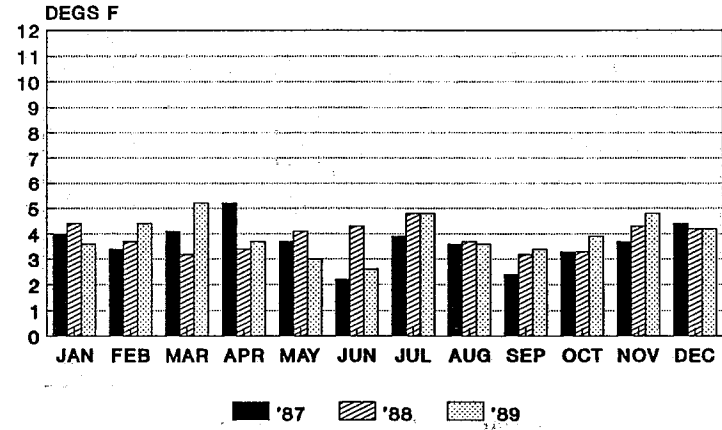
### CALDWELL MAE -- MIN TEMPS



### BOISE MAE -- MIN TEMPS

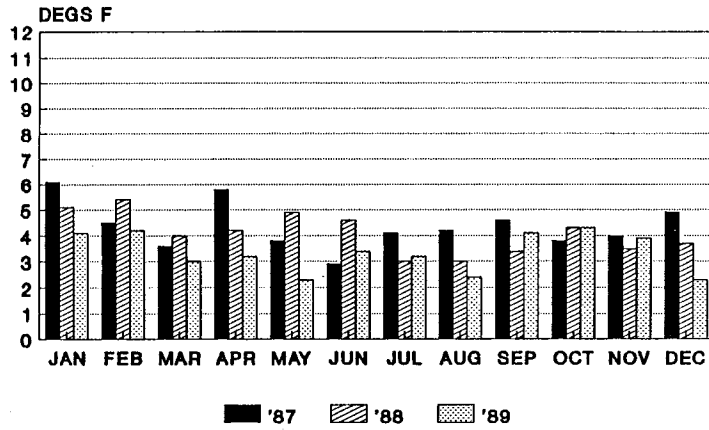


### MOUNTAIN HOME MAE -- MIN TEMPS

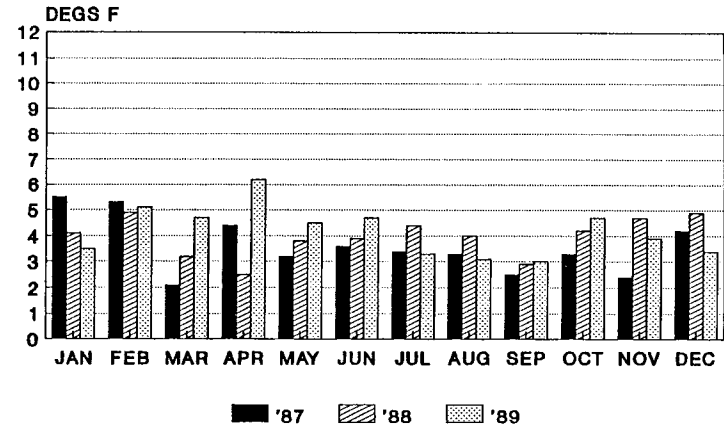


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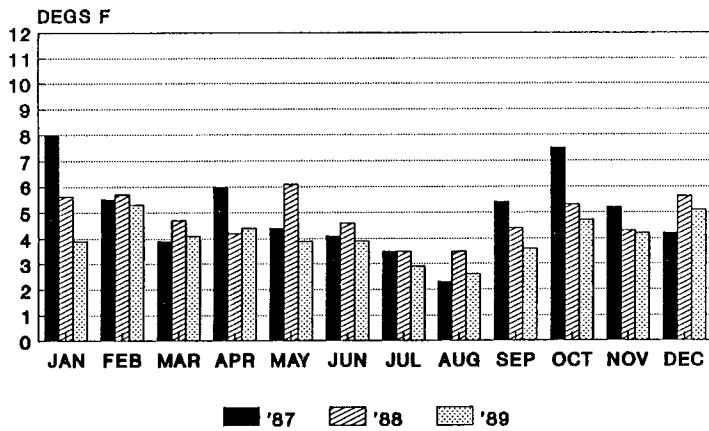
## JEROME MAE -- MIN TEMPS



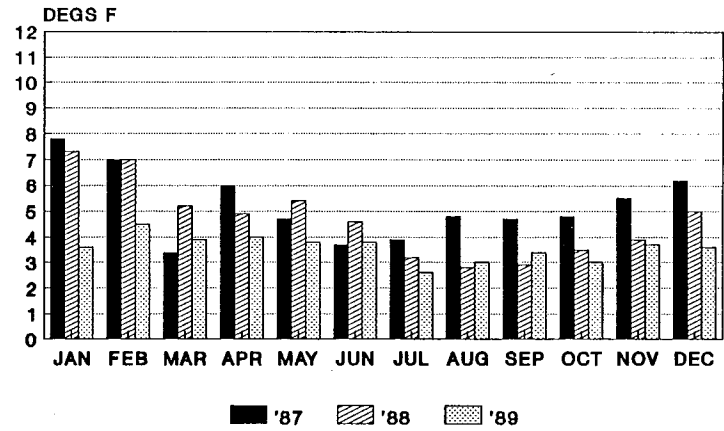
## TWIN FALLS MAE -- MIN TEMPS



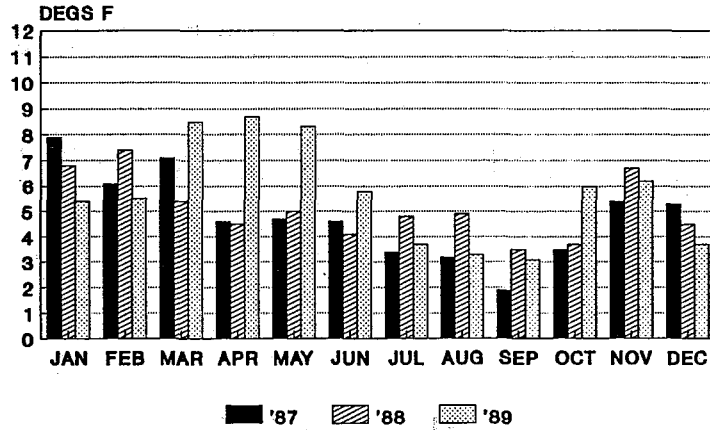
## BURLEY MAE -- MIN TEMPS



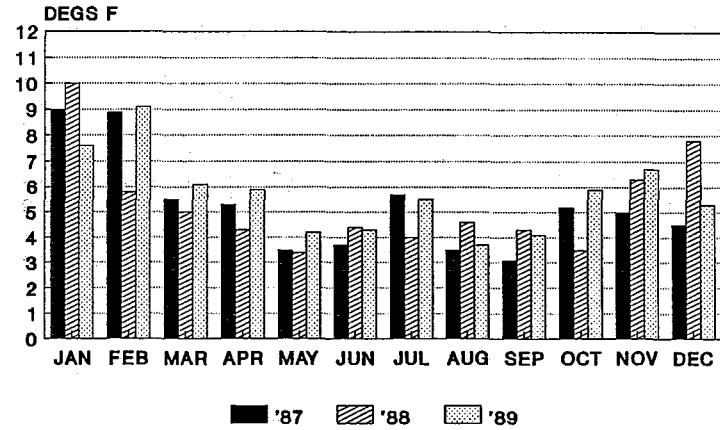
## RUPERT MAE -- MIN TEMPS



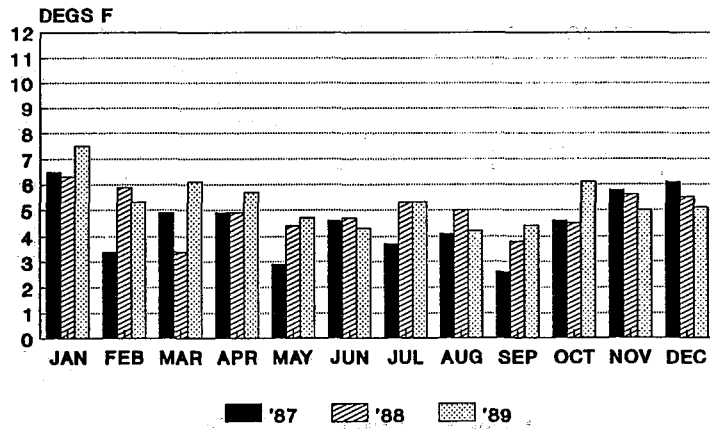
### HAGERMAN MAE -- MIN TEMPS



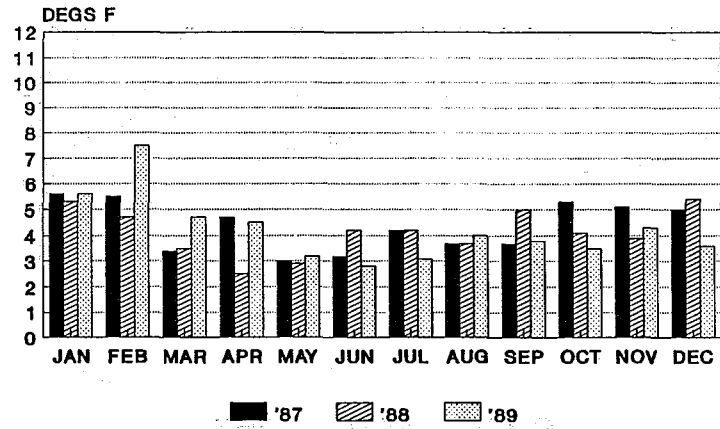
### FAIRFIELD MAE -- MIN TEMPS



### SUN VALLEY MAE -- MIN TEMPS



### POCATELLO MAE -- MIN TEMPS

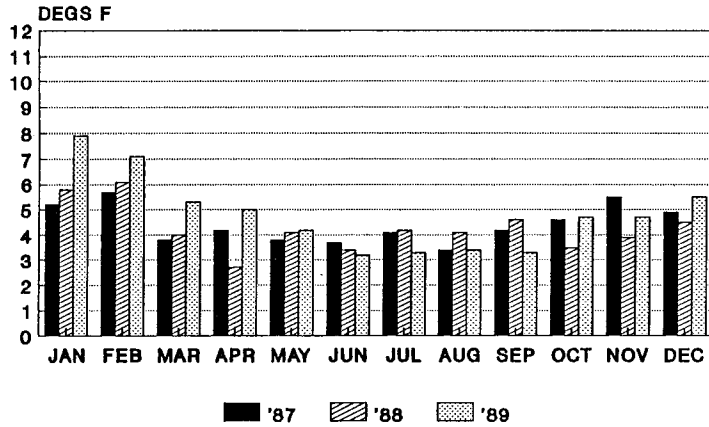


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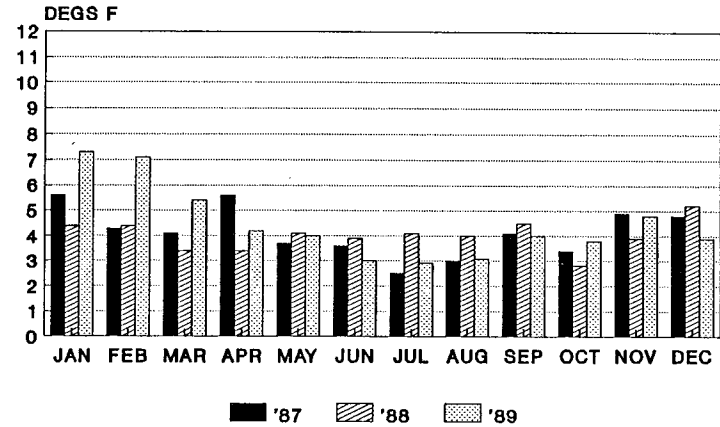
## IDAHO FALLS

### MAE -- MIN TEMPS



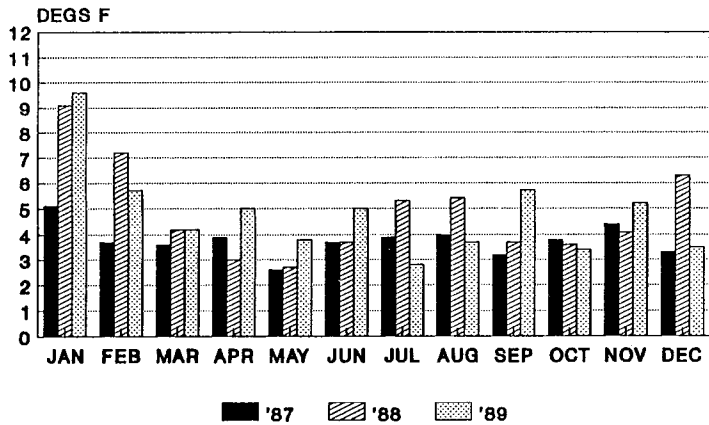
## REXBURG

### MAE -- MIN TEMPS



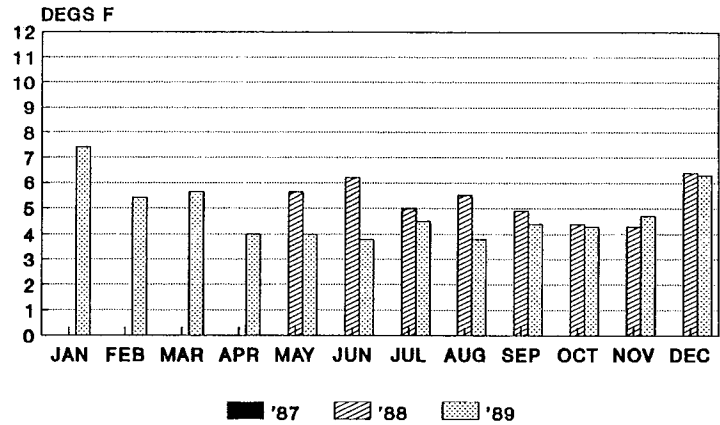
## MALAD

### MAE -- MIN TEMPS



## SODA SPRINGS

### MAE -- MIN TEMPS

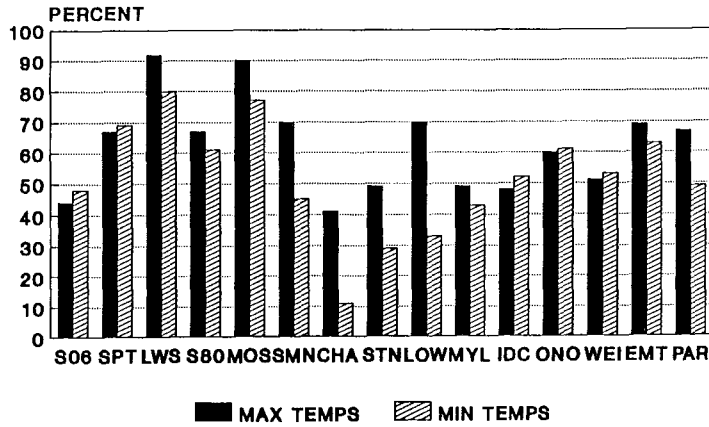


### APPENDIX III

Graphics showing the percent of time that the mean absolute maximum and minimum temperature errors were less than or equal to five degrees fahrenheit. Shown by month for 1987 through 1989. (Unadjusted LFM MOS guidance used in the forecast equations.)

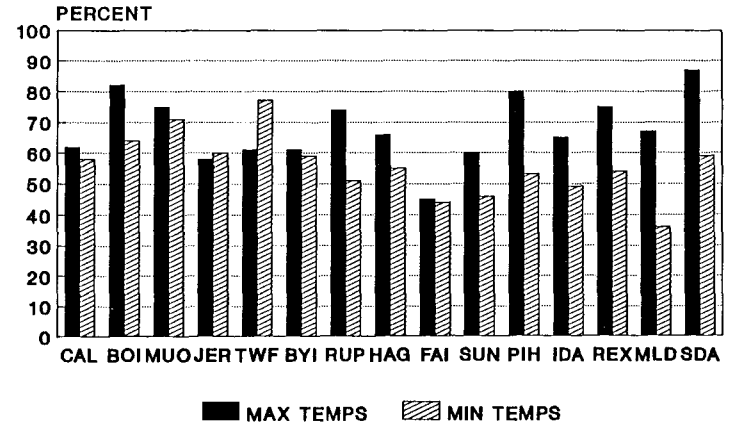
## JANUARY '87-'89

### PCT. FCSTS ≤ 5 DEGS F



## JANUARY '87-'89

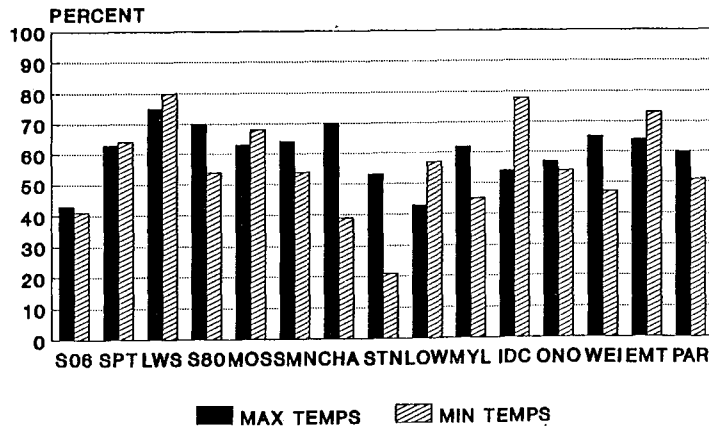
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T-III

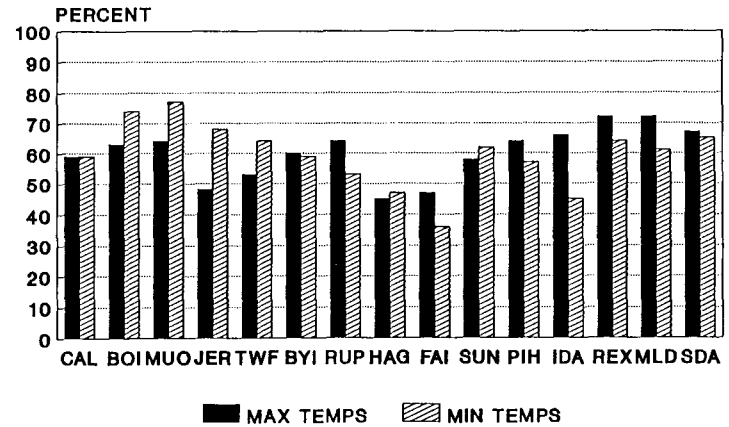
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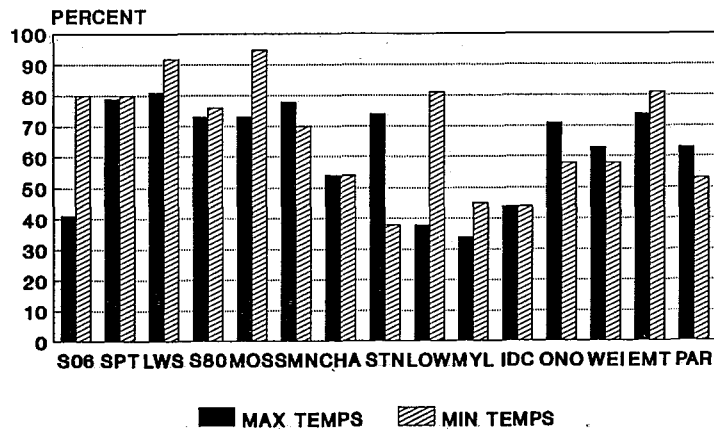


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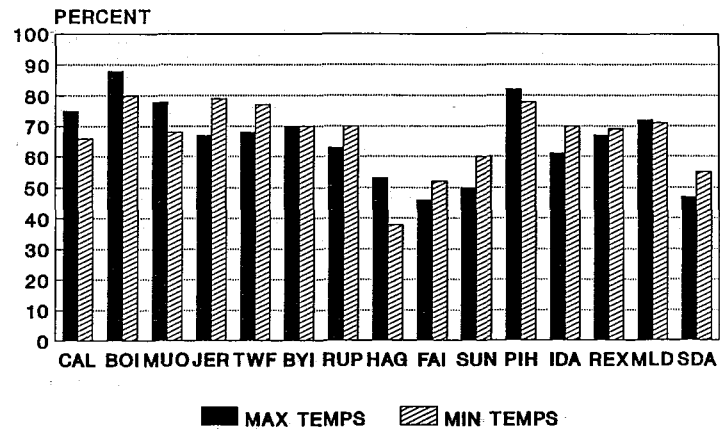
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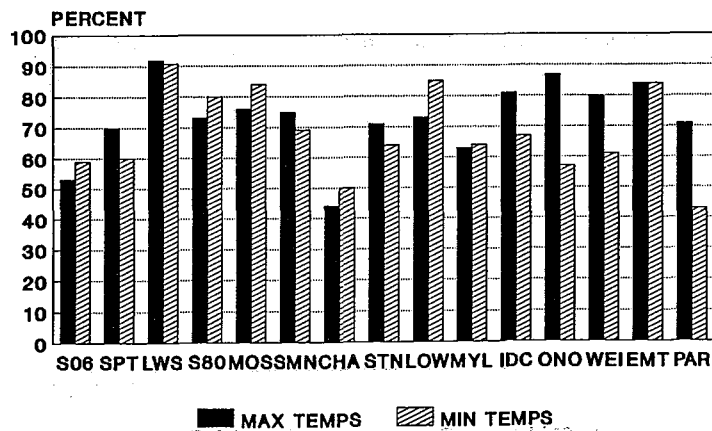
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PCT. FCSTS  $\leq$  5 DEGS F



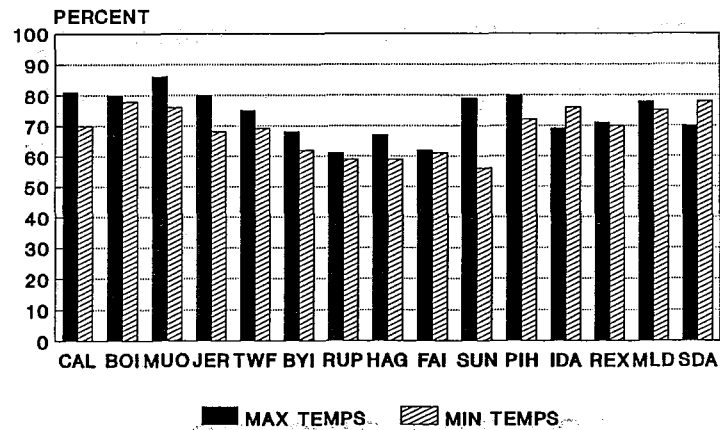
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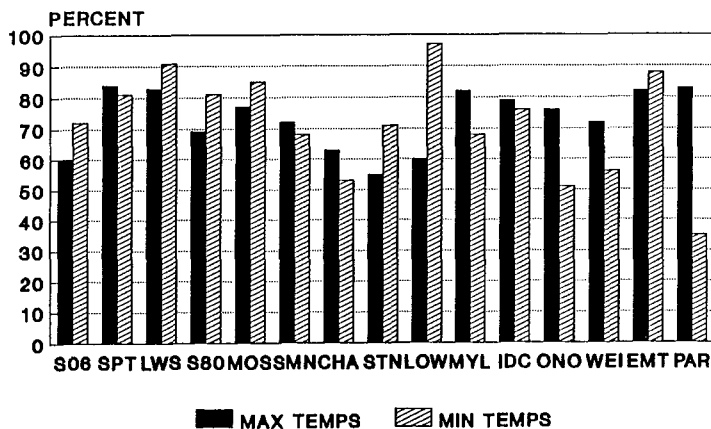
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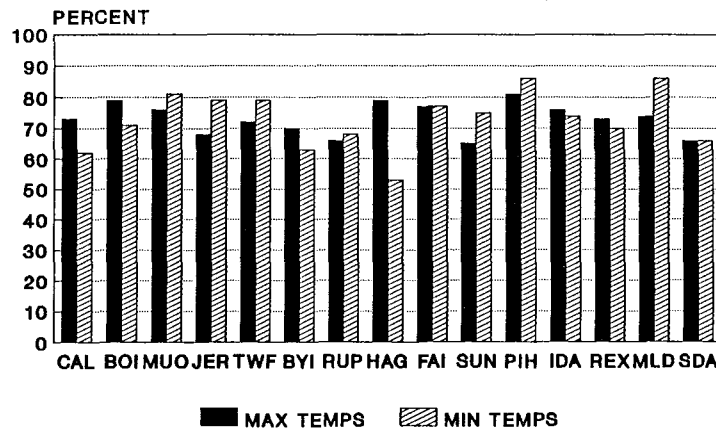
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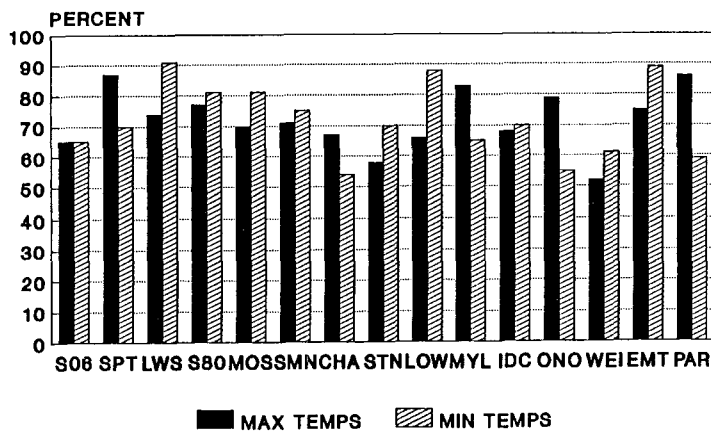
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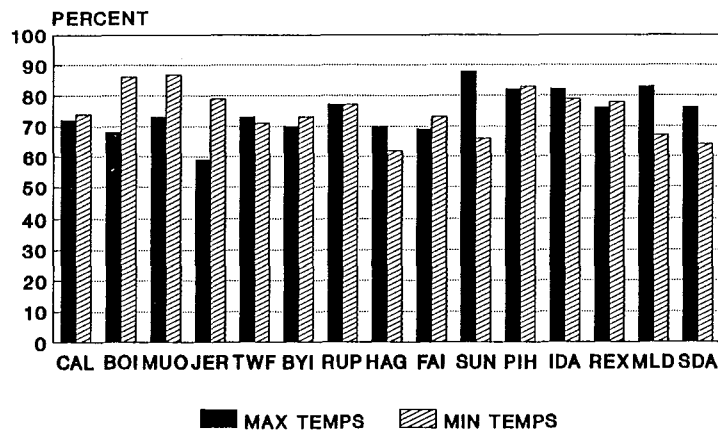
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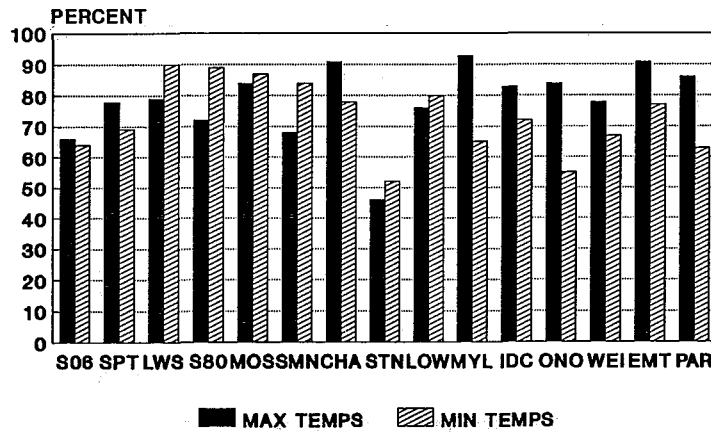
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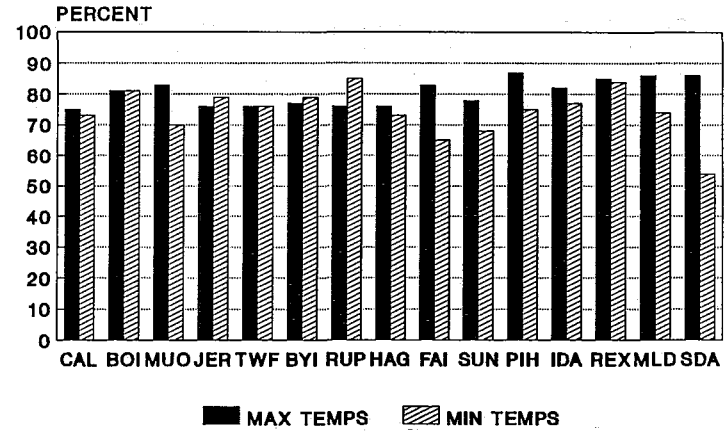
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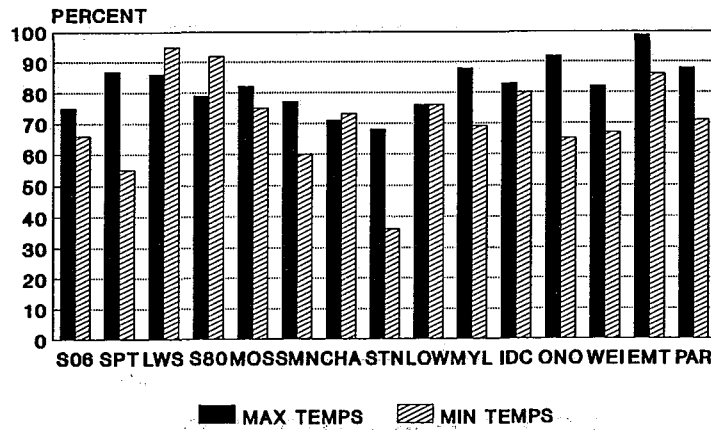
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**PCT. FCSTS ≤ 5 DEGS F**



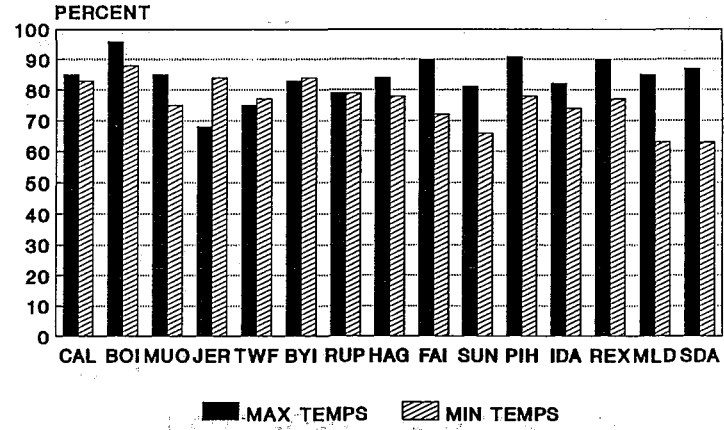
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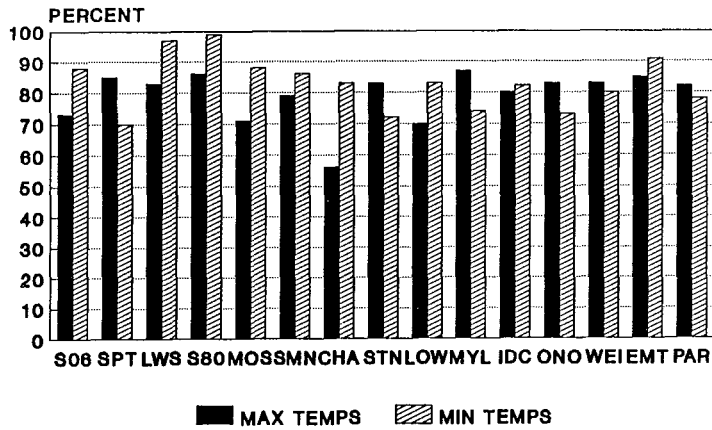
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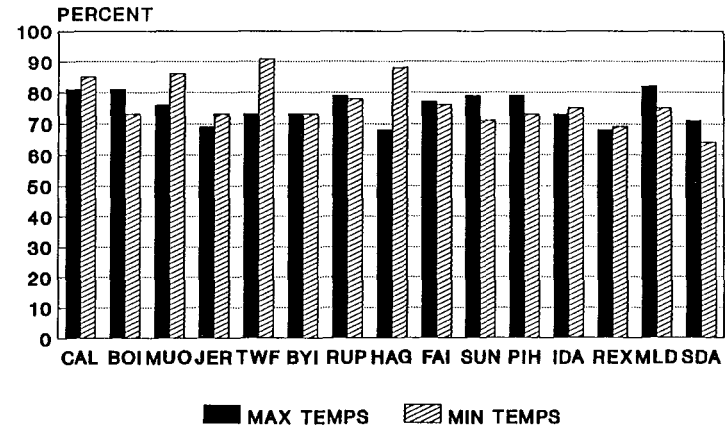
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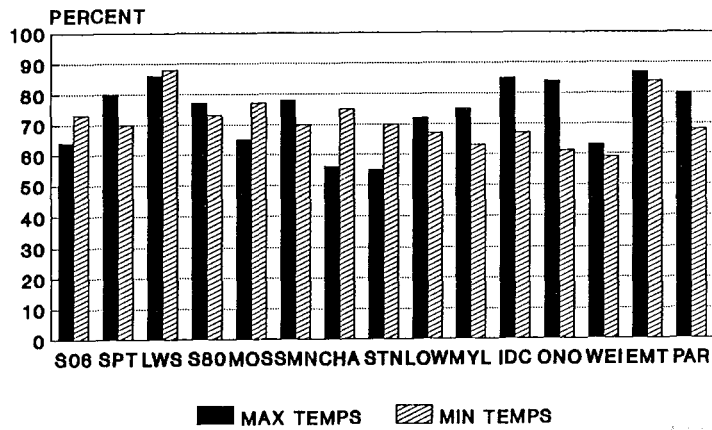
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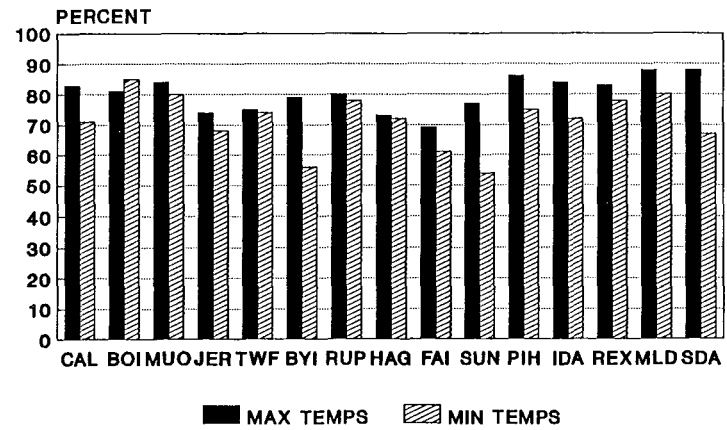
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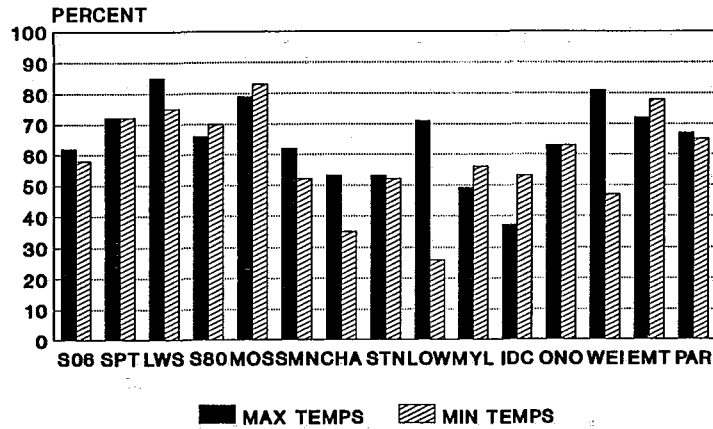
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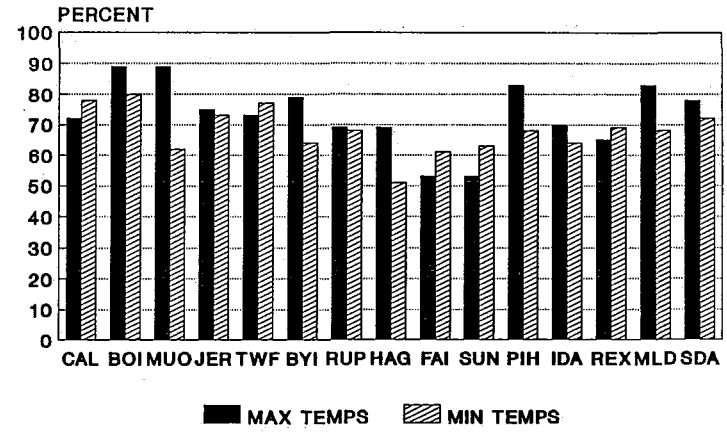
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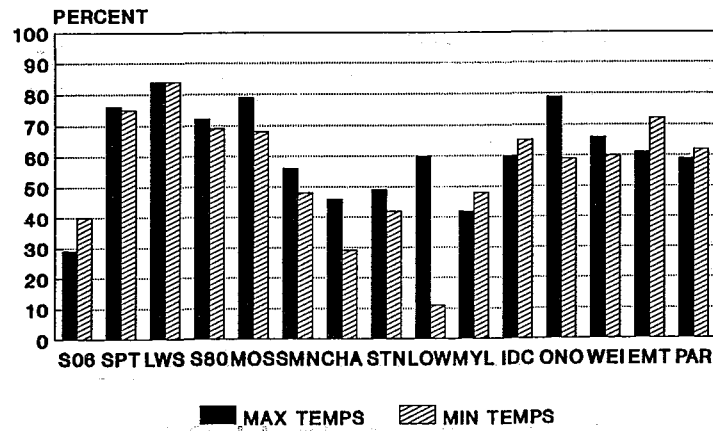
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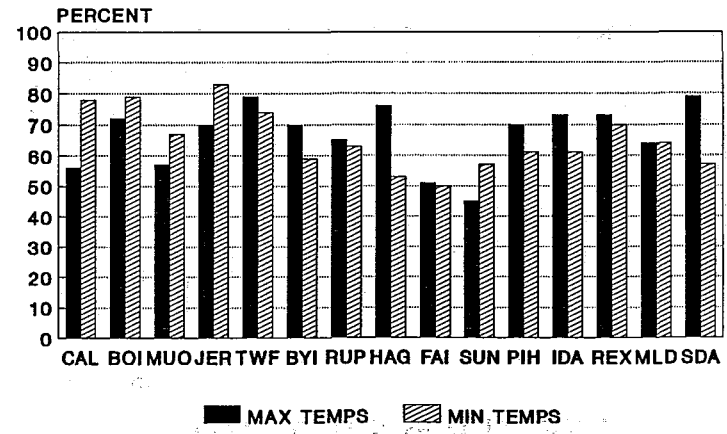
NOVEMBER '87-'89  
PCT. FCSTS ≤ 5 DEGS F



DECEMBER '87-'89  
PCT. FCSTS ≤ 5 DEGS F



DECEMBER '87-'89  
PCT. FCSTS ≤ 5 DEGS F





APPENDIX IV.

List of summer and winter forecast equations.

Legend: c= cloud cover w= wind speed and direction  
 (usually from MOS forecast at the nearest key station)  
 s= sine function for time of year=  $(\sin(A))^2$   
 cs= cosine function for time of year=  $(\cos(A))^2$   
 A=  $((30 \times M) + D + 150)/2/57.3$  ; Jan-Jun D= Day of month  
 A=  $((30 \times M) + D - 210)/2/57.3$  ; Jul-Dec M= Month of year

Maximum temperature equation first; Minimum temperature equation second

$$\text{Mullan} = (\text{GEG} + \text{MSO})/2 - 2 - (2 \times c) + (7 \times s) - (4 \times w)$$

$$\text{Mullan} = (\text{GEG} + \text{MSO})/2 - (3 \times w) + (4 \times c)$$

$$\text{Sandpoint} = \text{GEG} + 1 + (1 \times w) - (3 \times c)$$

$$\text{Sandpoint} = \text{GEG} - 4 - (1 \times w) + (4 \times c)$$

$$\text{Lewiston} = \text{LWS MOS max}$$

$$\text{Lewiston} = \text{LWS MOS min}$$

$$\text{Grangeville} = \text{LWS} - (7 \times cs) - 92.5 \times w$$

$$\text{Grangeville} = \text{LWS} - 10 - (3.5 \times w) + (5 \times c)$$

$$\text{Moscow} = ((\text{LWS} + 3) + (\text{GEG} - (5 \times cs)))/2$$

$$\text{Moscow} = ((\text{LWS} + 4) + (\text{GEG} - 5))/2$$

$$\text{Lowell} = (\text{LWS} - 5) + (3 \times c)$$

$$\text{Lowell} = (\text{LWS} - 3) - (4 \times w) + (2 \times c)$$

$$\text{Salmon} = \text{MSO} + 4$$

$$\text{Salmon} = \text{MSO} + 3$$

$$\text{Stanley} = (\text{PIH} - 9 \times cs) - (5 \times c) - (3 \times w)$$

$$\text{Stanley} = (\text{PIH} - 15) + (8 \times c)$$

$$\text{Mccall} = (\text{BOI} - 10 \times cs) - (1 \times w) - (4 \times c)$$

$$\text{Mccall} = (\text{BOI} - 15) - (5 \times w) + (4 \times c)$$

$$\text{Idaho City} = (\text{BOI} - 4) + (5 \times s)$$

$$\text{Idaho City} = (\text{BOI} - 12) + (5 \times w)$$

$$\text{Challis} = (\text{PIH} - 5) + (6 \times w)$$

$$\text{Challis} = (\text{PIH} + 1) - (5 \times w)$$

$$\text{Ontario} = (\text{BOI} + 4 \times cs) + (2 \times w) - (4 \times c \times cs)$$

$$\text{Ontario} = (\text{BOI} - 2) + (5 \times w) + (4 \times c)$$

$$\text{Weiser} = \text{ONO} - (2 \times cs)$$

$$\text{Weiser} = \text{ONO} - 2 + (.9 \times w)$$

$$\text{Emmett} = \text{BOI} + 2 - (1 \times w)$$

$$\text{Emmett} = \text{BOI} - 2 - (1 \times w)$$

Parma= ONO - (1 x w)  
Parma= ONO - 1 + (1 x w)

Caldwell= BOI + (4 x cs) + (2 x w) - (3 x c x cs)  
Caldwell= (BOI - 2) + (1 x c) + (3 x w)

Boise= BOI MOS max  
Boise= BOI MOS min

Mountain Home= (BOI + 3) - (1 x w)  
Mountain Home= (BOI - 2) - (3 x w)

Burley= BYI MOS max  
Burley= BYI MOS min

Jerome= BYI + (5 x cs) + (2 x w)  
Jerome= BYI + 2 - (7 x c)

Twin Falls= BYI + 2 + (3 x w)  
Twin Falls= BYI + (3 x w)

Rupert= BYI + 2  
Rupert= BYI - 4 - (2 x w)

Hagerman= BYI + 6 + (1 x w) - (3 x c)  
Hagerman= BYI + (6 x w) - (2 x c)

Fairfield= BOI - (8 x cs) + (3 x w)  
Fairfield= ((BOI + PIH)/2) - 11 - (5 x w)

Sun Valley= (BOI - 10 x cs) + (3 x w)  
Sun Valley= (BOI - 12) - (2 x w)

Pocatello= PIH MOS max  
Pocatello= PIH MOS min

Idaho Falls= (PIH - 2) - (3 x s)  
Idaho Falls= (PIH - 3) - (2 x w)

Rexburg= (PIH - 3) - (3 x s)  
Rexburg= (PIH - 4) - (3 x s)

Malad= (PIH + 3 x cs) + (4 x c)  
Malad= (PIH - 2) + (6 x c) + (4 x w)

Soda Springs= MLD - 5  
Soda Springs= MLD - 4 - (4 x w)

Winter Equations -- only those listed that differ from the  
summer equations.

Mullan= ((GEG + MSO)/2) - 2 - (4 x c)

$$\text{Mullan} = ((\text{GEG} + \text{MSO})/2) - 2 + (3 \times w)$$

$$\text{Sandpoint} = (\text{GEG} + 4) - (2 \times c)$$

$$\text{Sandpoint} = (\text{GEG} - 3) + (4 \times c)$$

$$\text{Grangeville} = (\text{LWS} - 9 \times cs) - (3 \times w)$$

$$\text{Grangeville} = (\text{LWS} - 8) - (3.5 \times w) + (5 \times c)$$

$$\text{Lowell} = (\text{LWS} - 3) - (4 \times w) + (2 \times c)$$

$$\text{Lowell} = (\text{LWS} - 5) + (3 \times c)$$

$$\text{Salmon} = \text{MSO} + 5$$

$$\text{Salmon} = \text{MSO} - 1 + (3 \times c)$$

$$\text{Stanley} = (\text{BOI} - 13) + (11 \times c)$$

$$\text{Stanley} = (\text{BOI} - 30) + (27 \times c) - (6 \times c)$$

$$\text{Mccall} = (\text{BOI} - 9) - (6 \times c)$$

$$\text{Mccall} = (\text{BOI} - 17) + (10 \times c) + (3 \times w)$$

$$\text{Idaho City} = (\text{BOI} + (2 \times w) + (2 \times c)$$

$$\text{Idaho City} = \text{BOI} - 14 + (12 \times c) + (1.5 \times w)$$

$$\text{Challis} = \text{PIH} - 3 + (4 \times w)$$

$$\text{Challis} = \text{PIH} + 1 + (5 \times w)$$

$$\text{Ontario} = (\text{BOI} - 3) + (3 \times w)$$

$$\text{Ontario} = (\text{BOI} - 3) + (4 \times w) - (2 \times c)$$

$$\text{Weiser} = \text{ONO} - 2$$

$$\text{Weiser} = \text{ONO} - 1$$

$$\text{Emmett} = (\text{BOI} + 1) - (1 \times w)$$

$$\text{Emmett} = (\text{BOI} - 1) - (1 \times w)$$

$$\text{Parma} = \text{ONO} + 1$$

$$\text{Parma} = \text{ONO} + 1$$

$$\text{Caldwell} = (\text{BOI} - 3) + (3 \times w)$$
$$\text{Caldwell} = (\text{BOI} - 2) + (1 \times w) + (3 \times c)$$

$$\text{Mountain Home} = (\text{BOI} - 1) - (2 \times w)$$
$$\text{Mountain Home} = (\text{BOI} + 2) - (1 \times w)$$

$$\text{Jerome} = \text{BYI} + 3 - (2 \times w)$$
$$\text{Jerome} = \text{BYI} + 2 - (2 \times w)$$

$$\text{Twin Falls} = (\text{BYI} + 3) + (2 \times w)$$
$$\text{Twin Falls} = (\text{BYI} + 1) + (3 \times w)$$

$$\text{Rupert} = \text{BYI} + 3$$
$$\text{Rupert} = \text{BYI} - 1 + (2 \times w)$$

$$\text{Hagerman} = \text{BYI} + 10 + (2 \times w) - (3 \times c)$$
$$\text{Hagerman} = \text{BYI} + 5 + (2 \times w) + (2 \times c)$$

$$\text{Fairfield} = \text{BOI} - 10 + (3 \times w) - (2 \times c)$$
$$\text{Fairfield} = ((\text{BOI} + \text{PIH})/2) - 17 - (5 \times w) + (3 \times c)$$

$$\text{Sun Valley} = (\text{BOI} - 7) + (3 \times w) - (2 \times c)$$
$$\text{Sun Valley} = (\text{BOI} - 15) - (3 \times w) + (3 \times c)$$

$$\text{Idaho Falls} = \text{PIH} - 2$$
$$\text{Idaho Falls} = \text{PIH} - 2 - (2 \times w)$$

$$\text{Rexburg} = \text{PIH} - 3$$
$$\text{Rexburg} = \text{PIH} - 4 + (2 \times w)$$

$$\text{Malad} = \text{PIH} + (4 \times c)$$
$$\text{Malad} = \text{PIH} - 5 + (4 \times c)$$

$$\text{Soda Springs} = (\text{MLD} - 6) + (3 \times c)$$
$$\text{Soda Springs} = (\text{MLD} - 5) + (4 \times w)$$

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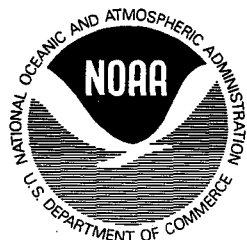
**CONTRACT AND GRANT REPORTS**--Reports prepared by contractors or grantees under NOAA sponsorship.

**ATLAS**--Presentation of analyzed data generally in the form of maps showing distribution of rainfall, chemical and physical conditions of oceans and atmosphere, distribution of fishes and marine mammals, ionospheric conditions, etc.

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**TECHNICAL MEMORANDUMS**--Reports of preliminary, partial, or negative research or technology results, interim instructions, and the like.



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